Report No. 8691-AFR

Analysis Plans for Understanding the Social Dimensions of Adjustment

July 1990

SDA Unit
Africa Region

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Document of the World Bank

Analysis Plans for Understanding the Social Dimensions of Adjustment

The World Bank
Washington, D.C.

This Volume on SDA Analysis Plans has been edited by Marco Ferroni, under the overall guidance of Lionel Demery, Christiaan Grootaert and Michel Noël. Authorship of the Chapters contained in this Volume is as follows: Chapter 1 (Analysis Strategy): Marco Ferroni and Christiaan Grootaert; Chapters 2 and 3 (Macro-Meso Linkages and the Poverty Profile): Lionel Demery; Chapter 4 (Employment and Earnings): Tony Addison; Chapter 5 (Health): Mark Pitt; Chapter 6 (Education): Jere Behrman; Chapter 7 (Food Security and Nutrition): John Hoddinot, Roger Hay and Graham Eele; Chapter 8 (Women and Structural Adjustment): Paul Collier; Chapter 9 (Smallholders): submitted by IFAD under the authorship of Joseph Mullen and Richard Pearce (this Chapter was revised by Lemma Merid); Chapter 10 (The Priority Survey Analysis Plan): Lionel Demery and Christiaan Grootaert. The Technical Appendix on income and expenditure aggregates was written by Andrew McKay and Jeffery Round. Jorge Wong-Valle assisted in preparing the Volume. The draft SDA Analysis Plans have benefitted from comments received during an Inter-Agency Technical Workshop on the SDA Information System which was held at the World Bank in November 1989. The Analysis Plans were further reviewed during an authors' workshop held at Woodstock (UK) in February 1990. The Volume also benefited from comments received from the members of a World Bank review panel, chaired by Steve O'Brien, and composed of Richard Westebbe, Nancy Gillespie, Ravi Kanbur, Martha Ainsworth, Peter Moock, Cornelis Tuinenburg, Subbarao Kalanidhi, Osita Ogbu, and Frederic Louat.

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Executive summary

Overview

The SDA Program, launched jointly by the African Development Bank, UNDP and the World Bank, with the World Bank as Executing Agency, and funded by a number of multilateral and bilateral donors, supports participating African governments (30 to date) in their efforts to assess and monitor the sectoral and group-specific consequences of macroeconomic adjustment. The contributions of the SDA Project include activities toward improved, poverty-conscious macroeconomic and sectoral policy management (policy studies and the organization of fora to facilitate exchange between policy analysts and decision-makers); the strengthening of national statistical systems with a view to generating the household and community-level information required by the above; the design and implementation of project-based poverty alleviation measures ("social action programs"); and technical assistance, training and institution-building in support of the foregoing elements. The agenda of the SDA Program is, therefore, an operational one, including direct field-level interventions and the improvement of the institutional, policy management and knowledge base for poverty reduction.

The objective of the SDA Program to enhance the knowledge base for poverty reduction in Sub-Saharan Africa requires applied policy analysis and the efficient collection of primary data. However, the policy research problem at hand (i.e., the assessment of the employment, distributional and welfare consequences of stabilization and adjustment and the timely development of operational recommendations in priority policy areas) is complex. In a nutshell, the SDA research task is to trace macro-micro relationships in order to understand the processes through which the effects of macroeconomic policy reform (or external shocks) are transmitted to households. This is less than straightforward because of theoretical limitations and data constraints at the household level in Sub-Saharan Africa. Macro- and microeconomics lack theoretical integration, and macro-micro analysis is complicated by the fact that (i) private behavior may offset the intended effects of adjustment policy on prices and the availability of goods; (ii) net market effects may depend on counteracting responses with theory offering little guidance regarding their relative importance; (iii) even if the direction of an effect is predicted clearly by economic theory, the magnitude of the effect is an empirical issue and may be a matter of controversy; and (iv) economic theory is more useful for the comparative statics analysis of different equilibrium states than it is for the study of transition processes and the time lags involved.

Therefore, and in view of the goal of the SDA Program to contribute toward improved, poverty-conscious macroeconomic and sectoral policy management, it is necessary to compile state-of-the-art analytical instruments to deal with the identified difficulties and guide country-based research and economic and sector work on the social dimensions of adjustment and, indeed, of

development. This is the objective of the Volume on SDA Analysis Plans. The Analysis Plans are detailed conceptual and methodological treatises on how to analyze key social dimensions on the basis of cross-section household survey data. They are meant to guide researchers in countries participating in the SDA Program, and they form the basis for training materials to be developed as part of the capacity-building activities undertaken by the Program.

Social dimensions of adjustment can be identified along three broad axes, viz., the *markets* in which the poor trade, the human resource *sectors*, and the livelihood conditions of selected socio-economic *groups* likely to harbor a particularly large fraction of people below the poverty line. In line with this notion of the three axes, the Analysis Plans assembled in this Volume focus on the nature and extent and (to a degree) causation of poverty, labor markets and food markets, human resource effects of structural adjustment in health and education, and the impact of adjustment on women and smallholders. A two-step analytical approach is posited, viz., macro-meso analysis to determine the effects of macro-economic policy reform on the meso-economy (markets and infrastructure), and meso-micro analysis to trace household-level effects and responses to meso changes. An Analysis Plan on the meso-economic effects of structural adjustment is therefore presented at the outset. As part of the SDA analysis package, it serves as an essential input into the other Analysis Plans included in the Volume. The "macro-meso" Chapter seeks to explain how some of the economic variables taken as explanatory variables in the other Chapters of the Volume are themselves influenced by policy interventions.

The data source assumed to be available to apply the Analysis Plans is a multi-topic cross-section household survey, complemented, where needed, by information from a community survey on prices and the availability of social and economic infrastructure. The SDA Program has worked to develop three survey types for use in participating countries, depending on analytical priorities, resources and "absorption" capacity, viz., the *Priority Survey*, designed to identify target groups for social aspects of adjustment programs and establish for such groups key indicators on welfare and basic needs fulfillment; the *Integrated Survey*, designed to collect comprehensive data on expenditures, income, assets and socio-economic characteristics of households and their members; and the *Community Survey*, designed to collect information on the social and economic infrastructure and the functioning of factor and product markets, including prices. The Priority Survey can be used as a monitoring instrument. It is designed for rapid enumeration and processing in order to generate quick results. An Analysis Plan for the SDA Priority Survey is included in this Volume (Chapter Ten).

Analyzing the meso-economic effects of structural adjustment

Adjustment policies can be expected to influence markets and infrastructure through the following major effects: (i) relative price changes as between tradables and nontradables; (ii) price changes within these two broad categories of goods — for example, trade liberalization can be expected to reduce the price of previously protected importables relative to exportables and other importables; (iii) various specific price policies (involving changes in consumer taxes and subsidies) which will further modify the relative price changes induced through the real exchange rate depreciation and trade liberalization; and (iv) changes in public expenditures. Insight into how an adjustment program has affected the main markets and, through public expenditure reform, economic and social infrastructure, cannot be achieved for every specific market or expenditure program — there must be some aggregation. There are strong analytical and empirical grounds for aggregating products according to their tradability in world markets. The Analysis Plan discusses the issues raised in making these aggregations.

The Analysis Plan then explains the process of adjustment (expenditure switching and expenditure reduction) going back to basic macroeconomic identities. Methods of estimating changes in the tradable/nontradable price ratio (the real exchange rate) over time are proposed, including an empirical example from Malawi and Tanzania. Expenditure-reducing effects are analyzed by identifying which of the broad categories of expenditure were subject to cuts (this involves the construction of time series showing the changes in central government public spending by major category). After the exposition of analytical approaches relying on the historical record, the Analysis Plan discusses economy-wide modelling techniques. It suggests a series of features which such models should possess, includ-

ing policy relevance, a minimum degree of disaggregation, a capability of representing macro-policy instruments and a capability of treating product and factor prices as endogenous.

The poverty profile

One of the first questions addressed in this Analysis Plan is the concept of poverty that is to be used. Recent work on poverty has tended to adopt relative poverty concepts, partly because this avoids the need to define some absolute poverty line. The Analysis Plan suggests that in cases where a poverty line is known and is accepted and used by policy makers, this should be applied to measures of poverty. However, should no such threshold be in common use, analyses based on relative poverty should be undertaken.

A review is made of alternative indicators of household and individual welfare which would form the basis of the analysis of poverty. Both economic theory and practical considerations suggest that total household expenditures per capita (or per adult-equivalent) should be taken as the basic welfare indicator in the poverty profile, though the Analysis Plan does list a number of alternative measures.

To reflect the intensity and incidence of poverty, as well as the degree of inequality among the poor, the Chapter recommends the adoption of the P Alpha class of indices. These indices are sub-group decomposable, which makes them particularly useful in assessing how the structural changes associated with adjustment are likely to affect poverty. Indeed, the Plan recommends that overall poverty be decomposed by socio-economic group. If these groups are well chosen, they should reflect the different ways in which adjustment affects various groups of society. By identifying which groups are most prone to poverty, some assessment can be made of how the sectoral shifts arising from adjustment interventions are likely to affect the distribution of poverty in the country concerned.

Employment and earnings effects

Increasing employment and earnings is crucial in Sub-Saharan Africa if the depth of poverty in the Region is to be reduced. Achieving this objective is daunting given a labor force growth of 2.7% per year, the highest of any developing region. Growth through increasing efficiency in the use of existing resources, and productivity improvements through higher investments are therefore essential if both employment and earnings are to rise together. This Analysis Plan reviews a number of different elements and suggested approaches for tracing how employment and earnings change over time as a result of the policy effects of adjustment.

The Chapter begins by outlining the impact of adjustment on employment and earnings through product-, labor- and capital-market effects. It then suggests basic cross-tabulations which should be developed for previously determined categories of socio-economic groups. For employment, basic data would include information on labor force participation, employment characteristics of wage earners, the self-employed, the formal/informal sector, and unemployment and underemployment. For earnings, basic data would include the distribution of earnings, sources of income, the nature of non-farm household enterprise income, characteristics of households receiving minimum wage income and indices of real earnings.

The Chapter then outlines methods of multivariate analysis to determine wage earnings, including earnings functions and associated estimation problems, as well as methods to correct for selectivity bias. Methods to analyze wage differentials by gender, formal/informal, public/private and traded/nontraded activities are proposed. Finally, the specification and estimation of profit functions to assess the determinants of the earnings of non-farm household enterprises are discussed.

Analyzing human resource effects: Health

Structural adjustment may influence people's health status by affecting expenditures on health-related services and market goods, by changing the cost of these services and by reducing real incomes due to changes in wage earnings and farm profits. But health is multi-dimensional and difficult to measure. It is suggested in the Analysis Plan that anthropometric measures are useful indicators of health, but drawing conclusions regarding health on the basis of nutrient intake is considered to be fraught with ambiguities. (Nutrients are important inputs in the production of health, but unsatisfactory indicators of health status). The Analysis Plan focuses on reduced-form demand equations for health, using prices of food and measures of accessibility of

public health programs, household assets and wages and household "public" goods (sources of drinking water, sanitary facilities, etc.) as independent variables. The policy discussion developed in the plan is in terms of food prices and "programs," i.e., health facilities, fertility control programs and household "public" goods.

Analyzing human resource effects: Education

The output of the education system in a country is the result of supply and demand factors. The supply side consists of the schools and institutions, as well as the teaching body and materials. Structural adjustment may imply budget cuts for the public education system, increases in user charges for education, changes in pricing policies for school materials and increased rationing of access to public schools. On the demand side, adjustment policies will affect household incomes as well as prices, which will have an impact on the amount of education services demanded.

Analytically, the income effect is to be distinguished from the price effect. The former operates through changes in income which directly affect the demand for education. The price effect works through making schools directly more expensive (user fees) and/or through changes in the opportunity cost of attending school. The Analysis Plan focuses on the determinants of the demand for schooling. Three policy issues are distinguished: (i) How much will the ability of households to send their children to school be affected by a reduction in their income? (ii) What is the impact from the price effect (i.e., the introduction of, or increase in, user charges)? (iii) What is the long-term impact of adjustment on the demand for education? If adjustment truly generates growth, there should be an increase in the demand for education due to an increase in the expected returns to education.

In the Analysis Plan reduced-form demand relations are developed for each of the variables determined by the household, including the time uses of all household members and including among those time uses the time spent investing in education. The measurement of appropriate dependent variables (observed in the SDA Integrated Survey) is discussed (this includes, inter alia, admission to, or enrollment in, a given type of school) and the observed predetermined variables (from the point of view of the household) are identified. They include assets and household characteristics, prices and infrastructure. The basic research strategy proposed is in four steps, viz., (i) preparation of data from the household survey and other relevant sources discussed in the Chapter; (ii) estimation of reduced-form relations of the type just described, for all of the relevant outcomes; (iii) estimation of the changes in the right hand side meso-price and infrastructure variables that are due to the adjustment policy for a given duration of that policy by relating the changes in the variables used to estimate the alternative versions of the basic reduced-form equation to the estimates of the changes in the meso-setting; and (iv) use of a different form to estimate the impact of adjustment policy on various outcomes related to the determination of education.

Household food security and nutrition

This Analysis Plan has the objective of demonstrating how policy changes introduced during adjustment affect food security at the household and individual levels and of showing how these effects can be estimated on the basis of a multi-topic household survey. There are at least four specific uses for policy makers from an analysis of this type, viz., (i) the assessment of the impact of past policy changes on food security; (ii) monitoring of the impact of policy reform on food security; (iii) the prediction of the impact of policy reform on the food security of different groups of households; and (iv) the assessment of the costs and benefits of policy revision or of additional policies that might be introduced to improve food security. These include policies that may ameliorate the transitory effects of the adjustment process on particular population groups.

The Analysis Plan reviews and proposes methods to estimate income-food expenditure and price-food expenditure elasticities and to use the results of this analysis to identify food-insecure households. Careful attention is paid to the definition and measurement of variables on both sides of relevant demand equations. It then discusses applications of this analysis in the design of programs to enhance or preserve household food security during adjustment. These include: (i) indirect income transfers in the form of general or commodity-specific food subsidies; (ii) use of public employment schemes; and (iii) use of targeted direct income transfers in the form of food

aid, cash, food stamps or ration cards entitling the holder to free or subsidized food. The Analysis Plan then moves on to review methods to assess individual-level nutritional status on the basis of anthropometric measurements. Z-score calculations and multivariate methods are presented.

The impact of adjustment on women

There are two broad issues that need to be addressed under this general title. First, there are questions concerning how gender-related constraints may serve to frustrate the objectives of an adjustment program, because they adversely affect labor mobility and flexibility in moving toward tradable activities. If women traditionally cannot engage in tradable activities, an expansion of tradable output will be far more constrained than it would be if such gender constraints did not apply. Second, does adjustment enhance or undermine the role, status and welfare of women? Do the changes induced by adjustment, especially the changes in the structure of incentives, lead to a breaking down of gender-related constants?

At the micro-level, economic decision-making is gender-specific because of four gender-differentiated processes. First, women may encounter discrimination outside the household. While in developed countries discrimination often takes the form of lower wage rates, in Africa it seems that in the labor market it more commonly takes the form of differential access to wage employment. Perhaps of greater importance is differential access to credit, because women generally do not own marketable land rights and, as subordinates in the household, cannot establish independent reputations for creditworthiness. Second, imitation, or copying, is an important way in which new economic ideas are disseminated. There is some tendency for men and women to have different role models, men copying other men and women copying other women. An implication is that, if some new economic opportunity is initially taken up by men, it may automatically be diffused over the male population but have a slower diffusion among females. Third, within the household there are asymmetric rights and obligations. Women are obliged to grow food for subsistence, to gather fuel and water, to cook and to rear children. In return, men meet certain cash needs. This pattern of reciprocal obligations is often unequal, women working considerably longer hours than men. This gives rise to a classic principal-agent problem: the woman has little incentive to work well. Finally, women bear the burden of reproduction. Because there is a phase during mid-life in which women's time is pre-committed, certain activities are precluded. The physical demands of child bearing and rearing strain health; studies show that female health deteriorates relative to male health in this period.

These processes jointly give rise to gender-differentiated economic outcomes. This is manifested by two symptoms. First, resources controlled by women (of which labor is the most important) tend to be allocated among economic activities in a radically different manner from male-controlled resources. Women's labor tends to be concentrated in activities whose output is internationally nontradable and which provide relatively low incomes. This suggests that women may be more constrained than men in gaining access to higher return activities. Second, differential constraints upon access can be observed by analyzing the process of the transition of resources between sectors. Structural adjustment is centrally about the re-allocation of resources between activities which should expand during adjustment, then this is likely to constitute a significant policy problem. The Chapter suggests lines of data analysis (such as Logit or Tobit) which are appropriate for multivariate analyses where the dependent variable is discrete.

The major gender-related task in the analysis of survey data is to identify the extent to which policy changes can assist women in overcoming differential constraints. Typically, access to credit markets, education, agricultural information and land is biased against women. There is therefore a case for an offsetting bias in the competing provision of public services. Yet, currently it is common for some public services to be biased in the same direction as private provision. The Chapter suggests how survey data can be used to identify the gender-specific effects of some important public policies.

Smallholders and structural adjustment

In most economies of Sub-Saharan Africa the overwhelming majority of agricultural producers, and indeed the vast majority of the total population, can be classified as smallholders. At the same time, the low or declining levels of agricultural productivity in the region are, to a large

extent, a reflection of the economic and physical constraints imposed on smallholder agriculture. This environment is characterized by very limited access to the resources necessary to raise productivity and by inadequately developed transportation and marketing infrastructure. Smallholders frequently operate at close to the margin of survival and under uncertain climatic and market conditions. Their decision-making, therefore, is distinguished by a conservatism indicative of risk aversion, which may circumscribe their ability to respond to new opportunities.

The smallholder Analysis Plan begins with an overview discussion of the way in which structural adjustment is expected to affect smallholders through expected changes in markets for products and labor. An uncertainty is expressed regarding the short-run effect of adjustment on rural wages relative to both the cost of laborers' consumption basket and the price of agricultural (tradable) output. A classification of smallholder households (including informal sector non-agricultural households in rural areas) is proposed, starting with a definition of smallholders in terms of the ratio of the amount of labor hired to total labor used in the household agricultural production process (the ratio must not exceed one for households to be classified as smallholders). Classification criteria are the relative importance of wage to total income, the choice of crops and livestock activities (tradable/nontradable and, in the case of the former, food crops for import-substitution versus export crops) and locational criteria. Five classes of agricultural households are proposed on this basis, viz., export-oriented producers, food-crop-oriented producers, wage laborers, subsistence farmers (i.e., families deriving a particularly low proportion of their income from wage activities and/or the sale of produce) and informal sector rural workers.

The Analysis Plan then discusses methods for the classification of agricultural commodities according to their degree of tradability, and it reviews approaches to the calculation of rural terms of trade and coefficients of net protection of agricultural output. The familiar agricultural household model is then introduced as the suggested analytical device to study the simultaneous determination of various production and consumption choices, including the optimization of the combination of off-farm and on-farm employment.

An analysis plan for the SDA priority survey

The concerns addressed in the previous plans require in many cases in-depth analysis of the data which the integrated survey is designed to provide, in many instances jointly with data from the community survey. It goes without saying that a certain amount of time will be involved to complete these analyses. This is warranted in view of the fact that many of the issues addressed have a medium to long time horizon. They will serve to put in place policies over the next three to five years and beyond. In many cases, they provide an input in development strategy as such.

The priority survey addresses the other side of the time spectrum, the immediate decisions that need to be made. The policy focus thus shifts from structural elements to symptoms and indicators of immediate need. For example, while development and long-term policies may be expected to solve the malnutrition problem, in the meantime starving children must be fed if they ever are to be the beneficiaries of these longer term measures. The priority survey therefore has a strong focus on poverty and basic needs because these are the key areas for immediate attention. Since the construction of income and expenditure measures cannot be undertaken through this instrument, the main challenge is the design of suitable proxy measures. Analytically the task is to use these measures to identify target groups.

The policy focus of the analysis is thus not so much the modification of employment, education or health policy, but rather to identify those groups in society which are particularly disadvantaged in any one of the dimensions that constitute the standard of living and to document the extent of the disadvantage. The analysis will thus not necessarily provide indications about the type of needed interventions to solve the problem in the long term. This indeed is the role of the sector-specific Analysis Plans. Here the aim is to set priorities based on observations of the extent of a problem in different socio-economic groups. For example, if in certain groups malnutrition is severe, this provides information on the direction of food aid. The actual provision of that aid will require solid knowledge of the country and of what type of interventions are feasible in the short run in the country.

Introduction and overview

The SDA Program, launched jointly by the African Development Bank, UNDP and the World Bank, with the World Bank as Executing Agency, and funded by a number of multilateral and bilateral donors, supports participating African governments (30 to date) in their efforts to assess and monitor the sectoral and group-specific consequences of macroeconomic adjustment. The contributions of the SDA Project include activities toward improved, poverty-conscious macroeconomic and sectoral policy management (policy studies and the organization of fora to facilitate exchange between policy analysts and decision-makers); the strengthening of national statistical systems with a view to generating the household and community-level information required by the above; the design and implementation of project-based poverty alleviation measures ("social action programs"); and technical assistance, training and institution-building in support of the foregoing elements. The agenda of the SDA Program is, therefore, an operational one, including direct field-level interventions and the improvement of the institutional, policy management and knowledge base for poverty reduction.

This Volume is concerned with the policy analysis strategy of the SDA Program. The objective of enhancing the knowledge base for poverty reduction requires research and the efficient collection of primary data. However, the policy research problem at hand (i.e., the assessment of the employment, distributional and welfare consequences of stabilization and adjustment and the timely development of operational recommendations in priority policy areas) is arguably complex. In a nutshell, the SDA research task is to trace macro-micro relationships in order to understand the processes through which the effects of macroeconomic policy reform (or external shocks) are transmitted to households. This is less than straightforward because of theoretical limitations and data constraints at the household level in Sub-Saharan Africa. Macro- and microeconomics lack theoretical integration, and macro-micro analysis is complicated by the fact that — as argued in this Volume — (i) private behavior may offset the intended effects of adjustment policy on prices and the availability of goods; (ii) net market effects may depend on counteracting responses with theory offering little guidance regarding their relative importance; (iii) even if the direction of an effect is predicted clearly by economic theory, the magnitude of the effect still is an empirical issue and may be a matter of controversy; and (iv) economic theory is more useful for the comparative statics analysis of different equilibrium states than it is for the study of transition processes and the time lags involved.

Therefore, and in view of the objectives of the SDA Program mentioned above, it is necessary to compile state-of-the-art analytical instruments to deal with the identified difficulties and guide country-based research and economic and sector work on the social dimensions of adjustment and, indeed, of development. This is the objective of the present Volume on SDA Analysis Plans.

The Analysis Plans are detailed conceptual and methodological treatises on how to analyze key social dimensions on the basis of cross-section household survey data. The social dimensions addressed in this Volume include the nature and extent and (to a degree) causation of poverty, the impact of adjustment on women and smallholders, employment and earnings effects and human resource achievements in the areas of health, education, and food security and nutrition. The analysis strategy of the SDA Program posits a two-step approach, viz., macro-meso analysis to determine the effects of macroeconomic policy reform on the meso-economy (markets and infrastructure), and meso-micro analysis to trace household-level effects and responses to meso changes. The aim of the Analysis Plans is to provide guidance to researchers studying the social dimensions of adjustment. The Analysis Plans are important elements in the set of analytical tools developed by the SDA Program for the purpose of assessing the distributional and welfare consequences of adjustment. These tools also include survey methods, and an Analysis Plan for the SDA Priority Survey (a large-sample monitoring instrument) is included in the collection in this Volume.

Social dimensions analysis cannot be carried out in Sub-Saharan Africa without primary data collection at the household level. There exists considerable experience with household budget surveys in developing countries. Fieldwork for these surveys is normally spread over a one-year period and the analysis can be time-consuming, even though there has been great progress in the past 10 years in data processing technology. The SDA Program has developed an integrated household survey questionnaire designed to permit extensive multivariate analysis. In the process of this work, however, it became clear that (because policy action cannot await the results of extensive surveying and analysis) a leaner, much more rapid and yet systematic survey instrument was also needed. The SDA Priority Survey is the result of innovative methodological work to balance the sample size implications of the need to obtain statistically representative estimates from heterogenous populations, the need for short interview times and the requirement of speed in processing and tabulation. It is estimated that the Priority Survey, which concentrates largely on outcome variables, can be implemented and analyzed in a matter of three to four months. Its properties and its relation to the comprehensive, multi-topic household survey (the data base for the Analysis Plans in Chapters Three to Nine in this Volume) are explained in Chapter One.

This Volume consists of ten chapters and a Technical Appendix and is structured as follows: In Chapter One, an analysis strategy for the social dimensions of adjustment is outlined, focusing in particular on methods for macro-micro analysis and implied data needs, and identifying key social dimensions and associated policy issues. Chapter Two, on macro-meso linkages, shows how to analyze the meso-economic effects of structural adjustment, i.e., the effects on prices in product and factor markets and the effects on economic and social infrastructure working through changes in public expenditure. In Chapter Three, a detailed approach to the construction of poverty profiles is presented. The identification of the poor and their classification in terms of income, expenditure and basic needs characteristics is the logical first step in applied social dimensions analysis. It is shown that social dimensions can be identified along three axes, viz., markets, sectors and target groups. A key market determining income is the labor market, and employment and earnings effects of structural adjustment and the functioning of labor markets are analyzed in Chapter Four. In Chapters Five, Six and Seven sector effects in the area of basic needs are analyzed, focusing on health, education, and food security and nutrition. In Chapter Eight, the impact of adjustment on a major target group, women, is analyzed. Chapter Nine is devoted to an analysis of smallholders under adjustment. Chapter Eight, on women, and Chapter Nine, on smallholders, overlap in part. In Chapter Ten, finally, the analytical possibilities of the SDA Priority Survey are set out. In the Technical Appendix, concepts and techniques to calculate income and expenditure aggregates from the SDA Integrated Survey (see Chapter One) are presented. Making these techniques (and conventions) explicit is of overriding importance in the effort to develop consistent data sets for use by successive, independent groups of researchers.

1

An analysis strategy for the social dimensions of adjustment

1.01 In setting out an analysis strategy for the social dimensions of adjustment it is necessary to explain how macroeconomic policy reform is linked to microeconomic outcomes and welfare consequences (paragraphs 1.02 through 1.11), to identify the key social dimensions to be addressed (paragraphs 1.12 through 1.16) and to identify the data requirements and specify an approach to the collection of primary data (paragraphs 1.17 through 1.24). Key policy concerns associated with each of the social dimensions analyzed in this Volume and an analysis strategy statement are the subject of paragraphs 1.25 through 1.54.

Adjustment and distribution: Considerations toward an analytical approach

1.02 Structural adjustment seeks to restore internal and external balance and thereby create a new basis for sustainable economic growth with equity. Adjustment programs consist of measures of price policy, broadly defined, which are often accompanied by institutional changes to improve the functioning of markets and the efficiency of the public sector. It is useful to view the price policy dimensions of structural adjustment as the opening of the national economy by means of the depreciation of the real exchange rate and hence the improvement of the price of tradables relative to the price of nontradables. The devaluation of the real exchange rate leads to changes in the distribution of incentives and income and can, therefore, introduce effective "structural" change in the economy, provided that markets work sufficiently well to permit the intended reallocation of productive resources from nontradables to tradables. If successful, adjustment will lead to renewed growth on the basis of domestic rather than largely imported resources, although the structural import dependency of African economies may hamper this process. External imbalances will be corrected under successful adjustment due to the revival of production for export and efficient import substitution. Adjustment is expected to increase equity by inducing a rise in the share of labor in the overall factor combination in accordance with the comparative advantage of the African economies under study.

1.03 The real exchange rate is influenced, broadly, by policy measures affecting the nominal exchange rate, monetary and fiscal balances and the regime of trade protection (Net capital inflows are a further determinant of the real exchange rate.) Inherent in these policies are elements of both demand reduction and expenditure switching. Whereas monetary and fiscal contraction can be recessionary (but beneficial from the point of view of inflation control), the restructuring of taxation and public expenditures under adjustment can and must be designed to support growth through more effective, less discriminatory taxation, a higher-yielding public investment portfolio, human capital formation and adequate infrastructural and institutional support to the tradable sector. Similarly, trade liberalization (i.e., more neutral pricing and greater "openness") is likely to contribute to

transitory unemployment in some sectors, but is expected, in time, to enhance production and income possibilities in the tradable sector which, typically, is "home" to the majority of the population in Africa, assuming, as seems correct, that the tradable sector covers much of agriculture as well as import-substituting informal sector activities. (Criteria for the classification of goods and services into tradables and nontradables are offered in Chapter Two.)

1.04 While prompted by financial imbalances, adjustment thus brings about changes in the real economy. In the standard "dependent-economy" model of adjustment it is assumed that real devaluation is possible and will have an expansionary effect. There is, indeed, positive evidence regarding the possibility of achieving real devaluation under African conditions (World Bank/UNDP, 1989), but the issue requires constant monitoring in view of the possibility that in situations characterized by serious balance of payments difficulties devaluation may work at best as "a tool that validates past monetary expansion" (Katseli, 1983: 360).

1.05 From a social dimensions point of view two sets of research questions arise from the above characterization of the adjustment process. First is a set of questions dealing with the distributional effects of the relative price changes triggered by real exchange devaluation. In particular, how does adjustment affect production, employment and consumption possibilities of the poor? (Consumers of nontradables and producers of tradables are expected to be affected favorably relative to consumers of tradables and producers of nontradables.) How do changes in the identified policy determinants of the real exchange rate affect specified socio-economic groups? And what are the time paths along which these policy changes act, noting that demand reduction measures tend to be effective in the short-run, whereas restructuring policies may be slow in taking effect.

1.06 A second, more action-oriented set of research questions is as follows: Are there alternative sequences and combinations of macroeconomic and market-level policies that entail smaller welfare losses on the part of the poor without jeopardizing the objective of restoring macroeconomic balance? What meso- and micro-level policies and programs are needed to enable producers and consumers to take advantage of the opportunities offered by changed relative prices? What are appropriate interim or short-run measures to address the social cost of adjustment by raising factor mobility, creating employment and improving food security and access to basic services? This question is closely tied to that of raising the poverty focus of public expenditures in the context of fiscal reform, by ensuring adequate funding and effective program delivery in areas of vital concern to the poor, viz., primary social services, food-linked transfer payments and decentralized economic infrastructure and services. The Analysis Plans on basic needs achievements in this Volume provide detailed discussions of these policy issues.

1.07 In the attempt to shed light on these policy issues, the SDA research task requires the tracing of macro-micro relationships in order to understand the processes through which the effects of macroeconomic policy reform are transmitted to households. This is because welfare is a matter of households and individuals, i.e., it is a micro concern. However, tracing macro-micro relationships is less than straightforward because of the well-known lack of functional, theoretical integration between macro- and microeconomics. "Microeconomics focuses on the decision-making behavior of individual units, in a partial equilibrium, ceteris paribus world. ... Macroeconomics, on the other hand, focuses on aggregate economic constructs and takes feedbacks into account, but is unable to relate the overall changes with which it deals to what is happening to individual units. The 'aggregation problem' is usually swept under the rug by assuming that aggregate change reflects microbehavior, without considering the role of compositional or structural change" (Ruggles and Ruggles, 1986: 245). A key challenge for SDA research clearly concerns the establishment of links between "overall changes" and "individual units." The feasibility of obtaining sufficiently robust answers, for policy and program purposes, to the question of how adjustment policies affect poor and vulnerable groups, therefore, is a major issue in SDA policy analysis. A two-stage methodology is proposed, i.e., macro-meso analysis to uncover the effects of policy on factor and product markets and economic and social infrastructure (the meso economy); and meso-micro analysis to illuminate the consequences for household welfare.

1.08 The interactions between the two analysis stages (macro-meso and meso-micro) are discussed and formalized in Chapter Two. Meso-micro analysis is the study of income-generation processes, expenditures and welfare indicators

(for example, nutritional status indicators, educational achievements) as a function of prices in the markets with which the household interacts, household assets and characteristics and relevant infrastructure available to the household. Standard utility maximization theory provides the framework for this analysis. The most pragmatic way is not to estimate outcomes from the data in a structural form but through reduced-form demand equations for relevant household choices. (The reduced-form demand equation for health is formally derived in Chapter Five.) Key areas of "choice" from the point of view of social dimensions are those related to the satisfaction of basic needs (housing, food security, primary health care and primary education). Reduced-form equations can then be used to simulate what would be the impact of various elements of macroeconomic policy change on relevant household outcomes (see the four-step research strategy in Chapter Six). Adjustment changes the price and (through changes in public expenditures) infrastructure variables in the reduced-form. This, then, will lead to changes in the outcome (or dependent) variables of interest.

1.09 The Analysis Plans presented in this Volume (except Chapter Two) concentrate on meso-micro linkages. Both descriptive analysis (cross-tabulations) and regression technique arising from household model structures (unspecified in most Chapters) are presented. In this approach, relative prices and infrastructural factors are treated as exogenous variables. Macro-meso analysis, in turn, is about how the price and infrastructure changes occur. This, and problems encountered in the measurement of product price changes and changes in real wages, credit markets and public expenditures is discussed at some length in Chapter Two (paragraphs 2.36 through 2.67). If data on price and infrastructure changes exist or can be constructed for a specified time period, the resulting changes in dependent variables (or outcomes) can be estimated in the reduced-form framework, as explained in Chapter Two. In this approach, however, the determination of household income is not linked to macro policy change and prices are still exogenous. To overcome these analytical constraints it is necessary to build a general equilibrium model of the economy, and this, again, is discussed in Chapter Two.

1.10 It is suggested in Chapter Two that infrastructure, like prices, plays a role as a conduit to pass on adjustment-related signals to investors, producers and consumers. Resource constraints on maintenance spending may hamper this process, but this depends in good measure on the pattern of aggregate demand reduction chosen by the government and associated resource implications for infrastructure considered essential to obtain a supply response and provide essential services. This kind of infrastructure spending, as well as subsidies to the consumption by the poor (where the poor are effectively reached) should not be cut in the context of fiscal reform. Instead, cuts might focus on non-performing development projects, defense and consumption by the rich. While these choices are inevitably political, there are analytical issues in terms of macro-meso-micro analysis which must be investigated. What are the implications for growth, participation of the poor in economic recovery and basic needs satisfaction of alternative patterns of aggregate demand reduction?

1.11 A further theme of macro-meso analysis is that of the best combination of macro policy instruments (notably exchange rate and fiscal and monetary policy) from a poverty reduction point of view. While individual lines of expenditure may have to increase to achieve goals of recovery and redistribution, total expenditure may need to be cut in the early phase of adjustment (stabilization). For given levels of external finance, the extent of fiscal retrenchment and the length of the period of austerity depend on the speed at which growth resumes. This, in turn, may be influenced by alternative rates and sequences of exchange rate adjustment, money expansion and deficit reduction. For example, whether a contraction in money supply leads to output reduction is likely to be influenced by the rate of devaluation. Similarly, if expenditure cuts in key areas for growth lead to a decreases in output, the macroeconomic constraints will tighten because of a reduction in tax revenue and/or the country's creditworthiness and ability to borrow. The challenge is to find the combination of expenditure cuts, revenue growth and monetary and exchange rate policy which decreases the deficit with the least adverse effect on supply. Thus, alternative macro strategies have different implications for growth and redistribution, and these can be traced, in principle, by means of economy-wide models.

Identifying the key social dimensions

1.12 Having introduced our two-step analytical approach, it is now necessary to propose a

way of organizing the multidimensionality of poverty and the social dimensions. Social dimensions are appropriately defined along three axes, viz., markets, sectors and target groups. The key markets in which the poor trade and whose prices determine real incomes are labor markets, credit markets and the markets for goods and services produced and consumed by the poor. Among the latter, food markets are of particular importance, given the role of food as a major wage good and input in the production of health and nutritional well-being. Food markets and household demand for food are analyzed in Chapter Seven below. (From the producer's point of view food markets are analyzed in the Analysis Plan on smallholders, Chapter Nine). On the income side, labor markets and employment are the primary area of study. The Analysis Plan on employment and earnings (Chapter Four) explains the mechanisms through which households generate income. Employment is not constrained to wage employment, but includes the generation of household enterprise income as well. Plans similar to the employment and earnings plan could be designed pertaining to the credit market and selected product markets. These would definitely be options to be considered for specific countries.

1.13 Along the sectoral axis, social dimensions research is particularly concerned with human resources, i.e., education, health and food security and nutrition. Health and nutrition are directly related to the survival of individuals, while education is the main element of capital acquisition that holds a promise for the future escape out of poverty. Each of these sectors represents crucial welfare-related outcome variables at the household and individual levels. Each sector also is associated with important infrastructure determinants at the meso level (for example, school and health facilities).

1.14 Finally, social dimensions policy research must be target group-oriented. The identification of specific target groups of interest will be much more a country-specific matter than the identification of sectors. Nevertheless, it is felt that there are at least three broadly defined target groups which must be considered in any analysis of the impact of adjustment, namely, the (pre-adjustment and post-adjustment) poor in general, women and smallholders. The reason for the selection of the poor (identified through the poverty profile) is self-evident. (For policy purposes, this target group needs to be disaggregated — the task of the poverty profile.) The selection of smallholders follows from the fact that in African countries the majority of the population is rural, and agriculture is the dominant sector in the generation of the countries' national product. The bulk of agricultural activities takes place on small farms. The Smallholder Analysis Plan, while focusing on a target group, is also parallel with the employment plan in that it focuses on the income-generation mechanisms of this particular group. The employment plan focuses on urban areas and the smallholder plan on rural areas.

1.15 The selection of women as a target group follows from the fact that in generating income men and women do not face the same constraints in taking advantage of income and employment opportunities. Their control over resources and their ability to spend income on consumption differs. Similarly, their demands for social services (i.e., the sectoral demands) are typically quite different. The corresponding Analysis Plan is not meant to suggest independent analysis for the case of women, but rather to demonstrate the importance of providing a gender breakdown in social dimensions analysis and to illustrate how this can be done in important areas such as women's participation in the labor market and education. This Analysis Plan makes the general point that households cannot be the final level of analysis in looking at the social dimensions of adjustment, but that at least the gender distinction needs to be made at the individual level.

1.16 A complete body of social dimensions analysis would cover all relevant markets, "achievement" sectors and target groups. The prioritization of these sectors and groups for social dimensions analysis is a country-specific matter. For the purposes of the SDA Program those sectors/target groups which are deemed to be of prime importance under adjustment and which are believed to be of relevance to the majority of countries participating in the Program were selected. They became the topics of the Analysis Plans assembled in this Volume.

Data sources

1.17 Information is required at each of the macro, meso- and micro-levels if policy makers are to know what changes are affecting households and how these changes occur. It is therefore useful to view information requirements in the context of an hierarchical information system

where data and empirical analysis are explicitly considered at each of the three levels. A distinction can be made between "analysis," "constructs" and "data." Thus, analysis can be either formal models or analytical studies. These analyses depend on empirical information, and a distinction is made between the raw data sources (censuses, surveys) and the various constructs used to assemble, organize or present these data for analytical use (national accounts, tabulation, summary statistics or indicators).

1.18 An hierarchical information system for social dimensions research is presented in Table 1.1. The reader is referred to a companion volume, World Bank (1990), for an explanation of the rationale underlying this system. While some data on macro, meso and, indeed, micro variables are already collected in most countries (though they are of variable quality), household survey data are the most critically deficient information source currently hampering social dimensions policy research. A key contribution of the SDA Program is, therefore, to improve the quality and availability of micro (and meso) level data through household and community surveys. This is the basic data source required for meso-micro analysis of the kind proposed in the Analysis Plans below.

1.19 The SDA Program has worked to develop three separate but interlinked prototype surveys which could be used to strengthen national information systems. These are:

(i) The *Priority Survey* (PS) aims to identify target groups for social aspects of adjustment programs and establish for such groups key indicators on welfare and basic needs fulfillment. Compared with the Integrated Survey (below), the content of the PS is much more restricted, but the data are collected over a larger sample and permit much faster tabulation and analysis. Ideally, the PS is conducted as the first component of a survey program, hence providing policy makers with an initial empirical basis for targeting essential and urgent interventions. When repeated, the PS also becomes a monitoring tool for tracing changes in welfare and basic needs fulfillment across target groups. Repetitions of the PS are recommended, because the micro-level effects of macroeconomic policy reform are distributed in time and thus call for a combination of cross-sectional and over-time data. The PS represents a *simplified methodology for analysis*, developed by the SDA Program to yield useful results rapidly, before the in-depth analysis based on the Integrated Survey is undertaken.

(ii) The *Integrated Survey* (IS) is designed to collect, for a relatively restricted sample, comprehensive data on income and expenditure processes, assets, socio-economic characteristics and welfare indicators of households and their members. This provides baseline information on the social and living conditions of different groups in society. The survey will permit in-depth analysis of household responses to changes in their living and working environment, which is essential for medium- and long term policy planning, including the design of adjustment policy with a solid focus on social concerns.

(iii) The *Community Survey* (CS) collects information on the social and economic infrastructure and on the functioning of factor and product markets (including prices). These elements constitute the meso-economic environment — the intermediate link in the macro-micro transmission chain of adjustment — within which households and individuals behave as economic and social agents. The CS can be conducted as a separate survey or tied in with the IS or PS. In many of the Analysis Plans presented in this Volume it is concluded that community-level information is desirable to complement the demand-side information available in the IS with indications from a CS regarding the supply of, for example, health facilities, schools and communications infrastructure. The CS is a potentially important data source in analyses of the costs and benefits of alternative marginal resource allocation choices in public expenditures. It permits the establishment of a link between public expenditure data and program performance at the community level.

1.20 The Analysis Plans presented in this document make heavy demands for micro-level data collected from household surveys. Although a great deal of analytical work can be undertaken using single subject surveys, the issue of measuring and understanding the standards of living of different household groups can never be adequately dealt with unless there is the possibility of correlating economic and social data at the household level. Thus a key requirement of the Analysis Plans is that they be able to draw on integrated multi-subject household data sets. The main source of such information is expected to be generated out of the IS. IS-type surveys should be viewed as strategic investments to generate the data needed for longer-term policy planning and development strategy choice. They take time

Table 1.1: A hierarchial information system for the SDA

(1)	(2) SDA Focus	(3) Analysis	(4) Constructs	(5) Data
Macro	*Policy* • Monetary, fiscal and exchange rate policy	• Macroeconomic models: -Aggregate (RMSM) -Multisectoral (CGE)	• National accounts • SAMs • CPI • BOP • Macro-indicators	• Economic, trade, financial statistics • Social and demographic statistics
Meso	*Effects* • Markets • Economic and social infrastructure	• Sectoral and institutional studies • CGE • Multimarket models	• SAMs • Food balance sheets • Sectoral quantity and price indices	• Community survey • Price statistics • Production statistics
Micro	*Impact* • Individual and household welfare	• Household models and analysis	• Poverty profiles • Social indicators	• Household surveys: -economic -social -anthropometric -demographic

Source: Structural Adjustment and Poverty: A Conceptual Empirical and Policy Framework, SDA Unit, Africa Region, Report No. 8393-AFR, World Bank, 1990; p.86.

to implement (data collection itself covers a full year) and analyze. Therefore, short-term policy action, by definition, cannot be guided by IS-based conclusions and recommendations. This function can be fulfilled by the PS, which has been designed recently for rapid enumeration of welfare characteristics under the SDA Program. An Analysis Plan for the PS is included below as Chapter Ten. A full description of the innovative PS, including a prototype questionnaire, is available in a forthcoming volume, World Bank (1990a).

1.21 As an instrument to study changes in poverty and basic needs achievement the PS is situated somewhere between indicator-based investigation and the IS. Food price indices, the real wage (particularly for unskilled labor) and the rural terms of trade are useful indicators to study changes in the living standards of the poor. In fact, social dimensions analysis should start by looking at these variables where observations on them exist or can be constructed from published price data. But indicators are not normally available for regional and socio-economic disaggregations, which makes them incapable of tracing distributional changes and thus limits their usefulness relative to survey-based measurements. Furthermore, even up-to-date consumer price indices for capital cities are rare in Africa. (Reference consumer baskets are often outdated because of the relative price changes known to have occurred during the 1980s.) There is thus merit in a rapid, sample-based assessment of employment, wage rates, income sources, expenditure proxies and basic needs indicators such as can be obtained by means of the PS, which can be conducted over a two-month field period (to which processing and analysis time of another month or two must be added), with individual interviews taking less than one hour (see Chapter Ten).

1.22 The market-specific, sectoral and group-specific Analysis Plans presented in this Volume are "written for" the SDA Integrated Survey and complemented by a Community Survey, where needed. The Analysis Plans thus aim to explain the concepts and methods needed to carry out detailed, "causal" policy analysis (in a household-level, as opposed to an economy-wide, sense) on the various social dimensions identified above — an endeavour which cannot be based on

the PS, because this survey lends itself only to limited multivariate analysis. An IS draft prototype questionnaire may be obtained from the SDA Unit and will be available as an annotated questionnaire in a forthcoming report, World Bank (1990b). (Space limitations preclude the reproduction of the IS and PS prototype questionnaires in this Volume.) The IS prototype questionnaire is divided into 12 modules, including a household roster and sections on education, health, employment, migration, housing, agriculture, expenditures, non-farm enterprises, assets and savings and anthropometrics. A clarification regarding the section on agriculture may be in order. The IS is not an agricultural (or farm management) survey and therefore cannot collect detailed, crop-specific information of the type required to estimate production functions. It is similar to the World Bank's Living Standards Surveys in that it sacrifices detail regarding agricultural behavior "in order to obtain the broader picture that can only come from the collection of a great deal of interrelated data on all aspects of the household's economic activities" (Deaton and Benjamin, 1988:5). In the section on agriculture, information is sought on income from cropping and livestock activities, expenditures on agricultural inputs, consumption of own produce and assets relevant to household farm production (in particular, land). Questions are asked on assets (land, livestock, equipment), crops grown, purchase of inputs, credit and agricultural processing activities. It will become apparent from the Analysis Plans below that, even though this survey option limits the scope of agricultural production analysis, it is able to sustain in-depth social dimensions analysis for the rural population.

1.23 In preparing for and processing the SDA Integrated Survey, two issues deserve special attention, viz., the definition of the household as the basic unit of observation and the concepts, methods and conventions used to calculate income and expenditure aggregates within a system of household accounts. Both of these topics are discussed in detail in the Technical Appendix to this Volume. We shall limit our comments here to the definition of the household for IS purposes. Both *de jure* and *de facto* definitions are in use for household surveys. The *de facto* definition pertains to those household members present at the moment the interview takes place and is most commonly used with censuses or other enumerations over short periods. The *de jure* definition relies on a criterion of presence which must be met before a person is considered a member of the household. The definition of the household used in the IS is a *de jure* one, but one which differs somewhat from the *de jure* definition used in other surveys that are concerned with a household composition at a specific moment in time. This is because the recall period for a number of IS questions is 12 months. Therefore, a definition of the household which is valid for this full period must be selected. In reality, of course, household composition can change substantially throughout the course of the 12 months. It is therefore necessary for the IS to use a definition which describes the *average* household composition during the period.

1.24 Three criteria are used in classifying whether persons are to be included in the household or not. First, and consistent with the United Nations definition, they should meet the criterion of usually living and eating together in the dwelling. (The definition of the dwelling is a country-specific matter.) The second criterion is that all of these persons living and eating together should acknowledge the authority of a single head of household, regardless of whether the latter is living with the other household members or living away. The situation of polygamous households can present problems depending on whether each wife is treated as a separate household or as part of one large household. In the former case, it will be necessary to apply an arbitrary rule, such as linking the head of household to the first wife in order to avoid double counts. The third element is the time period over which the first two criteria must have been met. It is recommended that persons should have been present in the household for a period of at least six months out of the last 12. It should, however, be noted that, beyond these general indications, the definition of the household in any particular integrated survey must take into account local conditions and knowledge regarding family structure, mobility and other factors impinging on the household concept.

An analysis strategy for the social dimensions of adjustment

1.25 This Volume is about how to assess the social dimensions of adjustment in countries undergoing processes of macroeconomic policy reform and/or spontaneous, uncontrolled adjustment in response to changed external conditions. The analysis strategy of the SDA Program con-

sists of support to data collection efforts at the household and community level as discussed in the previous section and the application of the analytical concepts and methods along the macro-meso-micro line discussed in this Volume. The precise nature and sequence of data collection and analysis efforts is a country-specific matter and cannot be prejudged. In this section, a possible strategy for the assessment of the social dimensions of adjustment is set out, and important policy issues to be addressed are summarized. These policy issues are derived from the Analysis Plans in this Volume. It is recognized that priority subjects for policy analysis vary among countries. Analysts, therefore, will define research priorities in accordance with local policy circumstances and priorities of policy makers. Nevertheless, the summary of policy issues emerging from the Analysis Plans and presented in this section may be useful as a guide in planning a country-specific research agenda.

Analysis of the Priority Survey

1.26 A country-specific research agenda might start with the implementation and analysis of a Priority Survey, followed later by an Integrated Survey and analyses at both the macro-meso and the meso-micro levels as discussed in this Volume. The *Priority Survey* focuses on symptoms and indicators of immediate need. It therefore has a strong focus on poverty and basic needs because these are the key areas for immediate attention. Since the construction of income and expenditure measures cannot be undertaken through this instrument, the main challenge is the design of suitable proxy measures. Analytically the task is to use these measures to identify target groups (Chapter Ten).

1.27 The policy focus of PS-based analysis is thus not so much the modification of employment, education or health policy, but rather to identify those groups in society which are particularly disadvantaged in any one of the dimensions that constitute the standard of living and to document the extent of the disadvantage. The analysis will thus not necessarily provide indications about the type of needed interventions to solve the problem in the long term. This indeed is the role of the sector-specific Analysis Plans. Here the aim is to set priorities based on observations of the extent of a problem in different socio-economic groups. For example, if in certain groups malnutrition is severe, this provides information on the direction of food aid. The definition of the actual modalities of providing food aid will require solid knowledge of the country and of what type of interventions are feasible and effective in the short-run.

Analysis of the Integrated Survey

1.28 Once *Integrated Survey* data are available, the analysis suggested in Chapters Two to Nine in this Volume becomes possible and should be undertaken in accordance with priorities defined at the country level. At the *macro-meso* level, this would include, ideally, general equilibrium analysis of the kind spelled out (but not formalized) in Chapter Two in order to develop scenarios of the growth and poverty-reduction implications of alternative macro strategies.

1.29 Regarding *meso-micro* analysis researchers are expected to be interested in the topics (social dimensions) treated in the market-, sector- and group-specific Analysis Plans assembled in this Volume (again, the prioritization of topics is a country-specific matter). The role of the *Poverty Profile* is pivotal in this context. The Poverty Profile is the first of the micro-level Analysis Plans to be implemented because it delineates the magnitude and the depth of poverty — the key social problem in most countries. The starting point is the extent of poverty, i.e., the number of poor people and households in relation to the total population. An immediate policy link is provided by decomposing that information over the socio-economic groups that make up the society. The socio-economic groups are defined according to policy-relevant criteria and they represent households which are relatively homogenous in terms of the way structural adjustment affects them, both through the income-generating mechanism and through consumption. Therefore, one can anticipate that poverty incidence will vary widely *across* these groups, because adjustment has different effects on different types of income. The decomposition of poverty will thus provide the first insight into which the main target groups are for poverty programs and into the extent of leakages that may occur under different targeting options.

1.30 On ethical grounds, one cannot make a distinction between people who have been poor a long time and those who have become poor or destitute as a result of structural adjustment. Therefore, the aim of the Poverty Profile is not to distinguish between the two, but rather to pro-

vide the relevant characteristics, that is, a profile, of all poor in the society. This Poverty Profile thus may not be interpreted as representing a causal link to adjustment. Indeed, adjustment creates both winners and losers. The currently poor, as observed by the data, include the people who were poor before adjustment and those who became poor thereafter. However, by definition, the gainers (i.e., the people who were poor before adjustment, but who have successfully responded to the new incentives and are now no longer poor) are not included.

1.31 Poverty is not just a question of having an expenditure level below a cut-off point, but also of having an inadequate satisfaction of one's basic needs: education, health and housing. An important task of the Poverty Profile is therefore to identify whether the poor, and in particular the destitute, are also suffering in the fulfillment of those basic needs. If it is found that this is the case, a double targeting of programs may be needed. First, programs need to be targeted which can improve the productivity and the income-generation potential of the poor, but second, programs must also be more directly oriented towards immediate alleviation of health and nutrition deficiencies, lack of access to education and inadequate shelter.

1.32 Beyond the development of a Poverty Profile governments and researchers are likely to be interested in carrying out analyses on other social dimensions. Some of the policy issues likely to arise are summarized below in the order in which the respective Analysis Plans are presented in this Volume.

1.33 The Analysis Plan on *Employment and Earnings* addresses the radical changes in the incentives for different types of work brought about by adjustment. In general, adjustment shifts the incentives from sectors producing nontradable goods to those producing tradable goods. The impact of this on rural populations will depend very much upon whether food in the country in question is tradable or not. Within tradable items, adjustment should promote the production of both export items and import substitutes.

1.34 Another area in which adjustment affects employment is through restructuring of the government and the para-public sector. This usually implies retrenchments as part of measures to enhance efficiency. The task is thus to find suitable employment opportunities for these laid-off people in the context of the incentive structure put in place by the adjustment program. In many countries the public sector's wage was, for a long time, well above market-clearing levels. In recent years this situation has disappeared due to salary erosion. Moreover, in many countries the public sector acts as the leading sector for wage determination in the private sector. The latter frequently exhibits inflexible wages, so that the bulk of adjustment occurs through changes in the volume of employment rather than wages. All in all, adjustment can be expected to induce a greater mobility of labor and to reduce job security. This means that a greater number of people are holding secondary jobs and/or that labor turnover has increased. The extent of this phenomenon and the types of workers most affected (male or female, educated or non-educated) is a major area of analysis because it will help determine the shape of the employment-creation programs.

1.35 A group that will deserve special attention is the unemployed — those people who have not managed to take successful advantage of new opportunities and incentives provided in the labor market. The question of youth employment is particularly stringent. In many countries the output of the educational system does not meet the demands of the labor market, and the educational system does not respond sufficiently rapidly to the changing incentives under adjustment. The extent of unemployment among recent graduates is therefore a key indicator, and programs will have to be designed to retrain those people in a suitable way.

1.36 Given the future importance of the urban informal sector as a creator of jobs, the productivity and profitability of the enterprises in that sector deserves attention. The analysis has to relate profitability to the characteristics of the entrepreneur in terms of age, education and migrant status. It will be important to monitor the sectoral composition of output to see to what extent enterprise profitability responds to the shifts in incentives in favor of tradable goods. Significant bottlenecks can occur in terms of access to credit, access to capital goods (which in many countries are imported and typically become more expensive under adjustment) and access to technical and commercial know-how. Special programs may need to be designed as part of the adjustment package to make sure that entrepreneurs have the ability to respond properly to the new incentives. Institutional bottlenecks can result in a major cost when allocative efficiency cannot be achieved.

1.37 Sector-specific social dimensions analysis

is likely to focus on health, education and food security and nutrition. Policy and analysis issues in these sectors are treated next.

1.38 The Analysis Plan on *Health* suggests that structural adjustment may influence people's health status by affecting governmental expenditures on health-related services and market goods, by changing the cost of these services and by altering real incomes due to changes in wage earnings and farm profits. But health is multidimensional and difficult to measure. It is suggested in the Analysis Plan that anthropometric measures are useful indicators of health, but drawing conclusions regarding health on the basis of nutrient intake is considered to be fraught with ambiguities. (Nutrients are important inputs in the production of health, but unsatisfactory indicators of health status.) Self-reported frequency of illness is another proxy for health. The Analysis Plan focuses on reduced-form demand equations for health, using prices of food and measures of accessibility of public health programs, household assets and wages and household "public" goods (sources of drinking water, sanitary facilities) as independent variables. The policy discussion developed in the Plan is in terms of food prices and "programs," i.e., health facilities, fertility control programs and household "public" goods.

1.39 The availability and quality of health facilities is in large measure a consequence of public expenditure choices, although private sector provision of health care (for example, through NGOs) is important in many cases. It is well-known that health sector governmental spending has tended to be concentrated on higher-order (i.e., hospital-based, curative as opposed to primary and preventive) care in Africa. Higher-order services tend to benefit the higher income groups. There is, thus, a policy issue in terms of the intrasectoral allocation of resources. Furthermore, the management of public spending in health, and program input combinations, are often deficient, leading to low and, in many cases, reportedly still deteriorating quality of health services. A question raised in the Analysis Plan is whether the reduced-form health demand equation accurately measures the effect of public programs on health outcomes. Official data on program placement and expenditure on recurrent inputs by district and Community Survey data on actual availability of health facilities and complementary inputs (drugs, disposable materials, health workers) may need to be combined to obtain an accurate picture of the supply of health care. However, simple associations between health programs and health outcomes may not measure accurately the effects of public spending on health care. The reasons for this include the possibility that the spatial distribution of government health programs may be influenced by environmental features favorable to the occurrence of certain debilitating diseases, which may lead to positive observed correlations between health program spending and frequency of illness. It is, therefore, recommended in the Analysis Plan to estimate how changes in local programs affect changes in the health of the local population (fixed-effects estimation in order to avoid biased conclusions based on spatial heterogeneity in factors determining the prevalence of disease).

1.40 The Analysis Plan on *Education* distinguishes between supply and demand factors as determinants of the output of the education system in a country. The supply side consists of the schools and institutions as well as the teachers and the teaching materials. Structural adjustment often implies budget cuts which may include expenditure cuts for public schooling, increases in user charges for education, reductions in the provision of education materials and increased rationing of access to public schools. On the demand side, adjustment policies will affect household incomes as well as prices, which will have an impact on the amount of education services demanded.

1.41 Analytically, the income effect is to be distinguished from the price effect. The former operates through changes in income, which directly affect the demand for education. The price effect works through making schooling directly more expensive (user fees) and/or through changes in the opportunity cost of attending school. The Analysis Plan focuses on the determinants of the demands for schooling. There are three key policy issues here: (i) How much will the ability of households to send their children to school be affected by a reduction in their income? In other words, what is the income elasticity of the demand for education? (ii) What is the impact from the price effect? Adjustment programs frequently include and increase user charges for education. (iii) What is the long-term impact of adjustment on the demand for education? If adjustment will truly generate growth, then there should be an increased demand for education due to an increase in the expected returns to education.

1.42 If a household is faced with a reduced

demand for education, this reduction will not necessarily be uniform for different types of household members. The demand analysis must at a minimum be differentiated according to gender. In doing so, the analysis of course overlaps with that addressed in Chapter Eight below on women and structural adjustment.

1.43 It is important to note that the impact of adjustment on education is not limited to the direct impact on the educational sector itself. There is an important indirect impact through the labor market, the smooth functioning of which depends on a steady supply of suitably schooled workers. It will also affect the ability of smallholders and informal sector entrepreneurs to increase their productivity and take advantage of new opportunities expected to accompany the adjustment process. Lastly, education has an impact on health and nutrition status.

1.44 The educational analysis therefore provides not just an input into the design of education policy, but also the determination of policy vis-a-vis nutrition, agriculture and other sectors. Although the education analysis plan does not specifically address the internal efficiency of education delivery, this issue cannot be overlooked. Indeed, even though Ministries of Education may be faced with budget cuts, the same amount of money can be used to deliver very different packages of services. A package which is mainly oriented towards higher education will be biased against the poor. On the other hand, a package which strongly supports universal primary education and the provision of adequate teaching materials for primary education will have a strong egalitarian impact.

1.45 Policy issues in the area of *Household food security and nutrition* include (i) the analysis of adjustment-induced changes in wage and producer income, food prices and consumption; (ii) the identification of food-insecure groups based on the foregoing and an analysis of food budget shares, expenditure elasticities and (where possible in view of data constraints) the comparison of food consumption with "requirements"; and (iii) the various market and non-market forms of intervention available to governments to raise the food security and nutrition of specified groups. These interventions include targeted indirect income transfers in the form of commodity-specific subsidies, public employment schemes and direct income transfers in the form of food aid, cash or food stamps or ration cards entitling the holder to subsidized food. The practical difficulties of targeting are well-known. Self-targeting through inferior commodities (in a consumer preference, not a nutritional sense) holds considerable potential to limit administrative cost and leakage of benefits to non-needy consumers. There are, however, few successful experiences of self-targeted food subsidy schemes in Africa, and opportunities for self-targeting should be explored.

1.46 Social dimensions analysis, finally, includes group-specific investigation. The analysis of women and smallholders (two groups which partly overlap in Africa) in the context of structural adjustment is therefore taken up next.

1.47 The Analysis Plan on *Women* starts off by pointing to the fact that adjustment changes incentives and constraints for the generation of different types of income. It is quite conceivable that the constraints faced by men and women, and therefore their ability to respond to those incentives, are not the same. On the demand side, men and women are not likely to have the same propensities to consume goods and services such as education and health. Therefore, when faced with falling income and/or rising prices, the consumption of goods and services and basic needs achievements may be differentially affected for men and women. Hence a gender distinction in analysis and policy design is warranted.

1.48 The supply response of individuals, both men and women, depends in essence on the amount of resources they control. The two key resources are labor and credit. Because households do not necessarily function democratically, women may not have complete control over their time. The traditional division of labor may dictate that they spend significant time on specific functions such as fetching water and wood. Consequently, it must be known (i) what the pattern of time use of women is, (ii) whether rural women have the necessary control to reallocate their time when, for example, the relative prices of different crops change and (iii) whether women can gain access to the necessary inputs such as land and credit.

1.49 A key question is the role of food in the adjustment process. If food is a tradable good, then major opportunities will open up for women. However, this also means that resource mobility will be highest among women, and the question is whether the current functioning of the labor market will make that re-allocation possible. Institutional, legal or other constraints may exist which will impede this re-allocation, resulting in allocative inefficiency which may need to be ad-

dressed through special programs. In rural areas an important element will be extension services. These services are often biased in favor of men, and to the extent that new technologies and promotion of new crops occurs through these services, women may have less access to them. This may require redesign and re-targeting of extension services.

1.50 There is a complex interplay between the use of health and family planning services and access to employment and education. It will be critically important to look at rates of non-enrolment in primary schooling, where such rates are frequently twice as high for girls than for boys, thereby creating a disadvantage for girls which they may never be able to overcome.

1.51 The analysis of policy issues regarding *Smallholders* starts from the realization that under given agro-ecological conditions, the income possibilities of smallholders are largely determined by their labor use and their cropping choices, which, in turn, are influenced by relative prices in relevant markets and the availability of labor. (Land scarcity is in many African settings not a binding constraint to production and income possibilities.) Smallholders typically pursue a combination of activities including off-farm wage employment and work on their plot where they produce tradable or nontradable crops and animals or, more likely, a combination thereof. The relative importance of these activities as determinants of total income may be used to classify the smallholder population into predominantly export crop producers, producers of tradable foods for import-substitution, rural laborers and "subsistence" farmers, i.e., rural families deriving a particularly small proportion of their income from exchange activities through labor or product markets.

1.52 The key policy issues related to smallholders under adjustment are the evolution of rural wages relative to product prices, the nature of changes in labor use, other inputs and the farm output mix. It is stated in the Smallholder Analysis Plan that rural wage labor (which is expected to benefit from adjustment in the longer run) might suffer a real wage fall in the short run. This could occur if larger farmers producing for export or domestic market consumption were slow to expand their production. It is also not certain whether smallholders would require a real wage fall to induce their expansion of tradable production. The short-term effects of devaluation on real wages are therefore ambiguous, and food intervention or other compensatory assistance may be required by some groups.

1.53 Another policy issue arises when poorer groups fail to benefit from adjustment as producers because price signals are not transmitted to them due to infrastructural and institutional shortcomings or because of an inadequate initial flow of consumer goods to the countryside. It is well-known that agricultural marketing processes are less efficient in Africa than in Asia (measured in terms of the proportion of the consumer price of food grains paid to farmers). Thus, if smallholders fail to shift to profitable (i.e., tradable) crops or to increase the relative importance of these commodities in their output mix, they cannot gain from adjustment as producers. Public investment in agriculture and the development of institutions capable of serving the needs of smallholders must accompany programs of macroeconomic reform.

Principles of analysis

1.54 As stated above, the selection of social dimensions analysis topics is a country-specific matter. It is expected that the Analysis Plans presented in this Volume serve the purpose of assisting country-based researchers in their task of assessing the social and distributional consequences of structural adjustment and longer-term development policy. The Analysis Plans discuss both methods of descriptive, tabular analysis and multivariate investigation. Both types of analysis are likely to be required in country-based SDA research. Careful attempts to set out the tabular analysis possibilities are made in particular in Chapters Four and Ten. Space limitations precluded an exhaustive presentation of sample tables (called "Frames" in this Volume) in all the Chapters. Readers are encouraged to develop their own sample cross-tabulations in their social dimensions field of particular interest. Given the complexity of macro-micro linkages, some multivariate analysis is indispensable in most situations. The frequently inevitable omission of important explanatory variables from cross-tables and the fact that interactions can be studied only rudimentarily through tabular analysis can lead to misleading policy conclusions in the absence of regression techniques. An attempt was made in this Volume to limit mathematical expositions to a minimum, to present them in special boxes so as not to interrupt the flow of the text and to provide verbal explanations for all points of

modelling expressed in the form of equations. While the various Chapters are designed to be self-standing, most of them apply a reduced-form approach to the estimation of outcomes as a function of household-choice variables. The reader might, therefore, find it useful to glean complementary analytical guidance from Chapters other than the one(s) in which he or she is primarily interested.

2

Analyzing the meso-economic effects of structural adjustment

Introduction

2.01 This Chapter is concerned with the real-economy effects of adjustment policy, and how these might be analyzed in the African setting. There are two main reasons for this analysis: First, most governments need to understand how policy reforms affect their economies, and elements of the SDA information system, notably the community survey, can enhance the data base for such an analysis. Second, as part of the SDA analysis package, this chapter serves as an essential input into the other Analysis Plans described in this Volume. Our main emphasis will be on the latter objective — the chapter will seek to explain how some of the economic variables taken as explanatory variables in the other chapters of this Volume are themselves influenced by policy interventions. The sub-set of explanatory variables with which we shall be concerned are at the *meso-economic* level. These are the variables which come between the macro-policy interventions, on the one hand, and the micro-level (or more correctly in this context, the household-level) variables on the other.

2.02 The next section places the macro-meso analysis described in this Chapter into the context of the SDA analysis program as a whole which is the concern of this Volume. A brief summary of the ways in which adjustment policy influences markets and infrastructure is given in paragraphs 2.12 through 2.16. Paragraphs 2.17 through 2.22 then outline the essential country background information that is required for macro-meso analysis. This is followed by a discussion (in paragraphs 2.23 through 2.28) of the distinction between exportables, importables and nontradables — a distinction which is central to any assessment of the effects of adjustment.

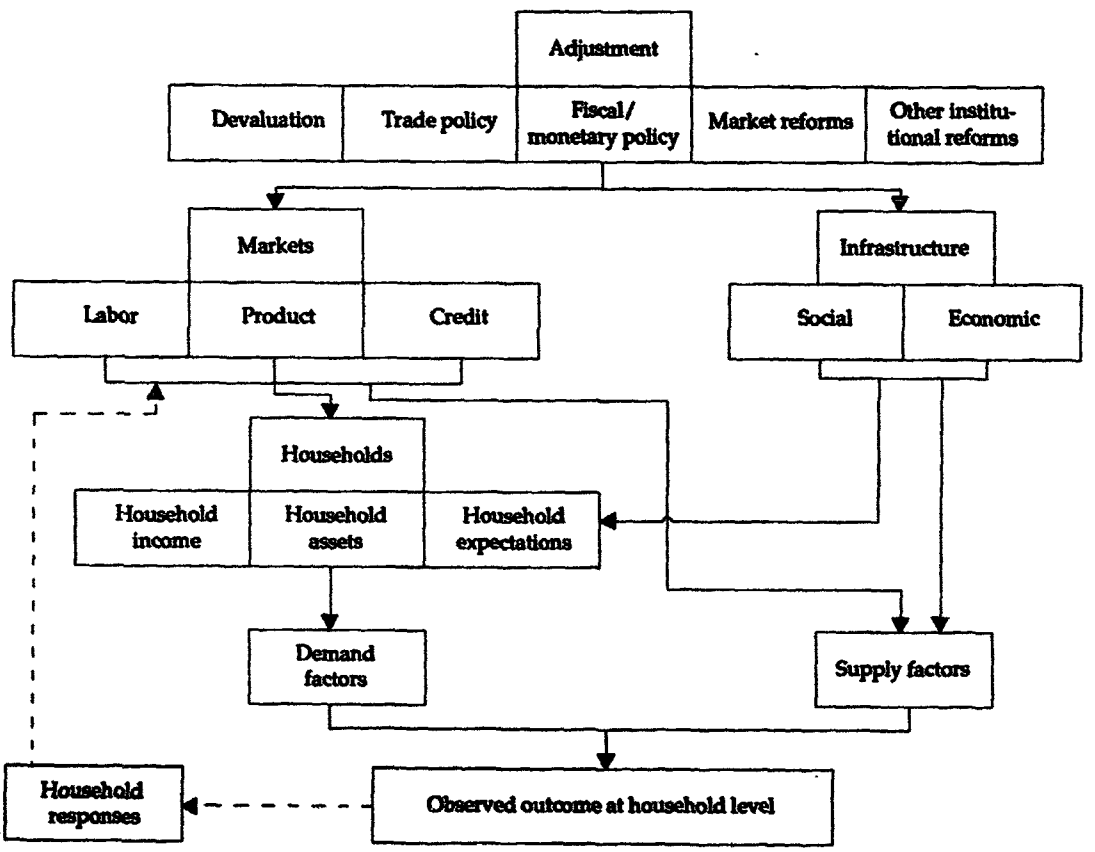
2.03 This Chapter differs in one important respect from the others of this volume. It relies generally on data sources that are external to the SDA household surveys, on which the other chapters are based. It is therefore difficult to set out an analysis plan with the same precision, since what is done in each of the participating countries will depend critically on the available data. Consequently, the chapter suggests two broad types of approach, each having quite different data implications. The first approach (described in paragraphs 2.29 through 2.67) assumes only a fairly basic data set — essentially the national accounts, public sector accounts and some price data. Paragraphs 2.29 through 2.35 review the process of adjustment. It applies the distinction between expenditure-switching and expenditure-reducing effects, and introduces a simple method for assessing the weight given to each in the adjustment program under consideration. Paragraphs 2.36 through 2.60 review ways in which expenditure-switching effects can be analyzed, whilst expenditure reduction is treated in paragraphs 2.61 through 2.67. A second approach, involving modelling techniques, which are highly data intensive, is then discussed in paragraphs 2.68 through 2.84. Finally, paragraphs 2.85 through 2.87 make some concluding observations.

The context of macro-meso analysis

2.04 Much of the previous work on the social dimensions of adjustment has failed to provide a convincing analysis of the effects of structural adjustment. This is because of a general failure to separate out the effects of the adjustment policies per se from other factors operating on households concurrently, including the effects of the shocks to which the macro-policies are adjusting. Many studies have been explicitly agnostic about whether the deterioration in the welfare indicators it traced were due to the recession itself or to the adjustment policies that followed (see, for example, Cornia et al, 1987). SDA policy analysis, however, should go some way towards attributing causation in its treatment of adjustment-human dimensions links. To achieve this, the proposed analytical methods treat explicitly the *conduits* at the meso level which transmit the effects of adjustment policies to the households, these being *markets* (both factor and product, official and parallel), and social and economic *infrastructure* (see World Bank, 1990). This is done by specifying a simple two-stage analysis design: In the first, the analysis is concerned with how policy interventions have affected markets and infrastructure - which we shall term macro-meso analysis. This is the concern of the present chapter. The second stage deals with meso-micro interactions, and these are the concern of the remaining chapters of this Volume. The interactions between these two analysis stages are illustrated in Figure 2.1.

2.05 At the top of the figure, five broad categories of 'macro-policy' interventions are listed. Some of these are macro interventions in the pure sense of that word - such as monetary policy and exchange-rate adjustments. Others are applied at the sectoral level - including institutional reforms and trade policy. These policy interventions are combined to achieve major macro-policy targets, typically increased economic growth, and internal and external balance (correcting high inflation and unsustainable budget and external deficits). They are also applied to improve efficiency (through resource re-allocations) and equity (through poverty alleviation). These policy

Figure 2.1: Macro-meso-micro analysis



instruments are shown influencing the two key elements of the meso-economy — markets and infrastructure. Three main market effects are noted in Figure 2.1: labor, product and credit markets. The figure also distinguishes the effects of macro-policy on social and economic infrastructure.

2.06 The significance of these meso-economic effects for household welfare is also illustrated in Figure 2.1. This defines (in the bottom box) some observed outcome at the household level which in some way reflects household welfare. This might be income, expenditure, poverty, education, health, status of women, and so on. These outcomes are shown to be the result of the combined influence of supply and demand factors. Thus, for example, education status of household members (an outcome variable) will be influenced by the availability of schooling (a supply factor) and the income of the household (a demand factor). Notice that markets influence both supply and demand sides of this equation. Similarly, infrastructure will affect both supply and demands. Thus, for example, changes in the labor market will affect the numbers of teachers available, and influence the supply of education services. Changes in product markets may influence household income, and thereby the demand for education. Social infrastructural expenditures by governments will have a direct effect on educational supply factors, but they may also affect household incomes, and thereby influence educational status through demand for education.

2.07 Typically, the meso-micro analysis plans follow three main stages. First, they define the dependent variable of interest. This obviously depends on the subject at hand, and on the particular dimension of household welfare of interest (for example, smallholder income, education, health, etc). Second, a series of explanatory or right-hand-side variables are defined, and these are used to explain variations in the dependent variable. This relationship takes the following general form:

$$Z = a + b_1X_1 + b_2X_2 + b_3X_3 \qquad (1)$$

where Z is the dependent variable of interest, X_1 is a vector of pre-determined household assets and characteristics, X_2 a vector of market variables, such as prices and dummies indicating quantity rationing, and X_3 a vector of infrastructural variables (such as dummies for health and education services, communications, access to marketing facilities, and so on). b_i (i = 1,2,3) are the parameters to be estimated. The meso-level variables as used in the meso-micro analysis plans are obtained from both the Community Survey (CS) and the Integrated Survey (IS) of the SDA information system. In some cases (for example, health and education services, and market prices), data are obtained directly through the CS. In others, the information is obtained from household members, through the IS questionnaire. Such questions as "Have you had any difficulty in obtaining credit over the past 12 months", can provide some evidence (albeit through the eyes of the household member) of meso-level characteristics, in this case the presence of rationing in the credit market. Given the once-off nature of these surveys, cross-section data must form the basis of estimating equation (1).

2.08 The third stage seeks to assess how changes in the X_2 and X_3 variables arising from adjustment affect the dependent variable, and thereby, household welfare. This is given by,

$$\Delta Z = b_2(\Delta X_2) + b_3(\Delta X_3) \qquad (2)$$

The changes in the meso-level variables induced by adjustment (ΔX_i, i = 2,3) will themselves induce changes in the dependent variable (ΔZ). This stage is certain to be the most difficult and challenging undertaking of the SDA analysis scheme. The main difficulty lies in quantifying how meso-level variables have changed as a result of adjustment policy interventions. This is the challenge of the present chapter. It seeks to identify the main meso-level variables used as explanatory variables in the analysis plans presented through this volume, and to suggest how induced changes in these variables can be estimated.

2.09 The network of influences illustrated in Figure 2.1 is the context into which the macro-meso analysis plan in this chapter is to be placed. An important implication of this for the present chapter is that we are not necessarily interested in all the effects of adjustment policy. SDA macro-meso analysis must focus on those elements of the meso economy which are considered of particular significance in determining household welfare. In other words, the analysis is not meant in any sense to be a fully comprehensive account of the way adjustment affects real economies. It is essentially selective, concentrating on the key right-hand side variables of the meso-micro analysis plans.

2.10 Figure 2.1 illustrates only the broad prin-

Table 2.1: Meso-level variables utilized in household data analysis meso-micro analysis

Meso variables	*Poverty*	*Smallholders*	*Employment*	*Education*	*Health*	*Nutrition/food security*	*Women*
Market variables							
Product market prices	**	**		*	*	**	
Input prices	**	**		*		**	
Market rationing		*				**	
Market access		*				**	**
Market wages			**	**	**	*	**
Wage inflexibilities			**				
Interest rates		*		*			
Access to credit	*	**		*	*	*	**
Infrastructural variables							
Roads/communications		*		*			
Irrigation services		**				**	
Marketing institutions		*	**			*	*
Extension services		**		*		**	**
Health services	**				**		*
Education services	**			**	*		*
Other social services	*					*	*

ciples which govern macro-meso analysis in the context of the overall SDA analysis program. It does not identify which meso-level variables are of particular concern to the various meso-micro analysis plans outlined in this volume. Table 2.1 attempts to bring all this together in a simple analysis matrix, by identifying which meso-level variables are utilized in each of the analysis plans. A double star in the relevant cell indicates that the variable is considered to be critical for meso-micro analysis. A single star indicates that the variable is utilized in the appropriate chapter, but it is considered desirable rather than critical. The wide range of subjects examined by meso-micro analyses implies that a variety of meso-level variables is called for. However, the double star rating suggests that a more limited selection of *key meso variables* can be identified. These are product prices, wage rates, credit, agricultural services, education services and health services. These are the main meso variables considered in this Chapter.

2.11 Before we embark on analyzing how adjustment might influence these key variables, some preliminary analysis must be conducted on three important issues. The first concerns the effects that adjustment policy can be expected to have on meso-economic outcomes, in principle at least. The second involves essential country background information, and the third deals with the operational distinction between the various classes of commodities used later in the chapter.

A review of the meso effects of adjustment

2.12 A program of policy reform usually involves changing a wide selection of policy instruments, ranging from the purely macroeconomic (such as monetary and exchange rate policy), to sectoral policies (trade and pricing policies), and even to policies at the micro level (as for example, in the case of re-training schemes for retrenched public-sector workers). A companion volume (World Bank, 1990) sets out a framework for analyzing how changes in these instruments (even macro-instruments such as money supply) are likely to influence the real economy. Our purpose is not to repeat these arguments here, but simply to rehearse the main conclusions, which is sufficient preparation for this macro-meso analysis plan.

2.13 Our review of the meso-micro analysis plans established two important elements of the meso-economy — markets and infrastructure. In what ways might adjustment policies be expected to influence these two elements (which are in turn expected to have some significance for household welfare)? Beginning with markets, we can define the following major effects:

- Most adjustment policies attempt to encourage resource transfers out of nontradables and into tradables. To achieve this, the real exchange rate (defined as the price of tradables relative to nontradables, or P_t/P_n) must be increased (known as a real exchange rate depreciation), either through a nominal currency depreciation (which

raises P_t), or through domestic monetary contraction (thus reducing P_n). If a government is successful in changing this fundamental relative price, it will give strong signals for resource reallocation. These signals will influence factor markets, the real wage falling (rising) if tradables are relatively less (more) labor intensive than nontradables. In the short run, the real wage change will depend on workers' consumption propensities.

- In addition to operating on P_t/P_n, a government may also change relative prices within each of these product categories, and especially within tradables. For example, trade liberalization can be expected to reduce the price of previously protected importables relative to exportables and other importables. Again, these relative price signals will induce resource transfers, and will lead to changes in factor markets. For example, real wage changes can be expected, depending on relative factor intensities in the sectors.
- An adjustment program can include any number of specific price policies (involving changes in consumer taxes and subsidies, and in the policies of state marketing boards) which will further modify the relative price changes induced through the real exchange rate depreciation and trade liberalization.
- Policy reforms will not only influence the structure of relative prices and resource *allocation*, they may also influence resource *utilization*. Whether adjustment leads to an increase or a decrease in resource utilization depends upon which of a number of opposing influences is the stronger. On the one hand, there are factors which should improve resource utilization — the increased availability of foreign exchange, removing rationing in both the foreign exchange and goods markets, increasing real wage flexibility, and enhanced investment opportunities and expectations. Set against these is the need for austerity during adjustment, which generally implies that governments must reduce fiscal deficits. Such policies generally reduce resource utilization.
- In addition to these direct product-market interventions, adjustment can influence the operating rules of the market through institutional changes. Privatization (especially of marketing institutions) can lead to significant changes in market prices. The removal of controls in credit markets can also cause an increase in interest rates and a change in the whole structure of rates in the market. Similarly, changes in labor legislation can have direct effects on wage determination.

2.14 In these ways, an adjustment program can have profound effects on relative product and factor prices. Macro-meso analysis must, above all, be able to offer some insight into how an adjustment program in the country in question has affected the main markets and relative prices of the country. Clearly, this cannot be achieved for every specific factor and every product — there must be some aggregation. There are strong analytical and empirical grounds for aggregating products according to their 'tradability' in world markets. Thus, macro-meso analysis must at least distinguish between exportables, protected importables, other importables and nontradables. The issues raised in making these aggregations in practice are discussed in paragraphs 2.23 through 2.28 below.

2.15 The meso-micro analysis plans presented in this volume also find infrastructural variables to be important in determining household welfare. And so it is important for macro-meso analysis to establish how adjustment might influence the provision of infrastructure. Most (though not all) infrastructural services are provided by the state. This means that such services are likely to be cut as adjustment seeks to transfer resources out of the nontradables sector, an important section of which is the government itself. Moreover, the need for fiscal discipline during adjustment often requires a reduction in government expenditure, which also may conflict with the provision of infrastructural services.

2.16 For these reasons, a period of adjustment may witness significant changes in the provision of economic and social infrastructure by the state. The net effect of the provision of these services depends on whether the private sector 'crowds in' — that is, steps in to provide the services through the market. For example, if the state provision of education and health care is cut, are there compensating increases in private schools and health clinics? Macro-meso analysis must, therefore, attempt to establish the extent and incidence of expenditure cuts, and to evaluate the implications for the provision of social and economic infrastructural services.

Essential background information

2.17 There are two main reasons why each country macro-meso analysis plan must begin with some background information of the type set out in this section. First, the characteristics of

countries participating in the SDA Program are certain to differ — in terms of their populations, economic structure, trade patterns, institutions and economic systems. To undertake a meaningful macro-meso analysis requires some preliminary understanding of these underlying country characteristics. Second, each country will have faced different economic imbalances and to different degrees, and will have responded in different ways to correct the imbalances. Again, to properly analyze the effects of adjustment on the key meso variables requires some preparatory work, establishing the periods of destabilisation and adjustment, and indicating the principal factors underlying both, are necessities.

Country characteristics

2.18 Information on the main economic and social characteristics of each country should be compiled as an important preliminary to macro-meso analysis. Some of this information may be available in the Country Poverty Assessment Paper, prepared under the SDA initiative for the country, but we repeat some of the more important pieces of information which are required here. The first set of tables which is needed deals with *economic growth and structure* over the past 15-20 years or so. Estimates of GDP, and the growth of GDP, population and per capita GDP should be presented. This should be accompanied by a brief account of structural change in the country, if possible showing changes in the structure of production and employment over the same period (or preferably, for selected years over the period). The following disaggregation should be sufficient:

- primary production (of which for export)
- mining
- manufacturing
  - consumer goods
  - intermediates
  - capital goods
- construction
- utilities
- services (of which government)

2.19 A third category of background data concerns the *trade and exchange patterns* of the country. Tables should illustrate the main changes in the external accounts over time, showing the principal sources of foreign exchange on current and capital account. This should identify the main exports and sources of finance. Information should also be presented on the main import categories, if possible identifying consumer-, intermediate- and capital-goods imports. Regulations on foreign exchange might also be identified, along with a review of the exchange rate system in operation.

2.20 Finally, background data are required on the *institutional characteristics* of the country, covering mainly its economic institutions. These include the nature of product and factor markets, the size (in terms of employment) and activities of the formal and informal sectors, the incidence of government controls and interventions in markets, the extent of public ownership, the 'depth' of the financial system, and so on. Background data should also be presented in the social and economic infrastructure of the country — describing the main forms of communications, recent trends in transportation, extent of electrification, irrigation services, and the main institutional arrangements in the provision of health and education services.

Periods of destabilization and adjustment

2.21 Information is also required about the periods of destabilization and adjustment in the country concerned. What is done here is essentially country specific, and depends on the timing of the SDA policy initiative in the country in relation to its recent economic history. If the data collection and analysis work occur after an adjustment program has been in place for some time, it will be possible to identify periods of destabilization and adjustment. The period of destabilization is one in which major unsustainable macroeconomic imbalances emerge, creating the need for the adjustment program which followed. During the adjustment phase, one would expect to find these imbalances being reduced. Thus, during periods of destabilization, inflation rates, external deficits and/or government budget deficits should increase. There might be other symptoms of the imbalances, such as an acute scarcity of foreign exchange, the imposition of import restrictions, a shortage of imports (of consumer, intermediate and capital goods), an appreciation of the real exchange rate, resource transfers into nontradables, and so on. These should all be examined in order to establish which period is best considered as one of destabilization. It might also be helpful if some account of the causes of these imbalances is given. This would be possible if the analyst can draw on existing work in this area. It is not recommended

that original research be conducted into this issue under SDA macro-meso analysis.

2.22 Similarly, the analyst must identify the period(s) of adjustment, and the policy instruments which were (or are) used to achieve the adjustment. This will involve a brief historical account of the main policy reforms enacted, including major fiscal and monetary contractions, exchange rate adjustments, price and marketing reforms, and institutional changes (such as privatizations). It is important to establish both the timing of the application of the policy changes and their effects on the major macro-balances — the trade and budget deficits (usually expressed as a percentage of GDP), the rate of inflation and the rate of economic growth. The periods of destabilization and adjustment may not be as clear-cut as the above discussion would suggest. There may be elements of policy reform during periods of destabilization, whilst some measures of macro performance (for example the rate of inflation) may continue to worsen during periods of adjustment (when other indicators show an improvement). The analyst must use his best judgement in such cases. But it needs to be emphasised here that the macro-meso analysis presented below cannot properly be instigated without some broad historical assessment of this sort.

Exportables, importables and nontradables

2.23 The distinction between exportables, importables and nontradables is central to the overall conceptualization of the SDA policy initiative, since most adjustment policies can be expected to influence each product category differently (see World Bank, 1990). One of the essential foundations of the analysis program of the SDA, therefore, is to operationalize the distinction at each country level. Whilst this is essentially country specific, some general guidelines are presented here.

2.24 Nontradables are those goods and services whose prices are determined by domestic supply and demand. This is due to the nature of the good involved (eg. public services, housing and construction) or because transport costs prohibit either the import or the export of the good in question, and insulate it from world markets. Tradable goods are those which cross frontiers and, in theory, their prices are determined directly by world market conditions, so that for a "small" economy, tradable prices can be taken to be exogenous. One of the more important problems encountered in using this type of classification of product markets is that commodities can switch categories, frequently in response to the policy change under investigation. The most important reasons why goods are nontraded are commercial policy (eg. prohibition of imports) and transportation costs. Taking the transportation mark-up to be q, and the world price of a commodity to be P^*, the domestic price must be equal to or less than $P^*/(1+q)$ in order for it to be exportable (assuming no trade taxes/subsidies). Similarly, for the commodity to be importable, its domestic price must be greater than $P^*(1+q)$, as otherwise its importer would not be able to compete with domestic suppliers. Thus we have a range of domestic prices for which the commodity is nontradable - neither an exportable nor importable. This range is simply given by,

$$P_x \leq P^*/(1+q) < P_n < P^*(1+q) \leq P_m \qquad (3)$$

2.25 The difficulty here is that a commodity can cross these boundaries and move from being nontradable to being either an exportable (if the domestic price falls sufficiently) or an importable (if the price rises). Country-based empirical work will clearly have to identify where such changes occur. A second difficulty is that commodity classifications may change geographically. A certain commodity may be importable at or near the port of entry, but as transportation costs increase its price in remoter areas, it may become entirely insulated from world markets. This may have become more common during periods of destabilization and adjustment, since transportation networks in Sub-Saharan Africa have deteriorated, and costs have risen accordingly. Again, the SDA Program will be required to make a careful assessment of how all this may affect prices facing households, especially if such groups are located in remoter areas not well served by physical infrastructure.

2.26 There are sectors whose outputs clearly fall under the "tradable" label, such as production of cash crops for export. Similarly, many government services are unquestionably nontradable. In between these pure cases, there lies a grey area of conceptual ambiguity. Any sector which is protected by severe import quotas should be included under the nontradable category, since changes in the world price will leave domestic prices unaffected, and will only influence the margins obtained by importers. In Chapter Eight,

below, it is suggested that a useful starting point for most African countries would be to consider manufacturing as protected importable (assuming that the good in question is not subject to highly restrictive import controls), and export-agriculture as unprotected exportable. With the nontraded sector comprising mainly construction, services and the public sector, the main area of ambiguity lies in classifying food agriculture. How food production is classified will need careful assessment for each country case.

2.27 Macro-meso analysis must establish for periods of destabilization and adjustment, this categorization of commodities. This must involve the identification of any changes over time in the classification. For example, during the early years, possibly during periods of destabilization, food might be a nontraded good, simply because of the import protection food producers received. But as policy reforms are applied (possibly a reduction in food import controls combined with a devaluation), food might switch to become a tradable. One of the objectives of this analysis is to identify such switches over time.

2.28 The analysis must also identify any geographical switches in these categories, the evidence coming mainly from the SDA Community Survey. Given information on prices at or near the ports of entry, and estimates of transportation mark-ups, it should be possible to predict what prices across the regions should be. Major departures from the predicted prices would suggest that the commodity in question is a nontradable.

The process of adjustment

2.29 The two main meso-economic variables which are utilized in the meso-micro analysis plans considered in paragraphs 2.04 through 2.11, are prices (for products and factors) and infrastructure. How are these influenced by adjustment policy? The extent to which relative prices change as a result of adjustment depends on the degree to which expenditure *switching* characterizes the policy reforms that are implemented. If the adjustment program involves a significant exchange rate adjustment, and changes in price- and trade-policies, relative prices will change, and act as signals for movements in resource reallocation (generally to exportables and unprotected importables, and away from nontradables). On the other hand, although infrastructural services may be influenced by the relative price shifts (as illustrated in Figure 2.1), they are likely to be particularly vulnerable to adjustment policies which emphasize expenditure reductions. A contractionary monetary and fiscal stance is likely to lead to cuts in government expenditure, which may reduce resources available for economic and social infrastructure.

2.30 As a first step towards understanding how relative prices and infrastructure might be influenced by the adjustment effort, some attempt must be made to assess whether adjustment was achieved mainly through switching or through expenditure reduction. This can be achieved through a simple decomposition exercise. But first, it is necessary to outline some underlying theory.

2.31 An analysis of the effects of adjustment policy must respect some basic macroeconomic identities. These are the National Income and Product Accounts (NIPA), which measure the flow of goods and services and incomes in the economy, the Balance of Payments (BP), which measures the flow of current transactions with the rest of the world, and the Monetary Survey (MS) [1], which measures the flow of money creation. The key point to be observed here is that these three sets of accounts are interdependent - any one can be derived from the other two. For simplicity, assume that all borrowing and lending abroad is undertaken by the government. The NIPA identity is given as,

$$C + I + (G_c + G_i) + (X - M) \equiv C + S + T \qquad (4)$$

where C is consumer expenditure, I is gross private domestic investment, G_j is government consumption (j = c) and investment (j = i) expenditure, X and M are respectively the exports and imports of goods and services, S is gross private saving and T is total tax revenue. GNP measured as aggregate product is given on the left hand side of (4), whilst it is measured as aggregate income on the right hand side. Re-arranging gives,

$$S - I \equiv (G_c + G_i - T) + (X - M) \qquad (5)$$

The left hand side of (5) gives the net flow of saving from the private sector into the financial markets and the right hand side sums the government's demand for deficit finance and the foreign sector's demand for funds to finance its current-account deficit.

2.32 The BP identity is given by,

$$X - M + \Delta L_{gf} \equiv \Delta R \qquad (6)$$

where L_{gf} denotes government liabilities abroad, R is the level of foreign exchange reserves, and as before, Δ denotes changes in the variable indicated. Here the current account surplus plus government borrowing abroad sum to the change in foreign exchange reserves at the central bank.

2.33 Finally, the MS identity is written as,

$$\Delta B \equiv \Delta R + \Delta L_{gc} \qquad (7)$$

where B is the monetary base and L_{gc} the liabilities of the government to the central bank. Notice, the MS identity can be derived from the other two identities. Net saving by the private sector, the left hand side of equation (5), can go to additional holdings of money balances (B) or to holdings of government debt (L_{gp}). Similarly, the government deficit ($(G_c+G_i)-T$) can be financed by sales of debt to the private sector, the central bank (L_{gc}), or abroad (L_{gf}). Thus for each item in the NIPA identity we can derive a corresponding change in assets and liabilities held by the institutions involved. Thus, equation (2) can be rewritten,

$$(\Delta B + \Delta L_{gp}) = (\Delta L_{gp} + \Delta L_{gc} + \Delta L_{gf}) + (\Delta R - \Delta L_{gf}) \qquad (8)$$

It should be obvious also that (8) is equivalent in an accounting sense to the MS identity (7). These accounting relationships form an excellent basis for comparative work on adjustment policies across countries, since it ensures internal consistency in the macro-accounts.

2.34 Using this accounting framework, and given the availability of the national accounts data, it is possible to decompose changes in the balance of trade deficit into the various expenditure elements. From the national income and product accounts (equation 4),

$$\begin{aligned} \Delta(X-M) &\equiv \Delta Y - \Delta C - \Delta I - \Delta G_c - \Delta G_i \\ &\equiv \Delta Y - \Delta E \end{aligned} \qquad (9)$$

where Y is GNP (= C+S+T) and E is aggregate expenditure (= $C+I+G_c+G_i$). Such calculations should be prepared in order to establish the extent to which the adjustment in the external accounts was brought about through increases in output (ΔY) or through decreases in expenditure. And if the latter, it should show which of the components of expenditure distinguished in the national accounts have borne the brunt of the adjustment. These calculations are very straightforward, and yet they provide considerable insight into the processes of the adjustment program. First, the data should be compiled along the lines of Frame 2.1, which decomposes the change in the trade balance into the changes that occur in output (ΔY) and the various expenditure components as given in (9). The sum of the changes in output minus the changes in expenditure will just equal the change in the trade deficit. These changes in the values of each of these items should also be expressed in percentage terms - the changes in output and expenditures being expressed as a percentage of the total change in the trade balance. Notice also that the table suggests a memorandum item, in which the changes in the trade balance are aggregated over years in order to capture key periods. Thus, for example, the memorandum item in Frame 2.1 decomposes the change in the trade deficit over the periods 1979-84 and 1985-90, assuming that the first period is one where the trade deficit worsened (hence the negative sign) — this being a period of destabilization — and that the deficit narrowed in the second (adjustment) period.

2.35 The purpose of Frame 2.1 is to show whether the changes in the trade deficit (and especially the improvement in the deficit during periods of adjustment) were associated with a change in output (which would be an expansion in output during the adjustment phase), or changes in aggregate expenditure (that is, declines of expenditures during the adjustment period). If the former, the adjustment is likely to have involved switching policies, which raised the production of tradable goods. But if the ad-

Frame 2.1: Changes in the trade balance and its related identities

	Δ(X-M)		ΔY		ΔE	
Year	*Amount*	*(Percent)*	*Amount*	*(Percent)*	*Amount*	*(Percent)*
1979		(100)				
1980		(100)				
1981		(100)				
...		...				
1989		(100)				
1990		(100)				
Memorandum item:						
1979-84	-	(100)				
1985-90	+	(100)				
1979-90	?	(100)				

justment was brought about mainly by cuts in expenditure, either switching policies were not applied, or they were mainly ineffective. This preliminary assessment should then lead on to a more in-depth analysis of the application and effects of switching policies and expenditure reducing policies. The types of analysis that are required for each are addressed in the following sections.

Expenditure-switching effects

2.36 The analysis of the switching effects of adjustment must be divided into three broad sections. First, it must examine the effects of adjustment on relative product prices. Second, some assessment must be made of the real-wage effects of policy interventions. Finally, some analysis should be conducted of changes in the credit market induced by adjustment policy.

2.37 A difficulty which is common to much of the analyses in this section arises from the presence of parallel markets in developing countries. These exist in product, credit and even labor markets, and also generally characterize the foreign exchange markets. Analysts should ideally trace induced changes in both official and parallel prices, since these may well differ, depending on the nature of the policy reforms adopted. With some households trading mainly in official markets, and others in parallel markets, this distinction is important for SDA meso-micro analysis.

Induced changes in relative product prices

2.38 One of the crucial ways in which macroeconomic adjustment influences the structure of relative prices is through its effect on the *real exchange rate*, defined as the relative price of tradables to nontradables (P_t/P_n). Changes in this relative price are frequently the main driving force of the adjustment effort, and are brought about mainly through currency devaluations. The calculation of the real exchange rate is particularly meaningful when other trade policies (such as import controls, tariffs and export taxes) are not changed during the adjustment. This means that relative prices within the tradables category (for example, the exportable/importable relative price, P_x/P_m) will remain unchanged, so that we may use the tradable composite. [2] Under such circumstances, the main relative price change induced by adjustment should be captured by changes in the real exchange rate. If other policy instruments change prices within tradables, then further relative price calculations will be called for (and these are discussed below).

2.39 There are broadly two methods for computing the real exchange rate: the first involves taking price indices of nontradables and tradables directly; the second, indirect method deflates the nominal effective exchange rate with appropriate price deflators. Each is discussed in turn.

2.40 Whether the direct method can be used to compute the real exchange rate clearly depends on the availability of the required price data. Prices of nontradables may or may not be available in the published sources. If not, they may be proxied by taking either the services component of the consumer price index (or GDP deflator), or a specific index which is expected to move in sympathy with nontradable prices. The latter might include a price index of a single sector (like construction or housing), or alternatively, a wage index (assuming that labor is a major component of nontradable production costs).

2.41 Choosing an appropriate index for exportables and importables also depends on data availability. Providing there are no quantitative restrictions to international trade, unit value indices may be used to indicate the movement of tradables prices. Thus, for example, the importables price index can be estimated using the unit value of imports (or a major component of imports such as manufactures). Similarly, the export price might be estimated using export unit values. On the other hand, there may be direct information on tradables prices from official sources (including the price data published by marketing boards). Such information is preferred when quantitative restrictions make unit value indices of little relevance in predicting the domestic price. On the other hand, official data tend to give a misleading impression of market prices since they usually omit parallel market prices, which are invariably significantly higher than the official market price.

2.42 Frame 2.2 illustrates the type of table which should be prepared, reporting the direct calculations of the real exchange rate. The memorandum items, reporting the mean index during the sub-period, should prove useful in gauging the extent to which the relative price movement changed as a result of the implementation of the adjustment program. That is, an estimate of $\Delta(P_t/P_n)$ for use in equation 2 above could simply be the difference in mean values of the price index for periods of destabilization and adjustment.

Frame 2.2: Relative price indices of tradables and nontradables
(1980 = 100)

	Services price[a] (1)	*Import unit value* (2)	*Export unit value* (3)	*Relative price estimates* (1)/(2)	(1)/(3)
1979					
1980	100	100	100	100	100
1981					
...					
...					
1990					
Memorandum Items:					
1979-84					
1985-90					
1979-90					

a. Alternatively, an index of construction/housing prices may be used.

2.43 The indirect method of estimating changes in P_t/P_n over time involves deflating the nominal rate of exchange. In the simple three sector dependent economy world, there are three related sets of relative prices. These are given by,

$$P_x/P_m = P_x/eP_m^*(1+k)$$
$$P_x/P_n = eP_x^*(1+s)/P_n$$
$$P_x/P_m = [P_x^*(1+s)]/[P_m^*(1+k)]$$

where e is the nominal exchange rate, k is the tariff rate imposed on imports, s is the subsidy/tax rate on exports, and the asterisk refers to world prices. Assuming (initially) that $s = k = 0$, and that P_x^*/P_m^* remains unchanged, then exportables and importables can be combined into a composite tradable commodity. It follows then that the real exchange rate, P_t/P_n, is given by,

$$\varepsilon = eP_t^*/P_n \qquad (10)$$

This index should reflect two important effects of adjustment. First, it should show the direction of induced resource allocations. A rise in ε, or a real exchange rate depreciation, should signal an increase in profitability in tradables, and therefore, a tendency for resources to flow into the sector, and out of nontradables. Secondly, it reflects the degree of the country's international competitiveness. A decline in ε reflects an increase in the real cost of producing tradables, and therefore a decline in competitiveness. (Similarly, an increase in ε should signal an increase in a country's international competitiveness.)

2.44 In calculating (10), the analyst will have to resolve three main difficulties: the selection of the best empirical counterparts to P_t^* and P_n with which to deflate the nominal exchange rate e; the possibility that e will vary across tradable commodities; and the effects that tariffs, import controls and export taxes/subsidies will have on relative tradable prices.

2.45 The first issue then concerns the choice of price indices to use in deflating the nominal effective exchange rate, the latter being defined as a trade weighted index of the nominal exchange rates between the domestic currency and the currencies of each trading partner. Three deflators have been suggested and used in the empirical literature.[3] First, the consumer price index (CPI) of the country in relation to its competitors is used. Equation 10 then becomes,

$$\varepsilon = e(CPI^w)/CPI^d$$

where the superscripts refer to world (w) and domestic (d) values. The world index can either be the CPI of a principal trading partner, in which case the calculation is on a *bilateral* basis, or it may be a weighted average of a number of trading partners' CPIs, in which case a *multilateral* real exchange rate is computed. We shall return presently to the calculations involved in computing the multilateral version of ε.

2.46 A second approach is to replace the CPI with wholesale price indices (WPI). WPIs comprise mainly tradable goods. This has its limitations, however, since the denominator in (10) should ideally reflect domestic prices of nontradables. Even as an indicator of international competitiveness, the use of WPI is inappropriate, since international variations in WPIs tend to be small. A third approach is to deflate using GDP deflators, that is a weighted average of the GDP deflator of the country's trading partners divided by the country's own GDP deflator. One of the limitations of using the GDP deflator in computing the real exchange rate is that it contains both tradable and nontradable commodities, and therefore does not exactly correspond to equation 10. Moreover, it is only made available annually, usually after some time lag.

2.47 Analysts will in all probability, calculate a number of estimates of ε, using various deflators, and using bilateral and multilateral real exchange rates. Following Edwards (1988 and 1989) and Harberger (1986), we suggest that ε is best estimated using the WPI of a country's competitor(s)

in the numerator and the CPI of the country concerned as the denominator. The former gives greater weight to the price of tradables, whereas nontradables usually figure prominently in the calculation of the latter. In this way, the estimate of ε closely corresponds to equation 10. Alternatively, analysts may prefer to use only components of the price indices — taking the tradables components of the price indices of trading partners (be these CPI, WPI or GDP deflators), and the nontradables component of the country's own price index (CPI, WPI or GDP deflator). In this way, the world price of tradables is indexed in the numerator and the domestic price of nontradables is indexed in the denominator.

2.48 This gives the 'best' estimates of ε as,

$$\varepsilon_b = e(WPI^{us})/CPI^d$$

and

$$\varepsilon_m = \left(\sum_{i=1}^{m} \alpha_i e_i WPI^w_i\right)/CPI^d$$

where the b and m subscripts refer to bilateral and multilateral versions of ε, e_i is an index of the nominal rate of exchange between the domestic currency and the currency of trading partner i, α_i are the trade weights used in computing the multilateral index, and WPI^w_i are the wholesale price indices of the trading partner, i (there being m trading partners). Once calculated for periods of both destabilization and adjustment, ε should be compared with the direct calculations of P_t/P_n. Generally, these should given similar patterns of relative price change, though the exact movement of the direct price series may be lagged somewhat behind the ε series.

2.49 These estimates of ε have been made on the assumption that the nominal exchange rate (e) is the same for all tradables, so that the index provides an accurate estimate of changes in the relative price of all tradables. This may not always be the case. Quite apart from the problem of multiple exchange rates (in which the official value of e will vary across sectors), some tradable sectors may purchase or sell foreign exchange in the parallel market, where the domestic currency price of foreign currency is generally higher. [4] Thus the calculated value of ε will prove a misleading indicator of resource flows. If producers of exportables are more likely to sell foreign exchange in the official market, if importables producers tend to purchase in the parallel market, and if an exchange rate depreciation narrows the gap between the official and parallel rates, P_x/P_m is likely to rise as a result of a devaluation. This means that resource flows into exportables will be greater (and into importables less) than that predicted by the calculated value of ε. If analysts feel that such changes are significant, and likely to invalidate the use of ε, they may calculate sector-specific values of the real exchange rate, using the exchange rate that applies to the sector concerned. This would also provide an opportunity to take into account sector-specific trade interventions, to which we now turn.

2.50 The third set of complications that arises in calculating the relative-price effects of adjustment concerns the presence of, and changes in other trade interventions, such as tariffs, import controls and export taxes/subsidies. If these are important, and especially if they are changed under the adjustment program, it is essential that the macro-meso analysis proceeds beyond ε, since this index will give a misleading impression of relative price changes, and therefore resource flows *within* tradables. For example, cuts in export taxes or cuts in import tariffs will shift relative prices in favor of exportables. These relative price shifts should be measured as part of macro-meso analysis, since they will clearly affect the various household groups differently. Where domestic price data are good, the effects of such policies can be traced directly, with a table similar to Frame 2.2 being computed for the domestic importables and exportables relative price. It is particularly important to attempt direct calculations of changes in relative prices within tradables if quantitative restrictions are imposed (and adjusted) on imports, since the indirect methods using world prices (discussed below) are not generally valid. For such commodities, world prices are a poor guide to domestic price levels.

2.51 Where price data are poor, the analyst is obliged to use world prices and from them to compute the domestic price. This procedure is only valid for importables when quantitative restrictions are not applied. Assume that s = 0, but that k > 0 (see paragraph 42 above), and that the government reduces k as part of its adjustment package. The effect on the domestic price of importables can be calculated from,

$$P_m = e[P_m^*(1+k)].$$

With changes in both k and e taking place under adjustment, it should be possible for the analyst to compute a time series for those importables

whose prices have been changed as a result. Calculating the price changes in this way means that the analyst can derive the policy-induced changes directly. Estimates of ΔP_m (based on P_m^*, and Δe and Δk) can then be used in assessing equation 2. Similarly, computations can be carried out for P_x^* using Δe and Δs.

2.52 Although not directly relevant to the meso-micro analysis plans set out elsewhere in this volume, the analyst may wish to establish whether these relative price changes have indeed induced resource transfers. Estimates of changes in output (or value added) in the various sectors should provide evidence of whether adjustment is succeeding in shifting resources out of nontradables (and possibly previously protected importables), and into tradables, especially exportables. More direct evidence on labor transfers is discussed in the next section.

Labor-market effects

2.53 As with price data, the possibilities for analysis of the real wage effects of adjustment are certain to be constrained by data availability. It is unlikely that reliable labor-force surveys will have been conducted at appropriate points for analytical purposes (that is, at the start of the periods of destabilization and adjustment, and some time after adjustment policies have taken effect). Moreover, these data will usually refer only to formal sector wages, and movements in these are likely to be different (quantitatively, and possibly also qualitatively) from informal wages.

2.54 Generally, data on public-sector wages are likely to be more readily available than for other wage series, and these can provide some clues of real wage trends overall. Similarly, minimum wages can be used to estimate wage trends change during destabilization and adjustment. Needless to say, such wage trends should be expressed in real terms, with nominal wages deflated by the consumer price index.

2.55 Ideally, however, measures of wage differentials, especially between tradables and nontradables, and formal and informal sectors, should be computed, since these are likely to change during adjustment (at least in the short run). Thus, if private-sector wage series are available, the analyst should compute changes in the public-sector wage in relation to private-sector (market) wages throughout the period under study. The expectation is that during destabilization, the public-sector wage will have risen relatively, and

Box 2.1: An example of relative-price calculations

An illustration of the type of problems encountered in calculating a relative price series is to be found in Collier's (1988) assessment of adjustment in Malawi and Tanzania. For Malawi, he had access to reliable data on the domestic price of exportables, but not for importables. Since Malawi did not use either import quotas or price controls, he was able to infer from the world price and tariff rates the domestic price of importables. By contrast, Tanzania used both quantitative restrictions and price controls extensively, and this procedure could not be justified. Fortunately, for this country, Collier was able to use sector-specific GDP deflators. From these sets of calculations he was able to estimate a price series for both exports and importables for the two countries. He also computed nontradables prices from various sources:

Domestic prices of exports, importables and nontradables, 1973-1983

	Malawi			*Tanzania*		
	Exports	*Importables*	*Nontradables*	*Agricultural exports*	*Non-oil importables*	*Nontradables*
1973	100	100	100	100	100	100
1974	118	132	108	106	116	120
1975	127	158	117	125	139	134
1976	146	182	126	141	155	142
1977	163	206	131	209	172	161
1978	202	210	135	194	191	176
1979	213	243	143	186	215	199
1980	214	308	149	225	279	241
1981	212	377	171	246	390	284
1982	202		192	307	458	339
1983	209		209	342	522	397

Source: Collier (1988: Table 9).

Methods of calculation:

Malawi: exports – direct data on domestic export prices; importables – cif import prices times one plus average tariff rate; nontradables – simple average of school fees, entertainment, personal services, travel, domestic help and low-income housing.

Tanzania: agricultural exports – from 1985 Agricultural Price Review; importables – manufacturing value-added deflator; nontradables – weighted average of GDP deflators for construction, wholesale and retail trade and transport.

The lesson from these calculations is that with limited data, some ingenuity must be used to compute meaningful price series. Note that for Malawi, the data clearly show that nontradables became markedly cheaper relative to importables, mainly as a result of expenditure switching policies. In Tanzania, the evidence indicates that price movements encouraged resource transfers out of exportables into importables and nontradables.

fallen during adjustment. Similar patterns might be expected of the rural-urban wage differential. An analysis such as this can reveal how relative wage trends have been changed as a result of adjustment. The main data limitations are certain to be in the area of the informal-sector (or market-determined) wage. It is very unlikely that such information will be available over time to permit meaningful macro-meso analysis.

2.56 Even without informal-sector wage data, official wage trends can be compared with average levels of living for the population in general. An example of this is found in Collier (1988). Using national accounts estimates and the CPI, he computed real private consumption per capita for Malawi and Tanzania. At the same time, he estimated a real-wage series for the formal sector from official sources, again deflating using the CPI. By expressing the real wage relative to average real consumption, he generated a time series which showed for both countries that the real-wage/real-consumption index fell from 100 in 1973 to around 65/70 in 1984. Thus he was able to show (albeit through an imperfect indicator) that formal-sector wages had fallen in relation to peasant living standards quite dramatically.

2.57 In the absence of wage data, there is some scope for using the results of the SDA Integrated Survey to assess the direction of likely wage changes, at least in the short run. This derives from the fact that the real wage will rise (fall) as a result of an expenditure switching policy if workers consume mainly nontradables (tradables). An examination of the expenditure patterns of wage-earning households should enable the analyst to infer something about the direction of the likely short run real-wage change.

Changes in credit market

2.58 In most African countries fiscal contraction is closely associated with monetary contraction, so that adjustment is usually associated with significant changes in the credit market. Credit markets invariably consist of a formal market, which is dominated by the organized, modern banking system, and an informal or "kerb" market. The former is directly subject to the restraints that are imposed under monetary contraction, while the latter is affected only indirectly. Typically, a credit squeeze will reduce the supply of credit in the organized banking system, so that many borrowers have to shift to the informal market to obtain their credit requirements. Since interest charges are fixed (and generally low) in the organized market, such borrowers face increased interest charges on their new debt. Interest rates in the kerb market, which are flexible, will therefore rise as the credit contraction in the formal market pushes more borrowers into the kerb market. Thus the effect of monetary contraction is to restrict the availability of credit in the organized market, and to increase interest rates in the kerb market.

2.59 In some programs, the fixed-interest regime of the formal market (referred to as a "repression" of the money market in the literature) is dismantled, so that interest charges are allowed to settle at their market-clearing values. Thus, in addition to any decrease in credit availability in the formal market, borrowers may face increased interest charges in the market as well.

2.60 Once again, the extent to which these changes can be convincingly analyzed depends critically on data availability. Information on credit and its terms is generally available from the official banking system, but this can prove totally misleading as a preparation for the meso-micro analyses of most households obtaining their credit from the kerb market. It may be, for example, that interest rates are not increased significantly among the larger banks, but because of credit restraint, kerb-market rates increase. Using official rates would be inappropriate in analyzing households which borrow through the kerb market. Data on the kerb market therefore are essential. If possible, therefore, nominal and real rates of interest applying in the organized banking system and in kerb markets should be computed for the period of destabilization and adjustment. In this way, some historical estimate of the effect of adjustment on the credit market can be obtained.

Expenditure-reducing effects

2.61 The first stage in the analysis of the effects of expenditure-reducing policies is simply to identify which of the broad categories of expenditure were subject to cuts (and also, by the same token, to identify those items which expanded during the destabilizing phase). Expenditures should be disaggregated initially into the four categories of equation 9: private consumption and investment, and public consumption and investment. [5] By dividing through equation 9 by Y (GDP), we can decompose changes in the trade

deficit/GDP ratio as follows:

$$\Delta[(X-M)/GDP] = 1 - \Delta(C/GDP) - \Delta(I/GDP) - \Delta(G_c/GDP) - \Delta(G_i/GDP) \quad (11)$$

2.62 Again, a table such as Frame 2.3 should prove extremely useful in any preliminary assessment of the implications of destabilization and expenditure reduction. It may be, for example, that the expansion of the trade deficit/GDP ratio during the period of destabilization (assumed to be 1979-84 in our hypothetical case), was associated mainly with an increase in government investment, whilst the contraction of the deficit during adjustment was due to cuts in private consumption and investment. Such asymmetry in expenditure changes over the cycle of destabilization and adjustment are important to identify, since they have a direct bearing on the social dimensions of adjustment. If the macro imbalance was caused by an over-expansionary fiscal policy, whereas its correction was borne mainly by private consumption, the social costs of the adjustment are likely to be significant.

2.63 Given the central role of the government in the provision of infrastructural services (through both investment and re-current expenditures), cuts in G_c and G_i will be of particular interest for macro-meso analysis. However, for our purposes, these expenditure items are simply not sufficiently disaggregated, since the meso-micro analysis plans require somewhat more refined estimates of changes in infrastructural services. Chapter Five on health, for example, explains health status of individual household members in terms of changes in health services available to the household. It is clear that SDA macro-meso analysis must disaggregate further the changes in government expenditures during destabilization and adjustment, and attempt to estimate how much the various items of expenditure have changed in real terms over the period, and especially during the adjustment period.

2.64 At the very least, therefore, a time series should be computed for each country, showing the changes in public spending by major category. For this, a table along the lines of Frame 2.4 (overleaf) should be prepared. The expenditure categories depicted in the table ought to be considered as a minimum disaggregation. It would be helpful, for example, to distinguish between the three levels of education (primary, secondary and tertiary), and different categories of health expenditures (primary health care, hospitals etc.).

Frame 2.3: Decomposition of changes in the trade-deficit/GDP ratio by expenditure item
(percentage)

		Expenditure change			
Year	Δ(X-M)/GDP	Δ(C/GDP)	Δ(I/GDP)	Δ(G_c/GDP)	Δ(G_i/GDP)
1979	100				
1980	100				
1981	100				
...	...				
1989	100				
1990	100				
Memorandum items:					
1979-84	100				
1985-90	100				
1979-90	100				

The whole table might be prepared for recurrent and development (or capital) expenditures, and comparisons made.

2.65 The analyst should be careful to define an appropriate price index in generating a time series of expenditures in real terms. In most cases, the consumer price index (CPI) will be all that is readily available, but in others, alternatives may be tried (at least for the sake of comparison). These would include a wage index (on the assumption that labor is the most important cost of many public services), the GDP deflator, or that part of the deflator which refers to the service/public sector. The proportion in total real government expenditure of each of the items depicted in Frame 2.4 should also be computed, and changes over time observed.

2.66 The data in this table merely show what has happened in real terms to expenditures on each of the items. Again we have the knotty research task of quantifying the change in infrastructural spending imposed as a result of structural adjustment, since it is on this basis that the first difference equation (2) is to be computed. In making judgements on this, the analyst must bear in mind the following:

- Taking deviations of expenditures from a time trend is an inappropriate method of assessing the impact of adjustment on that expenditure item. As we have been at pains to show, the period prior to the adjustment is unlikely to be typical of any long term trend, being one in which expenditures are likely to have been unusually (and unsustainably) high.
- Changes in the real expenditures on each

Frame 2.4: Real government expenditure by sector

	Social infrastructure				*Economic infrastructure*					
	Education	*Health*	*Social security*	*Housing welfare*	*Roads*	*Utilities*	*Transport/ communi- cation*	*Economic services*[a]	*Other items*[b]	*Total*
1979										
1980										
1981										
1982										
...										
...										
1990										
Memorandum items										
Percentage change										
1979-1984										
1985-1990										
1979-1990										

a. Including items such as irrigation and extension services. These may be listed separately if necessary.
b. Including general administration, defense, etc.

item may not necessarily reflect changes in the availability of services to households. This is because cuts in expenditures may be associated with more efficient use of resources, whilst the opposite may be true of periods of expansion.

- The effects of expenditure cuts will vary by region depending on how the cuts are applied within each sector. For example, expenditure cuts in higher education are unlikely to have any real effects on education services in rural areas. But if the cuts were applied mainly to primary schools, rural areas may suffer disproportionately. Similarly, cuts in teacher recruitment will inevitably harm rural areas more than urban, given the preference teachers attach to working in urban areas. The quantity adjustment of such a policy would be borne mainly by rural areas.
- Some changes in government expenditures may have taken place quite independently of adjustment, but are merely associated with the adjustment program chronologically. Obviously there is little that can be said by way of a generalization here — it is simply a matter for the analyst to make a judgement in his or her country.

2.67 However, the memorandum items in Frame 2.4 are designed to identify the key chronology of the expenditure changes, again dividing the period into meaningful sub-periods which reflect destabilization and adjustment. 1979-84 and 1985-90 are only illustrative examples. These would need to be specified in each case.

Economy-wide modelling techniques

2.68 The analysis suggested above relies on an examination of the historical record. The key lies in identifying periods of destabilization and adjustment. This then permits the analyst to draw conclusions about how adjustment has affected markets and infrastructure. But this type of analysis is subject to a number of serious pitfalls. First, the historical record does not imply *causation*, since what is observed happening over time is influenced by a wide range of factors, and not simply the macro-imbalances and the corrective adjustment policies. Movements in relative prices, for example, might reflect changes in supply conditions that are entirely unrelated to adjustment — including the favorable effects of technical progress and the adverse effects of drought. The methodology suggested above cannot entirely separate out these factors. [6]

2.69 The second main problem with the suggested analysis plan is that it takes a *first order approximation* of how policy interventions affect markets and infrastructure. To gain an understanding of this, consider again the diagrammatic presentation of the plan in Figure 2.1. The arrows show how the rationale of the analysis proceeds, beginning with the effects of policy interventions on markets and infrastructure, and then examining the effects of the meso variables on households. This approach ignores (or assumes

as insignificant) the *responses* of households to the market and infrastructural changes — so called higher-order effects. These are shown in the diagram as the dotted line, linking household responses back to markets. Thus, for example, a policy which raises the market price of a commodity will lead some households to purchase less of it, thereby reducing demand and causing the price to fall back somewhat. This might be related to the time period that is allowed in tracing the effects. The first order effects are impact effects, with the full effects taking time to work their way through the economic system. The first order impact on prices may well be greater than the full effect, since the initial change in prices is moderated by demand and supply responses. Notice, the feedback loop is drawn only to markets, since this is where higher order effects are to be expected. There may be ways in which household responses may cause further changes to infrastructural services, but these are likely to take some time to have some effect (as with, for example, responses through the political process).

2.70 The third weakness of the analysis suggested thus far is that it ignores the interactions between markets and infrastructure. Yet we know that the economy functions as a system, with changes in any one market influencing what happens in others. Thus, for example, an increase in the price of food will increase production of food, which in turn will raise the demand for farm labor. This may raise rural wages. These effects need to be traced in a *systematic* manner.

2.71 Finally, the above methodology does not produce any robust answers to the question, What might have happened had a different set of adjustment policies been applied? The *counterfactual* case is not readily derived from the historical approach that we have suggested. Yet, in most cases, governments would like to have some idea of how alternative policies might have worked (or not, as the case may be), and such impressions are difficult to form without more structured and rigorous methods.

The strengths and limitations of modelling

2.72 It follows, therefore, that a more systematic approach to macro-meso analysis might be needed. The use of economy-wide models has already a tradition in development economics and policy design. In the remainder of this section, we shall review the potential of economy-wide modelling for macro-meso analysis in the SDA analytical program. This is not meant, however, either as a review of such models, or as guidelines for the construction and use of models, since there are obvious space constraints in a chapter such as this. Our purpose here is to highlight the strengths and weaknesses of the approach, and to identify the main features an economy-wide model must possess to be of use in the SDA analysis program.

2.73 At the outset, it is important to emphasise that a model of the economy is simply a piece of capital equipment. And as such, it is intended to aid our thinking — not to substitute for it. Economy-wide models are to be used in a process which is human-capital intensive. They are to be combined with the application of human judgement, and not to replace it. In this way, the user will not be tempted to react in an extreme way to the model — either to dismiss all its predictions as too mechanical and useless, or to accept without reservation anything that is produced by the model (simply because it appears to be 'scientific'). The true response to and use of the economy-wide model involves an application of the analyst's own judgement and understanding of the country to which the model is applied, and to interpret the predictions of the model accordingly.

2.74 The main strength of the model lies in its formalization of the thinking process — it makes explicit what is often assumed implicitly in less formalised logic. It also serves to simplify the real world, by ignoring minor detail, and focusing on the more important interactions. In this sense, a model is a small, inferior version of the real thing — in this case the economy. Many models are important bridges between economic theory and the practice of economic policy (Dervis, et al., 1982). Whilst theoretical models are an essential starting point in considering a real-world problem, they cannot take us very far. This is because at best they can only provide qualitative predictions, whilst the policy practitioners must make quantitative decisions. Theory may suggest that a devaluation policy will work under certain circumstances, but the practitioner must know by how much to devalue. But theory is not always clear about its qualitative conclusions. This occurs especially in cases where there are two opposing effects of a change, the net result depending on which of the effects is the stronger. For this theory alone cannot provide an unambiguous answer. In such circumstances, the model comes into its own, since it can simulate the two

opposing effects, and reveal which is the stronger. Many policy issues are of this type, and require both quantification and simulation before an answer can be obtained.

2.75 The main weakness of modelling lies in its highly structured approach. First, it assumes that the economy can be described through a set of relationships which remain stable over time. Insofar as these might change, the predictions of the model will prove unreliable. Second, economy-wide models are generally not designed to take into account qualitative changes in the economy, which by their nature are not easily quantified. Finally, the degree of disaggregation that is meaningfully feasible in an economy-wide model remains limited — not by the capacity of the computer, but the understanding of the user. If the model is too detailed, it quickly becomes a black box to the user, resembling more the vast complexity of the real world than a simplified version of it to aid our thinking.

Required features of macro-meso models

2.76 These considerations apply to models in general but what are the specific requirements of our present concern, the macro-meso analysis in the SDA analytical program? The main features of an economy-wide model to trace the meso effects of adjustment policy may be summarised as follows:

- The model is to be used for policy analysis. As such, it should be designed to aid our understanding of the way the economic system operates, rather than forecasting the future. It must therefore treat policy instruments and targets explicitly. It should also be able to trace the causal mechanisms at work, linking the instruments to the targets.[7] Among the targets should be included the fiscal and external deficits.
- It must involve a minimum degree of disaggregation, at the very least distinguishing between the main producing sectors of the economy: exportables, importables, protected importables and nontradables. A macro-model is inappropriate, since it is incapable of analyzing the critical structural shifts brought about by adjustment policies;
- On the other hand, our ideal model must be capable of representing macro-policy instruments. Whilst many instruments are 'real' economic variables, such as government demands for consumer and investment goods, and many price policies, other policy instruments are monetary, such as monetary and interest rate policy. The macro-meso model must, to some extent, be able to track changes in both real and monetary policy instruments at the macroeconomic level. This issue is discussed further below.
- Since many adjustment policy instruments have their principal effects through changing the incentive structures of product and factor markets, the model should treat product and factor prices as endogenous. This means that product and factor supplies and demands must be modelled, and price changes related to excess demands. Price- and wage-endogeneity, however, may be constrained by rigidities which prevent markets from clearing instantaneously, and which result in rationing in the markets and persistent excess demands. This would obviously depend on the characteristics of the markets in the country concerned. These constraints can play a pivotal role in explaining how adjustment affects markets and thereby household incomes. Wage rigidity in particular, can determine how the labor market transmits the effects of adjustment policy to households.
- Finally, the macro-meso model should include the household sector, and trace how household incomes and expenditures are determined. We have already stated that the level of household disaggregation that is feasible in an economy-wide model may be too limited for many policy issues. And although the main purpose of the model is to trace meso-economic effects (at least in the context of the SDA analysis scheme), the household sector remains an important ingredient in the model. This is for two principal reasons. First, the model can provide useful insights into household effects, even if this is not altogether sufficient for policy makers. Second, without the household sector, the model would be unable to trace the full meso-economic effects. Figure 2.1 showed how household responses play an important part in determining what happens in markets as a result of policy interventions. Therefore, the determination of household incomes and expenditures should be considered as an essential element of the macro-meso model.

Do AGE models meet the bill?

2.77 Applied general equilibrium (AGE) models are frequently used in addressing policy issues in an economy-wide framework.[8] The main features of AGE models is the general equilibrium nature of the model. Producing units are

represented as purchasing factors from households, and thereby generating value added. In return for factor services, households receive income payments, which are allocated to savings and consumption. The sum of these production and consumption decisions yields supplies and demands in the various product and factor markets. These are reconciled through relative price adjustments, which yield zero excess demands in the markets unless some rigidity is assumed to exist. Described in this way, the AGE model seeks to trace the operation of the real economy. It yields predictions of what is likely to happen to the structure of relative product and factor prices if the assumptions of the model, or if policy instruments such as trade taxes, change. As such, it is an empirical application of orthodox real-economy theory, and as such, it describes a barter economy.

2.78 It should be clear from the above that AGE models show considerable promise for macro-meso modelling. They explain what determines relative product- and factor-price movements, and show how resource allocation rules operate. Most AGE models utilize base-year Social Accounting Matrices (SAMs), which represent how incomes generated by production activities are mapped across to households, and how expenditure decisions by households are allocated to sectors. As such, AGE models have a built-in focus on incomes and their distribution. Finally, AGE models usually explicitly model the external sector, and can be used meaningfully to analyze the effects of trade policy. Such qualifications make them eminently suitable for SDA analysis.

2.79 AGE models, however, have two principal weaknesses from the macro-meso analysis perspective. First, they do not usually embrace the macro-economy, especially its monetary components. Second, they only trace the effects of policy interventions on markets, and do not treat infrastructural effects. We shall discuss each limitation in turn.

2.80 AGE MODELS AND THE MACROECONOMY. AGE models are principally concerned with relative prices, resource allocation and trade. They are not usually designed to analyze macroeconomic changes. Most AGE models follow fairly simple price normalization procedures, whereby the aggregate price level is taken as exogenous, and all absolute prices are simply expressed in terms of some numeraire. Relative prices, of course, remain unaffected by such normalization. As a general rule, the choice of numeraire in such models is entirely arbitrary, since the model is not intended to explain the absolute price level. This means that such AGE models are incapable of tracing the effects of macroeconomic policy, especially when such policy intervention is through the operation of monetary variables.

2.81 AGE models, however, can be modified to incorporate a macroeconomic superstructure. This can meaningfully interact with the multi-sector general equilibrium model, and enable the user to conduct macroeconomic experiments in an AGE setting. Bourguignon et al (1989) have made an important recent contribution in this area. Their refinement of the AGE approach involves the addition of a macroeconomic model to the general equilibrium framework, in which the macroeconomic sub-model yields the level of aggregate demand in the economy (through a variant of an IS/LM system), whilst the general equilibrium sub-model computes the real-economy side, yielding aggregate supply. The price level is given by the relation between aggregate supply and demand. Their macro-model contains general asset-market equilibrium conditions, which determine a vector of rates of return. These in turn influence the level of aggregate demand. In a simpler version of the same, Demery and Demery (1990) take two financial assets (money and bonds), and trace the link between the monetary and real economies through the interest rate in textbook fashion.

2.82 In other words, there are now AGE models in use which do incorporate the macro-economy into a multi-sector general equilibrium framework. It is perhaps too early to judge whether these models provide an empirically convincing description of how macroeconomic changes influence the real economies of developing countries.

2.83 AGE MODELS AND INFRASTRUCTURE. The second major limitation of AGE models when applied to the analysis of the effects of adjustment concerns their inability to capture the full effects of infrastructural changes. This applies as much to economic as to social infrastructure. If adjustment entails cuts in government expenditure on education, health and physical infrastructure, there are two broads effects. First, there will be income losses for those employed in the sectors which previously benefited from these expenditures (ie. teachers, doctors, road construction firms, and so on). These direct primary-income

effects of expenditure cuts can readily be measured by AGE models, simply by tracing the full general equilibrium implications of the resulting contraction in sectoral demands.[9] To do this, the cuts in government expenditure items need to be translated into sectoral demands, so that they can be readable input into the AGE model (or a SAM).

2.84 The expenditure cuts, however, will have indirect effects on the incomes of households who previously benefited from the infrastructural services that were produced. Cuts in expenditure on education will not only reduce the primary incomes of those engaged in the education sector, they will also adversely affect the education of those who previously benefited from the services, reducing current levels of household welfare, and future levels of income. The same can be said of cuts in health expenditure. A reduction in other infrastructural services, such as road construction, will have similar effects. Households who cannot gain access to markets and inputs will experience declines in output and income. These indirect effects on incomes and welfare cannot readily be traced in an AGE environment.

Concluding observations

2.85 Macro-meso analysis in the SDA research scheme is certain to be the most tasking of all those outlined in this Volume. Yet this work is an essential prerequisite for what follows. Without an understanding of how adjustment policies influence the main explanatory variables considered by the meso-micro plans as important, it will not be possible to link the results of the SDA data gathering initiative with policy design.

2.86 What can be done in analyzing the meso effects of adjustment policy depends on the available data in the country. We have tried to keep the data requirements to a minimum in what we have recommended here. But in the last analysis, the data will constrain what can be achieved. At one extreme, we have presented some fairly basic analyses requiring only national accounts data. On the other, there is the application of AGE models, with their potentially voracious appetite for numbers. It is probable that most countries will lie somewhere in between these cases. In all cases, as some of our illustrations have shown, analysts will need to use the utmost ingenuity (if not imagination) to push the available data as far as they can convincingly go.

2.87 In cases where economy-wide modelling is not feasible, the approach recommended here concentrates on the historical record. The analysis program that we have recommended depends on the identification of periods of destabilization and adjustment, so that changes in the meso economy between these periods can be attributed (for the most part) to the adjustment program. This is an imperfect solution, since we know that there may well be other factors which have a bearing on the historical record. The analyst has to use his own judgement in making adjustments for these extraneous influences.

Notes

1. Using IMF terminology.

2. This also assumes that the international terms of trade (P_x^*/P_m^*) remain unchanged.

3. We ignore here the use of money wage indices as deflators, though these have been used effectively, especially when indices of international competitiveness are required.

4. Edwards (1989: 105ff) computes real effective exchange rates using both official nominal exchange rates, and rates which apply in parallel foreign exchange markets. He found that they bore very little relation to each other. Indeed, in 13 out of the 28 cases considered, the correlation coefficient between the two indices was negative. This suggests that where parallel markets are important, the use of the official rate can be seriously misleading.

5. This level of disaggregation is chosen because it is consistent with what is available from the national accounts. As we shall discover, a much more refined classification of expenditures will be required in assessing the infrastructural implications of adjustment.

6. Though it does attempt to separate out the effects of the 'recession' from those of the adjustment by carefully subdividing the historical record.

7. Forecasting models usually rely heavily on lagged endogenous variables and reduced form specifications. Although they yield better forecasts, such models generally mask the causal mechanism involved.

8. For an excellent summary of the main features of such models, see Dervis et al (1982: Ch. 5).

9. By the same token, a SAM can perform similar assessments. Thorbecke et al (1990) trace the primary-income distribution effects of alternative fiscal policies in Indonesia using a fix-price SAM multiplier model.

3

The poverty profile

Introduction and objectives

3.01 This Chapter is concerned with poverty, and how it is influenced by structural adjustment policies. It sets out a plan of analysis which is intended to guide researchers and policy makers in utilizing household data in developing countries for the purpose of constructing poverty profiles. It is directed particularly to the analysis of the SDA Integrated Survey. The methods proposed are relatively simple, and most of the results are designed to be presented in tabular form so that they can be understood readily by decision makers. As a profile, the analysis of this Chapter does not pretend to prove causation between adjustment and poverty, but to indicate some inferences about the likely effects. Neither does the profile enter into analysis of the causes of poverty. Again, it may provide some insights into this (as, for example, through the multi-variate analysis of income/expenditure), but this is not the main purpose of the Chapter. The analysis presented here is meant to be a first cut at identifying which groups are poor, and in making some assessment of how they might be affected by structural adjustment.

3.02 Other Chapters address different aspects of the social dimensions of adjustment, but the poverty profile must be given priority for a number of reasons. First, the goal of poverty reduction is paramount. It is one of the most fundamental objectives of development, and one which in itself demands attention. Second, poverty alleviation is a necessary condition for sustainable long-term growth, for without it, human capital accumulation is threatened. Third, it is a matter of some urgency for most policy makers. Identifying the poor and assessing how they fare in the light of policy reforms can be critical. In some extreme cases, adverse poverty effects can cause political instability, and it is vital for governments to be able to make some ex ante assessment of potential poverty problems arising from their policy interventions.

3.03 The poverty profile should also be given chronological priority in the SDA analysis program, since its results are certain to be essential inputs into other areas of analysis. This Chapter, therefore, is best considered as an 'umbrella' under which the other Analysis Plans are placed. The poverty profile should be the first of the analysis components to be undertaken in each country participating in the SDA program.

3.04 The main objectives of the poverty profile are to:

- identify which are the major poverty groups in the country concerned;
- assess how these groups have been affected by structural adjustment programs; and
- draw some policy inferences, concerning both the design of adjustment policies and the alleviation of poverty.

3.05 The first objective, though itself a major empirical undertaking, is needed as a basis for achieving the second and third, more fundamental objectives (from the SDA perspective). The

difficulties of establishing empirically a causal link between macroeconomic policy changes on the one hand, and the microeconomic outcomes at the household level on the other, have already been discussed in the companion volume, World Bank (1990), and they are addressed in Chapter Two. Care must be taken in the analysis of poverty and adjustment to avoid simply tracing poverty historically over the adjustment period, and assuming some causal link. In order to ensure that the analysis goes some way in establishing the causal mechanism between macro-interventions and micro-outcomes, a key analytical device is introduced — the meso economy. By understanding first the link between macro policy interventions and meso-economic outcomes (in terms of markets and social and economic infrastructure), and secondly the effects of meso-economic change on the household groups, SDA analyses will enhance understanding the processes through which households have been affected by policy interventions, which in turn will increase confidence in ascribing causation in the relationships observed. The poverty profile assumes that some understanding has already been gained about the key macro-meso effects of structural adjustment, as explained in Chapter Two. In particular, it assumes that the effects of adjustment policies on relative prices, economic structure, growth and social infrastructure are reasonably well understood.

3.06 The next section is devoted to a discussion of measures of welfare which are to be used in the poverty profile. Paragraphs 3.19 through 3.33 then review the meaning of poverty and describe its measurement. Paragraphs 3.34 through 3.77 address the central concern of the poverty profile — an examination of how adjustment policies affect poverty. The methodology outlined here emphasizes the first order effects of adjustment policy, whereby adjustment affects markets and infrastructure and these affect poor households. Higher order effects are considered only briefly. Basic needs dimensions of poverty are discussed in paragraphs 3.78 through 3.85, whilst paragraphs 3.86 through 3.91 trace some of poverty's dynamic aspects. Some concluding observations are made in paragraphs 3.92 and 3.93.

Measuring welfare

3.07 We begin with our first objective, which is the identification of the poor in the country concerned, and their main economic activities. In order to proceed with this, two key questions must be resolved. First, what *measure of welfare* is to be adopted as a basis for poverty analysis? Second, how should poverty in the community be measured? The second issue is dealt with in the next section. The first has been discussed to some extent in World Bank (1990), although some amplification would be in order here. Ideally, we should use some measure of *individual* welfare, but this is not always feasible given data constraints. The data base addressed by these plans is the SDA *Integrated Survey* (IS). IS data do not permit individual-level analysis of expenditure.[1] However, this does not prevent the analyst from developing data constructs which reflect individual well-being, for example through expressing household-level variables on a per capita basis.

3.08 The main problem faced in analyzing individual (or household) welfare is that utility is never observed directly. What is required is some counterpart to welfare which can readily be observed. A strong theoretical case can be made for using expenditure as our proxy for welfare.[2] Assume that individuals consume two broad classes of commodities — those that they purchase in product markets, and those that they produce themselves. For such individuals, the problem is to:

$$\text{Maximize} \quad U(x_1, x_2)$$

$$\text{Subject to} \quad p_1 x_1 \leq p_2(q_2 - x_2) + A - C \qquad (1)$$

where x_i represent vectors of market-purchased goods (i = 1) and the consumption of home produced-goods (i = 2), p_i are the corresponding prices, q_2 is a domestic output vector, A other (exogenous) income and C total production input costs. The values of q_2 and C are pre-determined through the household's production (net-revenue-maximizing) decisions.[3]

3.09 The dual expression of (1) represents the individual's objective as minimizing expenditure subject to some utility constraint:

$$\text{Minimize} \quad p_1 x_1 + p_2 x_2$$

$$\text{Subject to} \quad U(x_1, x_2) \geq \bar{U} \qquad (2)$$

where $\bar{U}$ is some minimum acceptable level of utility. Solving (2) gives the *expenditure function*:

$$E = E[(p_1 p_2), \bar{U}] \qquad (3)$$

Expenditure is a monotonically increasing func-

tion of $\bar{U}$, so that if all individuals share the same preferences (or utility function), and if they face the same prices (both explicit market prices and implicit own-production prices), the ranking of expenditures will be the same as the ranking of utilities. This then is a sound theoretical justification for the use of expenditure as a proxy for utility in poverty analysis. It is based on the assumption that individuals are utility maximizers, and that the main arguments of their welfare function are the commodities they consume.

3.10 The use of expenditure as our indicator of welfare also assumes that individuals face the same set of prices. In the real world, however, they may face different prices — of both purchased and own-produced commodities. In such cases, it is not valid to use nominal expenditure as a welfare indicator, simply because some variation in expenditures will be due to price differences. Thus, if we are comparing expenditures across regions, care must be taken to account for regional price variations in computing an expenditure variable to reflect relative welfare levels. To do this, a reference region needs to be chosen, and cost of living comparisons made with other regions. A suitable index for deflating regional expenditures into the prices of the reference region is the Paasche cost of living index. The Paasche price index (I_p) for region 1 is given by,

$$I_{p1} = \sum_{i}^{n} (q_{1i} p_{1i}) / \sum_{i}^{n} (q_{1i} p_{0i}) \qquad (4)$$

where p_{0i} and p_{1i} are the prices of commodity i (i = 1,...n) in the reference (0) and non-reference (1) regions respectively, and q_{1i} are the expenditures on commodity i in region 1. The index uses the non-reference region expenditures as weights to compute the regional price index. Alternatively, (4) may be written,

$$I_{p1} = \sum_{i}^{n} V_{1i} \; / \; [\sum_{i}^{n} V_{1i} (p_{0i} / p_{1i})]$$

where V_{1i} is the value of expenditure in region 1 on commodity i. Using this index to deflate expenditures across regions will yield a Laspeyres real expenditure index, in which expenditures in each region are valued at the prices of the reference region. These computations will require a reliable data set on prices across regions in the country. Price data may be derived from the community survey or from other sources, and expenditures (used as quantity weights in the Paasche index) can be derived from the household survey itself.

3.11 Similarly, if comparisons of expenditure are made over time, account has to be taken of changes in the overall price level. Ideally, regional Consumer Price Indices (CPIs) should be used to account for changes in price over time, but these are rarely available. In practice, only a national CPI will be available. The use of this index is valid so long as there are no significant variations in the rate of inflation among the regions of the country.

3.12 Within this framework, a number of income- and expenditure-based indicators present themselves for consideration. These will each need to be computed from the raw data collected in the survey, since they are not obtained from the respondent in a directly useable form. The following is a short-list of possible measures of welfare:

- total household income
- total household expenditure
- per capita household income
- per capita household expenditure
- total household income per adult equivalent
- total household expenditure per adult equivalent
- per capita food consumption
- proportion of household budget spent on food

3.13 These measures do not always produce the same results, and so it is important for the analyst to be sure that the indicator selected is appropriate for the purpose in hand.[4] The debate over whether welfare is better measured by income or expenditure (discussed in Grootaert, 1983) in part derives from the empirical problems that are encountered in measuring income through household surveys. In general, household surveys give expenditures in excess of income for many household groups, which raises questions about the reliability of the income estimates. Our suggestion, therefore, is to adopt an *expenditure-based* welfare measure.[5] 'Total Expenditures' should be the sum of all monetary expenditures made by the household, consumption of own-production, and the imputed value of services derived from the ownership of consumer durables and housing. Expenditure data must be corrected for regional price variations, using Paasche regional price indices as discussed.

3.14 Our main interest lies in individual welfare. But since the IS is designed to collect expenditures at the household level only, some adjustment is required to the household-level indicators to reflect more accurately the well-being of

the individuals within it. In order to account for differences in household size, total household expenditure should at least be measured on a *per capita* basis. Alternatively (and preferably), *adult equivalence scales* should be used to take into account differences in the age and gender structure of households, though this will inevitably make the analysis more complex (see Deaton and Muellbauer, 1980: Ch. 8).

3.15 The reason why adult equivalence scales are preferred arises from the fact that children are generally considered to be less demanding, in the sense that an additional child requires fewer additional expenditures to maintain household welfare than would an additional adult. Simply dividing total household expenditure by household size (the per capita measure) will give a misleading impression of welfare differences. For example, compare two households with the same level of total expenditure and of the same size, only with one comprising all adults and the other consisting of an equal number of adults and children. Clearly, the household with the children will enjoy a higher level of welfare, simply because its child members do not require the consumption levels of adults.

3.16 Dividing total household expenditure by household size implicitly ascribes a weight of unity to all household members, irrespective of their age. Applying an adult equivalent scale means that some members will be assigned a weight between zero and unity, depending on their age. Thus, a child between the age of thirteen and seventeen might be given a weight of 0.5, implying that his or her consumption requirements are approximately a half that of an adult. Similarly, children under seven years of age might be assigned a weight of 0.2 on the adult equivalence scale. Thus, instead of dividing total expenditure simply by the number in the household, each household member is assigned a weight depending on age, and the sum of the weights is used to divide total expenditure. The procedure to construct adult equivalence scales is beyond the scope of this chapter. Interested readers are directed to Deaton and Muellbauer (1986) for further details. The issue that the analyst must face here is whether to use weights derived from external sources or to attempt their estimation using IS data. In his analysis of welfare in Côte d'Ivoire, Glewwe (1988) uses weights which are derived from Sri Lanka and Indonesia. These are given as:

Age of child	*Adult equivalence scale*
< 7 years	0.2
7 - 12 years	0.3
13 - 17 years	0.5
≥18 years	1.0

Even if analysts do not have the opportunity to compute their own country-specific weights in the poverty profile, they may wish to use weights such as these, and compare the results with those using simple per capita expenditure.

3.17 These money-metric measures of welfare should be supplemented by other indicators, as we shall see below. Our rationale for using an expenditure-based welfare indicator assumed that only commodities entered the welfare function. There is nothing in principle against extending this to include other elements in the welfare function, including various basic needs that are not obtained through market purchases (such as health and education). The main problem arises in selecting shadow prices at which to value these services. Our preference, therefore, is to treat health and education separately (see paragraphs 3.78 through 3.85 and also Chapters Five and Six, respectively).

3.18 By the same token, some may argue that the welfare function of the poor does not simply consist of the commodities they consume, but of more fundamental quality-of-life determinants. For example, for many poor households, welfare may depend simply on whether there is sufficient food available, or whether children are sufficiently nourished. A case can be made for considering other indicators of poverty which may reflect this —such as food consumption or measures of nutrition. There are other arguments for using food expenditure only as the welfare indicator. Such expenditures is less susceptible to economies of scale (thus not requiring the use of adult equivalence), and they are easier to measure accurately, since respondents tend to recall more clearly frequently purchased items. Moreover, the use of food expenditures does not require any complex imputation of expenditures. Analysts may wish to adopt a food expenditure measure of welfare in addition to total expenditure, and make comparisons of the results.[6] In any event, these considerations are taken up in other chapters of this Volume — especially Chapter Seven on food security and nutrition. We shall, therefore, concentrate our attention on total-expenditure based welfare measures.

The nature and measurement of poverty

3.19 If it is agreed that the indicator of household welfare is to be per capita household expenditure in most cases, this leaves the second key question that will need to be addressed: how to determine the extent of poverty within the community? As poverty and its alleviation is at the center stage of the SDA endeavour, data analysis must adopt measures of poverty which will be helpful in guiding policy makers and in facilitating links between poverty and the main structural characteristics of the economy, which are themselves likely to be influenced by adjustment programs. In any measure of poverty, two broad issues present themselves: first, the identification of the *poverty line*; and secondly, the choice of a *single index* to measure poverty.

The poverty line

3.20 Much of the literature on poverty has been concerned with the respective merits of absolute and relative concepts of poverty.[7] Recent work has questioned the usefulness of absolute poverty, since what constitutes poverty in one society (at one point of time) may not be the same for another society (or the same society at a different time). Whilst Sen (1983) restates the "absolute" case, he retains much relativity. He distinguishes between the "capabilities" which incomes confer on individuals, and the goods and services needed to produce them. Poverty, according to this view, is the absolute absence of certain critical capabilities — such as avoiding shame, community participation and self respect. But the bundle of goods required to provide these capabilities varies from place to place and from time to time, and it is in this respect that poverty is relative. If the absolute aspect of poverty is ignored, as Sen (1983:156) puts it, "poverty cannot — simply cannot — be eliminated and an anti-poverty programme can never really be quite successful".

3.21 The debate on whether absolute or relative concepts are appropriate is simply about the choice of *poverty line*, and this is certain to be a subject that needs further clarification at each country level. The analyst must decide at the outset whether the poverty line is determined in some absolute sense (either by policy makers themselves or based on other criteria, such as minimum nutrition levels), or in relation to the income distribution in general.

3.22 Calculating an *absolute* poverty line is usually fraught with both conceptual and empirical ambiguities. What is the minimum caloric intake and level of food consumption that is required to avoid malnutrition? What is the corresponding income required to purchase this food? What non-food commodities should be considered as essential for the commodity basket which defines absolute poverty? These calculations, which will of necessity utilize the IS findings themselves, will inevitably involve the personal judgement of the analyst, and a measure of arbitrariness. If an absolute poverty line is to be calculated and used, it is important that the assumptions on which it was calculated (the basket of goods on which it is based and the vector of prices which is used to translate this real bundle into income terms) are made explicit. Should the poverty line be based entirely on nutritional requirements, there are obvious implications for the welfare indicator that is used. To be consistent with a nutritionally-based poverty line, welfare must be measured only in terms of food consumption. As a general rule, we would not recommend such calculations for SDA poverty profiles, unless policy priorities in the country concerned require it.

3.23 The use of an absolute poverty line (with its attendant value judgements) can be better justified in situations where there is already a general agreement among planners and policy makers about it. Of course, the analyst should be encouraged to use alternative poverty lines, and make comparisons with results derived from the official line. In such cases, SDA analysis should use the results of the IS to cross check on the realism of the official poverty line. For example, if planners are using a poverty line which was originally computed some years previously, but which has been updated using (say) the consumer price index, it would be important to check whether the inflated poverty line is consistent in real terms with the poverty line as originally defined. The consumer price index may not be a reliable inflator to trace changes in the prices of the basket of commodities which originally determined the poverty line.

3.24 The ambiguities of an absolute poverty line, its subjectivity and arbitrariness, have led many analysts to adopt an explicitly arbitrary *relative* poverty line. In some cases, poverty is defined as that income below which a certain percentile of the population is to be found. Thus,

the poor may be defined as the poorest (say) 40% of the population.[8] The poverty line is that income below which 40% of the population are distributed at the time of the survey. Kanbur (1988a), for example, selects a poverty line which defines 30% of the population as being poor, and an alternative 'hard-core' poverty line which places 10% of the population below it. This makes the selection of the poverty line arbitrary, but there is always an element of arbitrariness and subjectivity in deriving a poverty line, and such a procedure makes this quite explicit.

3.25 However, there are at least two drawbacks to this approach. First, the interpretation of the poverty line becomes extremely difficult -exactly what level of deprivation does a poverty line so generated imply? Are people suffering malnutrition below this line? Just what level of suffering is suggested? There is nothing in the procedure used to derive the line to provide any answers to these questions. Some additional assessment, therefore, may be needed to give the analyst and policy maker some impression of the extent of deprivation implied by the poverty line derived in this manner. A second drawback to this method is that it implies that poverty will always be with us — if the poorest 30% of the population are by definition poor, poverty will simply never be eradicated. And this was one of Sen's basic objections to an unbounded relativist approach to poverty. Kanbur (1988a) avoids this pitfall by identifying the poverty line as that which gives 30% of the population poor in the base year, and then retains this poverty line in an absolute sense for the analysis of later years.

3.26 Fortunately, there is an alternative relativist approach to the selection of the poverty line which does not suffer from these drawbacks (nor from the drawbacks of the absolutist procedure). This defines the poverty line in relation to *mean income* (or possibly median income). Thus, for example, the poverty line might be defined as a half of mean income —those individuals earning below half average income are considered as poor. The extent of deprivation implied by such a benchmark is more readily appreciated than with the percentile approach, since the analyst and policy maker will have some grasp of the standard of living to be obtained from the mean income, and therefore from some specified proportion of it. Moreover, defining poverty in this way does not imply that poverty is never eradicated. It is quite possible for incomes to be entirely distributed above one half of mean income.

3.27 To summarize, one of three broad approaches should be considered in calculating the poverty line:

- *A relativist approach.* In cases where there is no universally accepted notion of the poverty line, the analysis should take the poverty line to bear some relation to mean income (say two thirds or one half of mean income). Given its relativist assumption, this poverty line may vary over time, depending on whether mean incomes rise or fall. This procedure yields measures of poverty which have no 'absolutist' significance. Here, the significance lies not so much in the absolute numbers in poverty, but in the *patterns* of poverty across the various groups in society.
- *An absolutist approach.* In countries where a particular poverty line is well understood and generally accepted as dividing the population into the poor and the non poor, analysts should be encouraged to adopt it. This is particularly important if the threshold is accepted and used by planners and policy makers, since the findings of the analysis would gain in policy significance. The principle should be established that where a poverty line is currently in use among planners, it should be utilized. The key point to note here is that in such cases, the absolute level of poverty will have some meaning — policy makers and planners will be interested in just how many households are below this level. This raises serious questions about whether the data generated by the current survey designs used in SDA will provide accurate estimates of poverty in this absolute sense. (This is discussed further in the annex.)
- *A pragmatic approach.* Here, the poverty line is selected in an arbitrary manner for any one year (using a percentile cut-off, or taking some ratio of mean income), and this line is retained in real terms throughout the analysis, including the analysis of later years. As with the first approach, the absolute level of poverty will not have significance — but rather the patterns of poverty across groups.

The poverty index

3.28 Apart from the selection of the poverty line itself, the degree of poverty will depend on three basic factors:

- the *incidence* of poverty, as measured by the numbers in the total population living below the poverty line;
- the *intensity* of poverty, reflected in the ex-

tent to which the incomes of the poor lie below the poverty line;

- the degree of *inequality* among the poor, in that transferring income from the poorest to the better-off poor should raise measured "poverty".

3.29 Any index or measure of poverty should ideally reflect all three of these dimensions. Moreover, for our purposes, we need an index which can be used to assess the effects of adjustment. Since adjustment frequently entails changing the sectoral composition of output — from nontraded to traded goods, from import competing to exporting sectors, and favoring agriculture — our poverty index must be decomposable across sectors (Kanbur, 1987).

3.30 A useful index which meets this requirement is suggested by Foster, Greer and Thorbecke (1984). Their class of poverty index takes the following form,

$$P_\alpha = (1 / n) \sum_{i=1}^{q} [(Y_p - Y_i) / Y_p]^\alpha \qquad (5)$$

where Y_p denotes the poverty line, Y_i the income/expenditure of the ith poor person, n the total population and q the number of income earners below the poverty line. Essentially, the index takes the poverty gap of each poor person as a fraction of the poverty line $(Y_p-Y_i)/Y_p$, raises it to a power α, and sums over poor units. Not only does this index take into account the incidence and the intensity of poverty, it is also sensitive to the degree of inequality among the poor.

3.31 This class of poverty measures is flexible in two important respects. First, α is a policy parameter that can be varied to reflect correctly poverty "aversion". If $\alpha = 0$, it can be readily shown that (5) simply becomes,

$$P_{\alpha=0} = q/n = H \qquad (5a)$$

where H is the head-count ratio, ie, the proportion of total income-receiving units below the poverty line. Note, if $\alpha = 0$, it simply means that the measure is entirely indifferent to how poor each poor unit is — it does not matter how far below the poverty line each poor person is. Therefore, with $\alpha = 0$, the index is simply the *head-count ratio.*

3.32Alternatively, with $\alpha = 1$, the poverty index becomes,

$$P_{\alpha=1} = (1 / n) \sum_{i=1}^{q} [(Y_p - Y_i) / Y_p] = HI \qquad (5b)$$

where the "income gap ratio" (I) is given by,

$$I = (1/q) \sum_{i=1}^{q} [(Y_p - Y_i) / Y_p]$$

It is simply the average of the poverty gaps expressed as a fraction of the poverty line. $P_{\alpha=1}$ or HI therefore takes into account how poor on average the poor are, and reflects both the incidence of poverty (as reflected in H) and its intensity (as given by I). It also measures the amount of income, under perfect targeting, that needs to be transferred to the poor in order to exactly eradicate poverty. However, the $P_{\alpha=1}$ measure is insensitive to income distribution among the poor. Transferring income from the poorest unit to a richer (but still poor) unit will leave $P_{\alpha=1}$ unchanged (as both H and I will be unaffected). For this to be reflected in the index, greater weight has to be given to the poorest income earning units. This can be achieved in this class of poverty indices by assuming values of α in excess of unity. With $\alpha > 1$, a transfer of one dollar from the poorest units to other (better off) poor units will increase the poverty index. In short, the P_α indices suggested by Foster, et al permit the user to specify α, and thereby select an index which reflects his or her aversion to poverty.

3.33 The P_α class of poverty indices is flexible also in that it is sub-group decomposable (Kanbur, 1987). The "overall" index of poverty can be shown to comprise the summation of poverty indices among all the sub-groups in the population. If the study population consists of m groups or sectors, then,

$$P_\alpha = \sum_{j=1}^{m} z_j P_{j\alpha} \qquad (6)$$

where $P_{j\alpha}$ is the poverty index of group j, and z_j the population weight of group j (j = 1,...,m), $\Sigma z_j = 1$. As we shall discover, this decomposition property will prove useful in analyzing poverty changes in the SDA project, since it is possible to generate both overall indices in each country, and indices for each of the regional and socioeconomic groupings under consideration.

Poverty and adjustment

3.34 We now come to the key part of this plan: namely the analysis of the interactions between the adjustment program on the one hand and poverty on the other. In most instances, data will not be available on changes in poverty — all the

analyst will have initially are data across households at one point in time as given by the IS.[9] From these data, and from the analysis of the macro-meso interactions outlined in Chapter Two, links have to be established between adjustment (as it has taken place over the years preceding the survey) and poverty, as evidenced at the time of the survey. But before coming to the analysis proper, some thought needs to be given the peculiar problems raised in having a data set (initially at least) for only one point in time.

The poor and the vulnerable

3.35 In deciding upon the broad domains of policy concern for the SDA project, two criteria are used (World Bank, 1990): *poverty* and *vulnerability*. A household is poor if its income (or total expenditure) falls short of the standard that society sets — the poverty line. On the other hand, a household is vulnerable if it is particularly open to adverse external events or shocks, and cannot make the necessary adjustments to protect its standard of living. While it is true that ultra poor households are certain to be vulnerable because of their poverty, these are two quite distinct dimensions of need. Some households may be poor and not vulnerable, either because they are not affected by external events (as for example, in the case of subsistence farmers), or because they can readily cope with the changes (for example, production and consumption switching in the light of relative price movements). Others can be vulnerable but not poor, a case illustrated by retrenched public-sector workers.

3.36 There are three broad groups of concern to the SDA Program:

- *The chronic poor* whose situation is caused by multiple deprivations, such as low productivity due to poor health and nutrition, poor access to productive assets, etc. This poverty is deep-rooted, existing before the recent deterioration in economic circumstances and the implementation of adjustment programs. It includes the ultra poor or destitute. Some are vulnerable to recession and adjustment-related shocks, which may have increased their poverty further. Others in this group, however, may be relatively unaffected, while yet others may in fact benefit from adjustment.
- *The new poor* who are above the poverty line prior to the shock and adjustment measures, but have fallen into poverty as a result.
- *Other vulnerable groups* who remain above the poverty line but are severely affected by adjustment and therefore merit policy consideration.

3.37 The poverty profile is aimed particularly at the chronic and new poor groups. It does not attempt to cover non-poor groups who happen to be particularly vulnerable to external shocks and adjustment. With survey results available for only one year, it is difficult to distinguish between the chronic poor and the new poor, and to ensure that all the poverty effects of adjustment are covered in the analysis. For example, suppose that the SDA IS survey is conducted shortly after an adjustment program. To what extent can the poverty profile give an assessment of the poverty effects of adjustment? There are three 'poor' groups which are of interest: the chronic poor who remain poor after the adjustment (some may have benefited from the policy reforms, but not enough to take them out of poverty); the poor who benefit from adjustment, but benefit sufficiently from the reforms to take them out of poverty; and the new poor, who become poor as a result of the adjustment. The IS will fail to cover the second of these groups, and so will present a somewhat pessimistic picture of adjustment — it will be subject to a selectivity bias, giving greater weight to those who lose, and less weight to those who gain, from the adjustment. Clearly, much will depend on the timing of the survey. If the survey is conducted before the adjustment program, its main purpose will be to forecast the likely effects of adjustment — both harmful and beneficial — rather than make an ex post assessment. In this way, it may give a more balanced assessment of the gainers and losers from the reforms.

3.38 The once-off nature of the IS, therefore, limits what can be gained from the analysis. It must be recognized that the poverty profile, based on a survey following an adjustment program, will be subject to selectivity bias, and might present a more pessimistic view of the poverty effects than is in fact the case. Even if we are prepared to forego coverage of the groups who have ceased to be poor because of the adjustment, we are still left with the difficulty of distinguishing between the chronic and the new poor. There may be cases which can be defined with some confidence, for example, poor smallholders/rural-landless are likely to be chronic poor, whereas poor civil servants — or former civil servants — are likely to be new poor. But there are other poor groups identified by the survey who may or may not

have been poor before the adjustment.

An overall assessment

3.39 If it is assumed that the macro-meso links are reasonably understood, and that the real-economy effects of policy can be approximated (in terms of changes in the growth of real output per capita, relative price changes, infrastructural changes and differences in sectoral growth rates), the challenge of the data analysis now becomes one of linking what is observed at the household level with these sectoral changes. This exercise will involve four basic stages in the analysis. First, socioeconomic groups will need to be identified into which all households are categorized. This may also involve regional categorization. Secondly, poverty indices should be computed for these regional and socioeconomic groupings. Thirdly, the analysis should establish the main primary income sources (by sector) of each of the groupings. Finally, an attempt is then made to assess how each of the categories has been affected by adjustment policy. Each of these stages is discussed in turn.

3.40 STEP 1: DEFINING SOCIOECONOMIC GROUPS. The classification of households by socioeconomic group constitutes an essential element throughout the SDA analysis program, but especially in this poverty profile. Some consideration is given to the issues raised in selecting socioeconomic classifications in the companion volume, World Bank (1990). Some of these considerations are repeated here in brief. Any number of criteria might be used to establish the classification of socioeconomic groups, but the basic requirements of a useful criterion is that it should be unambiguous and have a clear policy focus. Apart from the obvious importance of policy targeting, classifications should be selected in such a way that households within them are reasonably homogeneous in the ways they are affected by (and respond to) adjustment policy. Since households are most often multi-individual units, a classification should ideally be chosen which is applicable to all individuals in a given household or, alternatively, to the household as a whole; otherwise, the fundamental notion of the household being a "unit" is lost.

3.41 A broad set of criteria have been used for classifying households, including wealth, income or expenditure (economic criteria); sociological; location; and characteristics of household head.[10]

3.42 *Wealth, income or expenditures.* Wealth is a fundamental factor affecting household behavior. In rural areas access to land is critical. Landless or near-landless households can be affected quite differently from the smallholder by adjustment policy. Among the relatively poor, those with some assets might be distinguished from those who have none. Wealth, as with income or expenditure, has the advantage of being a household-level criterion. However, the use of income, expenditure, and to some extent wealth, as classifiers, suffers from a major drawback, in that according to any of these criteria, a household's relative position, and hence its classification, might change over time or as a result of policy intervention. For instance, the mobility of households between income deciles makes total income a poor classifier for targeting policy on particular households. The wealth criterion is more effective because households are relatively less mobile between wealth groups in the short or medium run.

3.43 *Sociological.* These criteria include a range of factors such as race, religion or language, and assume significance in African societies where market fragmentation or even ethnic discrimination might be a common characteristic of the majority of the poor.

3.44 *Location.* Location is usually justified on the grounds that policy often has a locational element. Rural households need to be distinguished from urban households but, even beyond this, there is a strong spatial dimension in the way policy effects are transmitted through markets and infrastructure. Thus it might be important to use an even finer locational division for the purpose of classifying household groups and to capture the regional effects directly. However, administrative boundaries rarely make analytical sense.

3.45 *Characteristics of the household head.* The socioeconomic characteristics of the household head (e.g. occupation or employment status) are often used as criteria for classifying households. In doing so one is implicitly assuming that the behavior and level of well-being of all individuals in the household can be determined or adequately represented by the status of the head. However, the economic status of the household might be determined by the characteristics of the main earner who could be a different individual from the household head. So this criterion has to be used with much care in its practical application.

Box 3.1: Assessing the groupings

The key to the selection of socioeconomic groups lies in some measure of homogeneity within the group. In this way, households within a group can be assumed to be affected by adjustment (and to respond to it) in a similar way. To check whether the selected grouping is meaningful, the analyst may wish to assess the extent to which it explains how incomes are distributed across households. Income variance, of course, does not prove homogeneity within the groupings but it can be interpreted as a useful indicator of it. A simple method for this test would be to decompose the total variance in income (or expenditure) into two broad components — the variance in incomes *between* and *within* groups. The greater the proportion of overall income variance explained by between-group variance, the more successful is the grouping in capturing income variations. The overall variance (σ^2) in income can be decomposed as follows:

$$\sigma^2 = \sum_{j=1}^{m} z_j \sigma_j^2 + \sum_{j=1}^{m} z_j (\mu_j - \mu)^2 \qquad (7)$$

within group variance | between group variance

where σ_j^2 is the variance in income within group j, μ is the overall mean income, μ_j is the mean income of group j and z_j the population weight of each group (recalling that $\Sigma z_j = 1$).

The objective of the grouping exercise would be to maximize the second term on the right-hand-side of (7), so that as much of the overall variance in incomes/expenditures is explained by the grouping that is selected. If the between-group variance explains only a small proportion of overall variance (say of the order of only 20% or so), the analyst must inspect the within-group variance for each group, seeking to identify groups in which income variance is high (and which contribute significantly to overall variance). If the income/expenditure variance within a group is found to explain a significant proportion of the overall variance (as compared with the contributions of other sectors), there is a suggestion that the group is not sufficiently homogeneous for analytical purposes. The analyst may consider subdividing the group further in order to enhance homogeneity. Obviously, the more groups that are distinguished, the greater the explanatory power of the grouping. The decision of when to stop further disaggregation and live with the proportion of variance explained by the grouping has in the last analysis to be a judgement for the analyst herself.

3.46 In the case of Sub-Saharan Africa, an indication of some broad categories of socioeconomic groups that might figure in a number of taxonomies is as follows:

Rural sector

- export-oriented medium and large farmers
- export-oriented smallholders
- food/subsistence farmers
- pastoralists
- landless (or near landless) agricultural workers
- non-agricultural workers

Urban sector

- government employees (skilled)
- government employees (unskilled)
- private/formal sector employees
- private/formal sector employers
- informal sector self-employed
- inactive or unemployed

3.47 The above classification may be further refined by distinguishing between the capital city and other urban areas. The primacy of the capital city, which often makes it significantly different from other small urban centers, suggests that this distinction is important in data analysis. If possible, the selection of socioeconomic groups should bear some relation to the structural changes that have been brought about by adjustment. If, for example, macro-meso analysis distinguishes between a number sectors, it would be useful for the selection of socioeconomic categories to utilize this sectoral disaggregation. However, this may lead to a serious problem for the analysis of IS data — the problem of empty cells. Too detailed a disaggregation for socioeconomic groups might lead to small numbers appearing in the cells given the relatively small sample usually contemplated for the IS.

3.48 In the last analysis, the selection of socioeconomic categories must be country specific. It must not only reflect the specific characteristics of the country, but the policy priorities of the government. It is important that policy makers are fully consulted before the socioeconomic classification of households is finalized. The purpose of the classification is two-fold: it makes the data analysis more manageable; and second, it should enhance the ability of governments to design policies which can assist the groups in a targeted way. Because the poorest x percentile in most developing countries of Africa is heterogenous, income distribution data per se are generally unhelpful for practical policy design. Casting the analysis in terms of readily identifiable socioeconomic groups makes it more policy rele-

Frame 3.1: Decomposition of P_α poverty measures by socioeconomic group, Côte d Ivoire, 1985 (30% cut off)[a]

	P_α=0		P_α=1		P_α=2	
Socioeconomic group	*Value*	*Contribution (percent)*	*Value*	*Contribution (percent)*	*Value*	*Contribution (percent)*
Export farmers	0.365	22.3	0.114	20.4	0.050	18.8
Food producers	0.495	59.0	0.184	64.1	0.090	65.9
Formal employee, government	0.031	1.3	0.002	0.2	0.0002	0.1
Formal employee, private	0.061	1.9	0.009	0.8	0.003	0.6
Informal sector	0.193	15.5	0.062	14.5	0.030	14.6
All	0.301	100.0	0.103	100.0	0.049	100.0

a. Based on a poverty line giving 30% of the population as poor.
Source: Kanbur (1988a)

vant. Box 3.1 outlines how a simple analysis of variance can provide some insight into the usefulness (or otherwise) of the socioeconomic grouping selected.

3.49 STEP 2: P_α COMPUTATIONS. Having decided upon the regional and socioeconomic classifications of households, the analysis proper may begin. We suggest at the very minimum that computations are made of the P_α indices (based on total household expenditure per capita or per adult equivalent) for $\alpha = 0, 1, 2$ (or 1.5). These should be computed for the country as a whole, for the regions of the country, and separately for each of the socioeconomic categories. Any estimate based on cells in which the number of observations is less than 30 should be explicitly identified. Estimates should be reported for a number of poverty lines (for example, two lines representing one half and two thirds of mean per capita income, or giving 30% and 10% of the population as poor). Frame 3.1 provides an example of the basic type of tabulation which should be prepared under the poverty profile, taking a percentile approach to defining the poverty line.[11]

3.50 Before we discuss the inferences that can be drawn from such findings, it may be helpful to establish exactly what the figures reported in Frame 3.1 mean. Because all the P_α measures take the poverty gap as a proportion of the poverty line, they are all in the range of 0 and 1. As α increases, P_α becomes smaller, so that $P_{\alpha-1} > P_\alpha$. Beginning with the simplest case where $\alpha = 0$, the poverty index is simply the headcount ratio (H). In 1985, $P_{\alpha=0}$ was equal to 0.30 for Côte d'Ivoire as a whole, which means that 30% of the total population of the country was poor. Similarly (reading down the first column under $P_{\alpha=0}$), nearly 50% of food-crop farmers and only 3% of government employees were poor. Analysts should note that the n and q (and of course Y_i) values are different for each group. So in the calculation of group poverty indexes, q is the number of poor in the group, and n is the population in the group.

3.51 To decompose the total poverty index across the sectors, each sectoral poverty index is multiplied by its population weight (z_i), and this value is expressed as a proportion of the poverty index for the population as a whole. Thus, for example, for export farmers, the computations are as follows:

$$(P_{\alpha=0,\text{export}})(z_i) / P_{\alpha=0,\text{overall}} = \text{contribution}$$

$$(.365)(.186) / .30 = .223 \text{ (or } 22.3\%)$$

The population of export farmers comprises 18.6% of the total population of Côte d'Ivoire, so that with $P_{\alpha=0}$ for export farmers being 36.5% and for the country as a whole, 30%, the contribution of export farmers poverty to aggregate poverty (with $\alpha = 0$) is 22.3%. For $\alpha = 0$, the interpretation of this is very straightforward. It simply means that 22.3% of the poor are found among export farmers. Decomposing poverty across the various groups (given in the second column under P_α=0) tells us, for example, that only 1.9% of the total poor in the country were formal-sector employees, whilst 59% were food producers.

3.52 The interpretation of $P_{\alpha=1}$ is a little more complicated, but nevertheless an intuitive explanation is possible. With $\alpha = 1$, P_α equals HI, where I is the income gap ratio. Recalling equation 5b above, it is clear that I is also somewhere between 0 and 1. It is the poverty gap as a proportion of the poverty line, averaged across all poor units.

Since both H and I are in the range 0 to 1, $P_{\alpha=1}$ (which = HI) is also in this range. It also follows that H > HI, or $P_{\alpha=0} > P_{\alpha=1}$. Thus, for example, reading Frame 1, we can derive the income gap ratio (I) simply by dividing $P_{\alpha=1}$ by $P_{\alpha=0}$ (or H). Thus, for the country as a whole, since $P_{\alpha=1} = .10$, it follows that I is given by

$$I = HI/H = P_{\alpha=1}/P_{\alpha=0} = .10/.30 = .33$$

3.53 It remains now to explain intuitively what I = .33 and HI = .10 really mean. Beginning with I, this simply means that the gap between the poverty line and the average income of the poor is 33% (or one third) of the poverty line. Since,

$$(Y_i/Y_p) = 1 - (Y_i - Y_p)/Y_p$$

it follows that the average income of the poor is two thirds (given by 1 -0.33 = 0.67) of the poverty line. Values of I for each of the groups may also be computed and interpreted in this way. Thus, for example, the income gap ratio for food producers was 0.372 (= 0.184/0.495) and for government employees it was .065 (= 0.002/0.031). This means that on average, the incomes of food producers are 62.8% (= 1 - 0.372) of the poverty line, whilst those of government employees are 93.3% (= 1 - .065) of the poverty line. This highlights the extra information that is provided with $\alpha = 1$. We not only know that the incidence of poverty is greater among food producers than say government employees (through the head count ratio), but we also know that the intensity of their poverty is greater. The average poor food producer earns an income of only 63% of the poverty line, whilst a poor government employee earns on average just over 93% of the poverty line.

3.54 Recalling equation 5b above, it is clear that $P_{\alpha=1}$ or HI sums the gaps between each poor person's income and the poverty line, and divides by the total population. It is sometimes referred to as the 'per capita aggregate poverty gap'. This gives a measure of the amount of income in per capita terms that is necessary (under perfect targeting) to exactly eradicate poverty. It shows that if every member of the population chipped in 10.3% of the poverty line, there would be just enough to bring all poor people to the poverty line. Similarly, if all food producers chipped in 18.4% of the poverty line, there would be enough to bring all food producers up to the poverty line. Government employees would only need to contribute on average 0.2% to exactly eradicate poverty among their colleagues. As with $P_{\alpha=0}$, the $P_{\alpha=1}$ index can be decomposed across sectors. This shows how the aggregate per capita poverty gap is distributed across the groups. Of the resources needed to eradicate poverty (this being 10.3% of the poverty line in per capita terms), 64.1% would go to food producers, only 0.2% to government employees, and so on.

3.55 With $\alpha > 1$, no such straight forward intuitive interpretation is available, since the index now gives greater weight to the poorest groups. However, the principles are the same. The first column under $P_{\alpha=2}$ gives the index computed for each sector separately, and the second column reports the decomposition of the aggregate index across the groups. As with the other indexes, the group indexes are computed for group-specific values of n, q and Yi, and the decomposition applies population weights to the group values to generate contributions to overall poverty. We turn now to review some of the implications of these findings.

3.56 Frame 3.1 shows the usefulness of the decomposition property of P_α in understanding how poverty is affected by adjustment. Assuming that it is known how the various groups are affected by adjustment (a subject to which we return shortly), a great deal of information can be derived from a simple table as this. Taking the incidence of poverty first ($\alpha = 0$ in Frame 3.1), clearly the poor are mainly to be found among food producers (a sector containing 59% of the poor in Côte d'Ivoire). 22.3% of the poor are export farmers and 15.5% work in the urban informal sector (or are unemployed). Poverty is hardly present among formal-sector employees. Notice that the contribution to poverty of food producers rises (from 59% to 65.9%) as higher values of α are taken. Higher values of α mean that greater weight is being given to the poorest groups. This suggests that a relatively large proportion of food producers are among the poorest of the poor. If greater weight is to be given those in the extremes of poverty (that is, taking $\alpha = 2$) almost two thirds of measured poverty in Côte d'Ivoire in 1985 emanates from food producers.

3.57 Frame 3.1 can readily be extended to include regions of the country. Tabulations which report poverty by both socioeconomic group and region will be particularly useful to policy makers. In the case of Côte d'Ivoire, for example, it is essential to establish where the poor export-crop producers are to be found. A tabulation such a Frame 3.2 can readily provide this information.

Frame 3.2: Incidence of poverty by region and socioeconomic group: Côte d'Ivoire, 1985 (30% cut off)
(percentage)

Socioeconomic group	*Abidjan*	*Other-urban*	*West forest*	*East forest*	*Savannah*	*All*
Export-crop farmers	-	-	15.4	39.3	79.7	36.5
Food-crop farmers	-	-	24.1	53.3	60.6	49.5
Formal, government	1.2	3.0	0.0	8.3	19.4	3.1
Formal, private	2.6	6.7	43.8	79.2	0.0	6.1
Informal	9.5	19.1	26.1	58.2	71.7	19.3
All	5.2	13.1	21.1	45.9	61.3	30.1

Source: Kanbur (1988a)

Most of the poor export-crop producers are located in the Savannah region of the country, and these are mainly cotton producers. Similarly, the table shows that the majority of poor food-crop producers and informal-sector workers are to be found in the Savannah region. Such two-way tabulations can be extremely helpful to policy makers, and can be computed for other values of α (Frame 3.2 is computed for $\alpha = 0$).

3.58 The rank ordering of socioeconomic groups according to their poverty status is the key to most policy analysis. As we have already emphasized, where the poverty line is explicitly arbitrary, it is the pattern of poverty across groups in society that is important. In the above example from Côte d'Ivoire, the poverty orderings remain the same, regardless of the value of α that is chosen. [12] But this need not always be the case. It is possible that changing the poverty index, or changing the poverty line, will yield different rank orderings. To what extent can we be confident that the poverty orderings obtained with the P_α class of indices would also apply if another poverty line were chosen, or if another index of poverty were adopted? An assessment may be made of this through the use *dominance conditions*. [13] This test involves comparing the cumulative distributions of income/expenditure up to some maximum poverty line of all pairs of socioeconomic categories that are distinguished. Thus, if the cumulative income distribution of one socioeconomic group (say group A) lies nowhere below that of another (group B), then poverty can be said to be unambiguously greater in group A than group B. This is called the first-order dominance test. [14] It means that for all admissible poverty lines (that is, for all lines below the stipulated maximum poverty line), poverty in group A will be greater than among group B regardless of the choice of poverty measure. [15] This dominance test could be applied to all pairs of socioeconomic groups. In most cases, the test should prove conclusive, and the ordering obtained with the P_α index can be considered robust. But where the test is not conclusive, the P_α orderings should be suitably qualified.

3.59 STEP 3: IDENTIFYING PRIMARY INCOME SOURCES. The analysis thus far is based on fairly aggregative classifications of households. In so far as it is based on income sources, it relies only on the main occupation of the household head or on the principal crop grown. There are two main problems with this type of analysis if some judgements are to be made about how adjustment is likely to affect the poor. First, a greater degree of disaggregation is usually required for policy analysis. For example, 'export-crop producers' should be further disaggregated into cocoa, coffee and cotton producers, since adjustment policy is likely to affect each differently. But such disaggregations often lead to small cell problems, given the relatively small sample size of the IS. Second, the socioeconomic classification can be based only on the main occupation of the household head or the main crops grown. It only acts as a rough guide to the income source of the

Frame 3.3: Sources of income by socioeconomic group

	Percentage of total income by income source					
Socioeconomic group	*Wage*	*Agriculture enterprise*	*Non-farm enterprise*	*Rent*	*Transfers*	*All*
Export-crop farmers						100
Food-crop farmers						100
Formal, government						100
Formal, private						100
Informal						100
All						100

Frame 3.4: Share of poor household primary income by socioeconomic group and sector of origin
(percentage)

	Sector							
	Tradables					Nontradables		
	Agriculture		Manufacturing			Construction	Government	Other
Socioeconomic group	Export crop	Food crop	Exportable	Protected importable	Other			Total
Export-crop farmers								100
Food-crop farmers								100
Formal, government								100
Formal, private								100
Informal								100

Box 3.2: Income sources: An illustration

As an illustration of the type of tabulation suggested by Frames 3.3 and 3.4, the following is based on the results of the LSMS survey in Côte d'Ivoire, 1985.

Sources of income for various groups, Côte d'Ivoire, 1985
(percentage)

	Household category			
	All households	Farm households		
Income source		All	Large	Small
Cocoa	7.0	14.7	22.0	3.5
Coffee	3.6	7.6	10.6	2.9
Other crop	5.2	11.0	11.0	10.9
Home produced food	13.6	28.4	30.2	25.7
Livestock	1.0	2.1	2.3	1.7
Other farm income	0.4	0.8	1.3	0.0
(Total agricultural income)	(30.8)	(64.6)	(77.4)	(44.8)
Wage income	34.5	11.6	5.9	20.3
Rents, dividends, interest	13.8	9.0	6.9	12.6
Net transfer income	-0.4	-0.8	-1.1	-0.5
Net business income	19.8	14.0	9.3	21.0
Consumer durable services	2.5	1.7	1.6	1.7
(Non-agricultural income)	(69.2)	(35.4)	(22.6)	(55.2)
Total	100	100	100	100
Mean monthly income (CFA Fr. '000)	1580.4	1145.9	1440.8	870.0

Note: The bottom row gives the mean values of income, which is important in judging how the various groups compare. Large farmers in Côte d'Ivoire earn only 72% of average income. Small farmers earn less (55%). Reading down the columns shows the diversity of income source among groups: note how smaller farmers are more diversified — earning more than half their income from non-agricultural sources. Notice the importance of home-produced food in most household incomes.
Source: Derived from Deaton and Benjamin (1988: 34).

household concerned, and during times of adjustment, it may be a very weak guide indeed. This is for two reasons. First, the household head may increasingly engage in multiple occupations (or diversify output) in order to cope with deteriorating economic circumstances. His or her main occupation may be one of a number. Second, other household members are usually engaged in different occupations (or grow other crops), and may in fact contribute more to total household income than does the household head. For these reasons, it is necessary to trace in more detail the income sources of poor households.

3.60 Information on sources of income is obtained in the IS, including farm and non-farm enterprise income, wage income and other income sources (such as rental income and income transfers). From these computations, tabulations can readily be prepared to trace the main sources of income of poor households. Frame 3.3 reports the type of tabulation that would be required for this. From such a table, it would be possible to check whether the income source of the household head (or the main crop produced) is a useful indicator of the main source of income of the household. Thus, for example, we can assess whether a household in which the head is employed (say) in the public sector also receives most of its income from that sector — or whether the household (both the head through other occupations and other household members) earns significant income from other activities. This is critical from a policy perspective. It would be quite misleading to draw the conclusion that poor households whose head works for the government will lose out from public-sector wage freezes, if that household is also engaged in ac-

tivities which are likely to become more profitable (say wage income from employment in export manufacturing). Similarly, it would be essential to establish how much other income sources are tapped by agricultural producers. Frame 3.3 should be computed for both poor and non-poor households separately, since income sources among the poor may differ from those of the non-poor within each socioeconomic group.

3.61 These data are helpful in identifying the diversity of income sources of the household. However, we need to establish how the different socioeconomic groups are affected by adjustment. It would be helpful, therefore, to trace the sector of origin of income earned by the various groups. For this, we need only be concerned with primary income — that is, income earned from productive work. Frame 3.4 presents the type of tabulation which is required for this. The disaggregation of the productive sectors is designed to separate out tradable from nontradable, exportable from importable, protected importable from other importable, and government from private nontradable. These disaggregations correspond to the logic of the SDA conceptual framework.

3.62 STEP 4: AN ASSESSMENT OF THE EFFECTS OF ADJUSTMENT. Having these basic tables prepared, the analysis must now attempt to interpret them, and to make some judgement about how the poverty groups so identified have been affected by adjustment. This analysis should proceed in two stages. The first is conducted at the group level, and seeks to identify how each of the socioeconomic groups has been affected by adjustment. The second delves into the issue of within-group differences, concentrating on those groups in which most of the poor are found (as evidenced by Frame 3.1 above).

3.63 *Group-level analysis.* There are two main questions that need to be resolved here:

- Are the poor engaged in economic activities which are favored by the adjustment program?
- Are the poor able to respond to the incentives offered by structural adjustment?

The first deals with the current activities of poor households. To answer this question, the analyst simply has to relate the findings of Frames 3.3 and 3.4 to the results of the macro-meso analysis discussed in Chapter Two. At the time of the survey, were the poor engaged in activities which are likely to expand as a result of policy reforms? Were poor households deriving their incomes mainly from tradables rather than nontradables, exportables rather than importables, and nonprotected importables rather than protected importables? If the poor are to be found mainly among food producers, for example, reading across the appropriate rows in Frames 3.3 and 3.4 will reveal whether this group is engaged in activities in which returns are likely to increase as a result of policy reforms. It may be that a nontrivial proportion of the incomes of food-producers is gained from wage income (as evidenced in Frame 3.3), which means that such groups might be influenced in two broad ways by the adjustment. They are affected as food producers by the effects of adjustment on food markets (which may, or may not be favorable, depending on whether food is a tradable commodity), and also as suppliers of labor. The likely effect on the latter will depend on the direction of change in the real wage and on employment opportunities (again, see Chapter Four).

Frame 3.5: Access to credit by socioeconomic group

(percent of households obtaining credit over past year or percent of households unable to obtain credit over past year)

Socioeconomic group	*Poor households*	*Non-poor households*	*All*
Export-crop farmers			
Food-crop farmers			
Formal, government			
Formal, private			
Informal			
All			

3.64 This analysis provides only a static picture of the implications of adjustment for poverty in the country. It is also important to make some judgment about how poor households are likely to respond to the costs and opportunities associated with policy reforms. Some households may be producing the types of commodities that are favored by adjustment, but may not be able to raise production, or may not have access to market opportunities. Similarly, households may be producing products which are not favored, so for them the critical question is whether they can make the necessary adjustments to move into favored product lines. To get some idea of this at the group level, the analysis should make some assessment of the access of these groups to *productive assets*, on the assumption that this will reflect the ability of households to realize the potential gains offered by adjustment. If households hold key productive assets (such as productive land, livestock, farm equipment, tools,

labor etc) and if they have ready access to important inputs (such as fertilizer, extension services, irrigation/water, credit, and so on) it is more likely that they can respond positively to the beneficial (and even the unfavorable) effects of adjustment. The IS questionnaire obtains information on many of these assets and on the access of households to markets, inputs and credit. The following table gives an illustration of the type that is needed for this part of the investigation. Of course, similar tabulations should be prepared for other assets/inputs. Frame 3.5 illustrates two types of data that are obtained through the IS. The first concerns the amount of credit actually obtained by the household, whilst the second is derived from a specific question in the IS questionnaire on difficulties in obtaining credit. Whichever approach is adopted, the purpose of the tabulation is to uncover any significant problem encountered by socioeconomic groups in obtaining credit, and to establish whether poorer households experience greater difficulties (in this case in obtaining credit) than other households in the same socioeconomic group. If this is the case, the analysis would suggest the incentives of the adjustment program may not be sufficient to raise incomes among the poor (even though non-poor households in the same socioeconomic group seem likely to benefit). This would suggest that adjustment policies need to be complemented with credit-market interventions to assist poorer households in gaining credit.

3.65 *Within-group analysis.* Tabulations of the sort described thus far have two basic limitations. The first is that they aggregate across households within groups. In most cases they describe group means, and do not give any impression of whether there are significant variations within the group. In effect, the analysis has assumed that within-group variations in incomes and other relevant variables do not change in response to adjustment. This permitted us to use group means as the basis of our analysis. If you like, the groupings were selected to reveal the major effects of adjustment through their influence on between-group differences. Secondly, as tabulations, they can only take into account a limited number of influences.

3.66 The analysis should therefore be taken one stage further, through within-group multi-variate analysis. In this way we can investigate whether adjustment is likely to influence the within-group variations in expenditure, which was something that we deliberately suppressed in the between-group analysis. For example, assume that adjustment favorably influences export farmers as a group, so that other things being equal, the mean income of this group will rise. Does this necessarily mean that poverty will be reduced. This depends on whether within-group variations in income change at the same time. If income variance remains unchanged (or is reduced), poverty will fall. But if within-group variance actually rises as a result of adjustment (for example, through a reduced access of poorer export farmers to credit), there can be no presumption that poverty will be reduced. This is why some analysis of the within-group variation in income/expenditure is a necessary component of the poverty profile.

3.67 The dependent variable for the multi-variate analysis should be the same as that selected in computing the poverty index — taken in our case to be per capita total household expenditure. We specify the following general estimation equation for within-group analysis,

$$Y = Y[H, A, P, F, I] \qquad (8)$$

Per capita total household expenditure (Y) is assumed to depend upon five broad groups of regressors: household characteristics (H), asset holdings (A), a vector of relevant price variables (P), a vector of factor price variables (F) covering labor and credit prices, and a vector of appropriate infrastructural variables (I), such as access to roads, education/health services, credit, and so on. Equation (8) is a reduced-form of an implicit structural model in which income/expenditure of the household is viewed as the outcome of a decision-making process. The household is assumed to maximize utility and net income, subject to its resource constraints. This process depends on its characteristics and asset holdings, and on the market opportunities it faces. As a result of these decisions, there will be significant differences between households in the ways in which they generate incomes. Some households possessing productive assets will rely on family enterprises. Others, holding only their labor, will depend mainly on wage income. It is these differences which formed the basis of the socioeconomic grouping discussed above.

3.68 The reduced form, therefore, will obviously depend on the income-earning opportunities facing households. As a producing unit (operating either an agricultural or a non-farm en-

terprise), a household's income will depend on its productivity, which in turn depends on its holdings of non-labor assets. It will also be determined by the costs of purchased inputs (such as labor and fertilizer). On the other hand, households relying on wage labor will find that real wage rates and their human capital assets will have a critical influence on income. It is clear, then, that the specification of (8) will be quite different according to the source of income of the household. Therefore the reduced form should be estimated separately for each socioeconomic group, since we expect to obtain different coefficient estimates in each case. It may not be necessary to investigate expenditure variations within groups where very few poor households are to be found. From Frame 3.1, for example, there would seem to be little point in investigating within-group variations among formal government employees, since only 3% of such households were poor, and poverty among them represented only 0.2% of total poverty (with $\alpha = 1$). Within-group analysis, however, would be fruitful for export-crop farmers, food producers and informal-sector workers.

3.69 This exercise is intended to establish which of the right hand side variables significantly influences per capita total household expenditure. In this way, it will establish which factors determine the variations in income/expenditure within the group. For example, are export-crop households poor because of their location, small land-holdings, crop mixes, low levels of education, high dependency rates, use of and access to inputs or credit, access to markets, etc.? Having established which are the most important determinants of income/expenditure variation, we are in a position to understand why some households in the group are poorer than others, and whether such factors are likely to be affected by adjustment. Some of the right hand side variables are unlikely to be influenced by adjustment policy (such as land size or dependency rates), whereas others (such as market access, credit, and so on) may be significantly influenced by policy reforms. In this way, a more complete picture of the implications of adjustment for poverty can be gained.

Selective price interventions

3.70 The analysis thus far will have established the poverty effects of the adjustment in terms of its general repercussions on the structure of the economy. The level of disaggregation that will have been feasible for this part of the data analysis will be circumscribed by the detail that is available on the meso-economic effects of the adjustment. However, in many cases, adjustment will also entail the deliberate manipulation of key prices, through changes in tax and subsidy policy. This may be to achieve an improvement in resource allocation, by taking a domestic price nearer to the border price, or simply to reduce the fiscal deficit. For whatever reason, the analysis the poverty effects of an adjustment program is likely to be called upon to assess the effects of specific price changes.

3.71 The commodities selected for this rather more detailed analysis are inevitably country specific, and will depend on which prices are likely to be manipulated by the government and for which reason. The first (and obvious) point for data analysis is that it must take into account the effects on the poor as both consumers and producers of the commodity in question. The household data set generated by SDA will establish, in the first place, which groups of households produce and consume the commodity in question. Without this critical piece of information it would be quite impossible to make any

Frame 3.6: Expenditure patterns by poverty group: Ghana, 1987/88
(percentage)

	All	*Non-poor*	*Poor*
Market expenditure of food	42.6 100	43.9 85.9	36.1 14.1
Consumption of home-produced food	24.0 100	22.2 77.0	33.0 23.0
Consumption of home-produced non-food items	1.9 100	1.9 84.5	1.7 15.5
Other consumption expenditure	27.9 100	28.1 83.9	27.0 16.1
Remittances paid out	2.1 100	2.3 89.3	1.4 10.7
Expenditure relating to employment income in kind	1.5 100	1.6 90.8	0.8 9.2
Total expenditure	100 100	100 83.3	100 16.7

Source: Boateng, et al (1989).

Frame 3.7: Revenue from the sale of crops: Ghana, 1987-88
(percentage)

	All	*Non-poor*	*Poor*
Cocoa	22.9	23.5	21.0
	100	75.9	24.1
Oil Palm	3.4	2.9	4.9
	100	62.3	37.7
Plantain	9.6	10.1	7.9
	100	78.2	21.8
Bananas, oranges,	2.4	2.5	2.3
other tree fruits	100	75.1	24.9
Groundnut	4.3	3.9	5.7
	100	65.4	34.6
Pineapple	0.2	0.2	0.04
	100	94.3	5.7
Cassava	10.5	11.1	8.8
	100	78.1	21.9
Yam, cocoyam	7.8	6.8	10.7
	100	64.0	36.0
Maize	16.7	16.6	16.8
	100	73.6	26.4
Rice	3.3	3.2	3.7
	100	70.8	29.2
Vegetables	16.2	16.9	14.3
	100	76.9	23.1
Others	7.7	7.3	9.0
	100	69.5	30.5

Source: Boateng et al (1989).

poverty assessment. We shall present two tables to illustrate the types of tabulation that are useful for these policy issues, dealing with the effects on the poor as consumers and producers.

3.72 The IS survey obtains information on the expenditures of the household, including market purchases and home-produced consumption. Frame 3.6 reports patterns by fairly broad category of expenditure. It distinguishes food and non-food consumption, each reported separately for market purchases and home-produced consumption. Other items are remittances paid out and expenditure relating to employment income in kind. Each cell in the table contains two entries. The top right hand entry reports a column percentage, whilst the bottom left hand entry is a row percentage. Thus, poor households spend 36.1% of their total expenditures on market-purchases, but their purchases amount to only 14.1% of total market purchases of food.

3.73 A key point emphasized by Besley and Kanbur (1988) is that when governments seek to raise taxes or lower subsidies in order to reduce the fiscal deficit, it is more policy relevant to consider the effects on poverty *per unit of deficit reduction*. This has implications for how a table such as Frame 3.6 is used. For this, the relevant share is not the proportion of poor income that is spent on the commodity in question, but the fraction of total consumption in the economy that is accounted for by the poor. Thus, if the government were considering subsidizing the price of food in order to raise the real incomes of the poor, the relevant ratio is not that the poor spend 36.1% of their total expenditure on market purchases of food, but that their purchases represent only 14.1% of total market purchases. Thus, of $1 spent in subsidizing food, only 14 cents would benefit the poor. Clearly, Frame 3.6 should be computed at a higher level of disaggregation. In particular, it should identify most food commodities, and any commodities which are subject to tax/subsidy policy review under structural adjustment.

3.74 Similarly, price policy can have a profound effect on households as producers of the commodity in question. The poverty profile ought to present some basic tabulations which can give some initial guidance to the policy maker on this issue. Frame 3.7 gives an idea of the sort of tabulation that is needed. The interpretation of this table is similar to Frame 3.6. Ghana's most important export crop is cocoa. Of the total revenue raised from the sale of cocoa, about one quarter (24.1%) goes to the poor. Thus at the margin, every cedi used in raising the producer price of cocoa will be divided in the ratio 1 to 3 between the poor and non-poor households. From Frame 3.7, it is clear that pineapples should certainly not be supported if the objective is to raise incomes of the poor. On the other hand, groundnut and oil palm should receive higher priority.

Feedback effects

3.75 The above analysis is only a first approximation of the full effects of price changes. This is because it ignores the feed-back responses that occur, both in the product markets themselves and in other markets. For example, households facing a changing set of relative prices, will be induced to change their patterns of consumption in line with their preferences. These changes are not accounted for in the above analysis. And yet there is good reason not to ignore them. The above analytical approach asserts that households are poor if their income /total expenditure level is lower than some prescribed level, this level being chosen to reflect a fixed bundle of goods

that is required to avoid poverty. But even the poor might be able to exercise some choice in their consumption behavior, and to impose the requirement that a certain fixed bundle of commodities is needed to avoid poverty might be an unnecessary value judgement for the analyst. This is less clear for the destitute poor, for whom there are few choices. Hungry people need to be fed, and a case can be made for applying a restricted commodity bundle in defining their poverty. But for other poor groups, some consumption flexibility may exist.

3.76 To correct for this, Ravallion and van de Walle (1988) propose measuring poverty by using a suitable *utility index*. Their method, which is based on 'equivalent income', takes into account household preferences in deriving the poverty measure. In effect, their method ranks households by a money-metric measure of utility, with the poverty line defined in the same space. Households exercise choice in selecting the bundle of commodities required to achieve whatever level of utility is permitted, so that they are not obliged to consume any specified bundle of goods.[16] They are considered poor only if measured utility falls short of the poverty line. We shall not go into further detail here on this method, but it may be that some participating countries would wish to adopt this approach as a means of taking into account the consumption responses of households.

3.77 However, the responses to policy-induced price changes will not only be the consumption response of the households concerned. There will be demand responses by non-poor households as well supply responses. These all combine to produce product market outcomes which differ from the price outcomes assumed under first-approximation approach outlined above. Similarly, there may be repercussions in other markets which significantly affect poor households. Take food-deficit poor households facing a policy-induced rise in the price of food. The above analysis would suggest that the households would be made worse off, and measured poverty would rise. But the rise in food prices might induce increased food production among (non-poor) food-surplus households, and a general increase in the demand for labor and wage levels. If food deficit households benefit from these improved conditions in the labor market, the full effect on their incomes will not be as adverse as that indicated in taking the first-order approximation. This feed-back response through the labor market may in fact counteract the direct consumption effects. It is possible to take some account of these feed-backs using basically the same 'partial-equilibrium' approach proposed earlier, by making assumptions about what the likely wage response might be to any given price rise. An example of this can be found in Ravallion (1989).[17]

Basic needs and the poor

3.78 Poverty is a multi-faceted condition, and many of its dimensions will not be properly captured through the analysis of household expenditures. To complete the poverty profile, analysts must direct their attention to other aspects of poverty, focussing on the basic needs of poor groups. In the conceptual framework of the SDA project (World Bank, 1990) the social infrastructure is specified as an important element of the 'meso' economic system — linking poor households to macroeconomic policy. We consider this to be a critical element of adjustment/poverty interactions. Not only can access to human capital enhancing services increase welfare in the short run (improved health, for example, being desirable in and of itself), but it can have far-reaching economic effects into the long run — enhancing also the productive capacity of poor households (thus placing them on upward 'income escalators'). It may be possible to estimate these longer-run effects on productivity of a change in human capital among poor households (for example through enhancing their education and health status), but this should not be a preoccupation of the poverty profile. For present purposes it will be sufficient to trace whether their access to services has been affected by adjustment, and whether there is evidence that this is having noticeable short-run effects on poor households. The longer-run effects will just have to wait until later.

3.79 As with other elements of SDA data analysis, a two-stage approach would seem to be called for here. The first stage should analyze how adjustment policies (notably fiscal adjustment) have affected the *availability* and *quality* of services across the country. The second stage should assess whether these changes in the supply of services have interacted with demand factors to change *outcomes* at the household level.

3.80 The first stage (the macro-meso stage as discussed in Chapter Two) will involve tracing how adjustment has affected the resources that are available for health, education, and other

Frame 3.8: Mean number of days inactive due to illness: Ghana, 1987/88

Region	*Very poor*	*Poor*	*All*
Rural	5.0	5.0	5.3
Accra	-	2.4	4.5
Other urban	3.0	4.5	4.5

Source: Boateng et al (1989).

Frame 3.9: Percentage distribution of ill people by type of consultation and poverty group: Ghana, 1987/88
(percentage)

	Very poor	*Poor*	*All*
Doctor	13.1	16.9	25.6
Nurse	3.2	3.7	4.7
Medical assistant	10.0	11.9	11.0
Other	5.2	6.1	6.2
None	68.5	61.4	52.5
All	100.0	100.0	100.0

Source: Boateng et al (1989).

programs of social support (eg nutrition programs). If it has involved fiscal cuts, the analyst must identify how the cuts have been distributed across the various functional components of the exchequer accounts. By applying appropriate price indices, [18] these nominal changes should be translated into real resource adjustments facing each of the sectors. These calculations are needed in order to place the analysis of the SDA data into the context of the adjustment program. They should then be combined with the community-level data that the SDA project will generate. These data will include information on the availability of education and health services, and on the quality of the services (covering, for example, the availability of drugs, textbooks, etc.). In this way, the analysis should identify how the real expenditure changes imposed under the discipline of adjustment have affected the supply of social-sector services in the communities covered by the survey. Various indicators can be computed (teacher/pupil ratios, number of doctors/hospital beds per capita, non-salary recurrent expenditures, etc) which will give an indication of how the observed changes in resource availability have affected services across the country. Initially the community data set will be for just one point in time, but as the survey is repeated, it will be possible to have more accurate estimates of how services have changed at the community level. It might also be possible to distinguish those regions/communities where the poor are mainly to be found. In this way, an assessment may be made of whether the burden of fiscal adjustments has been borne disproportionately by poorer communities. [19]

3.81 The second stage examines the meso-micro relationships using the IS data set. The poverty profile should make some assessment of the health and education status of the poor, through tabulating a number of key indicators. These indicators are the outcomes of the combined influences of supply- and demand-side factors. In other components of SDA analysis (notably the analyses of health and education in Chapters Five and Six, respectively), more detailed analyses of these relationships is presented. The poverty profile should simply identify the level of the indicators for poor and non-poor groups, and seek to understand them in the light of the changes induced by the adjustment program.

Health

3.82 Tabulations on health should achieve two broad objectives. First, they should identify whether the incidence of illness (or injury) is greater among poverty groups than elsewhere in the community. A table showing the percentage of individuals reporting ill during the reference period specified in the IS, by poor/non-poor, region and socioeconomic group would be a useful starting point. Unfortunately, illnesses and injuries are self reported in the IS, and experience to date (with the LSMS surveys in Ghana and Côte d'Ivoire) have suggested that better-off households are more likely to report illness. This does not mean that the incidence of illness is greater among such households. A second broad objective is to establish what are the main repercussions of illness, in terms of the number of days lost through the illness and consultations with medical personnel. Tabulations on number of days lost and type of consultation by socioeconomic group and by poverty group would be conditional on the respondent reporting an illness.

3.83 Thus, tables should be prepared on the incidence of illness, numbers of days lost and type of consultation by poverty group and by socioeconomic group. Frames 3.8 and 3.9 are

Frame 3.10: Literacy and numeracy rates by region and poverty group: Ghana, 1987-88

	Very poor		*Poor*		*All*	
Region	*Literacy*	*Numeracy*	*Literacy*	*Numeracy*	*Literacy*	*Numeracy*
Rural	10.1	18.7	17.3	29.1	23.0	35.0
Accra	-	-	51.4	62.9	62.6	71.7
Other urban	20.0	27.1	24.0	35.7	35.4	49.0

Source: Boateng, et al (1989).

Frame 3.11: Percentage of children (aged 12-18) currently attending school by region and poverty group: Ghana, 1987-88

Region	*Very poor*	*Poor*	*All*
Rural	40.7	50.2	50.5
Accra	-	57.1*	58.5
Other urban	-	55.7*	61.4

* Observations = 7
Source: Boateng, et al (1989).

again drawn from Ghanaian data. The mean number of days inactive due to illness (conditional of course on being ill) is less for the poor than the non-poor in Ghana. This is to be expected — the poor simply cannot afford to lose working days through illness. Nevertheless, the fact that on average 5 days were lost over the reference period (of 28 days) among very poor ill persons, represents a serious problem for such people. Frame 3.9 also presents some sobering statistics. It shows that more than two thirds of the very poor who are ill do not consult with any medical personnel (which compares unfavorably for the ill population as a whole, among whom only a half consult no one). These results should be compared with (and possibly explained through) the macro-meso analysis conducted under the SDA program.

Education

3.84 Some simple tabulations should also be prepared to highlight the education of individuals in poor and non-poor households. Again, two simple groups of indicators present themselves. First, there are 'outcome' indicators, which reveal the effects of past education experience and past human capital investments. In some respects, these indicators can be considered as part of the *cause* of poverty, especially as they apply to adult members of the household. These are mainly literacy and numeracy rates. Secondly, tabulations on current education 'status' of household members should be presented. These indicators tell us something of the *effects* of poverty on the human capital of succeeding generations. Frames 3.10 and 3.11 give examples of the type of tabulations of outcome and status variables which prove useful.

3.85 Notice, the poor and very poor compare unfavorably in the cases of both outcome and status variables. Literacy and numeracy rates are significantly worse among the poor, and rural areas are consistently outperformed by urban areas. It is not surprising to note that both literacy and numeracy are highest among the better off in Accra. Status variables, suggest that educational disadvantage is likely to affect the next generation of individuals living in poor households. Among the very poor rural households, only 40% of children of secondary school age are attending school. This compares with 58.5% for poor and non-poor combined in Accra. Obviously, such tables should be prepared for other levels of schooling, including primary schooling if universal primary education is not yet attained. Notice in Frame 3.11 that the number of observations for some of the cells is very low indeed. Such instances should be identified explicitly. Again, the analyst must attempt to relate the findings of the micro outcomes observed for education to the macro-meso analysis described earlier.

The dynamics of poverty

3.86 Thus far, our concern has been with the poverty analysis of a data set at a given point in time, assuming that the IS is applied only once. However the IS is likely to be repeated after a passage of time (say after three or four years). If we have observations for two or more points in time, the opportunities for analysis are widened considerably, to include an analysis of changes in poverty over time. These dynamic issues are considered in this section.

3.87 The timing of the IS surveys in relation to structural adjustment is critical in interpreting the data, especially where data for two or more points in time are available. An understanding of what changes have occurred in the economy in the interval between the surveys, and the extent to which these changes have been brought about by adjustment policy. Much of the over-time

poverty analysis will involve repeating the tabulations that are described above, and comparing the two sets of results. The aim of such comparisons is mainly to establish whether the cross-section inferences that are drawn through the point-in-time analysis of the base-year data, are confirmed in the time series. For example, the analysis of the base-year data may suggest that adjustment will benefit the poor, since most are engaged in export-crop production. Observing what happens to poverty over time in the export-producing sector should confirm (or correct) this expectation.

3.88 The P_α measures for each region and socioeconomic group should be computed for each year, and comparisons made. For such comparisons, two observations are in order:

- A choice must be made about whether or not to be rigorously relativist in the treatment of the poverty line. Poverty line(s) may be selected for the base year, and kept constant in real terms for subsequent years. Alternatively, a poverty line defined in relation to mean income might be applied, in which case there is no certainty that it will remain constant over time. The interpretation of the results for such a case will be quite different of course.
- Dominance results can also be applied to comparisons of poverty over time. In this case, the cumulative distribution function in the terminal year is compared with that of the base year. If it is everywhere below the base year, poverty has unambiguously fallen, regardless of the poverty line and index selected. These calculations can be applied to overall poverty indices or to poverty in each of the groupings selected.

3.89 Having data for two or more points in time clearly extends the potential scope of the poverty profile in a number of ways. We shall highlight one important extension: decomposing poverty changes in growth and inequality effects.

3.90 *Growth and inequality effects.* There are two proximate causes to any change in the poverty index over time: a change in the mean income/expenditure; and a change in the distribution of income/expenditure around the mean. The first is simply the effect of a general growth in incomes, and the second is the result of changing inequality. It is a simple matter to decompose any change over time in poverty into that which is due to a change in mean incomes (keeping inequality at its base year) and that arising from a change in inequality (keeping mean income constant).[20] Let $P_{\alpha,b}$ be the overall poverty index in the base year and $P_{\alpha,t}$ be the index for the terminal year. Now denote $P^*_{\alpha,t}$ as the poverty level that would have occurred in the terminal year if the change in the mean income over the period had not be accompanied by any change in inequality. This is obtained by applying the terminal year mean to the base year Lorenz curve. Similarly, let $P'_{\alpha,t}$ be the poverty level in the terminal year that would arise if mean incomes had stayed constant over the period, but only changes in inequality occurred. For this, the base year mean is applied to the terminal year Lorenz curve. The change in observed poverty between the two years can then be decomposed as follows:

$$P_{\alpha,t} - P_{\alpha,b} = (P^*_{\alpha,t} - P_{\alpha,b}) + (P'_{\alpha,t} - P_{\alpha,b}) + \text{residual} \quad (9)$$

3.91 The first term on the right hand side of (9) is that component of the change in poverty which is due to the change in the mean income, holding the base year Lorenz curve constant. The second term indicates that part which arises from the change in the Lorenz curve, holding the base year mean constant. This analysis can throw light on the proximate causes of inequality change. Has poverty decreased mainly because of economic growth, or has there been a marked improvement in inequality?

Concluding observations

3.92 This Chapter has described how the household data generated through the SDA IS can be analyzed to present a poverty profile of the country concerned. The profile is designed to provide insights into how poverty is likely to be affected by adjustment, although as we have cautioned, the profile cannot provide any rigorous grounds for attributing causation. Emphasis has been placed on keeping the analysis relatively simple. The computations involved are straightforward, and most of the results are presented in tabular form. Such tabulations can be easily understood by policy makers. Clearly, further analysis should be applied to the data, some of which is described in other chapters of this volume. These studies will provide a more in-depth understanding of the reasons why some households are poor and others not.

3.93 The main objective of the analysis is to provide policy makers with an improved empiri-

cal basis for protecting poorer groups during structural adjustment. It should signal clearly where poor groups are particularly vulnerable to policy change, and where they are in need of immediate assistance. But more importantly, it should suggest ways in which policy interventions might be adjusted in order to dampen down adverse effects, and enhance any beneficial effects of policy instruments.

Notes

1. There are individual-level data obtained in the IS, covering employment, eduction, health, nutrition and so on. But expenditures are only obtained for the household as a whole.

2. The exposition of the theoretical basis for expenditure as a proxy for welfare follows that of Boateng, et al (1989: Appendix 2).

3. Along with other models of household behavior, we assume that production decisions can be solved separately from consumption decisions. See World Bank (1990) for a discussion of such recursive household models.

4. For a discussion of the differences in results obtained using alternative measures of welfare in the case of Côte d'Ivoire, see Glewwe and van der Gaag (1987).

5. Our theoretical justification of the expenditure-based measure assumed that only commodities entered the welfare function. The main limitation of this measure is that it ignores utility that is derived from leisure. To capture this, a full-income approach would be needed, which assigns a monetary value to leisure using the opportunity wage concept.

6. For a review of the relative merits and de-merits of food expenditure as a welfare measure, see Glewwe (1988).

7. For useful reviews of recent developments in the measurement of poverty, see also Atkinson (1987), Foster (1984) and Sen (1983 and 1987).

8. During the 1970s, poverty was popularly defined as the poorest 40%, mainly as a result of the analysis presented in Chenery et al (1974).

9. Although given time, the IS survey will be repeated, and observations for a number of points in time will be available. The implications of this for poverty analysis are reviewed in Section VI below.

10. Pyatt and Thorbecke (1976) discuss the merits of wealth, sociological criteria and location as means of classifying households.

11. The selection of socioeconomic groups used in the tables is different from that proposed above. No significance should be read into this — the categories in the tables are those which were used in studies on Côte d'Ivoire and Ghana.

12. And also regardless of the poverty line selected. The same orderings were obtained using the 30th percentile cut off as the 10th percentile.

13. See Atkinson (1987) and Foster and Shorrocks (1988).

14. The weaker second order dominance test is that the *area* under the cumulative distribution function for group A is less than group B.

15. So long as the poverty measure satisfies certain mild conditions, notably that it is continuous, separable, symmetric and weakly monotonic.

16. Clearly, to generate these indicators the analyst must have at his disposal an empirical expenditure system from which to assess the households' responses to the price changes under consideration.

17. An alternative would involve the use of a general equilibrium framework, though there is some evidence that little would be gained from this. In the case of Cote d'Ivoire, Kanbur (1988a:89) argues that 'taking account of the feedback effects via a complex general equilibrium model does not seem to invalidate the policy guidelines that emerge from the poverty profile analysis'.

18. Weights used in such price indices should ideally reflect the input combinations used in the sector concerned. It may not be possible to compute separate price indices for each of the social sectors, in which case proxy deflators might be used (eg the consumer price index, or, since labor comprises the main input, a money wage index).

19. As with our observations of the economic infrastructure, whether this is possible will depend on the sample that is drawn. If the poor are dispersed across all the communities, it will be difficult to identify how these infrastructural changes have affected them (as distinct from other household groups). However, unlike the economic infrastructure, social infrastructural changes will have noticeable effects at the household level, and these may reveal differential impacts of adjustment on the poor and non-poor.

20. For an application of this decomposition see Kakwani (1989) for Cote d'Ivoire and Ravallion and Huppi (1989) for Indonesia.

Annex: Possible bias in poverty measurement

It is important to highlight a possible weakness in the SDA data which may affect the reliability of estimates of poverty that are generated. A feature of the SDA household-level data is the relatively short reference period that is used in obtaining estimates of some of the components of income and expenditure (in some cases only two weeks in the current SDA design, though this varies according to whether income or expenditure are being measured, and in the case of the latter, on how frequently the expenditure item is purchased). Although the income/expenditure experience of a household will rarely be exactly typical of annual income/expenditure for that household, by summing across households unbiased estimates can be obtained for the population as a whole (or for sub-groups of the population) of mean incomes and expenditures. However, as estimates of annual income at the individual household level will not be accurately measured using the short (two-week) reference period, estimates of the dispersion in incomes (and other statistics which depend on the dispersion — for example, the Gini ratio, variance, standard deviation, etc.) will be biased. Scott (1989) has shown that this upward bias in the measure of annual income/expenditure dispersion or variance is both inevitable and large (possibly of an order of over 30%). The extent of this bias will obviously depend on the importance of those components of income/expenditure (for which short reference periods apply) in total income/expenditure. For example, most food expenditures are obtained over a short reference period, whereas other less frequently-purchased items are measured over a longer reference. Similarly, some income data (for example, wage income, are obtained over a shorter reference period than others)

It goes without saying that any upward bias in the measure of income variance has serious implications for poverty analysis, since the measures of poverty are also certain to be biassed. The direction of the bias for P_α measures can only be determined empirically, since a priori, the effect on P_α is indeterminate (depending, inter alia, on the position of the poverty line in relation to the mean). However, there are two sources of consolation for the SDA analyst faced with this problem. First, insofar as the analysis is based on arbitrary poverty lines, the absolute extent of poverty is not so important. Rather, as we have already mentioned, it is the pattern of poverty across the various groups which is of policy concern. It is unlikely that the poverty ranking of the various groups will be seriously affected by this bias (unless the source of the bias — that is the non-representativeness of reference-period incomes/expenditures — happens to be significantly worse for some income groups).

Secondly, it is possible that whilst the measurement of income dispersion using short reference periods is subject to this bias, the measurement of expenditure dispersion will be less so (assuming that both measures take the same reference period). This is because households faced with income variations will tend to smooth out expenditures over the year, based on expectations of the 'permanent' income for the year. The evidence Scott compiles to show that the bias is potentially serious are derived from measures of income. Moreover, some of the expenditure items derived in the SDA survey are obtained over a one-year reference period, which will reduce the resulting bias. Obviously, whether or not the measurement of income is more prone to this problem than measured expenditure depends on how they are derived in the IS questionnaire. If income is reported over the year, then this bias would not be present at all for income measures. For agricultural incomes, for example, the IS questionnaire takes a one year reference period, and for agricultural households, one might anticipate greater problems with expenditure-based estimates than income measures (abstracting from problems of recall error, that is).

4

Employment and earnings effects

Introduction

4.01 Structural adjustment affects employment and earnings through its impact on the level and structure of economic activity. But diverse views exist over this impact. Some observers argue that adjustment depresses livelihoods over the short-run without much (if any) long-run improvement. Others argue that adjustment improves livelihoods over the long-run compared to non-adjustment. All commentators recognize that adjustment has particularly strong effects on certain occupations, but pessimists argue that adjustment fails to generate alternative employment sources, while optimists take the view that adjustment encourages new employment opportunities. Pessimists would replace current adjustment programs with greater market-intervention and more import-substitution which they believe has stronger employment effects than export promotion. Among those favoring market-oriented adjustment, there are differences over how far the poor share in adjustment-led growth. If the poor as a group benefit from adjustment, then special assistance is not required; it will suffice to make sure that the correct policies are in place. But if the poor do not gain significantly, then assistance is called for. This involves reducing social, institutional and economic impediments to their economic participation, improving their human capital, providing direct assistance through employment projects, and improving their geographical and occupational mobility.

4.02 This chapter provides guidelines for analyzing the employment and earnings effects of structural adjustment. We focus on wage-earners and non-farm household enterprises. Agricultural self-employment is the subject of Chapter Ten in this Volume. We concentrate on the allocation of time to directly remunerative employment, referring to time use for the purposes of education, health-care and housework only in as much as they affect employment and earnings. The chapter is organized as follows. In paragraphs 4.05 through 4.10 product-, labor- and capital-market effects of structural adjustment are reviewed. Paragraphs 4.11 through 4.56 propose detailed descriptive analyses of employment and earnings effects and suggests appropriate cross-tabulations. Paragraphs 4.57 through 4.97 set out approaches to multivariate analyses of the determinants of labor supply, earnings and household enterprise profit. Paragraphs 4.98 and 4.99 conclude the Chapter.

The impact of adjustment on employment and earnings

Product market effects

4.03 Structural adjustment affects employment and earnings through product markets, labor markets and capital markets. Product market effects work through:

- *Contractionary fiscal and monetary policy.* These reduce aggregate demand (the precise effects depending on the mix of government expenditure cuts and revenue increases used to reduce

the budget deficit). The prices of nontradable goods and services fall relative to the prices of tradables, because domestic supply and demand determine the former prices whereas tradable prices are given (for small African economies) by world price levels. This in turn encourages tradables production to expand, and nontradables production to contract, the speed and extent of these changes depending on supply responsiveness.

• *Devaluation and import liberalization.* The former increases the domestic prices of tradables relative to nontradables, which further encourages tradables expansion. Not all tradables expand, however, because cuts in tariffs and quotas reduce the prices of importables relative to exportables. Sectors producing previously protected importables (usually manufactures) therefore contract relative to exportables which are mostly unprotected (or suffer from negative protection) in Africa.

• *Sectoral price adjustments.* The lessening of price controls, the adjustment of controlled prices to market-levels, and the reform of marketing institutions to increase their efficiency, together alter the structure of producer prices.

• *Changes in the provision and rehabilitation of economic infrastructure.* Public investment budgets are recast in the light of new priorities. This alters the returns that producers derive across product markets; new transport and processing facilities improve profitability in key sectors (such as agriculture), while investment cutbacks in disfavored sectors reduce their profitability.

4.04 These product market adjustments in turn alter the derived demand for labor, thereby completing the transmission of policy effects through to household livelihoods. If tradables are more labor intensive than nontradables, then in the long run employment and returns to labor (in both self-employment and wage-employment) will increase, provided that no labor market rigidities exist. The opposite result occurs when tradables are less labor-intensive than nontradables. The short-run outcome depends on how mobile labor is; if substantial retraining is involved, or if geographical mobility is difficult, then workers in expanding sectors will earn a premium on their labor returns, while those in contracting sectors will face a larger wage-fall or greater unemployment than if they were mobile. But how the gains and losses are shared also depends on government policies in the labor market itself (see below).

4.05 Product market adjustments also affect labor supply. Price increases for essential commodities will raise labor force participation, and hours worked. Reduced incomes among the households' main earners will increase participation among other members (more school-age children may work, for example). Fiscal measures themselves may affect labor supply (for example by reducing transfers to households and increasing their taxation).

Direct labor market effects

4.06 Adjustment directly affects labor markets through:

• *Changing the process of private-sector wage-determination.* Government minimum-wage setting sometimes encourages a dual employment structure; wages cannot be adjusted downward to clear 'formal' labor markets and the unemployed must resort to the informal sector. Minimum-wages may be relaxed under market-liberalization, with significant implications for formal and informal livelihoods.

• *Changing the process of public-sector wage-determination.* In some countries public sector wages are still set above market-levels. But in others, wages for professionals have fallen below those in the private sector. Most adjustment programs try to rectify these anomalies through public-sector reform programs.

• *Retrenchments in public-sector employment.* Where public employment is overextended, thereby contributing to budget deficits, retrenchments of unskilled staff release resources to pay more to scarce professionals. Given the concentration of public employment in specific locations, large changes in local labor markets are implied.

4.07 Whether labor markets operate efficiently via rapid adjustments in wages to shifts in labor demand and supply, is crucial to adjustment's impact on labor welfare (Johnson, 1986). Labor-market segmentation induced by inappropriate policies can impede this efficiency, but segmentation can also occur irrespective of policy. Causes include unionization and monopsony, monopoly employers, imperfect information, barriers to mobility, discrimination, and distortions in capital markets (Mezzera, 1981). Whatever its cause, segmentation significantly affects the impact of output fluctuations on employment and earnings.

4.08 Consider, for instance, a fall in the de-

mand for nontradables. With inflexible formal-sector wages, the formal labor market in the nontradables sector takes the brunt of the employment contraction, since some workers cannot retain employment by taking a lower wage. The informal labor market in the nontradable sector is expected to take the brunt of the wage-fall, because its labor demand falls, and the redundant formal workers move into it (this may result in more informal workers dropping below the poverty line). The formal-informal wage differential therefore rises (McDonald and Solow, 1985:).

Capital market effects

4.09 Adjustment affects capital markets through:

- *Alterations in the price of capital to producers.* This occurs through decontrol of the prices of capital equipment and changes in the prices of imported capital equipment consequent upon devaluation and import liberalization.
- *Changes in the structure of fiscal incentives offered to users of capital.* Programs often include the reduction of tax allowances on capital purchases, and the elimination of capital subsidies.
- *Elimination of financial repression.* In many countries loan interest rates are kept below market levels, thus cheapening the cost of financing capital purchases by borrowing. The upward adjustment of interest rates to market clearing levels is an important policy reform.

4.10 Each of these in turn alters the relative factor-price ratios facing both households and enterprises, leading to changes in the factor combinations used. On balance, in most countries, such changes will tend to make capital more expensive relative to labor thus favoring employment and wage growth. The strength of the latter will, however, depend on how quickly adjustments in capital stocks can be made, and on the elasticity of substitution between capital and labor.

A descriptive analysis of employment and earnings under adjustment

4.11 The SDA Integrated Survey contains a considerable amount of information of use to the analysis of employment and earnings. This section shows how that information can be presented in the form of tables to inform policy analyses. It is important to present the information in a manner which is readily understood by decision-makers. To achieve this, analysts and policy-makers should agree on a *standard data-presentation framework* which will complement existing information on employment and earnings, and alert policy-makers to problems requiring public interventions.

4.12 Although the features of such a framework can only be established at the country-level, some important aspects can be highlighted under the headings of:

1. Socioeconomic Groups and Data Presentation,
2. Characteristics of the Economically Active Population,
3. Distribution of the Labor Force Between Tradable and Nontradable Sectors,
4. The Structure of Public Employment,
5. Urban Employment and Migration,
6. Rural employment: farm and non-farm self employment,
7. Labor Flows between Occupations and Sectors,
8. The Structure of Earnings,
9. The Structure of Earnings from Non-Farm Self-Employment, and
10. The Structure of Wages.

4.13 Topics 1 to 7 cover employment, its characteristics and distribution, while topics 8 to 10 cover the structure of earnings from different employment sources. Topics 2 to 10 are addressed in turn, and sample frames (or tables) suggesting ways to present corresponding survey data are proposed. The identification of homogeneous socioeconomic groups and target groups for social dimensions (including employment and earnings) analysis is discussed in Chapter 3.

Characteristics of the economically active population

4.14 Although this section of an Employment and Earnings Report presents the most basic information, its interpretation can, as shown below, yield considerable insights into the employment and earnings effects of structural adjustment.

4.15 THE DISTRIBUTION OF THE ACTIVE POPULATION BY MAIN EMPLOYMENT. Frame 4.1 (overleaf) shows the 'economically active population' [1] distributed across their main employment, with disaggregation by gender, age, nationality group, and whether the individual's household is above or

Frame 4.1: Distribution of the active population by main employment status, gender and age group, nationality and by poor and non-poor households
(percentage)

	Unemployed	*Employed private*	*Employed public*	*Self-employed*
Female				
Age groups				
All				
Male				
As above				
All				
As above plus:				
Nationality groups				
Poor				
Non-poor				

Frame 4.2: Labor force participation ratio (L) and unemployment (U) by region, gender, age group and household headship
(percentage)

	Capital		*Other urban*		*Rural*		*National*	
	L	*U*	*L*	*U*	*L*	*U*	*L*	*U*
Female								
Age groups								
Household heads								
Other household members								
All								
Male								
As above								
All								
Age groups								
Nationality groups								
All								

below the poverty line.[2] A relatively fine disaggregation by age is recommended given life-cycle variations in employment prospects. Since most occupational mobility occurs among the young, the period from 7 to 25 years should contain the largest number of age groups.[3]

4.16 Frame 4.1 offers a useful *static* picture of the labor force, clarifying (for instance) the structure of youth employment, and the role of public employment. Reporting Frame 4.1 at regular intervals, from successive surveys, provides a *dynamic* picture of how employment changes under adjustment.

4.17 For instance in the short run, both private and public employment may fall heavily as a result of demand contraction affecting both private and public expenditures. In turn, this employment loss may be disproportionately spread; young workers often have less job-security than older workers and more women may be made redundant than men. Employment alternatives also vary significantly; young men may have fewer opportunities for self-employment than older men (because the latter may have greater access to productive assets), so open unemployment may be higher among younger males.

4.18 Obviously care must be taken in making such inferences, and the use of such tables should be part of wider analyses. But the presentation of the data in this way does provide a first indication of situations for further investigation. In this regard, with successive surveys, the magnitude of changes in cell values should be reported.

4.19 LABOR FORCE PARTICIPATION AND UNEMPLOYMENT. Frame 4.2 presents labor force participation rates and unemployment rates by location, gender, age group and household headship. Some cells may contain only a small number of observations. For example, unemployment among the 7-14 age-group in rural areas may be very small, and this should be indicated to the user, or excluded. However, child unemployment may be very significant in urban areas. In some countries orphans and abandoned children may have migrated to towns in search of work. Increasing unemployment and participation rates among this age group would indicate a serious child-welfare problem, including schooling deficiencies, since children in this situation are unlikely to be enrolled and attending school.

4.20 Disaggregation by location shows the situation in local labor markets following sectoral policy changes, and how this impacts on target groups. For instance, the employment effects of industrial rationalization are often concentrated on particular localities. This may have severe effects on a particular group because of the characteristics of the industry's employees (e.g., if the factory employed large numbers of female operatives). Frame 4.2, reporting the results of successive surveys, will give an overview of local labor market adjustment to such policy reforms. In the first survey a high rate of female unemployment in (say) the 'other urban' category might

be observed; the next survey would indicate whether that unemployment had persisted or not.

4.21 Female labor-force participation is, on average, lower than that of males because women have lower opportunity costs of non-participation when their wages are low. Unemployment rates are often higher among women because their opportunity costs of job search are lower, and discrimination in hiring leads to a lower job-opening rate for them. Information is therefore reported by gender. It is also reported by household headship, since household heads (of either gender) usually have a higher participation rate, and a lower unemployment rate than other household members (who are partly supported by the household head). This is particularly the case for females: in Tanzania for instance female-household heads have a much higher participation rate, and a much lower unemployment rate than females in general.

4.22 Finally, Frame 4.2 could also include marital status, since divorced\separated\widowed women generally have the lowest unemployment rates, and the highest participation rates, of all women. In losing the financial support of their spouses, these women face very high opportunity costs if they do not participate in the workforce.

4.23 Disaggregations such as these highlight the situation of different groups and, over successive surveys, show whether particular groups are faring better or worse than the average. The multivariate analysis of paragraphs 4.57 through 4.68 pursues these issues further.

4.24 EMPLOYMENT STATUS AND PARTICIPATION BY EDUCATIONAL ATTAINMENT. Frames 4.1 and 4.2 can be supplemented by tables showing employment status, labor force participation and unemployment by educational attainment (with further breakdowns by gender). Such tables have identical columns to those of Frames 4.1 and 4.2, but the rows are: no education, years of primary, secondary, tertiary education, and so forth. This will show whether men and women with the same educational attainments have significantly different employment patterns and, over successive surveys, whether these patterns change (because, for example, men are more easily absorbed into certain types of employment than women).

Frame 4.3: Distribution of the employed labor force between tradables and nontradables
(percentage)

	Self-employed	*Employed*	*Total*
Tradables			
Protected tradables			
Unprotected tradables			
Nontradables			
Nontradable Consumer goods			
Nontradable Capital goods			
Public services			

Distribution of the labor force between tradable and nontradable sectors

4.25 Since adjustment alters the output shares of tradables and nontradables, Frame 4.3 suggests decomposition of employment status by the tradability of sectors. The household questionnaire provides data on the industrial affiliation of respondent's activities, and this allows us to classify the trade, service or manufacturing activity into various tradable and nontradable categories, as shown in Frame 4.3.

4.26 Labor moves between nontradables and tradables, but labor re-allocations also occur within the tradable and nontradable categories (paragraphs 4.06 thorugh 4.08). Two types of tradables are defined: protected tradables (import substituting industries under tariff and quota protection) and unprotected tradables (mainly agricultural products).[4] Nontradables are disaggregated into consumer and capital goods, and into public services. These tabulations show the structure of employment at any one time, and successive surveys allow employment shifts to be tracked.

4.27 Two additional tables should also be presented. First, the distribution of employed persons resident in poor households across tradable and nontradable sectors, and disaggregated by employment and self-employment should be reported. Second, the distribution of the labor force by occupation across tradable and nontradable sectors should be given. The household questionnaire provides information on occupational status from pre-determined occupational lists (manual worker, professional etc). The resulting

table will have a format similar to Frame 4.3 with the tradable and nontradable sectors defining the rows, and occupations defining the columns.

The structure of public employment

4.28 In the past, government employees have enjoyed above-market salaries together with benefits such as subsidized housing and security of tenure. But these benefits have been eroded considerably in many countries, and the structure of public employment is now changing fundamentally. Since public employment is usually distributed unevenly, job retrenchments can affect local employment severely. Therefore, Frame 4.4 shows the distribution of public employment across regions. Employment in government and state-enterprises is shown, since job retrenchments can fall unevenly across the public sector.

4.29 Established and non-established public-sector employment is also distinguished. The latter has become more prominent as established posts have been frozen, but 'temporary' hiring of staff has been permitted. Unestablished jobs carry few fringe benefits, and the SDA survey yields sufficient information on fringe benefits to identify unestablished jobs. Unestablished jobs usually bear the brunt of retrenchments since the unskilled are concentrated in these jobs, and their costs of dismissal are low.

4.30 The table also disaggregates the information by gender and for the poor. Thus in a given region 10 per cent (say) of the regional labor force may be government employees and 5 per cent in state enterprises. Of the region's government employees, 80 per cent might be males, and 20 per cent females, while 10 per cent might come from poor households.

4.31 Women and men are usually spread disproportionately across the column categories because of variations in local hiring practices and participation rates, and differences in the educational attainments needed by public employees. Public sector retrenchments are therefore likely to have disproportionate effects on male and female employment. Females may also be concentrated in unestablished occupations, which further heightens their vulnerability to redundancy.

4.32 Verifying whether the poor share in public employment is important information for countries beginning retrenchment, since substantial assistance to redundant public employees is not warranted if few of them are poor (Demery and Addison, 1987). However, the poor may be concentrated in the unestablished category, in which case assistance should be targeted to this group. Successive surveys will also show whether the poor have been disproportionately affected by retrenchment. To date only circumstantial evidence has been available on this issue (see Addison, 1987, on The Gambia, for example).

Frame 4.4: Shares of government and state-enterprise employment in regional labor forces, shares of established and unestablished public-sector workers in the national labor force

(percentage)

	Each region		*National*			
	G	*S*	*G*	*S*	*E*	*U*
All						
Composition of public employment						
Female						
Male						
Persons from poor households						

G indicates government.
E indicates established.
S indicates state enterprise.
U indicates unestablished.
Note: An additional column for each region may be added giving the aggregate of *G* and *S*.

Urban employment and migration

4.33 Large changes can be expected in urban livelihoods under adjustment since nontradable services, and protected tradables, are urban focused, and these take the brunt of demand deflation. Formal job losses add to the informal sector, which may already be absorbing large amounts of labor if formal economic activity is stagnant prior to adjustment.

4.34 Frame 4.5 therefore decomposes urban employment (both wage- and self-employment) into its formal and informal parts, using criteria such as whether survey respondents have an employment contract, whether minimum wage legislation applies. The table indicates how important formal and informal employment is to different age groups and to males and females. Shares for the poor and non-poor can also be reported. Finally, the wage-and self-employment components of the formal and informal employment categories can be reported (although there may be insufficient observations to report this

Frame 4.5: Distribution of urban employed labor force between formal and informal sectors by age, gender and household headship
(percentage)

	Capital		*Other urban*	
	F	*I*	*F*	*I*
Female				
Age groups				
Household heads				
Other household members				
All				
Male				
As above				
All				
Age Groups				
All				

I indicates informal.
F indicates formal.
Note: Either employed or self-employed.

information by age group). Changes in the structure of urban employment can then be monitored as policy reforms are implemented.

4.35 Because adjustment causes substantial changes in the economy, a reversal of past interregional migration of labor may occur. Specifically, labor may return to agriculture, if (as is likely) adjustment shifts the urban-rural income differential in favor of rural employment.

4.36 Frame 4.6 captures important dimensions of migration under adjustment. For each region, the share of recent migrants (moved during the last year) in the region's work force is given. The SDA survey provides reasons for migration, and the share of recent migrants reporting redundancy or business failure is given. To establish how well they have adjusted to the local labor market, the percentage who are currently unemployed is shown. Finally, the income of households in which recent migrants now reside is reported as a percentage of the region's household income. This also indicates how they have adjusted to the local labor market. If successive surveys are available, then their progress can be tracked; over time their unemployment rate may fall, and their household's income may rise relative to the average.

4.37 A small sample of migrants will limit decomposition by personal characteristics. Frame 4.6 therefore gives two age-groups only; the cut-off age is the mid-twenties, since younger people

Frame 4.6: Regional migration and characteristics of migrants
(percentage)

	Each region			
	M	*ML*	*MU*	*MY*
Age				
7-24				
Over 24				

M indicates recent migrants as percent of region's labor force.
ML indicates percentage of M who lost their job or business in previous location.
MU indicates percent of M who are currently unemployed.
MY indicates household income of recent migrants as a percentage of average household income in the region.

Frame 4.7: Share of the employed labor force that reports non-farm self-employment by region, gender, age and nationality
(percentage)

	Capital	*Other urban*	*Rural*	*National*
Female				
Age groups				
Household heads				
Other household				
Members				
All	Y			X
Male				
As above				
All				
Age cohorts				
Nationality				
Groups				
All				

are more likely and able to migrate. If sample size permits, then decomposition by gender and poverty criteria should be used.

The structure of non-farm self-employment

4.38 Frame 4.7 shows, by region, the share of the labor force in non-farm self-employment. For example, X per cent of all employed males (and Y per cent in the capital) may report non-farm self-employment. Since this employment usually becomes more important as people grow older, decomposition by age group is shown (see Vijverberg, 1988b on Abidjan for instance). Gender differences are usually evident, as are differences across urban centers. Finally, in most

Frame 4.8: Distribution of household non-farm enterprises across activities by region, and for poor and non-poor households
(percentage of column total)

	Each region			*National*		
	AH	*NP*	*P*	*AH*	*NP*	*P*
Manufacturing						
Services						
Food commerce						
Non-food commerce						

AH indicates all households.
NP indicates non-poor households.
P indicates poor households.

countries there are significant differences between nationality groups in their reliance on income from non-farm enterprises.

4.39 Frame 4.8 seeks to capture the importance of different non-farm enterprises across regions; for instance services are generally more important in urban than rural areas. The SDA household questionnaire gathers information on up to three household enterprises, and these can then be aggregated to form the table (see Vijverberg, 1988b). The table shows the relative roles of different non-farm enterprises in the employment of poor households. They may predominate in services and food-commerce, where capital requirements are small, rather than in manufacturing which needs more capital. We can track how this changes as projects are implemented to improve their businesses.

4.40 Adjustment will cause changes in the shares of these activities over time. For instance services and non-food commerce usually become less important since these are predominantly nontradable activities, while informal manufacturing, being predominantly a tradable, will most likely increase. A reduction in rent-seeking upon the removal of market distortions will also reduce the role of non-food commerce in the short-term. Again the table should capture these effects.

Labor flows between occupations and sectors

4.41 Frame 4.8 clarifies the occupational changes that occur under adjustment, using information on employment histories. The current main occupation or other time use (housekeeping, education) is cross-tabulated with the previous main occupation time use. The table is then

Frame 4.9: Current occupation time-use in relation to previous occupation time-use
(percentage)

		Current			
		E	*H*	*S*	*01, 02 ... etc*
Previous	E				
	H				
	S				
	01				
	02				
	...				
	etc.				

E indicates full time education.
H indicates housekeeping.
S indicates searching for work.
01, 02... etc indicates main occupations.
Note: All columns add to 100 percent.

read down its columns. Thus for each present main occupation the percentages of those who were previously in full-time education, unemployed, in the same occupation, or in other occupations would be shown.

4.42 The table indicates the flow of persons between occupations as adjustment takes effect. For example, we can see how government workers are re-employing themselves by checking the percentages of urban businessmen and farmers who were formerly in government. The table could also be disaggregated by gender, to capture differences in the occupational mobility of men and women (due to barriers to entry affecting women more than men, for instance). Finally, the information should be reported for those in poor and non-poor households to highlight the difficulties faced by the poor in achieving occupational mobility.

4.43 A table similar to Frame 4.9 can be presented with occupations aggregated into groups of formal wage-employment (with sub-categories of public and private), informal wage-employment, non-farm household enterprise, and farm enterprise. Each of these can in turn be disaggregated for various categories of tradables and nontradables: for instance using a three-fold classification of tradability, formal wage employment in the private sector can be split into unprotected tradables, protected tradables, and nontradables. The questionnaire allows the matching of occupation with industrial status for both past and previous main employment.

4.44 Such a table would, for example, show the percentage of those wage-earners currently in

unprotected tradables who had previously been wage-earners in protected tradables or non-tradables. This provides important information (especially when successive surveys are available) on the short and long-term mobility of labor between tradable and nontradable sectors which, it was argued in paragraphs 4.03 through 4.10 is a major determinant of the labor welfare consequences of structural adjustment.

The structure of earnings

4.45 Sources of household incomes, occupational earnings across tradable and nontradable sectors, and tabulations and indices of real earnings are the subjects of this section. Frame 4.10 decomposes household income by source for poor and non-poor households. [5] It might be observed, for instance, that unearned income accounts for more than wage-employment among poor rural female-headed households (reflecting their dependence on remittances) or that non-farm enterprises make only a small contribution to the incomes of some poverty groups. Successive surveys, together with other information sources, can map changes in sources of income as adjustment proceeds. For example, self-employment income could fall among urban poverty groups if policy reforms depress the informal sector. Suitable project interventions can then be implemented to deal with this problem (and tabulations from successive surveys will highlight how income sources change as the projects are implemented).

4.46 As stated earlier, every employed person can be classified according to their occupational and industrial status, and each industry can be further classified according to its degree of tradability. For each occupation industry cluster, mean and median values for earnings can be calculated and reported in a table such as Frame 4.11. Given the likely skewness of the data, it is important to report the median value in addition to the mean. If repeated surveys were available, it would be possible to see how the structure of occupational earnings changes as measures such as devaluation improve earnings in tradables relative to nontradables, as trade liberalization alters the structure of earnings within tradables, and as earnings in nontradables are affected by measures such as civil service reforms. For example, adjustment might raise the earnings of manual workers in tradable sectors, but depress their earnings in nontradables. But as time passes, and workers are able to move out of nontradables, the differential in favor of manual workers in tradables will fall.

4.47 Price indices using information from the SDA community surveys should be used to calculate the real earnings provided by different employment sources. For example, the mean and median values of real earnings derived from wage-employment (both formal and informal), self-employment (both agriculture and non-farm),

Frame 4.10: The structure of household income in rural and urban areas by poor and non-poor households, and gender of household head
(percentage)

	Each region			
	Poor households		*Non-poor households*	
	Female-headed	*Male-headed*	*Female-headed*	*Male-headed*
Wage-employment				
Formal				
Informal				
Self-employment				
Agriculture				
Non-farm				
Enterprises				
Transfers				
Private				
Other				

Note: All columns add to 100 percent.

Frame 4.11: The occupational earnings in tradable and nontradable activities
(in local currency over a one month period)

	Each occupation		*Overall*	
	Mean	*Median*	*Mean*	*Median*
Tradables				
Protected tradables				
Unprotected tradables				
Nontradables				
Nontradables, Consumer goods				
Nontradables, Capital goods				
Public services				
Average by occupation				

Frame 4.12: Earnings of household non-farm enterprises for poor and non-poor households
(local currency per month)

	Each region							
	Gross revenue				*Net revenue*			
	Poor		*Non-poor*		*Poor*		*Non-poor*	
	ME	*MD*	*ME*	*MD*	*ME*	*MD*	*ME*	*MD*
Manufacturing								
Services								
Food commerce								
Non-food								
Commerce								

ME indicates mean.
MD indicates median.

Frame 4.13: The structure of wage-differentials by education level and age
(ratios of mean wage-rates)

	Wage-differentials			
Education level	*Female/ Male*	*Capital/ Other urban*	*Urban/ Rural*	*Public/ Private*
No schooling				
Age groups				
Primary education				
Age groups				
Secondary education				
Age groups				
Tertiary education				
Age groups				

and transfers can be reported for each region, with breakdowns for poor and non-poor households. Over successive surveys these will reveal changes in the structure of earnings as policy reforms take effect.

4.48 Lastly, given the effect of adjustment in changing the formal-informal wage-differentials discussed in paragraphs 4.03 through 4.10, it is important to provide real wage-indices for both formal and informal workers. Wage dispersion can narrow or widen during adjustment depending on the nature of the policy package.

The structure of earnings from non-farm self-employment

4.49 The profitability of household enterprises is measured by net revenues. Under adjustment these are affected by product- and input-price movements (due to demand effects, exchange rate adjustments, changes in trade interventions, and the relaxation of price controls). Net revenues are calculated from information on the values of outputs and inputs. Frame 4.12 reports these for various enterprise categories, and for poor and non-poor households. Successive surveys will show how profit incomes among the poor fare as adjustment proceeds and as project-based interventions to assist target groups take effect. Median values should be reported since evidence to date shows a skewed distribution of earnings among most categories of enterprise. Gross revenues are reported as well, since changes in these are indicative of demand conditions facing households. Frame 4.12 proposes a way to decompose activity earnings by region, thus capturing changes in enterprise profits depending on their location. For example, the demand for, and profitability of, urban services may fall if adjustment substantially reduces urban formal incomes. But due to growing agricultural incomes, the demand for rural services and their profitability may rise.

The structure of wages

4.50 An important task in the analysis of earnings is to establish the determinants of observed differences in wages between individuals. What are the respective roles of supply-side variables (for example, educational attainment, post-school experience) and demand-side variables (hiring practices, discrimination) in determining observed wage-differentials? The generation of an answer to this question requires multivariate analysis (see paragraph 4.69 through 4.73). But suitable cross-tabulation of the data can provide some guidance.

4.51 The wage-differentials of particular policy interest are those between genders, between regions, and between the private and public sectors. All of these are likely to change under adjustment. Frame 4.13 reports on these differentials expressed as ratios between, for instance, mean female and male wage-rates. In some occupations workers receive fringe benefits in the form of health, housing and transport subsidies. Earn-

ings-differentials including both wage and non-wage payments should therefore be reported.

4.52 The rows of Frame 4.13 are distinguished by educational level, with further sub-divisions in terms of age to proxy for post-school experience. If wages are mainly determined by human capital and work experience then the ratios will be close to one. How far actual values diverge from unity provides an indication of demand-side influences. For instance, government wage-setting may generate a significant public-private sector wage-differential. It may be found that the public sector pays above the market rate for young persons with primary education, but substantially less for those with tertiary education.

4.53 Regional wage-differentials may exist because of geographical immobilities, so that inter-regional labor flows do not equalize regional wage-rates. [6] The differential between the 'capital' and 'other urban' categories may be closer to unity for those with tertiary education, but greater than one for those with no education. Analyzed further in the light of what is known about the operation of urban labor markets, it may be found that the uneducated face a particular barrier to entry into the capital city's labor market.

4.54 Gender discrimination in hiring practices will create a significant male-female wage differential, by definition. The male-female differential may be close to unity for persons with secondary education, but much below unity for those with no schooling, indicating - perhaps - discrimination against uneducated women that needs further investigation. Comparisons of the differentials over successive years can reveal that a particular facet of adjustment is strengthening or weakening discrimination.

4.55 Depending on the sample size at hand, further disaggregations of the columns of Frame 4.13 may be possible. For instance disaggregating the public-sector into government and state enterprises may reveal that a substantial public-private wage-differential is due to wage-setting in only part of the public sector. Or disaggregating the female-male differential between public and private sectors may show that the differential is concentrated in only one of these sectors.

4.56 Finally tables summarizing the characteristics of households deriving a wage-income from sectors covered by minimum wage legislation should be presented. From this it can be ascertained whether minimum wages carry benefits for the lowest-income households or for particular target groups.

A multivariate analysis of employment and earnings under adjustment

The determinants of labor supply

4.57 PARTICIPATION AND HOURS OF WORK. With multivariate analysis it is possible to go much further than the cross-tabulations proposed above in understanding the impact of structural adjustment on labor supply. The determinants of both the decision to participate in wage-employment (or not), and, for participants, the numbers of hours supplied must be established. A dichotomous dependent variable LP, whose value is 1 if the person participates, and 0 if they do not and a dependent variable HW (hours of work per week or per month) must be defined. The equations to be estimated are:

$$LP = f(w, Y, T, P, Z, X) \quad (1)$$

$$HW = f(w, Y, T, P, Z, X) \quad (2)$$

where w = the market wage, Y = profit incomes, T = transfer or unearned income, P = an index of consumer prices, Z = a vector of the characteristics of the household and individual, and X = the characteristics of the community. Similar explanatory variables are used in the first estimation of each equation (although the final estimations will differ when some variables are insignificant for one equation but not the other). Separate equations can also be estimated for: males and females; individuals from poor and non-poor households; and rural and urban workers. In this case the dummies for these characteristics are omitted.

4.58 Frame 4.14 (overleaf) presents in more detail the types of variables that can be included. It was argued earlier that age and marital status significantly affect labor supply, so these are included. Education is likewise a standard variable in such equations. Time allocated to both housekeeping and the care of young-children limits both participation and hours worked (Grootaert, 1986: 164). Since the burden of these responsibilities usually lies with women, we can expect these variables to be particularly important in explaining their labor supply. Variables from the SDA community survey are also included, since poor people's access to health and education facilities may limit participation by raising the time spent ill, and the need to spend time taking children to remote health facilities

Frame 4.14: Wage-employment: Independent variables determining: (i) the decision to participate and (ii) the number of hours supplied by participants

Key variables	*Details of variables included*
Wages	Wage rate per period
Profit incomes	Profit of farm enterprises Profit of non-farm enterprises
Transfers	Household unearned income
Consumer prices	Consumer price index
Age	
Marital status	Unmarried Divorced\separated Widowed Spouse of household head
Education	Years of primary schooling Years of secondary schooling Years of vocational training Years of higher education Years of schooling completed Secondary schooling completed
Effect of children	Child 0-4 years Child 5-9 years
Housework variables	Time spent collecting firewood Time spent collecting water Time devoted to other housework
Nationality group	
Location	Urban Other urban Rural
Community variables (*dummies*)	Child-care facility within the community Health-care facility within the community
	Index of area development

etc. Likewise an index of area development using community survey data is included. The estimated equations can be used to assess policy-induced changes in these variables. For instance, the impact on urban female labor supply of providing more education for females, child-care facilities, and improving community social services can be predicted.

4.59 Decisions concerning the supply of wage-labor are interdependent with decisions to apply labor to household enterprises, and to consume goods and services. These three sets of decisions are best viewed as the outcome of the same household maximization process. This is why profit income from household enterprises (both farm and non-farm) and the prices of consumer goods are included in both (1) and (2).

4.60 Adjustment will simultaneously affect wage-rates, profit incomes and commodity prices, as discussed in paragraphs 4.03 through 4.10, and the household will re-allocate the labor of its members accordingly. Changes in wage rates caused by policy reforms will not only have the usual income and substitution effects on labor-supply, but will also affect the latter through changing household profits where the household uses hired labor. The latter effect might be large in the urban informal sector, but small in rural areas where households use less hired labor (this is one reason for estimating separate urban and rural versions of equations 1 and 2).

4.61 Profit income is affected by changes in producer prices, input prices and economic infrastructure under adjustment. We would expect profit income to be negatively related to both LP and HW, because a rise in profits will cause households to re-allocate their labor supplies from wage-employment to self-employment. The estimated equations can be used to simulate the effects of (say) producer price increases on household profits, and thence on labor supplies.

4.62 The estimated coefficient on the P variable shows the impact of changes in consumer prices (following devaluations, sectoral price adjustments etc) on labor supplies.[7] The size of this coefficient can be expected to vary depending on the share of consumption met by own-production. Take the example of a food price rise, for instance. Non-poor urban households might be able to participate more, and raise their work hours, to meet the higher cost of their consumption basket, and preserve their nutrition. But the coefficient on P might be very low for poor households, indicating possible constraints on their labor supplies, which endanger their nutrition. For rural households, food may carry a very small weight in their consumer price index, if most are food producers. But their labor supplies will be affected (but in an opposite way to that of urban households) by the profit effect of higher food prices. Again, the separate estimation of (1) and (2) by socioeconomic groups is shown to be important.

4.63 Unearned income (T) is included to cap-

ture the effects of changes in both private and public transfers to households, both of which are affected by adjustment. For example a fall in urban to rural remittances (due to adjustment's impact on urban nontradables) might lead rural households to compensate by increasing their labor supply. A fall in public transfers (e.g., food assistance) as part of budget cuts could have a similar effect, or through diminishing nutrition, actually reduce the hours supplied by poorer households. The latter is a particularly important effect to capture for policy purposes.

4.64 ESTIMATION ISSUES. Both (1) and (2) can be estimated by Ordinary Least Squares. However, a number of important econometric problems can arise. [8] The first of these concerns the choice of whether to participate or not. The estimated version of equation (1) can be interpreted as the probability that an individual will participate in the labor market, given information about the person's characteristics. However, although the underlying probability model might be correct, a given sample of observations on the independent variables may contain some observations which are associated with LP values outside the [0,1] interval. This means that if we used the estimated version of equation (1) to predict the values of LP, some of those predicted values would fall outside the [0,1] range. Thus, estimating (1) by OLS effectively constrains values to lie within the [0,1] range, which may lead to biased estimates of the coefficients.

4.65 A standard solution to this problem is to apply the Probit technique. This essentially transforms the original model in such a way that the predictions will lie in the [0,1] interval for all values of the explanatory variables. [9] The technique is computationally more involved than OLS (Probit uses non-linear maximum likelihood estimation). Researchers should choose their technique after comparing the OLS and Probit estimates and establishing the size of any biases involved in OLS, and thus the gain in using Probit.

4.66 The second econometric problem, namely the problem of selectivity bias arising in the estimation of the hours of work equation (2) is well-known. Essentially, the sample on which equation (2) is estimated is self-selected, given the prior choice whether to work or not, and is therefore non-random. This leads to biased parameter estimates when OLS is used. The problem particularly affects the labor supplies of women, since their reservation wage often lies above their market-wage. The correction of this bias involves the estimation of the 'Mills ratio' from the probit estimation of the participation equation (1). [10] The inverse of the Mills ratio is then inserted into equation (2) and OLS is applied.

4.67 A third econometric problem is simultaneity arising from the fact that the wage-rate in (1) and (2) is not a truly exogenous variable, since it is determined by labor demand and supply. If uncorrected, this leads to biased estimates. The solution is to use the predicted values from the estimated wage-equation (3) below, and to insert these in place of w in equations (1) and (2).

4.68 Overall, SDA analysts are advised to experiment with a variety of functional forms and estimation procedures to determine the most cost-effective methods for obtaining parameter values of policy interest.

The determinants of wage-earnings

4.69 THE EARNINGS FUNCTION. The key tool to analyze wage-differentials is the earnings function, which in general can be expressed as:

$$W = f(S, E, Z) \qquad (3)$$

where W = the wage rate over a chosen period,
S = educational attainment,
E = work experience,
Z = characteristics of the individual and household.

Frame 4.15: Independent variables for an earnings function
(dependent variable: Wages per hour)

Key variables	*Details of variables included*
Education	Years of primary schooling Years of secondary schooling Years of vocational education Whether university graduate or not (dummy)
Work Experience	Years in current main occupation Years in labor market
Characteristics (dummy variables)	Male or not Location (urban, rural etc) Agricultural or not Public employment Non-farm enterprise or not

4.70 The inclusion of education and work experience variables is standard to earnings functions derived within a human capital framework.[11] Frame 4.15 shows the variables that a typical earnings function might include under each of the above headings (Chiswick, 1976, Grootaert, 1986: 203). The dummy variables for location, and occupational status (public or private, formal or informal etc) are included to capture the effects of wage differences due to market segmentation (which is, however, more fully analyzed below).

4.71 In addition, separate earnings functions should be estimated for urban and rural workers. In the case of rural workers, the inclusion of an index of producer prices captures the effects of changes in labor demand on wage-earnings (Alessie et al., 1989). Thus in an estimate for rural wage-earnings an index of producer prices facing farmers would be included, while for informal and formal private sector workers, an index of manufacturing prices would be used.

4.72 The amount and quality of the productive assets possessed (or rented) by the household may be positively related to the wage-earnings of its members (Sahn and Alderman, 1988). Those who derive non-wage incomes from productive assets may be better nourished, more productive, and therefore more valuable to employers, than those without (Dasgupta and Ray, 1986). Measures of household assets can be entered into wage-equations using information from the SDA questionnaire.

4.73 Measures of area development, derived from the SDA community survey, may be included in separate wage equations for rural and urban workers since these positively affect wages (see Bardhan, 1984: 49, for example). Measures of community access to social infrastructure should similarly be used, since poor health-care, for example, will reduce productivity and therefore wage-earnings. The estimated equations may then be used to predict the earnings effects of projects at the household and community levels designed to improve economic and social infrastructure. They also reveal the loss of wage-earnings (especially among poor groups) which occurs if such infrastructure is cut back during adjustment.

Correcting for selectivity bias

4.74 Earnings studies generally exclude the self-employed from the sample, since their earnings represent both returns to capital and labor. The resulting OLS estimates suffer from the selectivity bias noted under labor supply above, since individuals can choose between wage-employment and self-employment. Hence, the sample of wage-earners is again non-random or 'self-selected' (Chiswick, 1983). Various solutions have been offered, including using a dummy variable for activity status (Blaug, 1974), or the share of self-employment income in total income (Chiswick, 1976), but these are unsatisfactory since the variables are not truly exogenous. The best procedure is to include in the estimated version of (3) the inverse of the Mills ratio calculated from the Probit estimate of the participation equation (1) above, and then estimate (3) by OLS.

Explaining wage-earnings: The public-private wage-differential

4.75 If labor markets are perfectly competitive, workers with the same characteristics will earn the same wage regardless of their sector of employment. However, if some employers set wages in excess of market-clearing levels (and restrict access to jobs in their sector by rationing), then different wages may be observed for workers with the same characteristics. The earnings function (3) described above represents a first step toward the analysis of wage-differentials by incorporating variables for enterprise-ownership (public sector or not). Significant coefficients indicate the presence of labor market segmentation between the public and private sector. Similarly, the gender variable is included to capture possible discrimination against women among employers.

4.76 However, one can thus go further by estimating separate earnings functions for wage-earner groups of policy interest. At the end of the procedure we can thus report the percentage shares of observed wage-differentials between sectors due to differences in worker characteristics and differences in wage-structures. In the following example, earnings functions would be estimated for government, state enterprise and private sector workers, where the subscripts denote the type of employer (g = government, s = state enterprise, and p = private sector). The explanatory variables would be the same as those used in (3), with the exception of the dummies for enterprise ownership. To facilitate the exposition let X stand for all the explanatory variables used. Three earnings functions would therefore be estimated of the general form:

$$W_g = f_g(X_g) \quad (4)$$

$$W_e = f_e(X_e) \quad (5)$$

$$W_p = f_p(X_p) \quad (6)$$

Earnings equation (3) implicitly assumed that the three sectors have the same wage-structure, and that wages for workers with identical characteristics will differ across the sectors only by a mark-up, captured by the dummy variable for enterprise-ownership. For (3) not to under-estimate or over-estimate the effect on earnings of enterprise-ownership, the three earnings-functions above would have to differ only in their intercept terms, and not in their coefficients (ie. they would all have the same slopes). This is obviously a restrictive assumption, and the SDA data set allows the analysts to estimate the three earnings functions separately, thus improving the accuracy of estimates of labor-market segmentation. The usual Chow tests can be employed to test whether the differences in the estimated coefficients between the three equations are statistically significant.

4.77 Having estimated (4)-(6) above we can construct 'representative' workers for each enterprise-ownership category. This is done by calculating the mean value of each of the independent variables for all the workers in each enterprise category. Each of these mean values is multiplied by the respective estimated coefficient of (4)-(6), and the sum of the products gives the predicted wage for the representative worker in that ownership category, ie:

$$\overline{W}_g, \overline{W}_e, \overline{W}_p \quad (7)$$

The next step is to calculate what the predicted wage would be for a representative worker from (say) the private sector if he/she were paid according to the government wage structure (fg), ie:

$$\overline{W}_p = f_g(\overline{X}_p) \quad (8)$$

In other words, Wp is the predicted wage for someone having the average characteristics of private-sector workers, but subject to a government wage structure. Thus the difference (D) in wages paid (for example) to representative workers in the government and private sectors is decomposed as:

$$D = \overline{W}_g - \overline{W}_p = \{\overline{W}_g - f_g(\overline{X}_p)\} + \{f_g(\overline{X}_p) - \overline{W}_p\} \quad (9)$$

$$= \quad E \quad + \quad U$$

The first term (E) of (9) is the part of the differential explained by private and government workers having different characteristics, while the second term (U) is the unexplained difference between government and private sectors in their wage-functions. If private sector workers had the same characteristics as government workers then E would be zero, and any wage differential remaining would be entirely explained by differences in wage-setting practices between government and the private sector as captured by U. Alternatively, if there was no sectoral difference in the latter practices then U would be zero and all the observed wage-differential would be explained by differences in worker characteristics such as schooling.

Wage-differentials: Gender, formal/informal, and traded/nontraded

4.78 The procedure above can be applied to decompose the observed male-female wage differential into that caused by employer discrimination against females, and that caused, for example, by females having less education. If discrimination is the main cause, suitable employment legislation is needed. If it is due to different characteristics, then female education and other characteristics need improvement. Policy interventions in these areas may be of great importance during adjustment, if women are to be enabled to benefit from new labor market opportunities.

4.79 Private sector wage-earners can be classified into formal and informal, and the wage-differential can be decomposed accordingly. Some of the 'unexplained' differential may be due to formal sector employers setting above-market wages if this results in profit-improvements through higher worker-productivity (the 'efficiency wage' argument). Alternatively, workers and employers may have an 'implicit contract' to keep wages stable when demand fluctuates. Both efficiency wages and implicit contracts may occur in the formal sector, because formal enterprises have lower turnover rates, and use more skilled workers than informal enterprises (since formal capital-intensities are higher). These practices are unlikely to occur in the informal labor market where labor is often hired by the

day, and where wages are expected to adjust rapidly to changes in market conditions without the lags which occur under longer labor contracts.

4.80 Identifying differences in formal/informal wage-setting procedures within the private sector is important, since they may intensify the dual labor market structure (unemployed workers cannot bid down formal wages and must therefore resort to informal employment), and exacerbate the costs of adjustment to informal workers. Decomposing the informal-formal wage-differential on the basis of data from successive surveys will reveal whether adjustment has caused formal employers to become more flexible in their wage-setting practices (in which case the formal-informal differential may fall), or whether rigidities have persisted (in which case, as paragraphs 4.03 through 4.10 stated, the differential will widen since informal wages are expected to fall disproportionately).

4.81 One of the reasons why formal enterprises can sometimes pay above-market wages is that they are monopolies in domestic markets, thereby permitting managers to share excess profits with workers (whose bargaining position is strengthened by the lack of competitive pressures). For nontradables, limited market-size may cause 'natural' monopolies, while the lack of foreign competition to businesses in 'protected tradables' encourages similar monopoly positions in small domestic markets for importables. The latter cause has become more pronounced in recent years as governments have extended import restrictions as a means of cutting trade deficits. They are, however, likely to become less important during adjustment, as trade regimes are liberalized.

4.82 To capture these effects on wage-determination, analysts may categorize private formal wage-earners according to employment in: private tradables, private protected tradables and private nontradables. It is suggested that earnings functions be estimated for each category, and that the predictive test outlined in paragraphs 4.75 through 4.77 above be applied (for instance, predicting the wage of the representative worker from the unprotected tradables sector if they were employed in the protected tradables sector or in nontradables). The proportion of the wage-differential which is not explained by worker characteristics, gives an estimate of the effect of different product market structures on wage-setting. This indicates the effects that import liberalization would have on wage-earnings in protected tradables. Once employers face international competition, their monopoly profits would fall, thereby reducing their ability to pay workers more than in unprotected sectors.

4.83 Much of the informal/formal wage differential may be due to wage-determination in only one part of the private sector (e.g., nontradable monopolies). The differential between each part of the formal private sector and the informal sector should be estimated, and again the differential decomposed into worker characteristics and wage-setting practices.

The determinants of the earnings of non-farm enterprises

Profit functions

4.84 Profit functions are used to analyze the determinants of the profits of household enterprises. Let P stand for the net revenues of the household enterprise (which is gross revenue minus all variable costs). Then:

$$P = f(L, K, X) \qquad (10)$$

where L is household labor, K is capital stock, and X represents selected household characteristics (Vijverberg, 1988a: 5 and Chiswick, 1983). [12] The coefficient for the capital variable is the return on capital, while the coefficient on L is the return on labor. Frame 4.16. shows in more detail the types of explanatory variables which can be used. [13]

4.85 Household labor is a variable constructed by aggregating across working hours by household members, drawing on questionnaire section 4 part B which gives hours per week worked. Since the dependent variable, net revenues, is given per month, household hours worked per month should be used. The survey does not collect the hours worked by non-household members, so this is proxied by the number of hired laborers and apprentices working in the enterprise. Alternatively the monthly wage-bill for hired labor can be entered. However, since apprentices are paid only intermittently, the wage-bill can be an imperfect proxy for hired labor input. Both owned capital and rented capital are entered. These are the aggregate values of buildings, equipment, machinery etc used by each enterprise (the survey collects this information by enterprise).

4.86 The dummy variables for government

registration and contracts for hired workers are used to capture the effects of enterprise formality/informality. The survey also identifies who the enterprise sells to. A dummy variable for foreign and domestic buyers is included to proxy for the effect of whether the enterprise is tradable or not. Buyers can be grouped into either formal (public enterprise, large private enterprise etc) or informal (other households, local trader etc), and dummies entered for these characteristics (this captures the benefits of supplying the formal sector market which may be less competitive than the informal market). The location dummies capture the effects of differences in local markets on enterprise profits. For instance household enterprises may face more competition in the capital city than in rural areas.

4.87 Household characteristics include the gender of the household head, the average education levels of household members engaged in the enterprise, experience and nationality (the latter reflects the dominance of foreigners in some informal activities in West Africa).

4.88 Profit functions should be estimated for the main types of household enterprise: food commerce, non-food commerce, services and manufacturing. Estimated coefficients can then be compared to highlight differences in the structure of each activity. Since food-commerce and non-food commerce together with services are primarily nontradables, while manufacturing includes tradables, comparison of earnings functions estimated from several surveys can indicate the effects of adjustment on the non-farm sector.

4.89 Separate profit functions (for each activity) should be estimated for enterprises in (i) male and female headed households, (ii) rural, capital and other urban households, and (iii) poor and non-poor households. Regarding (i), estimating profit functions for male and female headed households, gives a clearer indication of the different constraints facing each across the activity range. Thus the procedure adopted in paragraphs 4.75 through 4.77 above for estimating the effects of discrimination on female wage-earnings can be adapted to self-employed earnings. This involves estimating a profit function for enterprises in male-headed households, and then inserting mean values for the independent variables of female-headed households to predict the profits of the latter if they faced the same circumstances as male-headed households. This may reveal significant differences across the activity types: for example, there may be little difference in enterprise earnings of male- and female- headed households in services, once characteristics are controlled for. But there may be substantial differences in manufacturing if (say) male-headed

Frame 4.16: The determinants of the profits of household non-farm enterprises

Key variables	*Details of variables included*
Household labor	Total working hours of household workers in the enterprise (for a given period)
Non-household labor	Number of hired laborers and apprentices reported as working in the enterprise
Own capital	Total value of owned capital stock used by enterprise (in local currency)
Rented capital	Total value of capital rented for use by enterprise (in local currency)
Government registration	1 if the enterprise is registered with a government agency, 0 if not
Employment contracts	1 if hired labor has formal contract, 0 if not
Foreign or domestic purchaser	1 if a foreign, 0 if domestic
Formal or informal purchaser	1 if formal, 0 if informal
Location	1 if urban, 0 if not
Urban location	1 if capital city, 0 if not
Business age	1 if 'old' business, 0 if 'new' (criteria: number of years operating)
Gender of head	1 if female, 0 if not
Education variables	Variables for number of years of primary, secondary, tertiary and vocational education for household head, and averages for other household workers
Experience in this occupation	Variables for household head and averages (years) for other household members
Age	Variables for age of household head, and average age of others
Nationality	1 if national, 0 if not

households have favorable access capital and inputs (due for instance to discrimination against women entrepreneurs in informal and formal credit markets). Adjustment will aggravate or improve these constraints depending on the policy package.

4.90 Similar procedures can be applied to household enterprises in the same activity, but in different regions (stratification ii). For example, urban and rural households often face different factor-prices (resulting from input subsidies which favor urban producers, or differential access to formal credit markets). Credit market distortions benefiting urban enterprises may be reduced under adjustment (through financial liberalization), and their profits can be predicted when they have lower capital-labor ratios.

4.91 Regarding (iii) above, the procedures discussed under (i) can be applied when the sample is stratified between poor and non-poor households. One can thereby establish whether the earnings of poor and non-poor households differ by activities such as manufacturing because of lower returns to education.

4.92 Finally, profit functions can predict the effects of projects targeted to improving the assets of household enterprises, as part of strategies to raise their benefits from the adjustment process. In many countries the returns on owned and rented capital are high, reflecting a lack of access to capital assets among households. The earnings of many households would increase significantly if their capital were improved. Similarly the estimated returns on the different levels of education together with vocational training indicate how useful the country's education structure is to earning a livelihood in household enterprises. Separate profit functions for the groups outlined above provide estimates of the likely returns on targeted projects; for example, credit schemes for self-employed women, infrastructure projects of special importance to rural non-farm enterprises, and targeted vocational assistance to poor households.

Comparing the returns to labor in non-farm self-employment and wage-employment

4.93 An important issue is the degree to which participation in non-farm self-employment, especially in the urban informal sector, is 'voluntary' (ie. chosen in preference to wage-employment), or involuntary because insufficient wage-opportunities are available. The latter can occur when labor markets are segmented into a formal sector paying above market-wages, with those unable to obtain jobs resorting to informal employment. This dualism in the employment structure can be exacerbated when adjustment causes a formal labor shake-out, leading to the swelling of the informal sector, and a further depression of wage-earnings.

4.94 At the margin, the returns to an individual's labor in self-employment and wage-employment should be equal. Some guidance about whether self-employment is voluntary can be obtained by calculating the return to labor in self-employment using the estimated coefficient on the labor variable in the profit function above (Vijverberg, 1988: 28a). Given the estimated wage-function (3), the predicted wage for someone with the mean characteristics of the self-employed is calculated. If this wage is substantially higher than the return on labor in self-employment then this indicates that self-employment may not be a voluntary choice.

4.95 Although the non-farm enterprise sector offers scope for employment expansion, some of its parts are 'saturated' with new entrants and profit margins are low. Assisting more people into these occupations may be self-defeating when returns to labor are much lower than those in wage-employment. Encouraging more formal private-sector employment may be a better option.

Producer-household models

4.96 The decisions involved in the operation of household enterprises can be examined explicitly through the use of producer-household models. To date these have been applied in the analysis of farm-household enterprises (see Singh et al., 1986). However, they can be applied to households in the non-farm sector, without major changes, provided that one can assume that households face exogenous prices determined by complete product and labor markets (this assumption is easier to make for non-farm enterprises — at least in urban areas — than farm enterprises). In addition to showing how the demand for own-labor adjusts when relative prices change, household models also derive the effect on hired labor demand. When used alongside an estimate of labor supply to the sector, the induced change in wage-levels can be calculated in addition to the change in household profits.

4.97 Such modeling requires a comprehensive data set since the household's decisions concerning time-allocations, commodity demands, product choices, and investments are all jointly determined. A multi-topic survey of the SDA type permits the deployment of a wide variety of model structures.

Concluding observations

4.98 Because adjustment causes profound shifts in labor markets, the formulation of employment policies becomes more difficult at such times (van der Hoeven, 1987). Employment targets in national plans may have to be changed substantially as the whole economic base of the country alters under adjustment (Richards, 1986). In turn related fields of government activity (for example, education) are affected.

4.99 The kind of information that policy-makers need thus changes considerably under adjustment. The policy questions that arise vary considerably in nature. For example: Does adjustment influence female urban labor-supply? Will financial reform affect the earnings of rural non-farm enterprises? Are the employment prospects of school-leavers improved by policy reforms? What are the effects of devaluation on urban versus rural incomes? The examination of these and other policy issues requires a range of analytical techniques. Analysis must be accurate if it is to serve policy-making. But it must also be timely given the pace at which policy formulation proceeds. Inevitably there may be trade-offs between analytical rigor and meeting deadlines, and analysts may have to present their conclusions with a wider confidence interval than desired. The balance to be struck is a difficult one. The simplest techniques may be recommended on the grounds that they are the quickest to apply. However, mispecifying estimated equations will lead to erroneous conclusions and can seriously misinform policy-making. Researchers therefore need to be fully conversant with the problems encountered in using multivariate techniques.

Notes

1. The 'active population' covers people in work, looking for work, or presently ill. Persons enrolled in school, or who have been enrolled during the previous 12 months are usually excluded. Standard international definitions should be used (see Turvey, 1990).

2. Chapter Three discusses the construction of poverty lines under the SDA project. The main policy interest in Frame 4.1 is how the employment status of the poor differs from the non-poor.

3. For example, the Ghana Living Standards Survey Abstract reports employment data using age-groups of: 7-14, 15-19, 20-24, 25-44, 45-54, and over 55 (Republic of Ghana, 1988: 61).

4. The classifications presented here follow those of Chapter Nine below.

5. The data could be presented by household-income quintiles, but the difference in income sources for poor and non-poor households is the principal issue of policy interest.

6. Alternatively a significant money wage differential between regions may exist to compensate for differences in costs of living. In such cases the real-wage differential should be computed using the regional cost of living series available from the SDA surveys.

7. An advantage of the SDA data set is that labor supply and commodity demand can be jointly estimated, since each arises out of a joint utility maximization. This results in more efficient parameter estimates (Blundell and Walker, 1982).

8. These are treated in detail in Killingsworth (1983). See Killingsworth and Heckman (1986) for female labor supply, and Pudney (1989) for an advanced treatment.

9. Obviously, the values of the explanatory variables can be any number, depending on the given sample. The process underlying the Probit technique translates these values into probabilities (which therefore range from 0 to 1), while maintaining the property that increases in these transformed values are associated with increases (or decreases) in the dependent variable (in this case LP). The cumulative probability function provides a suitable transformation, since its range is the [0,1] interval.

10. See Killingsworth and Heckman (1986: 182) for the derivation of the Mills ratio.

11. A measure of school quality could also be included among the education variables (Behrman and Birdsall, 1983).

12. We use profit functions instead of production functions because our concern is with earnings rather than output per se, although of course the two functions are related by assuming household profit-maximization (see Lau, 1978).

13. It follows Vijverberg's (1988a) application of the model to the Côte d'Ivoire, although some additional variables are included.

5

Analyzing human resource effects: Health

The policy issues

5.01 Health is an important objective of both households and governments in developing countries. To households in low-income societies living near subsistence levels, small changes in household budgets or health program provision can critically affect physical well-being. In addition to its direct importance to individual welfare, health indirectly affects welfare through its influence on the productivity of work and the efficiency of human capital accumulation. Considerable public resources in low-income countries are devoted to programs which enhance health, providing medical and family planning services, building and maintaining sanitation and clean water facilities, controlling parasitic diseases and subsidizing foods. Public health technologies have dramatically improved life expectancy in developing countries without the improvements in nutrition, hygiene, housing and income that coincided with reduction in mortality in Europe and North America. The World Bank (1980) estimates that life expectancy in developing countries in 1970 would have been eight years less than what it was without the contribution of new and inexpensive public health technologies such as those based on pesticides and vaccinations.

5.02 In Africa, the disease reduction role of centralized agencies which rely on public expenditure is probably greater than in any other part of the world because of the continued prevalence of contagious disease and diseases spread by parasites and water. Reducing the prevalence of these diseases requires continued improvements in control and monitoring services, immunization and sanitation and public health education. Household purchasing power is low and thus so is the ability to purchase privately procured health inputs — most significantly, food. In an uncertain environment, one prone to calamitous drought and political upheaval, households, unable to smooth consumption through insurance or borrowing, are prone to catastrophic illness and hunger in the absence of outside intervention.

5.03 Structural adjustment may influence health by altering the expenditure on programs that provide medical and public health services (and the fees charged for these services), by reducing real incomes by altering wages and farm profitability, and by changing the prices of market goods. Not all households will be equally affected by structural adjustment. The relative impact of structural adjustment depends on the nature of state intervention prior to adjustment and the timing, magnitude and distribution of policy alterations that constitute the adjustment package. For example, producers of export crops may benefit from devaluation or the dissolution of state marketing boards. Food producers may benefit from the end of policies which artificially kept food prices down. Workers in state subsidized enterprises may become unemployed and the destitute poor may suffer from reductions in transfers from the state, food-for-work and other relief programs.

5.04 Much of the recent economics literature in the area of health in the developing countries has been very microeconomic in nature; making use of newly available micro datasets to evaluate the impact of various interventions — prices and programs — on health, and the influence of health of labor productivity, human capital accumulation, fertility and intra-household resource allocation.[1] Fortunately, the methods and results of this new literature are of direct relevance to the use of SDA household survey data in the analysis of structural adjustment in Africa. As the literature demonstrates, the analysis of these issues is complex both theoretically and empirically. Unobserved (by the investigator) determinants of health specific to individuals (inherent healthiness, referred to below as the individual health endowment) and to the locale in which the individual resides (the health environment) require specifications and statistical methods that pay attention to heterogeneity and the bias it can impart. Health is difficult to measure and attention must be paid to measurement error in empirical work. Of direct concern in the evaluation of structural adjustment is the accurate measurement of the effect of health program placement on health outcomes. As discussed below, if the spatial placement of health programs is responsive to the health attributes of targeted populations not measured by the SDA survey, simple measured associations between programs and program outcomes will not provide correct estimates of program effects. These considerations make the study of the determinants of health, and consequently the impact of structural adjustment on health, less than straightforward.

The macro-meso setting

5.05 In the common framework of the Analysis Plans presented in this Volume, households are affected by adjustment policy through two broad conduits, infrastructure and markets in which they trade. Food nutrients are of obvious importance as inputs into the production of health, and their prices and distribution have been the targets of government policy in almost every developing country. Food prices are affected by direct government subsidy and (much less often) tax, exchange rate policy, aid distribution, marketing and other supply restrictions and direct rationed allocation to consumers. Alteration of all of these interventions are likely to be part of a comprehensive structural adjustment. This topic is discussed in the Analysis Plan on household food security and nutrition in Chapter Seven.

5.06 Structural adjustment will typically move an economy towards free markets and away from quantitative regulation (rationing, import licensing and price control) and large scale intervention in markets. Given the levels of price distortion prevalent in much of Africa, the movements in relative prices in the aftermath of a structural adjustment may be very large. How households alter their consumption pattern in response to changes in relative prices, and how this change in relative prices maps into changes in individual health is therefore the key empirical question, and one that is addressed at length below. Of course, not all changes in price can be attributed to structural adjustment. Even with a stable policy regime, prices of many goods — certainly foods among them — tend to move over time in response to other shocks such as weather, crop failures, war and prices in world markets. The large seasonal variation in prices in many areas of Africa is evidence of a lack of storage and transportation infrastructure. Transport costs and lags as well as informational deficiencies are of such importance in much of Africa that even in a completely laissez-faire economy one might expect that the intertemporal variance in domestic prices for internationally traded agricultural goods would far exceed the variance in international prices. The implication is that the entire change in prices in the aftermath of adjustment cannot be attributable to adjustment.

5.07 The health effects of price changes depend on the price of goods whose prices have been affected, and the household's ability to substitute given its preferences and the biological health technology. Since most food price changes are likely to alter the composition and level of nutrient intake, increasing the intake of some nutrients while reducing consumption of others, complete knowledge of the full matrix of food and non-food own- and cross-price elasticities is not sufficient to judge the health effects of price changes. Indeed, of the nine food prices considered by Pitt (1983) in Bangladesh, variations in seven had both positive and negative effects on the intake of the nine nutrients considered.[2] Of eleven food prices considered by Pitt and Rosenzweig (1985), only one food price unambiguously affected the demand for all nine nutrients in one direction. There is a growing body of evidence that suggests that the poorest households are the most price sensitive, and are likely

to substitute more than richer households. There is of course substantial intercountry difference in substitution elasticities and the evidence from Africa is particularly sketchy.[3]

5.08 There is some evidence that for the poor changes in income have relatively small effects on nutrient consumption. Behrman and Deolalikar (1987) suggest that income elasticities of demand for poor households in semi-arid India are very low, implying that reductions in income result in much less than proportionate changes in the intake of calories. Again, African specific evidence is sparse and recent evidence from Brazil (Strauss and Thomas, 1989) suggests that these findings may be sensitive to specification. In any case, nutrition is but one set of inputs into health, and substitution between nutrients and non-food inputs, such as those provided by public health measures, may be small. While good nutrition may somewhat reduce the impact of malaria, diarrhea and other debilitating diseases, it is apt to be a poor substitute for disease control programs and medical intervention.

5.09 In addition, studies of the determinants of household-level nutrient consumption provide no information on how a change in the aggregate diet of a household affects the nutritional intake or status of *individuals*. If interest in aggregate (family level) consumption or overall nutritional "availability" in low-income households is mainly derived from concern about the nutrition or health status of members of such households, understanding how household aggregates map into well-being and health of individuals, and how the household distributes its resources among members, is critical. Indeed, there is evidence that the intra-household distribution of resources in not equal across family members (Behrman, 1988a; Behrman, 1988b; Pitt and Rosenzweig, 1990; Pitt et al., 1990; Rosenzweig and Schultz, 1982).

5.10 One aspect of the distribution of foods in low-income settings that has caught the attention of many social scientists is the disparity in nutrients received by women compared to men. One hypothesis that has been advanced is that gender-based inequality reflects disparities in labor market opportunities across men and women in these settings, with the pecuniary returns to a household from the allocation of food to women being less than those for men. Some evidence supporting this hypothesis is the existence of a relationship between sex differences in infant mortality rates and differences in labor market participation rates between men and women in South Asia (Rosenzweig and Schultz, 1982).

5.11 Although attention has mainly focused on gender inequality in food allocations, if the relationship between healthiness and productivity differs across occupations and activities, the distribution of activities across individuals within gender classes should also be related to the intrahousehold distribution of foods, preventive medical care and other health inputs. Pitt et al (1990), analyzing individual and household data from Bangladesh, found that there is a pecuniary return to health and effort in the labor market, and that work activity distributions substantially influence the intrahousehold distribution of food. They also found that energy-intensive effort tends to reduce health as measured by weight-for-height and that there is substantial calorie reinforcement for those best able to alter the energy-intensity of effort — adult males (aged 12 and above) and male and female children (aged 6 to 12).[4]

5.12 Not all of the costs of ill health are borne by the individual whose health is temporarily or permanently impaired. Within a household, the ill health of one person is likely to evoke resource adjustments by other persons, perhaps differentiated by gender, in the household in which the illness occurs. Estimates of the direct effects of changes in health policy will be underestimates of their true impact to the extent that these resource adjustments reduce schooling or labor market experience of other household members. For example, Pitt and Rosenzweig (1990) found that existing sex-based differences in the division of time between household care, schooling and labor force activities in Indonesia are worsened among teenagers where child morbidity is at a higher level. In particular, it was found that teenaged daughters were significantly more likely to increase their participation in household care activities, to decrease their participation in market activities and to drop out of school compared to teen-aged sons in response to increases in infant morbidity. Considering these "third party" costs of ill health will result in better estimates of the effects of policy changes that affect health and a greater awareness of the differentiated effects of such interventions.

5.13 Besides prices for market goods, food prices important among them, changes in the supply of health services and the cost to users for these services are the policy interventions most likely to affect health outcomes in the short run. In most developing countries, user fees for medical services are very low or zero. The largest

costs of using medical services are direct travel cost and the opportunity cost of time spent in travel and queuing. Thus, the market for medical service is rationed by the time costs of travel and queuing rather than user fees. Structural adjustment may result in user fees sufficiently high to ration the market, resulting in a very different allocation of service provision across individuals. Unfortunately, very little work has been done on how the demand for medical services responds to user fees, travel and queuing time, quality of service, informational constraints and the prices of other goods. An exception is the work of Gertler and van der Gaag (1990) who estimate own price and income elasticities of demand for medical services in the Côte d'Ivoire and Peru. They find that the demand for medical care is price sensitive, that the poor are more price sensitive than the rich and that child care is more price elastic than adult care.

5.14 Structural adjustment may involve reductions in government expenditure. Clearly, reductions in expenditure on health and health-related programs are of greatest concern in this context.[5] To the extent that public health provision is funded or directly provided by donor agencies, focusing on government budgets may provide a misleading index of total government expenditure on health programs. Reductions in health programs may be accompanied by renewed efforts to target programs to those whose health is thought to be at greatest risk, or by increases in user fees for non-poor users. Efforts at targeting can be enhanced by microeconometric investigation of the demand for health and related services and the efficacy of service provision in augmenting health.

Meso-micro analysis

A model of household behavior

5.15 In this section a model of household behavior is outlined to depict the major linkages between sets of policy variables, biological factors and the health of individual household members. Health status is viewed as purposeful behavior conditioned by costs and resource availability, tastes, and stochastic and non-stochastic environmental factors. The model's presentation below is non-formal. A formal economic presentation of the same ideas is presented in the accompanying boxes. Although the non-formal presentation conveys the basic implications of the model of household behavior, the reader is strongly urged to also read through the more formal presentation.

5.16 The basic conceptual framework is an integrated model of a multimember household in which both consumption and production decisions are made. In this framework health is a good which is produced by the household for each of its individual members using nutrients derived from foods, as well as other health inputs. For the discussion to follow, it is useful to disaggregate health inputs into those which are individual-specific, such as food consumption or vaccinations, those that are shared by all members of the household such as water quality, sanitation facilities and housing quality, and those that are shared by all individuals and households in the region in which the household resides such as temperature, humidity, altitude and propensity to parasitic infestation. It is further useful to divide all health inputs into those which are measured and observed, and those which are not known by the investigator. If one were to statistically estimate the health production function using regression techniques having only observed health inputs as regressors, the regression residual would contain the effects of unmeasured (unobserved by the investigator) health inputs on health. This residual may also contain a purely random component — random in the sense that it is not known or predicted by the household or individual.

5.17 The technology governing the production of health — the health production function — is a purely *biological* technology and not an economic behavior. The household's choice of health input quantities given this technology is, on the other hand, behavioral rather than technological. This biological technology (production function) may differ across types of individuals defined by age, sex and pregnancy or lactation status. Even individuals of the same "type" (age and sex) receiving identical sets of health inputs may have differing health status[6] because of differences in their *health endowment* — the innate healthiness of an individual inclusive of genetic endowments but excluding the innate healthiness of the region of residence — which affects health but cannot be influenced by the household. The health production function (Box 5.1) thus depicts how health is affected by food consumption, non-food health inputs and factors beyond the household's or individual's control, the health environment.[7]

5.18 The household maximizes a utility func-

Box 5.1 The health production function

Formally, the health production function is:

$$H^i = H^i(N^i, Y^i, G, T^i, e^i, \mu^i, \lambda), \qquad i = 1,...T \qquad (1)$$

where H^i is the health of individual i (denoted by the superscript i), using nutrients derived from foods (N^i), a set of nonfood health inputs (Y^i) which do not provide utility directly (medical services such as inoculations and other preventive care, public health facilities), a set of household "public" resources (G) which affect the health of each family member jointly (water quality, sanitation facilities, housing quality), the time of certain household members (T^i) devoted to such health-related activities as food and water preparation and child care (mothers time), and the (possibly) deleterious effects on health of effort expended working (e^i). Attributes of the region in which the household resides, such as temperature, humidity, altitude and propensity to parasitic infestation, also affect health but are locale-specific rather than household-specific as are the resources G.

There are many such regional attributes, most of which are individually unmeasured, which are summarized as a single "regional health effect" (λ). Also affecting health is the *health endowment* (μ^i) — the innate healthiness of an individual inclusive of genetic endowments but excluding the innate healthiness of the region of residence which is incorporated in λ — which affect health but cannot be influenced by the household.

The functions $H^i(\cdot)$ may differ across person-types (defined by age and sex, for example), thus permitting the effects of health inputs on health to differ across types of individuals. An alternative specification to the T separate health production functions of equation (1) would be to have a common functional form for the health technology — the superscript on the functional $H^i(\cdot)$ can then be dropped —but add to the list of health inputs a vector of individual characteristics — age, sex, and other health-relevant personal characteristics.

tion which includes as arguments the health of the individual members as well as foods. It is sensible to include both health and food consumption directly into the utility function since health is desirable in itself and because foods are consumed for reasons other than their nutritional value. The utility function also includes the leisure of individual household members, their consumption of non-foods and their work effort, the latter being a *bad* (utility decreasing) rather than a *good* (utility augmenting). This formulation is very general in that it permits households to assign different *weights* to the consumption by every individual of each good, including health. Allowing for the possibility of discrimination in the allocation of resources (including health) among members and types on the basis of sex and age is prudent in general but even more so in the case of Africa.

5.19 Health may affect the productivity of labor time and hence income. If markets recognize and reward health-related productivity differentials, then the wage for an individual is a function of his or her health, the strenuousness (energy intensity) of effort required by the individual's occupation, and the personal characteristics of the individual, such as schooling. In farm households, health status may directly affect agricultural productivity in addition to productivity in the wage labor market. The implication of these productivity effects is that they tend to reduce the net cost of attaining any level of health since increased health results in increased income through the productivity effect. In addition, to the extent that the pecuniary returns to increased health differ across member types (age and sex), the household will have an incentive to allocate more health inputs, such as food, to those individuals whose value of work time is most sensitive to increases in health. In the case of a farm household, the marginal product of work time may depend on the level of other farm inputs used in production.[8] Marginal products of labor for any given labor allocation will be higher for households with large quantities of land or farm animals, for example. Thus, the productivity returns to health will depend on the level of all farm inputs as well.

5.20 Households maximize household utility subject to the health production function, a time constraint that specifies that the total time available to an individual in any time period can be allocated to work, leisure and the household care activities (child care, household chores), and an income constraint that includes the return to household farm activities. The process of constrained household utility maximization is formalized in Box 5.2 (overleaf).

Reduced-form demand equations for health

5.21 The benefit of explicitly setting out the structural relations that underlie household behavior is that it informs us of the full set of policy

Box 5.2 Constrained utility maximization

Formally, the household, consisting of T individuals, maximizes a utility function of the form:

$$U = U(H^i, L^i, C^i, Z^i, e^i), \qquad i = 1,\ldots\ldots,T \qquad (2)$$

which includes as arguments the health of the individual members as well as foods (C^i).* It is sensible to include both health and food consumption directly into the utility function since health is desirable in itself and because foods are consumed for reasons other than their nutritional value. The utility function also includes the leisure of individual household members (L^i), their consumption of non-foods (Z^i)** and their work effort (e^i).

The total time available to an individual household member i (Ω^i) can be allocated to market (wage) work (J^i), household care activities (T^i), leisure (L^i) and, in farm households, to activities associated with crop production and processing (F^i). Thus the time budget is:

$$\Omega^i = F^i + T^i + J^i + L^i \qquad (3)$$

Health may affect the productivity of labor time. If markets recognize and reward health-related productivity differentials, then the wage for individual i is a function of his or her health, the strenuousness (energy intensity) of effort required by the individual's occupation (e^i), and the personal characteristics (d^i) of the individual, such as schooling:

$$W^i = W^i(H^i, e^i, d^i) \qquad (4)$$

In farm households, health status may directly affect agricultural productivity in addition to productivity in the wage labor market. The farm production function is described by:

$$Q = Q(F, F^h, X, A, K, H, y, u) \qquad (5)$$

where Q is farm output, F is on-farm family labor, F^h is hired agricultural labor, X is a vector of agricultural inputs, A is land under cultivation, K is a vector of capital inputs, and H and y are vectors of health status and personal characteristics of family members, respectively.

Households maximize the household utility function (2) subject to the health production function (1), the time budget constraint (3), the wage function (4), the farm production function (5) and a (full) income constraint that restricts them to spend no more on goods and health inputs than they earn in the labor market and in household farm production:

$$\sum_{i=1}^{T} W^i \Omega^i + V + \Pi = \sum_{k=1}^{K} P_k \left(\sum_{i=1}^{T} C_k^i\right) + P_z \sum_{i=1}^{T} z^i + P_y \sum_{i=1}^{T} y^i \qquad (6)$$
$$+ \sum_{i=1}^{T} W^i (L^i + T^i)$$

where Π is farm profit

$$\Pi = P_Q Q - P_x X - \sum_{i=1}^{T} W^i F^i - W^h F^h \qquad (7)$$

V is non-earnings income (nonlabor and nonfarm income), W^h is the wage paid hired workers, P_z is the price of good Z (the non-food consumption good), P_Q is the price of the farm output Q, P_X is the price of farm material inputs, and P_k is the price of food k.

* If all human nutrition came from foods, the health production function (1) could have been written with foods C^i as inputs instead of the nutrients N^i. To complete the formulation with nutrients as inputs, an expression converting nutrients into foods can be added. However, this additional equation adds nothing to the discussion of this section.

** There are many distinct non-foods consumed by households so that consumption of non-foods by individual i, Z^i, is a vector of goods as are foods C^i. However, because of the key role played by food in the production of health, the individual elements of the vector C^i will be made explicit by the use of summations over vector elements in the equations that follow. For notational simplicity, Z^i and other vectors of goods to be introduced below are not so treated.

It does not matter for our household model whether the household utility function represents the preference of an altruistic family dictator, a unified set of preferences among household members, or is the result of a bargaining process. The list of arguments that appear in the (reduced-form) equations to be estimated are unaffected by the derivation of the household utility function. If, for example, it is found that mothers wages have a bigger effect than husbands wages on the allocation of health resources devoted to daughters, and the reverse is true for health allocations to sons, one cannot claim that this unambiguously establishes the validity of a bargaining model in which higher wages give one more bargaining power and parents "prefer" offspring of the same sex. Such an outcome is also possible with non-bargaining models.

variables that may affect health and by what mechanism they work. In particular, this household maximization problem leads to a set of *demand* equations for all household choices as functions of all the exogenous (non-household-choice) variables — known as the *reduced-form* demand equation. In its most general form, the household's demand for health for household members of any type (age/sex) is a function of all the exogenous variables: the prices of all goods (including time) in the utility function, the health production function and the farm production function; the health endowment or innate healthiness of each member of the household; the

region-specific health environment; the gender and other (exogenous) personal characteristics of every household member;[9] and the quantities of land, capital and unobserved factors that affect farm output. The reduced-form demand equation for health is presented in Box 5.3.

5.22 The following comments on the health reduced-form demand equation are in order. *First*, by including the actual quantities of land and productive capital rather than prices, we are assuming that these *quantities* can be considered fixed, in that they are not choice variables (at least in the medium-term) to the household. *Second*, in practice the housing quality goods (the G goods) can also be treated as fixed to the household so that their (typically unmeasured) prices (P_G) can be replaced with a set of variables which measure the quantity of these goods consumed by the household. *Third*, the individual health endowments (μ^i), the regional health environment (λ), and unobserved factors that affect farm productivity (the cultivation endowment u) are unobserved by the researcher, but presumed known to some extent by the household. As they are unknown to us, they will form a part of the regression residual when the demand equation is estimated.

5.23 *Fourth*, if markets are sufficiently well functioning, the farm household can be thought of as solving its farm production and utility maximization problems recursively (in sequence). It will first act to maximize farm profits in its choice of farm inputs, and then maximize utility given these profits. This recursive structure — known as *separability* — means that the prices of farm output (P_Q), the hired labor wage (W^h), prices of material inputs (such as fertilizer) (P_X), quantities of land and capital (A and K), and the unobserved characteristics of the cultivator (u) can all be dropped from the demand equation (8) and replaced simply by measured farm profits (Π). The reasonableness of the separability assumption will certainly vary across regions in Africa. Separability seems reasonable for cash crop farmers, such as cocoa or tobacco cultivators, but less so for food crop cultivators for whom market sales and purchases of agricultural output or agricultural wage labor are rare (subsistence farmers).[10]

5.24 *Fifth*, of very direct concern, the prices of the non-food health inputs (P_Y) are typically not available, or if they are available, are not economically relevant in that they do not represent true (private) opportunity costs. For example, even if inoculations are "free" in that no fee is collected from the inoculant at the time of inoculation, the opportunity cost to the household of an inoculation may not be zero. It is possible that not everyone who wants an inoculation gets one. This may be because there is an insufficient supply (excess demand exists). Also, the true "price" of an inoculation includes important pecuniary and nonpecuniary costs to the household in addition to any inoculation charge. These costs may include the cost in terms of time and money of getting to an inoculation center, a cost which may not be inconsequential in many areas of Africa. In addition, there is the "cost" of acquiring information. An individual who is not well informed about the benefits of inoculations or how to go about getting them will behave like one who confronts a high price — he or she will not get inoculated even if no fee is levied. Similar reasoning applies to other public health programs and interventions such as public health clinics, family planning clinics and the like. Other types

Box 5.3 The reduced-form demand equation for health

Formally, the reduced form is:

$$H^i = D^{H^i}(P_1,\ldots,P_K, W^1,\ldots,W^T, P_Z, P_G, P_Y, \mu^1,\ldots,\mu^T, \lambda, P_Q, P_X, W^h, D^1,\ldots,D^T, A, K, u) \qquad (8)$$

In this reduced-form demand equation, the demand for health of person type i depends on the prices of all K food goods prices (P_1 through P_K), the wages (time prices) of all T household members (W^1 through W^T), the prices of non-food goods (P_Z), the price of health inputs which do not provide utility directly (P_Y, the "medical inputs"),the price of household "public" resources which affect health (for example, housing and water quality, sanitation facilities of the household), the health endowment or innate healthiness of each of the T members of the household (μ^1 through μ^T), the region-specific health environment (λ), the price of the (farm) output produced by the household (P_Q), the prices of all purchased inputs into producing this good (P_X), the wage rate paid hired workers (W^h), the gender and other (exogenous) personal characteristics of every household member (D^1 through D^T), the quantities of land available for cultivation (A), productive capital (K), and the unobserved characteristics of the land and cultivator which affect productivity (u).

of public health initiatives by their nature do not involve a fee-for-service because of the *public goods* nature of the services provided — malaria control and the spraying or draining of the breeding places of water-born parasites and other disease carrying organisms are examples. If it is true (as is typically assumed by most researchers) that health program placement is exogenous in the estimation of individual-level health reduced-form demand equation, then the availability of (or traveling distance to) public health programs and facilities can be used as regressors in lieu of prices. Unfortunately, considering the possibility that programs are unlikely to be placed randomly throughout a country but rather placed by government in response to observed regional health deficiencies, makes the correct statistical measurement of health program effects on health problematical. Adjustment policies often result in significant changes in public health program budgets, so that it is quite important that this research obtain an accurate measure of the influence of public health program availability and placement on individual health. Alternative methods of estimating the effects of public health program placement on individual health will be addressed at greater length below. For now, we will treat public health program placement as exogenous and thus replace the price of health programs (P_Y) by measures of availability or distance (Y).

5.25 *Sixth*, it is difficult to determine theoretically appropriate functional forms for the reduced form demand equation ($D^H(\bullet)$). By choosing a functional form for the utility function (equation (2)) — such as the Stone-Geary utility function that underlies the simple Linear Expenditure System (LES) or a quadratic utility function — and a functional form for the health production function, one can not (in general) analytically solve for the health reduced-form demand equation. The demand equations are not LES (even if the utility function is of the LES (Stone-Geary)) form because the maximization problem of a household that must produce one or more of the goods it consumes (health) differs from the usual problem of utility maximization subject only to a budget constraint. Treating health as a utility augmenting good produced in the household implies that its demand equation is a combination of the demand for health from the utility function and also the supply of health from the health production function. For example, consider the impact of a compensated increase in the price of a food on the demand for health. As both food and health are goods in the utility function, the magnitude of the price effect depends on the extent to which they are substitutes or complements in preferences. But as food is also a source of nutrients which are used to produce health, the increased price of food will also increase the price (or cost) of achieving any level of health. The size of the increase in this implicit (shadow) price of health depends on the nutrient content of the foods, and the marginal rates of substitution in health production among all health inputs. Thus, the total (reduced-form) effect of a food price increase on the demand for health includes influences from both preferences and the biological health production function. Because of this complication, the usual strategy is simply to assume a linear functional form for all the reduced-form demand equation. Furthermore, the unobserved health endowments μ^i are assumed to enter additively. We can think of the residual (ε^H) of the linear reduced demand equation for health as containing the own- (δ^{ii}) and cross-effects (δ^{ij}) of health endowments on the health of individual i, in addition to all other sources of unexplained variation (η^H):

$$\varepsilon^{H^i} = \delta^{ii}\mu^i + \sum_{j=1} \delta^{ij}\mu^j + \eta^{H^i} \qquad (9)$$

5.26 With the above points in mind, the estimable reduced-form demand for health equation can then be written (supressing the superscript i):

$$H = \alpha^H_o + \sum_{j=1}^{K} \alpha^H_j P_j + \sum_{j=1}^{T} \beta^{Hj} W^j + \sum_{j=1}^{T} \gamma^{Hj} d^j \qquad (10)$$
$$+ \theta^H G + \psi^H P_y + \phi^H \Pi + \rho^H V + \varepsilon^H$$

where the Greek letters in equation (10) (except Π and ε) refer to parameters to be estimated, the superscript H on these parameters refers to the fact that they are the parameters of the health reduced-form rather than the reduced-form of another household choice variable. Also note that this version assumes that the health reduced-form demand equations for every member type are identical except for the sets of $d^1,\ldots,d^T$ personal characteristic variables (age, sex). Alternatively one could estimate separate health reduced-form demand equations such as (10) for sets of individuals defined by age and sex.

5.27 Reduced-form demand equations for all contemporaneously determined household choice variables (necessarily) have the same set of left

hand side variables (regressors) as the health reduced-form. There may be some interest in studying the effects of structural adjustment on the demand for health inputs as well as on health outcomes. The analysis of the demand for food and food nutrients (which are important health inputs) is discussed in Chapter Seven. For example, the reduced-form demand equations for non-food health inputs Y^i are (supressing the superscript i):

$$Y = \alpha^Y_o + \sum_{j=1}^{K} \alpha^Y_j P_j + \sum_{j=1}^{T} \beta^{Yj} W^j + \sum_{j=1}^{T} \gamma^{Yj} d^j \qquad (11)$$
$$+ \theta^Y G + \psi^Y P_y + \phi^Y \Pi + \rho^Y V + \varepsilon^Y$$

Variables in the reduced-form for health

5.28 MEASURES OF HEALTH. The SDA Integrated Survey provides four types of data on health status: the self-reporting of respondents as to whether or not they had suffered an illness, the effect of any illness on the performance of customary activities, the anthropometric measurement of height and weight of children five years and under, and information on miscarriages, stillbirths and infant deaths for pregnancies within the past twelve months. Anthropometric measurement is less likely to suffer from measurement error than the two self-reported health status measures. Of particular concern for the self-reported indicators of health status is the possibility that the propensity to consider one's state of health as being "ill" versus "not ill" may be correlated with individual and household characteristics such as education, age and (full) income. Pitt and Rosenzweig (1985) used self-reported illness (whether the respondent was sick in the prior week and whether he or she was sick in bed) as the dependent variable in estimating separate reduced-form health equations for 2,347 farm household heads and wives from Indonesia. They interpreted the positive relationship between respondents' schooling (in years) and the probability of reported illness as resulting from systematic self-reporting measurement bias.[11] The other self-reported indicator of health status, whether illness has altered the usual activities of the respondent, is also likely to suffer from measurement error which is correlated with some actual determinants of (unobserved) "true" health — the opportunity cost of time, and the marginal utility of health and income. This problem is probably more acute for another measure of health status available in the SDA questionnaire: whether or not the respondent stayed in a hospital or health center and for how many nights. Clearly, this measure of health is likely to be strongly related to the socioeconomic status of the household conditioning on actual healthiness.

5.29 There is some evidence that the other set of health data available from the SDA survey, miscarriages, stillbirths and the death of young infants, tend to be under-reported by households in similar surveys. Furthermore, it is not likely that the probability of not reporting such an event when it in fact transpired is unrelated to household attributes and the economic environment.

5.30 As the preferred anthropometric data are available for persons aged five and under, the measurement error in self-reported indicators of health is of consequence in analyzing the effects of structural adjustment on the health of a majority of respondents. It would be a mistake to ignore this sub-population or to think that self-reported health indicators do not contain useful information on health in spite of the measurement problem. Although it is likely that the reduced-form coefficients associated with age, education, wealth and wage rates of household members will be estimated with bias in an equation having self-reported health status as a dependent variable, it is likely that many of the regressors in the health reduced-form are not correlated with self-reporting measurement error and consistent estimates of their effects on health can be obtained. In particular, all the market- and region-specific variables such as prices and health program availability are unlikely to be highly correlated with self-reporting error or with the individual- or household-specific variables correlated with self-reporting measurement error. Thus, it is still likely then that the effects of the exogenous determinants of health most directly affected by structural adjustment will be reasonably well measured. Nevertheless, anthropometric measurement of health status, in particular weight and height, are still to be greatly preferred in an analysis of the economic determinants of health and the impact of structural adjustment on health. Enumerators will need different weighing instruments for adults than children and some additional training in order to weigh and measure adults.

5.31 A more satisfactory measure of self-reported health status would make use of a list of reported health symptoms, such as fever, diarrhea, skin outbreak and the like. In areas where certain types of disease are known to be wide-

spread, symptoms associated with these diseases can be itemized in the questionnaire. This type of measure may actually be more informative in some respects than weight and height although more likely to suffer from self-reporting bias.

5.32 REDUCED-FORM DETERMINANTS OF HEALTH. The regressors of the health reduced-form suggested by the conceptual model described above and available in the SDA household survey include:

- *Prices (P_j):* prices of foods (see also community level data)
- *Wages (W^i):* predicted wage rates of head of household and spouse
- *Individual attributes (d):* gender and possibly age, ethnicity or religion of respondent
- *Household "public" goods (G):* sources of drinking water for the household, nature of rubbish disposal, type of toilet, physical attributes of household dwelling (type of dwelling, number of rooms, whether dwelling shared, source of lighting, main fuel use for cooking, construction materials used in outside wall, flooring and roof), age and education of head of household and head's spouse
- *Prices of nonfood health inputs (P_v):* measure of availability and accessibility of public health and fertility control programs (from community-level data)
- *Nonearnings income, farm profits and wealth (II and V):* measures of wealth including land ownership,value of livestock, value of agricultural equipment, assets of non-farm enterprises, nonearnings income and farm profits.[12]

5.33 The following comments are in order. *Prices* should preferably be derived from the community-level survey rather than by calculating unit values by dividing the reported value of consumption or expenditure by a household by the physical quantity. Calculating household-specific prices by the unit value method imparts bias if individual food categories consist of items of varying quality. Higher quality food has a higher unit price than lower quality food, and since taste for quality is (likely) a normal good, price and income effects are confounded.[13] This quality bias problem is more likely to be a problem for heterogenous goods such as "beef" and "fish & shellfish" than for more (locally) homogenous goods like kerosene or salt. If independent measures of prices for constant quality foods are not available from the community questionnaire, much of the quality bias problem of using unit prices can be eliminated by using the average unit price in a locality (village) for each food category.

5.34 *Wages.* Wage rates can also be derived as "unit values" from the household questionnaire or from a community survey, the latter being preferred. If the household questionnaire is used it is necessary to calculate the average wage for each gender by schooling level and season. A more sophisticated approach would estimate selectivity-corrected wage equations by gender and use these wage equations to predict wage rates. In most African contexts there would likely be little return to the effort required.

5.35 *Household public goods.* Most of these are categorical variables in the SDA questionnaire. Depending on the distribution of outcomes and sample size, it may be necessary to aggregate some categorical outcomes. For example, twelve choices for source of drinking water would require 11 binary (0-1) variables. Some of these may be empty (never chosen) in the data or be chosen by such a small number of households that reasonably precise estimation of their health effects is impossible. Investigators should then use their judgement to aggregate categories. Some other regressors are probably of only second order importance as determinants of health or are highly correlated with each other. In particular, not including as regressors the full set of variables describing the construction of the dwelling will likely not have a consequential impact on the estimated parameters of interest.

5.36 *Prices of non-food health inputs.* As noted above, measures of the availability and/or distance to providers of health and related services obtained by the community survey will act as proxies for the prices of these services. Investigators should be careful not to use as regressors the information on actual use of health services and the cost of travel to the service location provided by the household questionnaire. The primary problem is that use of health services is a household choice, a dependent variable rather than an exogenous independent variable. There is obvious "simultaneous equations bias" resulting from using as regressors the survey information on whether an individual had consulted a health practitioner or visited a health center or consulted anyone about an illness. One is more likely to have consulted a health practitioner if one has been ill so we would expect that visits to a health practitioner and one's health would be inversely correlated but would certainly not want to draw the conclusion that visits to a health practitioner

cause poor health. The same problem exists even for the use of preventive medical care — the less healthy a person's inherent healthiness (the less their health endowment), the more likely that person will seek out preventive medical care, all else being the same.

5.37 *Nonearnings income, farm profits and wealth.* It would be useful to create a variable for the total value of assets from the data provided in the SDA survey. The exogeneity of all sources of nonearnings income is problematic. Transfers that are not "regular" may in fact be a reflection of the ill health of household members or other household outcomes that reflect household choices. One can make the case that even "regular" transfers represent past consumption, investment and migration decisions of households that are correlated with unobserved determinants of health, hence resulting in biased coefficients. To the extent that nonearnings income is unimportant or zero for most households this issue may be moot. However, in some African countries, remittances from household members who work and reside away from their immediate family members may be an important source of non-earnings income to the sample household. If the remitters reside outside the sampled households village or town, it may be useful to treat this as exogenous nonearnings income — included in the reduced form.

Estimation methods

5.38 TABULAR ANALYSIS. The first step in the analysis of data should always be simple tabular analysis. Creating some simple tables is a quick and easy way of getting a "feel" for the data and will indicate whether the range and variation in variables of interest are sufficient to use in regression analysis and if outliers or coding errors are present. The first table to be produced should be a table of means, standard deviations and minima and maxima for all the variables described above.

5.39 Following this table of descriptive statistics, a set of cross-tabulations should be undertaken to examine patterns in the data. In particular, health outcomes should be tabulated against gender and age, region of residence (or ethnicity), measures of wealth and income, education of household head and spouse, and availability of important public health and family planning programs and medical providers. A more sophisticated cross-tabulation might attempt to control for an important correlate of health status, such as age, while tabulating against community access to important public health programs (see for example Frame 5.1).

5.40 Conditioning on age as in Frame 5.1 may be useful to uncover the effects of health programs that primarily affect the health (as measured by weight-for-height) of infants (age less than 2 years) rather than older children. Cross-tabulations such as these thus help researchers uncover "stylized facts" about the association between health interventions and health outcomes. However, cross-tabulations necessarily involve only a subset of the variables the prior analysis has indicated are behavioral determinants of health. Cross-tabulations thus only provide us with partial associations and may be misleading. For example, a variable chosen for cross-tabulation with a health outcome may be highly correlated with a variable not in the same cross-tabulation, and may thus be picking up the effect of the omitted variable and not just its own effect. Past research with this type of data has indicated that this "omitted variable" bias can be severe. For this reason, a regression that controls for all reduced form determinants of health is the preferred method of analysis.

5.41 REGRESSION ANALYSIS. Estimation of the health reduced-forms using an anthropometric measure of health as dependent variable is simply accomplished by ordinary least squares regression. Estimation of the health reduced-forms that use binary indicators of health such as self-reported illness should use probit or logit estimation methods. These procedures are found in many popular econometric software packages. There are some problems with the reported t-statistics when ordinary least squares regression (or probit or logit) are applied to these data. A more technical discussion of this issue is presented in Box 5.4 (overleaf). The reader is strongly encouraged to read this material as it suggests a

Frame 5.1 Weight-for-height of children by age and program availability
(100 grams/cm.)

	Health program present in community	*Health program not present in community*
Ages less than 2		
Ages 2 and 3		
Ages 4 and 5		

Box 5.4 Technical issues in regression analysis

While ordinary least squares regression provides consistent parameter estimates under fairly general circumstances, with household survey data it may tend to give estimates of the standard errors of regression parameters that are biased downwards — that is, the reported t-values will be biased upwards. This bias occurs when the regression residuals are not independent. This lack of independence can be the result of (in order of magnitude):

(i) An individual appears more than once in the estimation sample because he or she was sampled at more than one survey round and multiple survey rounds were pooled for estimation. As the regression residual includes time invariant individual health endowments, the residuals for an individual are likely to be correlated across time periods.

(ii) More than one individual in a household appears in the estimation sample (even in a single cross-section). Members of a household are not only likely to have individual endowments (μ^i) that are correlated, in part representing unobserved household-specific determinants of health, but also they share a common health environment (λ), many of the attributes of which are unobserved by the investigator.

(iii) More than one individual from a region appears in the estimation sample. Again, their regression residual will be correlated because of thier common incompletely observed (measured) regional health environment (λ). Note that in the case of multiple survey rounds, individuals measured in a common survey round will will have correlated residuals if there are time-specific factors such as season, prevalence of contagious disease, or other natural phenomena, which importantly affect measured health.

Consistent estimates of the standard errors of coefficients can be obtained by estimating a random or fixed effects model. Random effects estimation is a form of generalized least squares that makes use of the information that the residuals have a correlation structure (random effects estimation also requires the assumption that the random effects [the components of the residuals that are not independent across observations, in this case endowments] are not correlated with the regressors, which is the assumption made about residuals in all reduced-form estimation). Many common statistical packages have random effects estimation built-in. Fixed effects estimation treats the commonality among sample observations essentially as a fixed parameter. For example, if an individual is sampled at more than one point in time, all time invariant (observed and unobserved) characteristics can be captured by a (binary) dummy variable specific to the individual. For even small samples, this results in a relatively large number of extra parameters that need to be estimated. This problem of too many parameters is eliminated by differencing across time periods — a procedure which results in the same parameter estimates as explicitly including dummy variables. (Eliminating unobservables common to all household members by household fixed effects entails differencing the regressors for each individual from the average for all household members. An example of this approach to studying the intra-household distribution of health and food is Pitt et al (1990). A consequence of household fixed effects is that the effects of household-specific determinants of health [including the household public goods G] cannot be identified.) Note that the fixed effects model precludes the estimation of the effects of time invariant factors (such as gender and many household characteristics such as drinking water source) on health.

When estimating health reduced-form equations for persons over the age of five, self-reported illness must be used as the dependent variable. Because the dependent variable is dichotomous, logit or probit models should be estimated. Unfortunately, the problem of correlated errors discussed above is likely to be a problem that is too difficult to deal with computationally when the dependent variable is not continuous.

variety of econometric specifications that are useful and not difficult to implement.

5.42 The interpretation of the regression coefficients is quite straightforward in a reduced form. In the case of linear regression (without interactions), the coefficients are the effects of a unit change in each regressor on the dependent variable. For example, the coefficient on the price of milk in a weight-for-height reduced form is the effect of a unit change in the price of milk on the weight-for-height of a child. If milk prices are in currency units per liter, and if it is known that structural adjustment resulted in an increase in the price of milk of 10 currency units per liter, then the effect of this increase in price on weight-for-height is simply the regression coefficient times 10. If natural logarithms are taken of the dependent variable and all (continuous and nonzero) regressors, then the coefficients have the familiar elasticity interpretation. In the case of prices and program availabilities, these elasticities are the direct effect of a percentage increase in each price and program on the health outcome.

5.43 Interpretation of coefficients is only slightly more complicated in the case of a probit or logit regression. Partial derivatives, which have the same interpretation as a linear regression coefficient (above), and elasticities are often output from computer packages that estimate these models.

Other problems

5.44 HEALTH PROGRAM PLACEMENT. As noted above, there remains the issue of whether the reduced form estimation strategies described above accurately measure the effect of public programs on health outcomes. A fundamental problem in program evaluation is that the location of programs and the timing of program initiatives — program placement — is not likely to be random to the extent that government decision rules are responsive to unmeasured attributes (regional health endowments) of targeted populations. Simple measured associations between health programs and health outcomes may not provide correct estimates of program effects and thus mis-estimate the effects of structural adjustment on health.

5.45 In any country, at a point in time, program efforts vary widely across areas, even if the programs are funded and controlled by the central government. Access to public health clinics, hospitals, maternity clinics and fertility control programs varies considerably from region to region within a country. Given the limited resource capacities of the central public agency, program allocations must be rationed. The placement of programs is thus likely to depend on the expected location-specific returns to the program, which will vary across areas according to, among other attributes, their physical and demographic characteristics (endowments). If program placement is attentive to location-specific endowments, and such endowments influence outcomes of interest to policy-makers, it is important in program evaluation to have information on endowments. It is inevitable, however, that not all exogenous locational characteristics are measured or are measurable. This is surely the case in the African countries participating in the SDA Program.

5.46 For example, consider the case of a country which has certain areas that have environmental features favorable for the propagation of geographically concentrated debilitating diseases such as malaria, river blindness (onchocerciasis), trypanosomiasis (sleeping sickness) or schistosomiasis (bilharzia). The central government, knowing this, places a disproportionate level of health programs in these regions relative to regions in which these diseases are less frequent. The correlation between frequency of illness or weight-for-height and health program availability based upon household data that relies on spatial variation may then be positive. It is clear that it would be incorrect to conclude from this negative coefficient that health program investments *caused* ill health; rather health programs were placed where health endowments were lowest. The result of this "reverse" causation is to underestimate the effects of health programs on health outcomes when the latter is regressed on the former.

5.47 Data on the spatial distribution of health programs and outcomes at more than one point in time, expected to be available in the SDA surveys, can be used to consistently identify program effects. Fixed effects estimation (see above), which estimates how *changes* in local programs affect *changes* in the health of the local population are free from the contamination of areal heterogeneity bias. Note that if the points in time are too "close", it will be difficult to get good estimates of program effects since health program availability will have hardly changed at all. However, if a structural adjustment program importantly affects the ability of the government to maintain health programs, significant changes in health program availability will be found in the aftermath of structural adjustment.[14] If there is in fact little change in health program availability after structural adjustment, then there is likely to be little change in health outcomes as a consequence of changes in health program availability, so that the measurement of health program effects becomes unimportant.

5.48 FUNCTIONAL FORM AND SAMPLE DISAGGREGATION. The reduced form demand equations for health and health inputs presented in equations (10) and (11) are written as linear forms simply because of the computational simplicity of working with linear-in-the-parameters estimating equations. If degrees of freedom are adequate, investigators may wish to allow for interactions[15] among variables where it seems such interactions are justified by some prior information about behavior. For example, it would be sensible to interact program variables with mothers' education if there is reason to believe that the effect of certain program interventions on the health of children depends on mothers' education. There may be also be policy reasons to estimate models that permit an analysis of the incidence of structural adjustment among variously defined groups. If there is some reason to believe that the healthiness of these groups (or demand for health inputs) may respond differently to changes in reduced-form determinants, the investigator may either introduce a variable which defines groups

(rural/urban location, region) with reduced-form regressors or break the sample and estimate separate reduced-forms for each group of interest. Statistical tests (Chow tests, F tests) can be used to determine if such disaggregation or interaction is statistically valid.

5.49 THE PROBLEM OF MORTALITY AND FERTILITY SELECTION. Drawing inferences on the effect of health interventions (including food prices) on children from studies which are based solely on samples of *surviving* children may lead to an incorrect assessment of program effects if the effects of programs on survival and fertility probabilities are ignored. In many African countries, infant mortality rates are very high and health programs which affect child health (as measured by height and weight, for example) also affect the probability of survival for children ever-born. It is not enough to consider the impact of health programs and goods prices on child mortality in addition to their impact on health. Estimating the reduced-form determinants of child health is further complicated because changes in mortality induced by changes in programs which affect health (due perhaps to structural adjustment) may alter the average health of the surviving population by causing those with higher inherent probabilities of illness (those with low health endowments μ^i and λ) to not survive. It might be expected that the likelihood of infant death will be importantly related to this health endowment — those infants not inherently healthy or residing in unhealthy environments are less likely to survive. Consider, hypothetically, a health program that predominately affects survival but not the health status of those who survive (oral rehydration?). Such a health program may actually *reduce* the average health status of the surviving population (and have a negative coefficient in a reduced-form for health) by permitting the survival of some low endowment children who would otherwise die, while not appreciably augmenting the health of those who would otherwise survive. Only if infant mortality was uncorrelated with health endowments would there be no survival selection since the average endowments of survivors and nonsurvivors would be equal. Only in this limiting case does finding that a program has no effect on the average health of survivors imply that the health of those who would otherwise survive is not enhanced. Thus, knowing only a program's influence on the average health of surviving children may be dangerously inadequate in evaluating its effectiveness and the effect of changes in program availability on health.[16]

5.50 Unfortunately, correcting for the selective effects of mortality is difficult. It is necessary (but not sufficient) to know the effects of programs and prices on the rate of survival *and* the average health of survivors. Knowing the former requires information on mortality during a (common) reference period. The current SDA prototype survey questionnaire only provides this information for infants born in the twelve months prior to the survey date. Considering that mortality rates are highest in the first year of life, this is still useful information. It would be better to record information on all child deaths in each woman's reproductive life, and the year, sex and birth order of all live births and whether they resulted in surviving infants (at the time of the survey) or deaths (and when death occurred). Statistical methods exit (and are available in some "canned" statistical packages) that measure and correct for the selection bias imparted by nonrandom mortality. A simple to implement two-stage method first estimates the reduced-form determinants of mortality using the same set of regressors as equation (10).[17] This estimation stage is valuable by itself since infant mortality is an important health outcome and the effects of structural adjustment on mortality as well as anthropometric measures of health on living children needs to be studied.

5.51 Another source of sample selection that is more subtle but potentially as important as mortality selection is fertility selection. Health programs (and food prices and wages) not only affect which infants are alive to be surveyed but also the fertility decisions of households — whether pregnancy occurs or not. As with mortality, changes in programs and prices resulting from structural adjustment may alter the fertility decisions of households, and the additional children born, or whose birth is averted, as a result may have nonrandom health characteristics. Pitt and Rosenzweig (1989) examined the effect of fertility selection on the estimated parameters of reduced-form health demands for infants in Malaysia and found fertility selection to be significant and that ignoring it resulted in large mismeasurement of program effects on health. Like the case of mortality selection, correcting for the effects of fertility selection requires the estimation of a reduced-form having the same regressors as the health reduced-form (10) (with the

exception of the gender of the child as this is not known to the household at the time the fertility decision is made). The measure of fertility to be used as dependent variable should be the number of pregnancies over a reference period. In the SDA household survey, anthropometric data are available for surviving children up to age six, so that it would be most useful to have information on all pregnancies that could have resulted in a child in that age range.

Reduced-form demand for health inputs

5.52 As noted above, the reduced-form determinants of all (contemporaneously determined) household choice variables have the same set of regressors as the health reduced-form. A linear formulation of reduced-form demands for health inputs is given by equation (11). Most of health inputs typically included in household surveys are measured as binary or polychotomous variables which require the use of binary probit, binary logit and multinomial logit estimation methods. The caveats associated with estimating and interpreting the health outcome reduced-forms described above apply equally for health input reduced-forms. The complete set of health inputs measured in the SDA Integrated Survey follow:

- Consulted health practitioner for checkup
- Consulted health practitioner for illness
- Consulted health practitioner for prenatal care (last 2 weeks)
- Consulted health practitioner for postnatal care (last 2 weeks)
- Frequency of postnatal care (12 months)
- Choice of health practitioner for illness
- Child vaccinations by type
- Place of vaccination
- Duration of breastfeeding of children
- Participation in community feeding program
- Frequency of prenatal care in past pregnancies
- Source of prenatal care
- Household food consumption (see Chapter Seven)

5.53 To finish the section a few comments are in order. It is not necessary that econometric estimation be carried out for all these health inputs. Investigators should single out a health input for intensive study if simple tabulations of the data show that its utilization has importantly changed in the aftermath of structural adjustment, if they are aware of significant budgetary changes affecting the ability of public health facilities to provide services, or if they are aware of significant changes in fee schedules. Data limitations can also make tabulation a useful alternative. For example, if the community level data available is only a count of public health facilities in each region that provide a particular health service without regard to the quality of service provided and other attributes such as queuing time, a policy shift that keeps the count of facilities unchanged but reduces service flows and quality will not be uncovered by regression analysis of the community level data. If information on budgets, staffing or other indicators of quality and service flows are available from other sources, even anecdotal information, investigators would do well to link this information with information on changes in utilization derived from the household surveys.

Estimating the willingness to pay for medical care

5.54 As was noted above, it is unlikely that user fees for medical services ration the market. The opportunity cost of travel time has been found in almost all studies of the demand for medical care in developing countries to be an important and significant determinant of medical care demand. If the community or household questionnaire provides information on the distance or travel time to different types of medical care providers, it is possible to impute a price to medical care. Using the observed or imputed wage of an individual as the opportunity cost of time, the price of medical care provided by a specified type of provider is the fee charged by that provider plus the product of travel time and the wage. Wages can be imputed either by estimating selectivity-corrected wage regressions based upon the subsample of individuals who would report market wages and hours, or more simply in the case of rural areas, by averaging wage rates (by gender) within in each village. Within village and gender groups, individual variation in wages is likely to be small. For children who are typically accompanied by an adult to the health care provider, the price of medical care can be taken as the price of adult time for the gender which most often accompanies children (women) plus any return to child time that can be imputed.

5.55 Estimating the price elasticity of medical care is accomplished as described in section III.6 (reduced form demand for health inputs) above. The imputed prices for medical care should sim-

ply be added to the list of regressors. Indeed, if these prices are calculated, they can also be added to the list of regressors for inclusion in the reduced form demand equation for health. Their regression coefficient has the interpretation of the effect of a change in the medical care price on a measure of health outcome.

5.56 An econometric issue to consider in estimating models of medical provider choice, is the appropriate estimation subsample. For example, the household questionnaire provides information on the health practitioner visited for illness, for prenatal care and for children's vaccinations. The former two questions provide information on provider choice *conditional* on a prior endogenous (household choice) event — being ill or pregnant.[18] No one seeks "prenatal" care if one is not pregnant, or seeks treatment for illness if one is not ill. But it is not likely that the existence of pregnancy or illness is unrelated to the observed and unobserved determinants of provider choice. As a result, estimating a model of health practitioner choice when ill using only the subsample of those individuals who report themselves ill will result in "selectivity bias." The appropriate procedure is to estimate a polychotomous variable model having as dependent variables a set of indicators for choice of provider if ill (or pregnant) but also for the outcome "not ill" (or "not pregnant").

The efficacy of health inputs: Estimating the health production function

5.57 The health outcome and health input reduced-form demand equations described above tell us how social and economic factors influence health behaviors. As the model presented makes clear, the reduced-form is not the effect of health behaviors (health inputs) themselves on health but rather the combination of the effect of health behaviors and the determinants of that behavior. The reduced-form regression coefficients thus reflect the preferences, beliefs, perceptions and information of the household, and not solely the effect of health behaviors. However, the health production function, which provides the direct biological effect of health inputs on health, can be estimated and is of policy interest in assessing the potential efficacy and cost-effectiveness of health program interventions.

5.58 Ideally, estimation of the health production function requires information at the level of the individual for all inputs that affect health. Information on food consumption at the individual level is not available in the household questionnaire. As food intake is likely to be a primary determinant of individual level health, estimation of the health production function is problematic. One solution adopted by Pitt and Rosenzweig (1985) is to estimate the health production function using household data: the dependent variable is proportion of household ill and the dependent variables are household aggregates of health inputs. This approach is valid if the individual health technologies are linear and identical (except for intercept shifters) across household member types (age/gender). Irrespective of the data used, health production function estimation requires instrumental variable estimation methods (such as two-stage least squares) since the health inputs are presumed to be endogenous. The instrumental variables are the reduced-form determinants of health listed in paragraphs 5.32 through 5.37. Identification requires that the number of reduced-form determinants of health in that list which are not also included in the specified health production function exceed the number of endogenous health inputs. Two-stage least squares estimation is commonly included in standard econometrics software packages.

Principles of analysis and policy implications

5.59 The preceding discussion suggests that an analysis of the relationship between government policy interventions, health and other household behaviors has stiff data requirements. Health is multi-dimensional and difficult to measure — anthropometric measures, although expensive to collect, offer important benefits. The importance of unobservables in the determination of health imply that longitudinal data will also aid in economic analysis. Panel data also allow the analyst to estimate the effect of changes in government programs without the bias that non-random program placement (as described above) can impart. Finally, the selective effects of mortality and fertility can significantly affect the accuracy of the reduced-form determinants of health. Correcting for these sources of selection requires data not only on the health status of the (surviving) sampled population but also on mortality and a complete pregnancy roster of all women.

5.60 Using nutrient intake as an indicator of welfare or health has some serious drawbacks. Nutrient intake itself cannot be considered an

argument in the utility function or even a good indicator of welfare. The focus on nutrients derives from its importance as an *input* into the production of health and the common absence of adequate data on health. Knowledge of how nutrient intake maps into health is important for policy analysis. Even complete knowledge of the matrix of food price elasticities may not lead to conclusions about the effects of price interventions if price changes do not unambiguously result in a rise or fall in the intake of all important nutrients. Furthermore, to the extent that households that have greater access to health services or live in less sanitary environments also face higher or lower food costs (e.g., rural versus urban areas), cross-sectional estimates of food price effects that ignore the health infrastructure may lead to misleading conclusions about the consequences of food price interventions.

5.61 In addition, studies of the determinants of nutrient intake are necessarily at the household-level in the SDA Integrated Survey. It is likely that households do not allocate resources equally among their members and so the implications of policy for the well-being of certain classes of individuals (women, children) are not identified. Health data are at the individual level so that reduced-form demand equations for health directly provide the effect on the health of the individual by type of changes in policy interventions (prices and programs).

5.62 Changes in individual health have implications for labor productivity, wages, fertility and human capital investment. These are particularly difficult issues to measure, but ignoring them may lead to serious under-estimation of the returns to investing in health.

Notes

1. For an excellent and comprehensive review of this literature see Behrman and Deolalikar (1988c).

2. This result pertains to uncompensated price elasticities for households whose food expenditures were greater than those of 75 percent of all households. For households in the 90th percentile, six of nine price elasticities had non-identical signs across the nine nutrients.

3. On the importance of substitution elasticities for the evaluation of nutrition based food policy see Timmer (1981), Timmer, Falcon and Pearson (1983), and Pitt (1983). For an African case study, see Strauss (1984).

4. The relationship between productivity, wages and health or nutrient consumption has also been confirmed by Strauss (1986) using data for farm households in Sierra Leone, Deolalikar (1988) using Indian data, and Sahn and Alderman (1988) for Sri Lanka.

5. In examining cuts in real government expenditure in thirty-seven developing countries, Hicks and Kubisch (1984) found that social expenditure was the most protected among the five categories of government expenditure defined, and more so in the lowest income countries. For a thorough examination of the evidence on the impact of economic adjustment on health and nutrition see Behrman (1988).

6. Discussion of issues surrounding the measurement of health will be deferred to paragraphs 5.28 through 5.31.

7. Below we will also introduce a purely random component to health, the importance of which depends on how health is measured. For example, this random component will be relatively larger if the measure of health is a dichotomous indicator of whether an individual is "sick" on any given day than if the measure is the height of an individual. Although individuals may have differing propensities to become ill (their μ^i), whether or not one is sick in a short reference period depends more on purely random events than does one's height, the result of a lifetime of health behaviors and endowment. As will be made clear below, this random component to health differs from the terms μ^i and λ in that while all three are unknown to the researcher and thus contribute to the error term in statistically related relationships, the μ^i and λ terms are *not* random events to the household.

8. The discussion below refers to household farm activities for clarity of presentation but applies equally to any household production of goods and services for the market such as weaving, crafts, processing and other small cottage industries, as well as trading, transportation services and other services produced by household members.

9. Typically, the schooling and age of the head of the household and his or her spouse are treated as exogenous variables to be included in the reduced-form demand equations. The age and schooling of children are often not considered exogenous as they reflect recent fertility and human capital decision by the household which are not independent from the health input decisions of households. Indeed, the Education Analysis Plan in Chapter Six explicitly considers the schooling of children as a choice variable of the household affected by structural adjustment.

10. Explicit statistical tests of the separability hypothesis in developing country agriculture have been performed by Pitt and Rosenzweig (1986) and Benjamin (1988), both studies using data from Indonesia and both not able to reject separability. The Pitt and Rosenzweig paper is of particular relevance here since it used information on the health of cultivators to test the separability hypothesis. The test was based on the following implication of separability: if perfect markets exist for the services provided by farm family cultivators, then the healthiness of any of them (which was demonstrated to significantly affect labor supply) should not affect farm profit as market substitutes are available. Benjamin's separa-

bility test was based on a related implication: household size and composition should affect family labor supply but not affect farm profits if labor markets are well functioning.

11. A similar conclusion about self-reported health is also drawn by Wolfe and Behrman (1984).

12. Farm or non-farm enterprise profits should be replaced by the reduced-form determinants of profits — prices of inputs (including labor) and outputs, as well as quantities of land, capital and other fixed factors — if it is believed that household production decisions are not separable from consumption decisions.

13. On the treatment of this problem see Deaton (1988).

14. However, this change in the availability of health services may not be captured by all measures. This point is further discussed below.

15. Interaction is meant to include not just the products of regressors with other regressors but also the product of a regressor with itself (quadratic terms).

16. An example much more applicable to developed countries concerns measuring the effect of intensive neonatal care facilities on some measure of the health of a sample of (living) infants. As is well known, a primary result of neonatal intensive care has been a dramatically increased rate of survival of very premature infants. It is also well established that premature infants are significantly more prone to health problems during their life than infants carried to full term. Neonatal intensive care is likely to have little impact on the health of most full term infants. A regression having a measure of infant health as dependent variable and the accessibility of intensive neonatal intensive care facilities as a regressor is likely to show that neonatal intensive care facilities have a detrimental effect on infant health. The negative regression coefficient reflects the influence of neonatal intensive care on the survival of low endowment infants. These low endowment infants, by surviving, reduce the average healthiness of the sampled (surviving) population. It is clear that these facilities can only improve the health of any infant conditional on its survival. The negative sign simply reflects the selective effects of mortality on inclusion into the regression sample — surviving infants.

17. Since the dependent variable is binary in this case (infant survives, infant dies), a probit or logit regression is appropriate.

18. Strictly speaking, the choice of children's vaccination provider is conditional on there being a child in the household — that is, prior fertility — which should be considered an endogenous choice of households as well.

6

Analyzing human resource effects: Education

The policy issues

6.01 Education can occur in many forms. Usually emphasis is placed on formal education through schools because this is one of the most important forms of education, because it is a more easily observed form of education than are many others and because it is a form of education that is thought to be particularly affected directly by policy. For such reasons this Chapter focuses on education through formal schooling. But some attention also will be given to other forms of education — for example, through formal and on-the-job training and preschool and outside-of-school education in the household.

6.02 Education is determined by both supply and demand factors. Adjustment policy may have effects on education through both supply and demand. In some cases these effects may be fairly direct and perhaps obvious. In others they may be much more indirect and probably less obvious since they reflect the filtering of adjustment policy through a myriad of different types of institutions in the economy — firms, farms, governmental organizations, private and public schools and training programs and households. These institutions, in turn, may be affected by adjustment policy through direct policies — such as reductions in school subsidies, increases in school users fees or increased rationing of school positions — or much more indirectly such as through the impact of reduced fiscal deficits on household income and thus on the consumption and time use choices of households. Generally members of poorer households, although not necessarily the poorest households in particular, are thought to be most vulnerable to such effects.

6.03 Because of such complexities, in a sense the impact of adjustment policy on education can not be considered in isolation. The concerns of other Analysis Plans in this Volume have important implications for the determinants of schooling. For example, the determinants of the poverty profile, of employment and earnings, of health and nutrition and of the role of women all have important implications for education.[1] And, perhaps with a lag, education will have important implications for all of these other outcomes of interest. Moreover, all of these social dimensions that may be affected by adjustment also are affected by the overall macro developments and structural shifts in economic activities that may be engendered by adjustment policy. Furthermore, all of these effects have an important time dimension, with longer-run outcomes perhaps differing substantially from short-run effects, not only in magnitude, but possibly in direction.

6.04 Nevertheless, given the apparent importance of education in attaining a number of society's goals, it is useful to attempt to sort out the probable impact of adjustment policies on education. This Analysis Plan attempts to indicate how this task might be approached. The loci of the proximate determinants of education are various micro institutions such as households, farms, firms and schools. The major emphasis of this paper is on how to analyze the impact of adjustment policy on education through such

proximate determinants, to which paragraphs 6.30 through 6.59 are devoted. But before examining this micro behavior, some consideration of the macro-meso setting in which it occurs is relevant. Paragraphs 6.08 through 6.29 discuss this setting. And to motivate the whole Analysis Plan, it is useful to indicate the main policy preoccupations pertaining to adjustment policy and education. Because these are dependent on the time horizon, it is useful to distinguish between the short run and the longer run for this purpose.

Policy interventions that are likely to influence education in the short run

6.05 The most obvious of these policy interventions are ones that directly affect the supply of formal schooling and training programs. Adjustment policy usually involves short-run cuts in governmental expenditures in order to reduce fiscal deficits. The general cuts in governmental expenditures may include cuts in subsidies for formal education and training, which in turn may cause increased efficiency in the use of resources for such purposes, reduction in the quality of such education, reduction in the noneducational amenities associated with education (e.g., school lunches), reduction of the quantity of such education (perhaps accompanied by increased rationing of such education), and/or increases in the users' charges or prices for such education. Increased efficiency of the use of resources used in the production of such education may occur without any diminution in the quantity and the quality of such education. Such efficiency may be attained within a given schooling type, or by re-allocating resources across schooling types. The latter may occur at the same time that user charges are increased. All of the other changes are likely to cause a reduction in the quantity of education, the quality of education, or both. Who is affected by such changes depends on the exact nature of the policy changes. But in most societies the poor are politically less able to protect themselves against such changes than are those who are better off. Note that while most of these changes are likely to be negative, there are possibilities of changes that are positive on the supply side due to adjustment policy. For example, if firms that have training programs with a long gestation perceive that their medium- and long-run prospects are improved by the adoption of adjustment policies, either because of expected sectoral shifts or because of expected macroeconomic improvements, they may act to increase the supply of such training even in the short run.

6.06 The demand for education also is likely to be affected substantially by adjustment policy. The major effect in the short run usually is presumed to be a reduction in the demand for schooling because of a short-run reduction in income. To what extent this affects the demand for schooling, of course, depends upon whose income is reduced, with the strongest effects occurring if those at the margin of schooling continuation decisions experience income reductions. There also may be reduced demands for schooling that result from reduced health and nutrition of children, and thus less capacity for gaining from attending school or training programs. There further may be reduced demand for education because of time allocation decisions so that the opportunity cost of children's time spent in school increases relatively because of the increased importance of their time spent in either economic or household activities. For example, if women spend more time in labor market activities to offset reductions in household income from reduced employment of men, older children (particularly girls) may be called upon to fulfill various household activities instead of going to school. But the same example also points to the possibility of the opposite effect if women spend less time in economic activities due to reduced employment options or if children have less attractive own firm/farm or labor market options. Also, on the demand side as on the supply side, there may be a short-run increased effect if the adjustment policy increases the expected private rate of return to education due to expected improvements in the medium- and longer-run prospects of the economy if the adjustment program is successful. The explicit adjustment policies that might have such effects through the demand side include any adjustment policies that may affect employment, wages and relative prices faced by the household. This means, effectively, that virtually all adjustment policies may have such effects, from devaluation to fiscal restraint to price and wage policies.

Policy interventions that are likely to affect education in the longer run

6.07 The longer-run effects depend very much on the degree of success of the adjustment policy. The more successful it is, then as compared with the situation that would have prevailed without

the adjustment program, probably the private returns to education of most types and the supplies of resources to be used for education will be greater, but the opportunity cost of time spent in education rather than in productive activities also is likely to be greater. Generally the former effect is expected to dominate, though it is far from obvious that it will in all cases. The relevant policies in this case are likely to be the whole set of adjustment policies once again since what counts are realizations (that condition future expectations) for the economy as a whole.

The macro-meso setting for the impact of adjustment policy on education

6.08 The micro level behavior that determines the supply and demand for education occurs within a larger macro context that is affected by adjustment policy. The meso setting includes the conduit mechanisms that transfer the effects of adjustment policy at the macro level to the proximate determinants of the micro household and other relevant micro institutional behavior that directly determine education. On a general level the meso setting is likely to be affected by adjustment policies in two major respects. *First*, by altering the markets in which micro entities function. *Second*, by changing the infrastructure in which they operate. The major adjustment policies that are likely to have effects on education through these meso variables are likely to include currency devaluation, fiscal and monetary restraint, and international and domestic price liberalization. A discussion of the impacts of such policies on general macro aggregates is not in the scope of this paper.[2] But it is useful to note that such effects may be complex, depending on the combination of expenditure switching (through relative price changes), expenditure reduction (through income effects), and changes in expenditure composition that occur as part of the adjustment policy itself or are induced by that policy. And, once again, all of these effects have an important time dimension so that, for example, the immediate aggregate effects may be contractionary, but the longer-run ones expansionary if the adjustment program is successful.

6.09 The purposes of this section are to set out the most important dimensions of the meso environment in which the relevant entities for education determinants function and to review how these dimensions may be affected by adjustment policy. We begin with a brief discussion of the two major elements of the meso setting that serve as conduits for the impact of the macro adjustment policy on the micro determination of education and then discuss the empirical issue of linking economic adjustment policy to these conduits.

Major elements of the meso setting that transmit the impact of adjustment policy on the determination of education

6.10 As noted above, the meso setting relevant for the determination of education by households and other relevant micro institutions includes two broad conduits for the transmission of adjustment policy to these micro institutions, markets and infrastructure. These are now considered in turn.

6.11 *Markets*: Markets further can be characterized in a number of ways. Probably most useful for the present case is to distinguish among factor, product and financial markets, with the recognition that each of these types of markets may be more or less formal (in the sense of being subject to explicit contracts and governmental regulations).

6.12 Factor markets are important in at least three respects: *First*, for those many poor who work as employees, such markets are the major source of their income, which in turn is a major determinant of at least some forms of education, including formal schooling (Chapter Four). If adjustment policies change wage rates or employment options in such markets, these may lead to changes in the demand for education. If the initial stage of adjustment involves retrenchment, these effects initially may be negative. If the adjustment program is successful, these effects are presumed eventually to be positive. *Second*, changed wages also may have a price effect on the demand for education in addition to the income effect just described. One dimension of the price effect is the opportunity cost of time spent in education instead of in the labor force. If adjustment policy results in an initial decline in labor market demand and in real wage rates, the opportunity cost of time devoted to education declines, though if the adjustment policy is successful eventually it increases. A second dimension of the price effect refers to the expected return to investment in education in terms of labor market rewards.[3] These presumably reflect expectations about labor market developments after the termination of the education, and thus

may refer to some time in the future. If the adjustment policy is perceived to have some reasonable probability of successfully improving the economy over what it otherwise would have been without the adjustment program, then it would seem likely that expected returns on educational investments would increase. However, this effect may be dampened by any initial negative impact on labor markets since typically current experiences enter into the formation of expectations about future outcomes. *Third*, factor market changes also may affect the supply side of education. If initial restrictive policies result in an initial reduction in real wages of more educated individuals, for example, there may be an initial reduction in the cost of the most important (at least in financial terms) input for supplying education. With a successful adjustment policy, of course, over time this effect probably will be reversed by increasing demand for more-educated labor.[4]

6.13 Product markets have at least four important possible dimensions for the concern of this study. *First*, in most developing countries a number of the relatively poor generate income primarily as small-producers in agriculture or in the informal sector. The product prices that such producers face are an important determinant of their income. The overall adjustment policy is likely to have a negative effect on these incomes initially (once again probably reversed in the longer run if adjustment is successful) if there is a reduction in overall aggregate demand and if that reduction in other parts of the economy causes laborers to shift into such self-employment. But that is not the only effect. For certain important segments of this part of the economy — e.g., those involved in the production of tradables including basic agricultural staples — the aggregate price effect favoring such products due to devaluation and trade liberalization is likely to work in the opposite direction, and may more than offset any adjustment policy-induced decrease in aggregate demand even in the short run. *Second*, parallel to discussion in the previous paragraph, there also is a price effect for such self employed that affects both the opportunity cost of their time to invest in education and their expectations about the returns to education.[5] *Third*, a major factor affecting household real income of the poor and therefore their demand for education is the relative prices that they face for consumption items. Such prices are likely to decline initially because of the probable initial overall reduction in aggregate demand, though the price effect of devaluation works in the opposite direction for tradables, some of which (e.g., basic staples) may be very important in the consumer basket of the poor. *Fourth*, a product price of direct obvious relevance is the product price of education. The impact on this price is not immediately obvious. For formal education, often adjustment policy involves a reduction in subsidies, sometimes the introduction of (or increases in) user fees, and sometimes increased rationing of positions in public schools (the last two of which may be equivalent to price increases, broadly-defined). On the other hand, at least in the short run, the possible reductions in the costs of the budgetarily most important input in the educational process (ie., more-educated persons) and of greater efficiencies and possibly of expanded scholarship and loan programs may result in a decline in the real market product price for education.

6.14 Financial markets may have important effects through facilitating income production and investment in education on the demand side and through facilitating the supply of education on the other side of the market as well. Typically adjustment policy attempts to make such markets more efficient by increasing to the opportunity cost levels real interest rates in formal credit markets and by reducing rationing in those markets. The rise in real interest rates, if anything, would seem to discourage investment in education (as well as other forms of investment) ceteris paribus. But generally there has been very limited access to such capital markets by poor people, particularly for investments in education. So the effects depend in substantial part on the extent to which adjustment policy efforts in the formal credit markets spill over into informal markets and on the extent to which there is fungibility in household resources (under the assumption that even in the informal credit market loans explicitly for education are not common). Once again, the net effects are hardly obvious. In the pre-adjustment situation, for example, even if real interest rates were low (and credit rationed) in the formal credit market, interest rates may have been quite high in the more relevant informal market. Moreover, efforts to rationalize credit markets may cause an ongoing reduction in interest rates in the informal markets, and any short-run restraint in aggregate demand may induce a fall in interest rates as well.

6.15 *Infrastructure*: Infrastructure is used here

to refer to publicly-provided physical capital and publicly-provided services. In broad terms infrastructure can be subdivided into social and economic infrastructure.

6.16 The most important social infrastructure that affects the determination of education obviously is that which directly is used in education, particularly publicly-provided formal schooling and training. The availability and quality of both the capital stock and the current inputs (most importantly the staff) are critical determinants of the amount of education and of its quality. The current inputs into the process can be altered fairly quickly by budgetary stringencies, resulting in inadequate availability of material inputs such as books and of personnel inputs such as teachers. Even with civil service regulations precluding the rapid dismissal of teachers, for example, normal attrition without replacements can reduce the numbers of teachers (often quite capriciously from the micro point of view of individual schools), and turnover with less qualified replacements can reduce the quality of such teachers. Reduced real wages and salaries for teachers and other staff as part of budgetary stringency may tend to increase such attrition and turnover. But such effects may not be so large in the short run because overall macro stringency probably diminishes the immediate attractiveness of alternative employment for such individuals. Even if such real wage declines do not cause an exodus of experienced teachers in the short run, they may cause morale problems or encourage moonlighting that reduce the short-run efforts of teachers. They also may cause longer-run exodus of experienced teachers and less success in attracting higher quality new recruits if the adjustment policy is reasonably successful from an aggregate perspective so that other opportunities for relatively-well-educated individuals improve, particularly if real wages for teachers do not increase rapidly enough. Though the immediate impact of any budgetary stringencies is likely to be mostly on current material inputs and on staff, there may be some important effects even in the short run on physical stock. Schools and training institutions simply may be closed, which may appear to be a sensible rationalization from an overall point of view, but imposes at least a time and transportation cost on those who would have utilized such facilities had they not been closed. Maintenance, moreover, often is reduced in such circumstances, which may have a delayed, but still substantial impact on the provision of educational infrastructure. Moreover, it appears at times that there are threshold effects with regard to maintenance of such capital stock, with the result that the cost of delays may be considerable in the longer run.

6.17 Though such educational infrastructure is the most obvious part of the social infrastructure to affect educational investments, it is not necessarily the only part of the social infrastructure that is relevant. Reductions in other social services may have a negative impact on education, either because their provision is coupled with the provision of education or because they work through households to affect the demand for education. Examples of the former include food and nutrition programs that are provided through the educational system, such as subsidized or free school meals. Reductions in such programs in themselves may reduce the attractiveness of sending children to school because of the lessened tied (to schooling attendance) real income transfer in the form of food to the families of such children. But reductions in nutrition and health programs may have a negative impact on schooling attendance even if such programs are not tied to school attendance, both by reducing the real income of the former recipient households and by increasing to them the effective prices that they pay in money and/or time for health and nutrition inputs, which in itself may reduce the productivity of time that children spend in school and thereby lessen the incentive for such children to even be in school.[6] Reductions in other social infrastructure, such as in more general welfare provisions, are likely to have a similar income effect on the demand for education, though not a particularly important price effect.

6.18 Changes in economic infrastructure due to adjustment policies also may have indirect effects on education. In the short run these are likely to be three. *First*, reduction in maintenance and in expansion of transportation and communication systems as part of efforts to reduce fiscal deficits may increase the time and monetary costs of travel to educational institutions and thus effectively increase the price of such attendance to actual and potential users. *Second*, the reduction of such activities is likely to reduce the demand for laborers, with negative impact on the income of households and the accompanying reduction in their demand for education through the labor market (as discussed above). *Third*, the adjustment policy may affect the expected longer-run quality of the economic infrastructure and thereby

alter expectations about general economic development and thus the economic returns to education. It is hard to know a priori in which direction this effect is likely to work since reasonable expectations may be for an initial deterioration in economic infrastructure due to short-run fiscal stringency but for eventual improvements in such infrastructure relative to what it would have been without the adjustment policy if the adjustment policy in fact succeeds in longer-run economic development-related goals. In the longer run the adjustment policy can have similar indirect price and income effects on the demand for education, depending crucially on the degree of success of the adjustment policy.

Assessing empirical links between macro adjustment policy and the meso setting for the determination of education

6.19 The empirical assessment of the links between macro adjustment policy and the meso setting for the determination of education is difficult indeed. This is so for at least seven reasons. *First*, a number of the effects of adjustment policy on the meso setting described previously, work their way through the complexities of the overall economy in order to affect factor, product and credit markets. *Second*, some of the effects work through altering expectations about returns to educational investments, and such expectations usually are not known well by policy makers and analysts. *Third*, there is a time dimension to the effects, with substantial differences and possibly even reversals in effects over time. *Fourth*, some of the important changes in the meso setting may be quality changes rather than quantity changes, which usually are not observed very well empirically. *Fifth*, some of the changes may occur through rationing rather than price changes, and the former may be harder to observe or to control in the estimates than the latter. *Sixth*, the whole evaluation presumably should be in comparison with what would have occurred without the adjustment policy, not in comparison with some ideal or unsustainable situation. *Seventh*, in many cases previously existing analytical studies and tools, such as applicable economy-wide models, are likely to be limited or nonexistent.

6.20 Nevertheless, the issues are important and therefore it is desirable to proceed as effectively as one can with analysis of the relations between adjustment policy and the meso setting for the determination of education. Such an evaluation requires an economy-wide perspective and the capacity to control for the counterfactual situation regarding what would have happened without the adjustment policy. If the country experienced a commodity boom or bust with regard to its major primary commodity exports at the same time that it was attempting to undertake the adjustment policy, for example, it would be misleading to look at the impact on the meso variables for the determination of education without controlling for changed world commodity markets.

6.21 Ideally one would like an evaluation of such effects for each of the major meso variables that are suggested in Frame 6.1 [7] for each of the major types of households that are likely to be of primary concern because their location in the income distribution means that their decisions regarding educational investments are likely to be particularly at risk due to adjustment. Hopefully some important elements of the types of meso data that would be desirable will be available from the other SDA studies of the country, particularly those on the poverty profile, and employment and earnings.

6.22 To evaluate the impact of adjustment policy on the meso variables related to the determination of education, ideally one would use an economy-wide model of the relevant economy that includes the explicit details of the adjustment policy and controls for other shocks and that determines endogenously the meso variables of interest. Such an evaluation can be facilitated enormously if there exists usable and sensible economy-wide models that incorporate all or most of the explicit policy changes that are part of the adjustment policy package, other primary sources of macroeconomic shocks (e.g., changes in the international terms of trade), and endogenous determination of the major meso variables of relevance. With such a tool, counterfactual experiments could be conducted to evaluate the impact of the adjustment policy on the major relevant meso variables. In the best of all cases such models may be available to determine *some* of the variables of interest. For example, there are some models such as those in Dervis, de Melo and Robinson (1982) and Adelman and Robinson (1988) that generate some of the important variables regarding income distribution and factor and product markets. If such models are available, they should be used to estimate the impact of adjustment policy on as many as possible of the variables in Frame 6.1. But in the best of all

cases such models as are currently available do not permit estimation of the impact of adjustment policy on *all* of these variables. Moreover, in most cases such models are not readily available at all. Since the construction of such models or the adaptation of existing ones is likely to require resources far beyond those available for the study of the impact of adjustment policy on education, some alternative approaches generally are required to estimate the impact of adjustment policy on the relevant meso variables.

6.23 In the absence of such tools, two modes of analysis are recommended as components of a second-best approach.

6.24 *First,* for the meso variables of interest it would be desirable to undertake estimates of the deviations from the secular trends during the adjustment period. The relevant questions to ask are: (1) are there significant deviations from the underlying secular trends and (2) if so, do they appear to be in a pattern that suggests that the deviations in the relevant meso variables may have been caused by the deviations in the adjustment policies instead of by other macro shocks? Simple regressions of these variables (or of their logarithms) on time trends and on dichotomous variables for the structural adjustment period provide a means of evaluating whether there have been significant deviations from the underlying trends during the period of the adjustment effort.[8] Such a procedure permits the separation from ongoing trends of events that at least are coterminous with the adjustment policy. Therefore it lessens the possibility of misinterpreting, for example, any ongoing deterioration in meso variables due to the previous situation that called for the adjustment effort as being due to the adjustment policy. It also lessens the possibility of mis-attributing an impact to the adjustment policy if there is a one-year change in the reported value of some relevant meso variable from the period immediately before the adoption of the adjustment policy to the first period of the adjustment policy by incorporating information about a longer time period.[9]

6.25 While such a procedure is likely to be much more systematic and satisfactory than frequent efforts that merely selectively eyeball the available data, such a procedure has its limitations: (1) The presumed counterfactual is continuation of the secular trends, which in some sense could not have been maintained for long since the previous situation was not sustainable; for this reason, if anything, such a procedure uses a counterfactual that (at least eventually) is too optimistic about what the situation would have been otherwise and thus too pessimistic about the impact of the adjustment program. While the bias towards excessive optimism (at least eventually) about the counterfactual situation seems likely if indeed there is a need for the adjustment policy, it does not follow that there is such a bias for the initial part of the adjustment period in such a counterfactual. If employment was high prior to the adjustment policy because of unsustainable governmental deficits, for example, then eventually — but not necessarily at the start of the adjustment policy — such employment probably could not have been sustained. At most such a

Frame 6.1: Suggestive list of meso variables for SDA analysis plan for education

1. Markets
   - *1.1 Factors*
   - Labor
     - Wage rates (low-skilled; higher-skilled as bases for expected returns to education; teachers, trainers; by sex, region, experience)
     - Employment/Unemployment by skill
   - Nonlabor
     - Inputs for small-scale own-enterprise (prices and availabilities)
     - Inputs for education (prices and availabilities)
   - *1.2 Products*
   - Education
     - Schooling prices and availabilities (including admission examination success rates and other indicators of rationing)
     - Training prices and availabilities
   - Major consumption items
     - Staple and other food prices
     - Nonfood prices (e.g., clothing, housing, health inputs)
   - Major products of small enterprises — prices
   - *1.3 Financial*
   - Formal: interest rates, terms, availabilities
   - Informal: interest rates, terms, availabilities

2. Infrastructure
   - *2.1 Social*
   - Education
     - Schooling: quantity and quality (e.g., teachers/student, education of teachers, books and other teaching materials per student)
     - Training: quantity and quality
   - Noneducation: quantity and quality of health and welfare services
   - *2.2 Economic — current and longer-run expenditures and staff*
   - Transportation
   - Communication
   - Employment related
   - Extension (agricultural, other)

procedure indicates association, not causality, and even understanding the association may be somewhat difficult if there are lags in the impact of adjustment policy.

6.26 But despite such limitations, in many contexts looking at the deviations from the secular trends of the relevant meso variables may be a cost-effective way to evaluate the impact of adjustment policy on such meso variables and to avoid errors that easily can occur from selective eyeballing of the data or from proceeding on the basis of a priori suppositions.[10] The results of such an investigation indicate whether the changes in the meso variables were significant during the adjustment period. If they were significant, such estimates also give an estimated magnitude of the associated change that could be used with the micro estimates discussed in paragraphs 6.28 through 6.59 to estimate the impact on education.

6.27 *Second*, for some of the meso variables there might a priori seem to be particularly strong links with particular elements of the adjustment policies.[11] For example, reductions in real central governmental educational expenditures plausibly might have a direct impact on the available indicators of educational infrastructure such as those that are suggested in Frame 6.1. But at the same time a x% reduction in governmental expenditures is not likely to have a x% impact on the indicators of educational infrastructure because some internal efficiencies may be implemented, because relative prices may change, and because there may be substitution among inputs in the "production" of education. Moreover, the effects of the reduction in central governmental educational expenditures probably affect differentially different types of households of interest due to their differential locations and use of different components of the educational infrastructure. Therefore it may be useful to estimate reduced-form relations with the available indicators of educational infrastructure as the dependent variables and with central governmental expenditures on education and other important indicators of adjustment policy as the right-side variables. Such relations may provide a useful basis with which to explore the possible impact of actual and of alternative patterns of changes of central governmental educational expenditures and other policies on education.

Meso-micro analysis of the impact of adjustment policy on education

6.28 The previous section discussed the market and infrastructure dimensions of the meso setting in which the determinants of education occur and how one might estimate the impact of adjustment policy on the key variables in the meso setting. Paragraphs 6.01 through 6.27 suggest a number of hypotheses about the impact of adjustment policy on education, as transmitted through the market and infrastructure conduits of the meso setting:

Hypothesis 1: The income effect, reflecting developments in both factor and product markets, is likely to lead to a short-run decline in the demand for education ceteris paribus for households whose incomes decline due to budgetary stringencies or dependence on production of nontradables (e.g., many urban labor and informal sector households), but even in the short run there may be the opposite effect for households that depend on tradable production for their income (e.g., smallholders and rural labor households that depend on production of tradable staples for their income). In the longer run, if the adjustment policy is successful, the generally increased income is likely to lead to increased demand for education for most households, ceteris paribus.

Hypothesis 2: The direct educational price effect related to the cost side is likely to be negative for many households, but ambiguous for other households. In the short run the time and monetary costs of education are likely to increase generally due to reduced educational and transportation infrastructure, increased formal schooling and training user charges, and increased rationing of positions in public schools and training programs, all reflecting budgetary stringency, though some of these effects may be lessened with more time if the adjustment policy is successful. Households and individuals that face *increased* demands for their labor in the short run (e.g., smallholders and rural labor households that depend on tradable production of staples for their income once again) and in the longer run (probably most households if the adjustment policy is successful) have the negative price/cost effect reinforced through the higher opportunity cost of their time in terms of economic activities. On the other hand, in the short run a number of poor households are likely to face *reduced* opportunity costs of time devoted to education because

of the lessened overall aggregate demand, reinforced by shifts in the composition of demand due to relative price shifts for those involved in production of nontradables. The opportunity cost of time dimension of educational prices/costs, thus, is likely to be in the opposite direction from the income effect.

Hypothesis 3: The price effect directly related to the expected rate of return on educational investments is likely to be generally positive if there are expectations that the adjustment policy will be successful in improving at least somewhat overall economic prospects. The exceptions to this general statement would seem limited to some specialized form of training for occupations in production activities in sectors that are likely to decline because the expected negative price effects due to the adjustment policy more than outweigh the expected positive income effects if adjustment policy is somewhat successful in the longer run. Casual observation suggests that such specialized training for such declining sectors is not likely to be very widespread.

6.29 The present section is the heart of this Chapter: how to analyze the impact of adjustment policy, through the induced changes on the meso setting, on the micro determination of schooling and how to test resulting hypotheses. At the micro level, as emphasized in paragraphs 6.01 through 6.07, there are both demand and supply sides of the determination of education. But to the extent that much of the supply side is determined by governmental policy (as for formal public schooling and training), important and perhaps predominant components of the supply determinants already have been discussed with regard to the meso setting. They basically affect the infrastructure faced by the household. Therefore this section focuses on the demand for education, though such demand is conditional on supply considerations and there is some discussion of supply considerations. Since the locus of demand decisions concerning education is usually centered in individuals who share a number of resources within a household, the household is the focal unit of analysis.

The household's role in the determination of education

6.30 As noted, the household plays a major role in the determination of the demand for education of its members. With a broad definition of education (not just one limited to its formal components), the household also plays a major role as the supplier of some forms of education. Parents, relatives and older siblings, for example, help to educate younger children. And probably there is some important education that adults receive from the children as well, though there may be differential perceptions across the generations about the relative importance of the flows in the two directions. If the household also is the locus of a family farm/firm, there probably is further education that accompanies the employment of household members in that enterprise. Sometimes, particularly in agriculture, such education about the local micro environment appears to be quite important in determining micro household enterprise productivity.

6.31 Before turning to the conceptualization of household behavior, two general points merit emphasis. *First*, the definition of what constitutes a household is not without controversy. Is a household a coresident group? Those who share a hearth? Those who share other functions and resources? But for practical purposes, the definition of households that matters to the researcher is that used in the survey basis at hand. *Second*, the household is not the only institution in which individuals are involved, nor the only institution that may affect educational demand. Individuals are involved in a multiplicity of networks and relations, including (but hardly limited to) relatives, friends, religious associations, work relations, tribes, clans. All of these may affect the determination of education. But generally the household is the most important institution of relevance for this purpose, and to a certain extent the roles of these other institutions can be captured by resource transfers to and from the household. In fact, the available data do not permit much representation of these other institutions beyond the resource transfer role.

6.32 The standard economic conceptualization of household behavior includes a set of allocation rules, household production functions, budget constraints, predetermined assets of the household, and exogenous prices and infrastructure. An example of an allocation rule would be to maximize the satisfaction of household preferences or to engage in bargaining among household members to determine allocation of resources and of time uses among them. An example of a household production function would be that the health of a child is "produced" by the food, water and health care that the child receives, the child's genetic endowments, the household and

community environments, the health-care skills that the child's mother has (reflecting both her formal education and the habits and knowledge she has acquired over time) and the time that she devotes to health care of the child. The budget constraint is a "full income" constraint that indicates that the total available household resources (including the time of household members, as well as physical and financial resources and transfers to the household) must equal or exceed the total use by the household of such resources (purchases at market prices, time uses including those related to education and to economic activities and household production and leisure, and transfers from the household). The predetermined assets of the household include physical and financial assets and human resource assets, which in turn reflect previous formal education and training and usually unobserved endowments due to factors such as genetics and childhood environment of current adults.

6.33 Application of the relevant resource allocation rule leads to reduced-form demand relations for each of the variables determined by the household, including the time uses of all household members, and including among those time uses the time spent investing in education. These left-side variables may be continuous, such as the time spent in education or test scores. They also may be limited dependent variables, such as admission to a given schooling level or to a given type of schooling at that level (e.g., admission or not to public and to private secondary schools). The right-side variables in these relations are the variables that are given (or predetermined or exogenous) from the point of view of the household: assets, prices and infrastructure: [12]

$$Z_{ij} = f(A, P, I) \qquad (1)$$

where Zij is the jth outcome determined by the household affecting the ith individual in the household (most important examples of which for this chapter are the time and other resource uses of various individuals in educational investments, examination performances, and admissions to various types of schools); [13] A is a vector of all of the predetermined assets of the household for the period of relevance (physical, financial, human resources, genetic and other endowments); P is a vector of all the relevant product and factor market prices that the household faces; and I is a vector of all of the relevant infrastructure that the household faces.

6.34 The basic *research strategy* has the following four steps:

1. Prepare data from the SDA household survey and from other sources that permit estimation of a set of relations of the general form of equation (1) for all of a number of outcomes related to education that are observed in the survey.
2. Estimate relation (1) from these data for all of the relevant outcomes.
3. Estimate the changes in the right-side meso price and infrastructure variables that are due to the adjustment policy for a given duration of that policy by relating the changes in the variables used to estimate the alternative versions of equation (1) to the estimates of the changes in the meso setting induced by the adjustment policy that are discussed in the previous section.
4. Use the following differenced form of the estimated relations of the form of equation (1) and the estimated changes in the right-side meso variables from step 3 to estimate the impact of adjustment policy of a given duration on various outcomes related to the determination of education:

$$\Delta Z_{ij} = f(\Delta P, \Delta I), \qquad (2)$$

where Δ is the difference operator for the relevant duration of the adjustment policy under consideration.

6.35 Most of the rest of this section is devoted to elaborating in some detail on these four steps. But before turning to those details, it is useful to emphasize five important features of relations (1) and (2).

6.36 *First*, both relations refer to an outcome for a specific individual, but both include on the right side predetermined characteristics of all individuals in the household. That is, for the determination of the time invested in the education of small children or the probability of admission to different schooling levels, the schooling and other human resource endowments of all household members are included. This is the case because if any of these predetermined human resources were different, the difference would cause a change in total household resources and a re-allocation of household resources that in general might affect the time invested in education of small children or the probability of admission to different schooling levels, together with all other outcomes determined by the household. This means that for the exploration of the impact

of adjustment policy over a given duration on a number of different dimensions of educational investments by a household (e.g., education of small children, admission to levels of education for which there is rationing, apprenticeships of older children, training of young adults), the right-side variables should be the same even though the outcomes differ.

6.37 *Second*, for similar reasons the prices include all relevant product and factor market prices and the infrastructure variables include all relevant social and economic infrastructure. That is, the prices include not only the direct prices of education, but all product and factor prices affecting the household. These include the prices of all important consumption products and services items faced by the household, including the prices of the opportunity costs of time of household members. If the household has a family farm or enterprise, moreover, all the relevant product and factor prices for that activity also should be included. [14] Likewise, the infrastructure should include not only the social infrastructure directly related to education, but also the social infrastructure relating to health and other outcomes and the economic infrastructure. Changes in the health infrastructure due to adjustment policy, for example, may affect household resources and resource allocation (including the time for investment in education) whether or not they affect the health of the individual of concern regarding a particular educational investment.

6.38 *Third*, note that income is not included explicitly in either relation. However, income is included implicitly because income is the return on assets (importantly including time) and both the assets and their returns (the latter in the prices) are included. This treatment avoids the estimation and interpretation problems that would occur if an income measure were included that reflected the endogenous choices of the household, such as the number of hours worked in economic activities. It also allows, in so far at the data permit, the representation of the possibility that the income effects vary depending on who in the household receives such income. For example, some conjecture that the income impact will be greater on children's education if mothers receive such income than if fathers receive such income. If so, an increment in mother's education ceteris paribus might be associated with a greater impact on children's schooling than an increment in father's education that results in an identical increase in family income.

6.39 *Fourth*, any given estimation is for a given time period. As the time period lengthens, the changes in the right-side variables in equation (2) also differ. The time pattern of such changes presumably depends critically on the time pattern and the success of the adjustment policy. If budgetary stringency causes deterioration in infrastructure and reduced real wages initially, but adjustment policy leads eventually to better infrastructure and higher real wages than would have prevailed without the adjustment policy, then the short- and the longer-run impact of adjustment policy must be considered separately.

6.40 *Fifth*, the exclusion of any of the right-side variables at the estimation stage may cause omitted variable biases if such variables are correlated with observed (and included) right-side variables. Important examples of difficult to observe right-side variables include abilities and motivations of different household members and rationing rules, both of which may cause biases, for example, in the estimated coefficients of household assets or income. [15] The suggestion below to include among the outcomes admission examination performance and admission success is motivated in part by the desire to deal directly with rationing, though this exploration will be free of bias only if such examinations are the only basis for rationing. If there are other bases for rationing in particular countries, it would be very useful for the researchers to collect information on the rationing procedures so that there can be control for such rationing in the estimation. [16]

Step 1: Variables to be used in the micro analysis of household demand for education

6.41 We now turn to details concerning the variables that are represented at a high level of abstraction in equations (1) and (2). Of course exact representations of the concepts underlying many of the variables are not available in many cases. However, often one or more indicators of the desired variable are available. If there are several such indicators for a particular variable, it generally will be desirable to explore the empirical implications of the alternative indicators since each may be measuring imperfectly the phenomenon of interest. In some cases good indicators for the relevant variables exist in the SDA household survey data. In other cases some manipulation of the SDA household survey will be required. In yet other cases — particularly

with regard to data on test scores or other variables used to ration public school places — it is strongly recommended that the SDA household survey be supplemented by community surveys and other approaches to obtain the necessary information. Consider first the dependent variables and then turn to the right-side variables. Before considering the details of concern about individual variables, however, it is important to emphasize that each of the relevant variables first should be examined to see if the distributions are plausible since errors easily can creep into statistical analysis. Questions should be asked, for example, about whether the ranges of variables are sensible. If some seven-year old children are reported to have completed five grades of schooling, for instance, there probably are some problems in the underlying data that need to be rectified before proceeding.

6.42 INDICATORS OF RECENT EDUCATIONAL INVESTMENTS AND OTHER RELATED OUTCOMES. Recent educational investments and other related outcomes (e.g., admission to public school at different school levels) are of particular interest because they reflect recent developments and because the variables that will be available to represent the right-side determinants of education for the estimation of equation (1). The education section of the prototype SDA household questionnaire contains information about recent formal schooling and some information about apprenticeships, though it does not include much information about other forms of education.

6.43 For household members in the 7-30 age range, it is asked whether they attended school in the past 12 months. This is likely to be the single most useful variable in the current SDA prototype household questionnaire for the assessment of the impact of adjustment policy on education through the estimation of relation (1) and the use of relation (2). The advantage of this variable over others is that it refers to the recent experience on which the other household and community survey data focus. However, since whether or not a particular individual attended school in the past year is likely to be heavily dependent on whether that individual attended school the previous year, in a sense this variable still reflects the impact of more distant past conditions.[17] With the data obtained in the prototype SDA household survey, it is possible to explore some dimensions of the possible impact of previous conditions indirectly, though not to control for them as directly as would be desirable in an ideal world. Because rationing of school places apparently is important in many contexts, especially for post-primary schooling, it would be desirable to supplement the current prototype SDA household survey with information related to the outcomes of such rationing. For example, if rationing is by scores on examinations, it would be useful to know if each child sat for such examinations in the past year and if they did, what scores they obtained (or at least, whether they were successful in obtaining admission).[18, 19] Because schooling attendance varies enormously across different children and with differing conditions related to child health and participation in income-generating activities, it also would be useful to collect information on days absent from school for children who were enrolled in school in the past year.

6.44 Since schooling attendance and examination sitting and performance all are highly age-dependent and perhaps sex-dependent, the first step in the analysis should be to summarize the sample data controlling for age and sex. Frame 6.2 provides a useful framework for an initial summary of a number of relevant variables by age and sex. Age is indicated by year in this table, not some more aggregated grouping, since there often are significant differences between two adjacent years of age regarding schooling attendance and examination performance, particularly for ages that are the transitions between one schooling level and the next schooling level for many students. Examination of these data will provide the basis for making several decisions about subsequent analysis. *First*, this examination will be a critical input into the decision on which ages to concentrate. The ages of most interest for the present Analysis Plan are the ages at which there is substantial variance of schooling attendance and at which decisions are made about continuation of schooling to subsequent levels, perhaps in part through some rationing mechanism such as admission examination performance. If due to compulsory schooling attendance regulations almost everyone attends the initial grades of schooling, for example, then the ages associated with those grades are not of much interest for the proposed analysis. If almost no one continues into tertiary schooling, on the other hand, the ages associated with such schooling also are not of much interest for the present purpose. What is of interest are the ages for which there is substantial variation in schooling atten-

Frame 6.2: Summary of schooling characteristics from SDA survey: range, median, mean, standard deviation and number of observations for following variables by age and sex[a]

General education
- Ever attended school
- Highest grade
- Highest diploma

Past 12 months[b]
- School/college attendance
- Grade enrolled in
- Time going to and from school

Educational expenses (past 12 months)
- School and registration fees
- Contributions to parent associations
- Uniforms and sports clothes
- Books and school supplies
- Transportation to school
- Food, board and lodging
- Other expenses (clubs, extra classes)
- Other in-kind expenses
- Who paid
- Scholarship?
- Value of scholarship

Characteristics of main occupation in past 12 months
- Training in present job?
- Training duration
- Hours per week in training
- Who paid for training
- Salary lower during training?
- How much salary lower

Characteristics of secondary job in past 12 months
- Training?
- Training duration

High priority additional variables[c]
- Examination performance[d] and time of examinations (for admissions and for achievement) particularly for past year, but also for earlier years if possible
- Whether in school one year earlier and, if so, in what grade
- If in school in past year, number of days absent from school

Curriculum

Primary
- Highest grade
- Interruption?
- Length of interruption
- Repeat grade?
- Number of repeats
- Public/private
- Certificate?

Secondary
- Ever attended, type
- Highest grade
- Repeat grade?
- Number of repeats
- Highest certificate
- Private/public

Technical
- Ever attended
- Highest grade
- Highest certificate
- Private/private

Tertiary
- Ever attended
- Years
- Institution type
- Highest diploma

Apprenticeship
- Ever been?
- How long
- Main trade
- Fees?
- Free room and board?

Training courses
- Ever attended
- Months attended
- Main subject

a. Based on May 1989 version of SDA draft household questionnaire. For dichotomous variable or variables with relatively few categories, present percent distribution across categories. Some of the questions are not applicable for some ages (e.g., those on secondary schooling for seven year olds).
b. This information is particularly relevant since it is for past 12 months about which much other information is available.
c. This information is not in the current prototype SDA household survey but it would be valuable to add it. If rationing of public school places is by some means other than admission examination performance, it would be desirable to collect information on the rationing mechanism and how each individual child fared with regard to that mechanism.
d. If examination scores are not available, information instead about passing versus failing admissions examinations will be useful.

dance and for which there are substantial changes in schooling attendance. *Second*, this summary of the data will give insight into whether other variables are of interest or not for differing age-sex groups. For example, scholarships may be of relevance only for certain age ranges or schooling levels. *Third*, these data will give an indication of whether there are sex differentials in schooling attendance, in highest grade completed, in total expenses, in scholarships, in who paid for schooling expenses, in schooling interruptions, in repeating grades, in days absent from school, in sitting for admission examinations, in success on admission examinations, and in cognitive achievement. In light of the often hypothesized high returns to female schooling and the frequent

apparent differences in the educational options for males versus females (e.g., Schultz 1988b), asking systematically whether there are such differences is useful. Careful examination of the version of Frame 6.2 for males versus that for females should be enlightening in this regard. Quite possibly such differences are small, if existent, in certain age ranges (probably the younger ones), but may be larger and favoring males in other age ranges. Therefore such examination should proceed with sensitivity to possible changes in sex differentials with age. Beyond visual examination of these data it will be useful to test for statistical differences between the sexes for different variables so that it is clear where the differences are significant in a statistical sense.[20] *Fourth*, these data will provide useful background for the multivariate analysis in step 2 in other respects. For example, as noted above, there is a question about how dependent the schooling attendance decision for the past year is on whether or not a particular individual attended school in the year before last. The information summarized in this table regarding attendance proportions by age and schooling interruptions should help to understand whether or not for given age ranges almost everyone attends school (so for such an age range there is not a problem regarding past experience) and whether schooling interruptions are common (in which case whether or not an individual attended school the year before last is less relevant in the decision about attendance in the past year). Another important example pertains to the question of who paid for schooling expenses; in particular, to what extent did individuals beyond the parents pay, since that may influence the specification of the right-side variables in the estimated version of relation (1) for some age ranges.

6.45 After such examination of the data, the dependent variables should be defined. In such a definition a basic question remains how to treat age and sex differences. As is noted in the first two points in the previous paragraph, consideration of Frame 6.2 in most cases should narrow considerably the relevant age ranges for independent variables of interest. The examination of sex differences in point three also may limit the sex differences of relevance. Nevertheless, in most cases there will remain a number of ages of interest and some evidence of sex differences in schooling attendance and related variables. At least two strategies are possible for dealing with these. One, the dependent variable can be defined relative to that for other individuals of the same age and possibly sex by subtracting the mean experience for the relevant reference group defined by age and sex.[21] Such a procedure has the advantage of controlling for age and possibly sex in a manner that makes it possible to combine observations across individuals in the multivariate analysis discussed in step 2 below without further concern in the estimation for age and sex differences, but at the cost of assuming that once there is this control there are no other age-sex differences in the coefficients of relation (1). Therefore subtraction of the reference mean for the same age and possibly sex seems to be the preferred way of modifying the dependent variable to control for age and possibly for sex. *Two*, alternatively, some or all of the estimated coefficients can be allowed to differ across age and sex with the untransformed variables used as the dependent variables. This has the advantage of allowing for greater flexibility in accounting for differential effects in the coefficients of relation (1) by age and sex, but at the cost of estimating, presenting, and interpreting more relations. This cost, of course, is less the more that the initial examination of Frame 6.2 leads to a limited number of ages of interest. The second alternative is likely to be preferable unless the difficulties of estimation are very large (so that there is a great advantage to undertaking fewer estimates) or the sample is very small (so that there is a great advantage to combining observations across age and sex groups).

6.46 The first panel in Frame 6.3 (overleaf) gives the dependent variables of interest, which are available from the SDA Integrated Survey (with suggested additions regarding examination performance and days absent from school in the past year) and with an indication of probable priority. The first-priority variables refer to the education experience of the past 12 months, for which period there is considerable information for the right-side variables. The second and third priority variables are of interest, but are measured for any time in the past (not just the last year) so the indicators for the right-side variables have much more measurement error given that the right-side variables change over time.

6.47 The second panel in Frame 6.3 gives similar information for the right-side variables that represent the predetermined household assets, the time and money prices, and the infrastructure. The major general point about these variables is that the last two groups depend much

more on community than on household characteristics, and thus are more likely to be attained from community questionnaires, though by averaging across household variables in a given community one also can obtain information about the nature of the community markets and infrastructure. The indicated priorities are only meant to be roughly suggestive about what variables might tend to be most important for the purpose of this analysis plan, though of course there may be substantial variations across countries, regions within countries and household types.

6.48 The following variable-specific point should be noted. For the predetermined adult education in the household, education for parents is indicated as first priority. But, as noted above, others may play a major role in the determination of children's schooling. If the examination of Frame 6.2 leads to the conclusion that others within the household often are important, it would be desirable to treat the schooling of other adults in the household as first priority variables rather than as a second priority variables as is indicated in Frame 6.3.

Step 2: Estimation of relations for the determination of the education indicators

6.49 Once the variables in Frame 6.3 are ready, the relations of the form of equation (1) can be estimated with the alternative indicators of education that are given in Panel A and with the right-side variables that are given in Panel B. The natural starting point would seem to be estimates of the form of relation (1) in which all of the right-side variables enter in additively. Several points about this estimation merit emphasis.

6.50 *First*, all of the estimates should be multivariate estimates in order to control for the other observed determinants when obtaining the estimated impact of each individual determinant. In fact it is only to control for such possibilities that the A matrix should be included in equation (1), since in the differenced version in equation (2) it disappears. That is, it is only because some variables in A are likely to be correlated with those in P and I that is necessary to include the A variables in the estimation of equation (1). Parental schooling, for example, is likely to be associated with the quality of local schooling in I; therefore, if the former were excluded a priori, the estimated impact of the latter probably would be biased upwards.

6.51 *Second*, ordinary least squares (OLS) procedures should be used first for estimation. These have the advantage of being relatively easy and quick to undertake and of being relatively robust to problems in the underlying assumptions. In the present context, moreover, there should not be problems due to simultaneity and less-than-the-usual problems with omitted variables biases.[22] However, some of the proposed dependent variables are limited rather than continuous, in which cases the assumptions underlying the OLS estimates are not satisfied and OLS estimates may be misleading. Important examples of such variables include the dichotomous ones for whether one was in school in the past year, whether one has had training, whether one sat for admissions examinations for particular schooling levels last year, and whether one was admitted to particular schooling levels last year. For the relations for which such variables are the dependent variables it would be desirable also to use some limited dependent variables estimators such as probit, logit, or Tobit to see how robust the estimated effects are to the OLS violation in the underlying distributional assumptions. This is particularly likely to be important for variables for which the means are far from 0.5, such as the proportions of children at higher ages who attended school in the past year. For some possibilities the alternatives are more than two — for example, whether one was admitted to a public school, a private school, or not admitted. For these cases multinomial estimates should be made with all of the possibilities considered in one system of estimates.

6.52 *Third*, for a given dependent variable there is the question of how aggregate the estimates should be with regard to age, sex and household type. This issue was discussed at some length above with regard to age and sex, and it was concluded that it probably is preferable to undertake separate estimates by age and sex in order to explore whether the coefficients differ across age and/or sex. Also there is discussion above about the possibility that different type households (e.g., smallholders versus rural labor households versus urban labor households versus small-scale household enterprises) may face different demand conditions beyond the ways indicated by the observed right-side variables. For the OLS estimates, covariance analysis (sometimes called Chow tests) permit systematic evaluation of whether subsamples should be combined, and such tests should be undertaken. If the tests indicate that the restriction that the coefficient

Frame 6.3: Regression variables for determinants of education

	Probable priorities		
	1	2	3
Dependent variables (Z_{it})			
School/college attendance last 12 months	x		
Grade enrolled in last 12 months	x		
Private versus public schooling			x
Ever attended school[a]		x	
Highest grade completed[a]		x	
Highest diploma obtained[a]			x
Vocational/technical[a]			x
Highest vocational/technical grade[a]			x
Literacy (read short text)[a]			x
Literacy (write letter)[a]			x
Written calculations[a]			x
Ever literacy course[a]			x
Ever apprentice[a]			x
How long apprentice[a]			x
Ever short training course[a]			x
Months in short training course[a]			x
Training in primary occupation[a]			x
Training duration in primary occupation[a]			x
Training in secondary occupation[a]			x
Training duration in secondary occupation			x
* Whether sat for admissions examination for various schooling levels in past 12 months	x		
* Performance on admissions examination	x		
* If enrolled in school in past year, number of days absent	x		
* Cognitive achievement test scores	x		
Right-side variables			
Predetermined household assets (A)			
Human assets			
Mother's schooling[b]	x		
Father's schooling[b]	x		
Other co-resident adult's schooling[b]		x	
Mother in household	x		
Father in household	x		
Other adult co-residents		x	
Physical assets			
Housing characteristics			
Rooms per occupant		x	
Type of dwelling	x		
Occupancy status		x	
Drinking water source[c]			x
Lighting type[c]		x	
Cooking energy[c]			x
Garbage disposal[c]			x
Toilet type[c]		x	
Outside walls material[c]	x		
Floor material[c]		x	

estimates across such subsamples are equated is not rejected, then the relevant subsamples should be combined.

6.53 *Fourth,* there is an issue about exactly what subsample should be used for a particular estimate in order to avoid selectivity bias. Selectivity bias results when there is a selectivity rule for a subsample that is based on unobserved characteristics that play a role in the estimation for which the subsample is used but are not controlled in that subsample. [23] There is empirical evidence that selectivity bias may cause substan-

Frame 6.3: Regression variables for determinants of education (continued)

	Probable priorities		
	1	2	3
Roof material		x	
Area per occupant	x		
Production assets (total value of agricultural or other enterprise assets)[d,e]	x		
Factor, Product and Financial Market Money and Time Price (P)			
Factor markets			
Local wage rates (male, female)[f,l]	x		
Expected wage rate increases for relevant level of schooling[l]		x	
Inputs for own enterprises[g]			x
Major consumption item prices			
Basic staples prices[i]	x		
Other food prices[i]		x	
Other consumption prices[i]			x
Health services[j]		x	
Major own-enterprise product prices[e]	x		
Education prices			
Monetary costs[h]	x		
Time costs[h]	x		
Financial market prices			
Interest rates (formal and informal)			x
Infrastructure[k]			
Social			
Education			
Schooling/training availability[m]	x		
Schooling/training quality (e.g., teachers/student, qualification of teachers,books/student)	x		
Noneducation (e.g., health clinics)		x	
Economic			
Transportation (monetary and time costs to regional center)	x		
Communication			x
Employment-related			x
Extension		x	

a. Only for those < 25 years of age.
b. Zero if no information. Control with next set of variables.
c. Data will have to be examined to determine a relatively small number of relevant categories, each of which will be represented by dichotomous 0-1 variable.
d. It may be desirable to use physical measures of specific assets, such as agricultural land area.
e. The inclusion of this variable may depend on separating households by major income sources.
f. From community survey or averaging over household survey results for adults in same community with same schooling level (possibly with control for receipt of such wages).
g. For example, fertilizer for smallholders.
h. From community survey, or average over households in community.
i. Need to be careful regarding seasonal fluctuations.
j. Ideally from composite community health care price index from SDA Health Analysis.
k. From community questionnaire.
l. For example, the relative increase in wage rates in the local community due to the schooling/training level in question.
m. For appropriate schooling/training level given age. This may include, for example, the proportion of students in the community of a given age and sex who sat for particular admissions examinations and the average performance of such students.
* Not in current prototype SDA household survey instrument, but would be desirable to add (though cost of cognitive achievement score may be substantial since a standardized test would have to be administered).

tial misunderstanding of empirical micro relations related to human resources in developing countries (e.g., see the surveys in Schultz 1988b and Behrman 1990). Selectivity bias can be avoided by controlling for the selection rule in the estimates if a subsample is used [24] or by formulating the question so that the estimates do not depend on a selected subsample.

6.54 In the present context, the upper secondary schooling admissions decision provides an illustration. Those who are admitted to upper secondary school typically are very selected: They

entered and graduated from primary school, they entered (perhaps after some examination or other rationing procedure) and graduated from lower secondary school, and they in many cases sat for and passed the upper secondary school admissions examination. If one attempted to estimate whether or not they were admitted to upper secondary school only with the subsample of individuals who graduated from lower secondary school or who passed the upper secondary admissions examination (as in Appleton, Collier and Horsnell 1989 for Côte d'Ivoire), it would not be possible to interpret the estimates with confidence because the failure to control for the previous selection rules would be likely to cause selectivity bias in those estimates.

6.55 To avoid such biases, one of two options needs to be followed. (1) The previous selection rules can be controlled in the estimation of the outcome of interest.[25] One way of controlling for such rules is to include in the relation of interest a variable constructed from the estimated probability that each individual in the subsample would have been selected by the selection rules; that is, in the example of the previous paragraph regarding upper secondary school admission, to include a variable constructed from the estimated probability that each individual in the subsample had entered and completed primary and lower secondary school and had sat for and passed successfully the admission examination for upper secondary school. However, to follow such a procedure the selection rules must be identified. That is, there must be variables that determine the selection process, but which do not enter into the decision of interest.[26] In the case presently being discussed, this requires variables that affected entering and completing primary and lower secondary school and sitting for and successfully passing the upper secondary school admissions exams, but which do not have an impact on the decision of whether or not to enter upper secondary schooling. It is unbelievable that it will be possible to find variables that satisfy such conditions except through arbitrary exclusion restrictions in the SDA data.[27] (2) The question can be posed in a way so that the use of a selected subsample is avoided. For example, rather than estimate whether or not an individual who successfully passed the upper secondary school examination enters upper secondary school from the selected subsample of individuals who successfully completed that examination, one could estimate for the *entire* sample of 14 year olds[28] what determines whether or not they enter upper secondary school.[29] This may have the apparent disadvantage of lumping together those who do not enter upper secondary school for a diverse set of reasons (ranging from never entering primary school to deciding not to enter upper secondary school despite having passed the entrance examination). But it has the more than offsetting advantage of avoiding the selectivity bias that would result if the subsample were limited to some group such as those who sat for the upper secondary school entrance examination. Therefore, this general approach is recommended unless there is a possibility of controlling directly for the selectivity rules (which is anticipated to be relatively rare).

6.56 *Fifth*, there are a number of additional issues that might merit exploration for some countries. (1) *Interaction effects* may be important, say, between parental schooling and infrastructure (e.g., Schultz 1988a,b, Behrman 1990). Some have argued that parental schooling effectively substitutes for schooling infrastructure, while others have argued that it complements such infrastructure. Such possibilities could be explored by seeing what the sign of any significant interaction terms between parental schooling and observed indicators of schooling quality are if such terms are added to the linear form of relation (1).[30] (2) *Exogenous income components* may be explored instead of the assumption that all of income is endogenous. Typically in empirical studies, for example, it is assumed that "unearned" income (i.e., income other than from labor income) is exogenous. This assumption is problematic since such income often reflects current labor time use decisions in own farm/firm activities or past labor time use decisions that led to current returns to past savings in the form of physical and/or financial assets. Nevertheless, it may be desirable in some studies to test for the endogeneity of such unearned income by using the standard Wu-Hausman endogeneity test.[31] (3) *Who controls income*, not just the amount of household income, is thought by some to be important. In particular, there is the hypothesis that income controlled by women is more likely to lead to increased investment in child schooling (and in other forms of investment in children) than is income controlled by men. This may be important in assessing the impact of adjustment policy on education if such policy affects men and women differentially, as well it might due to occupational segregation by sex. It is very diffi-

cult to explore such possibilities empirically, however, because of the same problem just discussed of the endogeneity of income; this is an even clearer and more widely recognized problem if the income of interest is labor income, reflecting not only unobserved characteristics relating to wage rate determination but also those relating to labor supply. The basic proposed estimates will give some insight into this question if it is possible to include wage rates among the prices. [32] Beyond that, it may be possible to explore the impact of nonlabor income through the transfers received by different household members as recorded in Section XI of the prototype SDA household questionnaire if such transfers are sufficiently common, although the endogeneity issue remains. (4) *Unobserved household, individual and community fixed factors* may bias the estimated results, though as discussed above this may not be such a problem for the purpose of the project since the coefficient estimates of the parental schooling variables, that appear to be particularly susceptible to such problems, are not of primary interest in themselves for this analysis. In those cases in which the sample design leads to a panel data, however, this could be explored by differencing relation (1) over time before estimating it. Such differencing permits control for all individual, household, and community factors that remain fixed over time. (5) The *time period* may be relevant, if there are adjustment lags in various decisions. As is emphasized above, any given estimates are for a particular time period, so that the estimates may change over time. Generally, the available data do not permit much exploration of this possibility at the household reduced-form *estimation* stage, though there is some possibility of dealing with it at the next stage of the analysis in which relation (2) is used. Given the nature of the available data, it would seem that at the regression estimation stage the only question is what assets are assumed to be fixed in A. The longer the time period, the more such assets can be affected by savings/dissavings and further training and education even for adults. In some cases it may be useful to explore to what extent the estimates of the coefficients of the prices and infrastructure change if the set of variables in A is reduced by eliminating those that would seem to change most rapidly (e.g., measures of consumer and producer durables). In those cases in which there are panel data, some further estimates can be undertaken to investigate the lag structure (or at least a simple possible form of it) by including the lagged dependent variables in the relations. The coefficient of the lagged dependent variables can be interpreted as an adjustment coefficient within the following simple model:

$$X_{ijt} = a\,X_{ijt-1} + b\,(X^{d}_{ijt} - X_{ijt-1}) \qquad (3)$$

where the t and t-1 subscripts refer to the time period and X^{d}_{ijt} is the desired long-run level of X_{ijt} that is determined by observed variables as in relation (1) and towards which there is adjustment each period to cover b of the gap between the current desired long-run level and the previous period actual level. [33]

Step 3: Estimating the impact of adjustment policy on the price and infrastructure variables that determine household educational decisions

6.57 The next task is to use the results of paragraphs 6.08 through 6.27 to make estimates of the changes in the prices and infrastructural variables that enter into the right-side of relation (1) due to the adjustment policy. As emphasized in paragraphs 6.08 through 6.27, such changes are likely to be very dependent on the duration of the adjustment policy, and may change over time in magnitude and possibly even in sign. Therefore, it will be desirable to have sets of estimates of the impact of such changes for different time periods: the first year of the adjustment policy, a medium-term perspective of several years and a long-run perspective. Of course the longer the time perspective, the more speculative are such estimates. But it is important to keep in mind these different perspectives in order to assess fully the impact of the adjustment policy. For example, suppose that the immediate impact of the adjustment policy is to reduce economic options and the quality and the quantity of the infrastructure due to budgetary stringency, but that in the longer run it successfully turns around a stagnant economy and improves economic options and the infrastructure. In such a case an evaluation that considered only the short-run effects probably would undervalue the gains from the adjustment policy just as one that considered only the longer-run effects would overstate the gains.

6.58 The meso variables considered in paragraphs 6.08 through 6.27 and the meso variables used in the estimates of relation (1) that are discussed in this section generally will not be identi-

cal. Therefore, some links will have to be established. Probably it will not be possible to estimate linking regressions for such links since the necessary data are not likely to be available. [34] Therefore, the researchers will have to use their judgement to determine to what extent the more aggregate changes measured in paragraphs 6.08 through 6.27 affect the disaggregated variables used in the estimation of relation (2). For example, if the real central governmental resources on primary education declines by 10% in the first year of an adjustment program, what impact is that likely to have on the schooling infrastructural variables that are used in the regression estimates? Considerations to keep in mind in making such judgements include that some increased efficiencies may be induced by the restriction in resources, that there may be induced shifts in the composition of inputs into the educational production process by the induced changes in prices and scarcities due to adjustment policy, that prices may go down considerably for some important inputs (particularly staff), and that some of the resources for local education come from sources other than the central government. All of these considerations imply that the probable declines in the indicators of local schooling infrastructure that are used in relation (1) are likely to be less than in the more aggregate measures that are discussed in paragraphs 6.08 through 6.27. Given the inherent uncertainties in making such judgements, however, it probably will be desirable to make a range of estimates under alternative assumptions about the extent to which the intervening factors such as mentioned above mitigate the impact of adjustment policy on the meso variables observed at the household level.

Step 4: Estimation of the impact of adjustment policy on educational indicators

6.59 This last step is straightforward. Simply use the estimates of the changes in the meso variables from Step 3 and of the parameters of relation (2) from Step 2 to estimate the impact of adjustment policy on the range of educational indicators included in the dependent variables (Z_g) of Frame 6.3 for alternative time periods and for alternative assumptions from paragraphs 6.57 through 6.58 concerning the extent to which observed more aggregate changes from paragraphs 6.08 through 6.27 affect the indicators of the meso setting used to estimate relation (1). For any given outcome, this will lead to a set of estimates. For example, there will be a set of estimates regarding ranges of possible induced changes in school attendance for primary-age boys for the first year of the adjustment policy, for the medium run, and for the long run.

Policy implications

6.60 The policy implications that can be discussed in any specific case of course depend on the details of that case. But this Analysis Plan has indicated an approach to attempt to quantify the impact of some adjustment policy related choices on educational investment, and thus hopefully to inform better policy choices. In this section an attempt is made to provide some general principles on which such policy inferences may be drawn and to present some appropriate illustrations.

6.61 The *first* general policy principle pertains to the need to place the educational sector in a larger perspective. The effects of adjustment policy on education have to be assessed in terms of the tradeoffs elsewhere. If a given reduction in central governmental resources devoted to education would cause a 10% reduction in lower secondary schooling enrollments in the first year of an adjustment plan, the question of relevance is what is the trade-off in terms of other objectives? In order to lessen this reduction to, say, 5% how much deterioration would one have to accept in child health, the balance of payments, the rate of inflation, or in other indicators of the success of the economy regarding short- and longer-run goals? Although the type of analysis laid out in this Analysis Plan for education is partial equilibrium in nature, and the broader issues of tradeoff are economy-wide, the indicated analysis (together with similar analysis for other parts of the economy) can help to give some quantitative insight on the basis of which better policy formulation can take place.

6.62 The *second* general policy principle pertains to the importance of the time dimension. The impacts of adjustment policy on education and on other outcomes of interest have an important time dimension to them. It would be inappropriate for policy evaluation to consider either only the immediate impact or only the longer-run impact. Both need to be considered. Otherwise the chances of inappropriate evaluation of policies increase substantially. Of course it is difficult to know what the time paths are likely to be for all of the different outcomes of interest.

The approach taken in this Analysis Plan illustrates a means of attaining some quantitative sense of what the impact on education would be over different time periods. With the use of similar approaches for other sectors, the policy perspective over time with inherent tradeoffs over time can be illuminated to give a better basis for policy.

6.63 A *third* general principle is that there may be considerable substitution within the household regarding the demand for education and related outcomes. This is one important reason that changes in central governmental resources directed towards education may not result in simple proportional changes in education. The household that is making the education decisions is operating in a meso setting of multiple markets and social and economic infrastructure, all of which is likely to change somewhat in response to adjustment policy. Changes in household income due to changes in labor markets may have greater impact on educational investments than do changes in educational infrastructure. Only by viewing the household as making educational decisions within this larger context and allowing for internal substitution within the household can the probable effects of changes in the educational infrastructure due to adjustment policy on household educational decisions be estimated. This analysis plan gives an approach to such estimation.

6.64 A *fourth* general principle is that aggregation may be very important in understanding the impact of adjustment policy on education. The impact may be much different for males than for females, for primary schooling than for secondary schooling, for schooling versus training, for smallholders versus labor households, etc. Examination of the aggregate effects may miss many of these details. For example, if aggregate schooling attendance declined in the short run by only 3% it would be wrong to conclude that there were not some important deleterious effects if at the same time primary schooling attendance by girls in poor rural households declined by 15%, given both distributional goals and the high apparent total returns to schooling for females. The approach outlined in this paper permits some quantitative assessment of such differential effects.

6.65 A *fifth* general principle is that there also may be important choices that can be made regarding the impact of macro changes in central governmental educational expenditures that are the concern of adjustment targets relating to the overall governmental budget on the meso schooling infrastructure that households face. For a given central educational budget, there is a range of combinations of subsidies, user charges, scholarships, and direct provision of educational services that the Ministry of Education can provide. Different combinations may have different implications for the education of different groups in society. The general approach outlined in this Analysis Plan, particularly if supplemented by more analysis of the "production" of education from the supply side, can help illuminate what are some of the tradeoffs in determining the composition of educational policy given various educational goals.

Notes

1. These other Analysis Plans provide insight into the analysis of the impact of structural adjustment on the returns to education in labor markets, own enterprises and household production. Changes in those expected returns, in turn, feed back on the demand for education which is the subject of this Chapter.

2. Such a general discussion provides part of the background for all of the Analysis Plans. Addison, Demery, Ferroni, and Round (1990) provide such a discussion. Related references are Addison and Demery (1985), Behrman (1988), Behrman and Deolalikar (1988b, 1990) and Demery and Addison (1987a).

3. The impact of adjustment on actual labor market returns, including those to education, are discussed in the Analysis Plan on employment and earnings effects (Chapter Four). There may also be important returns in the smallholder sector. There further may be important returns in terms of health and nutrition, which are discussed in Chapters Six and Seven.

4. For some other inputs in the education production process, prices of factor inputs might be expected to increase. Examples would include imported inputs, such as specialized instructors and equipment that are not available in very elastic supply from domestic sources (at least in the short run). Such cases are likely to be relevant relatively rarely except for specialized advanced education. The impact on the cost (price) of education abroad is a related, and probably from a general point of view, more relevant phenomenon.

5. Whatever are these first two effects for the self-employed, they also carry over in the relevant factor markets for employees who work in the same or similar activities, with both income and price effects once again.

6. See Behrman (1990) for a review of empirical studies of the impact of health and nutrition on child school performance in developing countries. These studies are suggestive,

but not persuasive because of the failure to control for simultaneous determination of health and nutrition.

7. The variables in Frame 6.1 are ones suggested by the discussion in paragraphs 6.10 through 6.18 above. They are meant to be suggestive only, with considerable variations across countries with regard to what is available. Hopefully this suggestive list will be helpful not only as a checklist, but also to encourage investigators for each country to think of other relevant indicators for the particular situation under study.

8. The statistical question is whether the dichotomous (sometimes called "dummy") variables have significant coefficient estimates according to standard t-tests and, if so, what are their signs.

9. Such errors are likely not to be uncommon in the conditions prior to the adjustment program, particularly if they involved considerable inflation, relative price changes, and efforts by the government to play down the extent of the economic crisis. For examples in which deviations from longer-run trends indicate much different patterns of what happened during a structural adjustment effort than just examining the change from the year before to the first year of the adjustment effort in an explicit case, see Behrman and Deolalikar (1990) or consider the underlying studies that are compared therein from Behrman and Deolalikar (1988b), Boyd (1988) and Cornia and Stewart (1987).

10. For examples of the problems with the latter approach, once again, see the references in the previous note.

11. Though a priori, within the economy-wide framework, *all* components of adjustment policy affect each meso variable for education.

12. This relation is for the jth outcome determined by the household for the ith individual in the fth family in the hth household in the tth time period. To avoid a plethora of subscripts, household and time period subscripts are not indicated. The reader is referred to Chapter Five for a formal derivation of reduced-form demand relations.

13. Not all of the outcomes determined by the household are individual- or even family-specific. Variables that are not do not have the i subscript, but just the family and/or the household subscript.

14. This assumes, as probably is appropriate, that the income generation and consumption decisions of the household are interconnected rather than the former determining the latter recursively without feedback. Such interconnection or simultaneity may be due to incomplete markets, to consumption decisions through health and nutrition affecting productivity in a range of activities, and to farm/firm selling prices differing from buying prices due to transaction costs. For more extensive discussion of these issues see Singh, Squire, and Strauss (1986), Behrman and Deolalikar (1988c), and Alderman (1987) and the references therein.

15. Some examples of the former are given in Behrman and Birdsall (1983), Behrman and Deolalikar (1988a), Behrman and Suesangkarn (1989), Behrman and Wolfe (1984a), Birdsall and Behrman (1984), and Boissiere, Knight and Sabot (1985). Also see the survey in Behrman (1990).

16. Rationing may be a problem for some of the other Analysis Plan topics as well, such as with regard to employment and health care and nutrition programs.

17. Therefore, it would be useful if the household survey also asked whether or not each individual had attended school in the year before the last one as well. With the answer to such a question it would be possible to investigate whether the observed right-side variables during the past year caused a change in schooling attendance between the year before last and the last year. This approach effectively would control for conditions before the past year.

18. Though such information is most useful for the past year given that most information in the SDA data set refer to that year, it also would be desirable to obtain retrospective information about sitting for examinations and examination scores for previous years as well.

19. Here the focus is on admissions examination performance. If such examinations are used to decide on admission, their results (at least at the level of whether or not admission was granted) should be relatively available at low cost. It also would be useful to have the results of cognitive achievement tests for all household members, as for the Ghanaian LSMS, as indicators of schooling performance. The costs of administering standardized tests, however, are likely to be substantial, so much emphasis is not placed on such measures in what follows.

20. There are standard procedures for such tests. For qualitative variables (e.g., whether or not attending school currently, whether or not successful on admission tests for a particular schooling level), chi squared tests are appropriate. For continuous variables (e.g., how many grades of schooling completed, examination scores), t-tests for the differences in the means are appropriate. Such tests also can be conducted by estimating a simple regression with the dependent variable being the variable of interest and the right-side variable being a dichotomous ("dummy") variable with a value of one if the individual is a male and a value of zero otherwise; the estimated coefficient of such a dichotomous variable is the estimated mean difference between the sexes for this variable and the t-test for this estimate is a test for the significance between the sexes.

21. An alternative is to divide the value for a particular individual by the mean for the reference group of the same age and sex. However, there are the disadvantages of the division procedure that the control is very particular, and that the interpretation of the dependent variable may be less transparent than for the untransformed variable. An illustration of the particular and perhaps peculiar feature of the control by division rather than by subtraction can be seen by considering the age-by-age series for an individual who enters school at an age one year younger than everyone else in

his/her age peer group: infinity, 2, 1.5, 1.3., 1.2, ... even though such an individual is by assumption always just one year ahead of the relevant peer group.

22. There should not be simultaneity problems because the relations are reduced-form demand relations, so the right-side variables are predetermined or exogenous from the point of view of the household. The omitted variable problem is less than usual because a major form that omitted variable bias often apparently takes is to result in overestimation of the impact of parental schooling due to the failure to control for unobserved parental abilities, motivation, etc. (e.g., Behrman 1990). But in the present context the impact of parental schooling per se is not of interest since it only is important to include it as a control in relation (1); the resulting estimates of parental schooling do not enter into relation (2) if A enters into relation (1) additively. Therefore, it is not troublesome if parental schooling in part is representing the effects of such unobserved parental characteristics; in fact the more that it picks them up the better since that lessens the probability that the coefficient estimates of the other variables are biased because of failure to control for such unobserved variables.

23. These selectivity issues are hardly limited to the analysis of education decisions. They are pervasive in much socioeconomic analysis. Perhaps the most emphasized case is in estimating the determinants of wage rates given that there is a selectivity rule pertaining to who participates in the labor force. Another example concerns the selection of type of health-care provider given the selection processes regarding who considers themselves to be sick. Therefore, the other Analysis Plans also need to be concerned with these issues.

24. Such control may be with the inverse of the Mills ratio as suggested by Heckman or by estimating the selection rule as part of the maximum likelihood estimation. See Maddala (1988) or any standard econometrics text.

25. See the previous note.

26. This is an exclusion criterion for identification. There are other means of identification, such as by functional form, but such approaches are not very satisfactory in the present context since there are no persuasive reasons for the choices of functional forms.

27. If there were panel data there would be more possibility of finding such identifying variables because some of the selection processes occurred at earlier times when conditions differed.

28. Separated by sex since that is not an individual or household choice variable and since the relations well may differ by sex.

29. Similarly, for the entire sample of 14 year olds, other questions could be explored, such as whether or not they had completed primary school, completed lower secondary school, sat for the upper secondary school admissions examination, and successfully completed the upper secondary school admissions examination. The critical point is that the *entire* sample of 14 year olds would be used for the estimates for each question, *not* just the ones who had passed some previous selection rule.

30. It should be noted that if relation (1) has such interactions, relation (2) becomes more complicated by including, in addition to the explicit terms indicated above, $\Delta X_1 * X_2$ and $X_1 * \Delta X_2$, where X_1 and X_2 are the two variables that interact in relation (1).

31. If the unearned income component that is to be explored is the net revenue (or profit) from household enterprises, for example, such net revenue is estimated as dependent on the exogenous assets and prices that affect the enterprise production, the residuals are calculated from that relation, the variant of relation (1) is estimated in which net revenue is included instead of the exogenous production-side prices and assets but in addition the estimated residual from the net revenue function is included, and a t-test for the significance of the coefficient estimate of the residual net revenue indicates whether there is a simultaneity problem with such income. See Pitt and Rosenzweig (1985) for such an application and any recent basic econometrics text, such as Maddala (1988), for a detailed discussion of this exogeneity test.

32. Of course individual wage rates will not be observed for every individual. In fact, the same selectivity problem noted above is likely to be very important in determining what wage rates are observed. Therefore it is important to control for such selectivity in estimating wage rates if they are to be used in the analysis.

33. If there are unobserved fixed effects, however, the previous period actual value should be treated as endogenous, with identifying instruments from other previous period exogenous variables.

34. In cases in which the necessary data for the variables discussed in paragraphs 6.08 through 6.27 are available in cross-sectional form, they should be used directly as indicators of the meso setting in the estimation of relation (1).

7

Household food security and nutrition

Introduction

7.01 Food security issues are high on the agenda of many African countries engaged in policy reform. This Analysis Plan provides a framework for analysing the impact of structural adjustment on household food security and nutrition. It also seeks to acquaint researchers with the tools required to carry out such an analysis. Household food consumption patterns and individual nutritional achievements are viewed as functions of household characteristics and market-level factors, notably prices and infrastructural variables. Hypotheses are formulated regarding changes in meso-level variables arising from structural adjustment and approaches to the estimation of the resulting food security and nutritional effects are proposed.

7.02 The key unit for food security analysis is the household (although the meaning of individual-level food security is explored below), whereas for nutritional status evaluation it is the individual. The purpose of analyses at the household level is to identify households whose food security is at risk, to identify the factors that affect food security and to attempt to quantify the relationships between them. The nutritional status of individual household members (for example, young children) is similarly explained in terms of household-level variables. The main concern is to identify how changes in household incomes, the relative prices of basic food and other commodities and key household and community characteristics, affect the level and variability of expenditures on food, nutrient intake and other measures of food security. The specification and estimation of relationships will allow the calculation of key parameters, elasticities and other factors that indicate how changes in the independent variables affect measured outcomes. These parameters can be used to indicate the effect of past policies and to simulate the impact of future interventions.

7.03 Given the wealth of analytical possibilities, it is important to understand the limitations operating on the analysis of food security and nutrition during a process of structural adjustment. At the national level, it may be possible to predict the impact of policy changes on outcomes such as the level and variability of national food supply. As the level of analysis is disaggregated, the relationships being examined become more complex. At the level of individuals, there are many different factors that may affect food intake and nutritional status and it may be difficult to detect the effect of specific macro policy changes.

7.04 The analysis proposed below can be used in a number of ways. These include the following:

(i) *Predicting* the impact of policy reform on the food security of the nation and of different household groups. This requires an understanding of the household economy, the relationship between households and markets and the responses of households to public policy reforms.

(ii) The *assessment of the impact* of past policy changes on food security. Here, emphasis is

placed on the impact of policy changes on food-insecure target groups. It should be noted that it will be difficult to separate the impact of adjustment policies from the underlying conditions which lead to the adjustment package.

(iii) *Monitoring* food security and nutrition in a period of policy reform. Given resource constraints, this may be achieved by focusing on selected household groups and indices that are sensitive to declines in the well-being of these households.

(iv) Assessing the *costs and benefits* of policy revision or of additional policies that might be introduced *to improve food security*. These include policies that may ameliorate the transitory effects of the adjustment process on particular population groups. This is both the most important and the most difficult type of analysis.

7.05 The remainder of this Chapter is divided into three main parts. It begins with an overview of issues facing the food security analyst, including the clarification of the levels and time frames of analysis. It then develops a detailed guide to the analysis of household-level food security in the adjustment context. The third section looks at the analysis of the effects of structural adjustment on the nutrition of individuals.

Issues in food security analysis

7.06 Food security can be defined in a number of different ways. In this Chapter, we will work with the definition put forward by Reutlinger and Selowsky (1976). Food security is thus defined as access by all people at all times to enough food for an active, healthy life. There are two dimensions to the analysis of food security. The first concerns the *level* of analysis. Food security can be examined at the national, regional, community, household or individual level. Much of the analysis in the context of structural adjustment will focus on the impact of *national* policy reform on *households* and on *individuals*. We will be particularly interested in those households that are food-insecure and those whose food security is threatened by the adjustment process. The second dimension relates to the *time frame*. For example, households may be unable to gain sufficient access to food on a continual basis. This is termed *chronic food insecurity*. Here, analysis focuses on the *level* of food consumption and the factors that determine this. Alternatively, access to food may be adequate on average but variations result in access to food being inadequate some of the time. This is termed *transitory food insecurity*. It may result from regularly occurring events, such as dry seasons, or irregular events such as droughts. The emphasis here is on the *variability* in food consumption and its consequences. A working definition of food security exists only when the level and time frame of the desired analysis is specified.

Food security at the national level

7.07 Food security at the national level is a major policy goal for almost all Sub-Saharan African countries. National food security may be defined as a satisfactory balance between aggregate food demand and food supply at prices which do not exclude poor households from access to food. Alternative definitions compare some aggregation of theoretical food needs with total supply. While this approach has some superficial appeal, in practice it has a number of drawbacks. First, the translation of food needs in terms of nutrients into quantities of food commodities is complex. Second, it generally ignores the role of prices and incomes as determinants of demand and the effects of changing prices and policy reforms as factors influencing supply.

7.08 Nations are chronically food-insecure when, over a series of accounting periods, food supply (which includes domestic production, commercial imports, food aid and changes in stocks) is insufficient to meet food demand at reasonable prices. Transitory insecurity will result when, from time to time, supply is inadequate with respect to demand. Here, food prices will rise and the poor will be forced out of the market. In general, policies related to improving national food security tend to concentrate on the stabilisation and increase of food supply. Almost all Sub-Saharan African countries have national policies designed to increase the level of food supply, especially that component derived from the national production of basic food staples. The achievement of national *self-sufficiency* in basic staples (which is rarely defined precisely) is seen as a key national objective. The achievement of national food security, however, presupposes both adequate and stable supplies (obtained through an appropriate combination of domestic production and trade) and sufficient demand or purchasing power to guarantee adequate access to food. The demand side analysis of food security has to be carried out at the household level, where individual food consumption is deter-

mined. An assessment of the level and the variability in the availability of food from all sources, and of food needs, is required. The latter calls for the use of normative measures of nutritional requirements.

Food security at the household level

7.09 A conceptual framework for analysis at the household level is provided by Sen's theory of exchange *entitlements*. [1] Households can be considered as having a set of entitlements. These are defined by the economic, social, legal and agro-economic environment in which the households live. They include entitlements to own production, to trade, to the labor of the household members and to a variety of transfers, including social security payments, food aid distribution and other mechanisms. Households can choose to use their entitlements in many different ways; for example, they can choose between using household labor to produce food and other agricultural commodities or they can seek employment and purchase food from the income they obtain. What they choose to do will, in part, be determined by the exchange rate or price at which the entitlements can be exchanged for food and other goods and services. The set of *exchange entitlements* is the set of food and other commodities which may be obtained with all possible combinations of entitlements at given prices.

7.10 A household will be food-insecure when its set of exchange entitlements is insufficient to meet the food needs of the household members, taking into account that food is only one of the basic needs of the household. If the exchange entitlement set is insufficient to meet food needs all of the time then the household will suffer from chronic food insecurity. This is a function of poverty. Transitory food insecurity occurs with a temporary decline in the exchange entitlements set. This may result from a regularly occurring set of events such as seasonal variation, or it may be the result of factors such as drought or other environmental calamity or the impact of macro-policy change and structural adjustment.

7.11 The exchange entitlement concept implies that the food insecurity at the household level is a result of inadequate demand for food. Total household income, including the value of own production, transfers and all other income sources is not sufficient to provide the household with enough food to meet its needs at the prices the household faces. To paraphrase Sen, household food insecurity is the phenomenon of households not having enough food to eat, it is not the fact of there not being enough food. In the context of structural adjustment, the analysis of household food security needs to be concerned with the impact of adjustment policies on the entitlement set of different types of household and on the prices, or exchange rates that these households face.

7.12 Investigation of these issues is not easy; there are a number of both theoretical and practical problems to be faced. Even though the SDA Integrated Survey in most countries will be a complex and wide ranging data collection exercise, it will not be able to capture all the subtle and detailed aspects of household food security. For example, in an African context, household entitlements may include assets and incomes that households can claim from kinsfolk and the state when income shortfalls are experienced. These will include traditional links with other households which imply transfers in times of need as well as officially organised relief programs. These transfers will only be directly observable in times of crisis, but omitting them will lead to an overstatement of household food insecurity. [2] As already indicated, food security has a time dimension which is difficult to capture in a single cross-sectional survey. While countries will be encouraged to repeat the IS at regular intervals, in many places this will not be possible. It will be important, therefore, for the analyst to realise the limitations of the data he or she is dealing with and to ensure that the wider picture is not obscured by the details of the data that are available.

Individual food security and nutrition

7.13 In a similar fashion, food security at the level of the individual can be defined as continuing access to adequate food to live an active and healthy life. As analysis shifts from the household to the individual, however, food security is affected by an increasing number of factors. Individual food security can be viewed as an individual's claim on household food resources in relation to the needs for growth, work and the maintenance of essential body functions. A "food-secure" household environment is clearly an important determinant of individual food security, but it is neither a necessary nor a sufficient condition. An important factor determining individual food security is the relationship between members of the household. Food security at the

level of the household does not necessarily mean that every individual household member will receive sufficient food to meet his or her needs. Alternatively, food-insecure households may restrain the consumption of some members of the household to protect the vulnerable individuals, or they may distribute food in accordance with power and status, thereby compromising the food security of weaker members. The mechanisms that determine how food and other resources are distributed between household members are complex and difficult to measure in large scale surveys. In SDA policy analysis, the main emphasis will be on those mechanisms that are likely to be directly affected by adjustment measures. These may well include changes not only in levels of income, but also in who actually earns it. These issues are discussed in more detail in the Analysis Plan on the impact of adjustment on women.

7.14 At the level of the individual, much of the analysis will focus on nutrition and in particular on measures of the physical impact of inadequate food consumption. In part this is because of the problems associated with the accurate measurement of individual food and nutrient intakes, but good nutrition is an important objective of policy in its own right. Household food security is related to nutritional status, but it is clearly not the only factor involved. For young children, on whom much of the analysis will concentrate, protein-energy malnutrition is related to three main factors: the incidence of disease and infection; child care practices; and the ability of the household to maintain its food security. The analysis of nutrition in the context of food security, therefore, must be closely related to the analysis of health (Chapter Five).

7.15 The emphasis on the nutritional status of young children is justified by the fact that this group of the population is most vulnerable to inadequate food intake. Insufficient ingestion of calories and protein by young children will result in poor physical and mental development and may well be a major cause of mortality. In many African countries, malnutrition is thought to be a major cause, or an important contributory factor in many infant and young child deaths. In addition, the indication of the malnutrition through the anthropometric measurement is a well developed technique that can be relatively easily applied in household surveys. Measures of the nutritional status of adults can be developed, however, and the use of these techniques are discussed further in the next section below.

7.16 Within the context of food security, protein-energy malnutrition (PEM) is the most important nutrition problem faced by African countries (Latham, 1984). Other nutrition problems do exist, however, for example, vitamin A deficiency, iodine deficiency and anaemia. In a number of countries their incidence and severity result in major public health programs. Structural adjustment may well have an impact on these types of malnutrition, but the main mechanism will be through the changes imposed on the operation of health services. The effects of adjustment on these components of nutrition, therefore, are considered in the Health Analysis Plan.

An approach to the analysis

7.17 The potential uses of the analysis have been outlined above in paragraphs 7.01 through 7.05. In order to reach the stage of policy analysis of deciding what needs to be done, however, a number of steps will need to be completed. In general terms, the stages can be outlined as: (a) identifying the nature of food insecurity in the country; (b) specifying who is food-insecure and identifying the main characteristics of the households and individuals who suffer from food insecurity; and (c) establishing the causal factors and mechanisms which determine and are related to food security. Clearly within SDA, the emphasis in this last stage will be on the specification of the relationships between the macro-adjustment measures and food insecurity at the level of the household and the individual.

7.18 The analysis of both household and individual food security is a demanding exercise. The approach adopted throughout this Chapter is to undertake the simpler analytical steps first, and then build on these using more sophisticated techniques. While the order of the presentation below places some emphasis on the estimation of consumption parameters, the analyst is strongly advised to start with a detailed examination of basic tables and descriptive statistics. The mechanical application of econometric techniques, without a thorough understanding of the data and the situation they are describing can easily lead to misleading results and wrong conclusions.

The analysis of household food security

7.19 As households operate in an economic environment determined, at least partially, by

public policy, this section is divided into two parts. Below, linkages are developed between adjustment policies, the household economy and food security. The discussion then turns to analytical methods for analysing household food security and nutrition. The focus is, in particular, on the estimation of income-food expenditure elasticities, the estimation of demand systems and the identification of target groups for food policy interventions.

The household economy, adjustment and food security

7.20 The definition of food security outlined in paragraphs 7.06 through 7.18 indicates that households become food-insecure when the acquisition of food falls below that required for all members to live "active and healthy" lives. Accordingly, for a household to be "food-secure", the following balance should hold:

$$Ac \geq R$$

where $Ac = B + O + G + A + \Delta St$,

- Ac is household acquisition of food expressed in nutrient units;
- R is the sum of individual nutrient requirements;
- B is food bought;
- O is household food production retained for consumption;
- G is food received as private gifts;
- A is food aid received as wages or gifts;
- ΔSt is the net change in household food stocks.

7.21 This food balance equation highlights the fact that households use their entitlements to acquire food in a number of ways. It also highlights the fact that they may be both producers and consumers. It is important to be aware of this feature when assessing the impact of structural adjustment on household food security. For example, raising food prices might worsen food security by increasing the cost of food. However, it also increases household income which, ceteris paribus, should improve food security. Before going on to a discussion of the impact of adjustment policies, it is useful to summarise the relevant literature in this area. The analyst is also referred to the chapters in this Volume on education and health, as well as the SDA conceptual framework (World Bank, 1990).

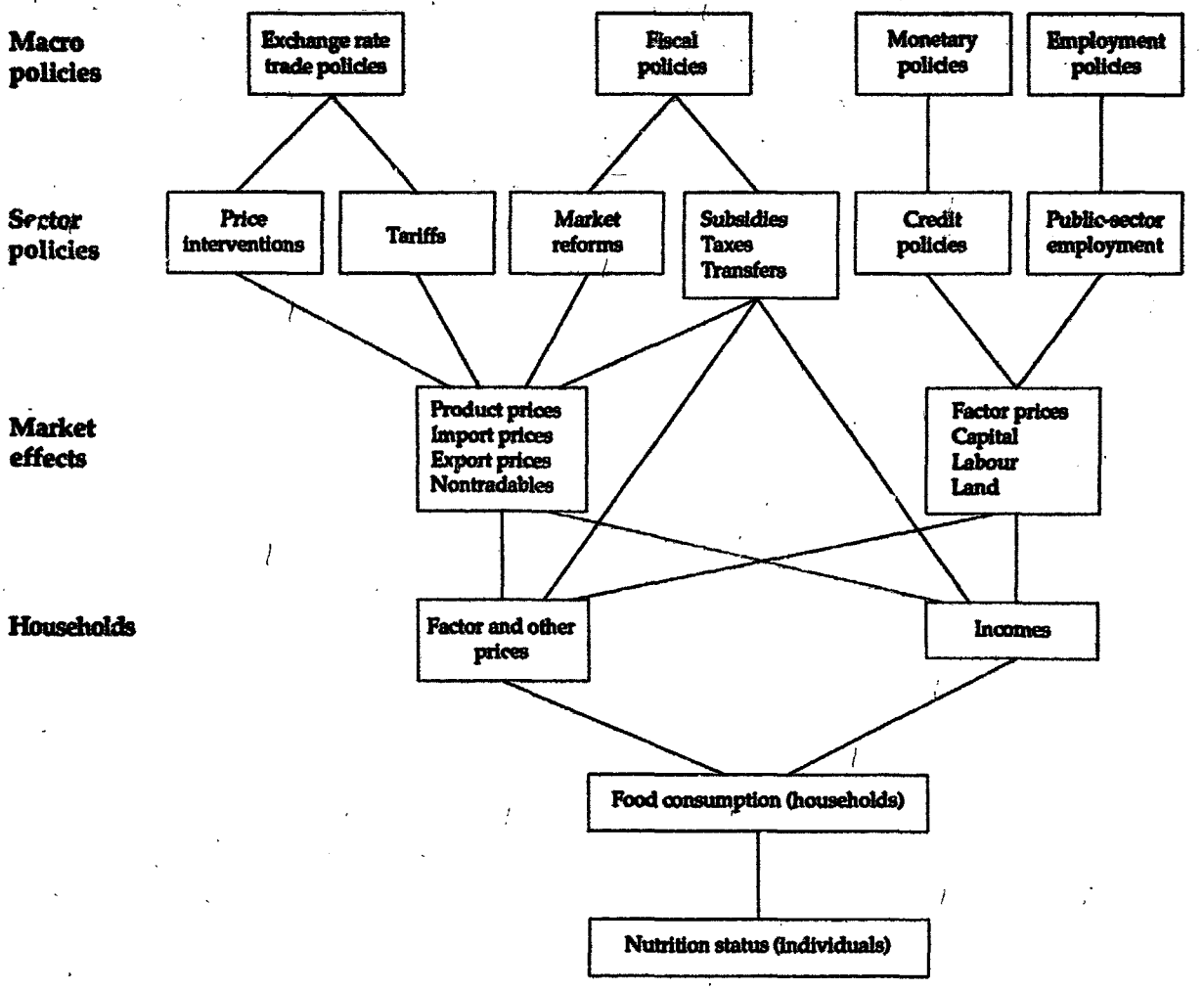
7.22 Empirical and theoretical work on the (rural) household economy has been summarized in a volume edited by Singh, Squire and Strauss (1986). The authors develop a feasible way to model household responses to policy changes likely to affect food security. Specifically, the approach allows the analyst to incorporate both production and consumption behavior in the same framework.

7.23 The approach by Singh et al (1986a) can be summarised as follows. Households are assumed to have a utility function consisting of three arguments: an agricultural staple; a market purchased good; and leisure. This utility function is maximised subject to a cash, time and technology constraint. Consequently, households make decisions in three areas: production; consumption; and labor supply. With respect to production, it is assumed that households will seek to maximise profits by setting marginal costs equal to marginal returns. Provided the household knows the existing wage rate, it can determine the optimal amount of labor input. It does not need to decide how much food it will consume nor how much labor it will supply itself. Thus, production decisions can be made independently of consumption and labor supply. However, consumption and labor supply decisions are not independent of production decisions. These depend on both prices and incomes. Although prices can be taken as given, incomes are partly affected by production decisions. Thus, consumption decisions are not independent of production decisions. This is termed the profit effect and is incorporated into analyses of the effect of price changes on consumption. The formal derivation of this is summarised in Box 9.1 (Chapter Nine).

7.24 It should be noted that these models assume a perfectly competitive market for labor exists in rural areas. In many parts of Sub-Saharan Africa, this is not the case. Furthermore, they ignore the fact that production and expenditures may be differentiated by gender. It is also difficult to incorporate risk and seasonality effects. Production and consumption decisions are not separable where health or nutrient intake affect labor productivity. Where separability does not hold, it is necessary to replace net farm profits with input prices and quantities.

7.25 Within the context of the model developed above, adjustment policies affect household food security by changing prices, incomes and the institutional structure in which households operate. The linkages between policy shifts and

Figure 7.1: Links between macro policy and food security



the household economy are illustrated in Figure 7.1. As the SDA companion volume (World Bank, 1990) contains a detailed discussion of policy change under structural adjustment, discussion here is limited to policy changes with a direct impact on household food security. It should be noted that the net effects will be specific to different income groups, to net producers and consumers and to different regions, particularly where markets are poorly integrated.

7.26 A typical outcome of adjustment policies is the liberalization of *product markets* including food markets. The removal of regulations and subsidies from domestic markets will affect the relative prices between farm inputs and outputs and between producer and consumer prices. The reduction in regulation of external trade, together with exchange rate liberalization and fiscal constraints, will affect the cost of imported farm inputs and food in both nominal and real terms. Liberalisation of financial markets will affect the cost and availability of formal sector sources of capital. [3] Labor markets, particularly in urban areas, are also likely to undergo changes during the adjustment process. Fiscal austerity and institutional reforms often reduce public sector employment. Wage rate regulations may also be changed. This may lead to increases in unemployment and reductions in the income of many urban households. It will also have consequences for households in rural areas, where remittances constitute an important source of income.

7.27 The net effect of structural adjustment on rural household entitlements will depend on

several factors. Incomes will rise if additional revenues derived from producer prices are not offset by higher input costs or reductions in remittance income. Where households can switch resources from less remunerative activities to those receiving increased prices, further gains in income will accrue. Should these offset the reduction in welfare associated with higher consumer prices, household food security will improve. However, food deficit households will be made worse off if they cannot increase production and if they are unable to increase their non-agricultural incomes. Finally, the benefits will be region-specific. Food producers in remote areas will almost certainly experience a rise in input costs. Output prices may fall despite an overall increase in nominal producer prices. Food producers closer to entry points and centers of demand are more likely to enjoy a relative improvement in their trading position. Below, the methodology for analysing the relative strengths of these effects is outlined.

7.28 Entitlements of urban households will be affected by changes in incomes through the effects of structural adjustment in the labor market. They will also be affected by changes in prices, though this will partly depend on their previous access to food at subsidised prices and changes in supply brought about by price incentives to producers and trade liberalization.

7.29 The analyst should pay particular attention to two interlinked features when examining the effects of adjustment policies on households. These are the time scale and household groups. Households whose food security is likely to be threatened by these changes during the transitional period include rural families depending on rural labor markets, the families of state sector employees made redundant, and low income urban families facing declining wage rates relative to food prices. As the length of the "transitional period" is unknown, it is not appropriate to assume that these short-run changes will disappear quickly or automatically. In the long run, adjustment policies should increase household income in relation to food prices and therefore improve food security. Producers should gain from adjustment policy reforms, particularly if they produce export crops and have access to inputs and markets for their products. This suggests that a major objective of the analysis should be to *identify* and, if possible, *predict* which groups of households are likely to gain and which are likely to lose from adjustment policies, concentrating particularly on those whose food security may be threatened. The methodology for doing so is discussed in paragraphs 7.57 to 7.64.

Household level analysis using SDA data

7.30 Household level food security analysis typically involves a number of steps. In this section, we propose the following order of activities: (i) examining the relationship between measures of food consumption and economic factors largely operating at the meso level, starting with an assessment of the relationship between food and nutrient intake and income, including the estimation of expenditure and calorie elasticities; (ii) extending the analysis to incorporate prices and the estimation of price elasticities; (iii) developing the analysis to include the general economic and social environment in which households live through the specification and estimation of household models; and (iv) using the results of this analysis to identify food-insecure households. The results of these activities lead to an examination of the policy implications and recommendations for the development of data collection systems.

7.31 ESTIMATING INCOME — FOOD EXPENDITURE ELASTICITIES. The discussion of household food security noted several conduits through which households obtained food. In analysing the relationship between income and the consumption of food, emphasis is placed on explaining how changes in the former affect the latter (how income changes in light of structural adjustment programs has been discussed earlier). This is accomplished by estimating the elasticity of demand for food with respect to income. As this is relatively straightforward, the method of doing so is outlined first. In the next section, the analysis is made more complex by extending it to include prices.

7.32 Existing studies differ substantially in their estimates of income-food expenditure and income-calorie elasticities. The former range from 0.01 to 1.18 (Bouis and Haddad), depending on the commodity in question, on differences in estimation procedures and on the extent to which food groups were disaggregated. The analyst is referred to Bouis and Haddad (1988) and Behrman and Deolalikar (1988c) for a detailed summary of these. Income-calorie elasticities appear to be generally rather lower for reasons which are relevant to SDA survey analysis. [4] Recent evidence

suggests that when households, even low income households, face a decline in the value of their income, they are able to maintain calorie acquisition by switching to lower quality or otherwise cheaper foodstuffs, reducing waste and entertaining less. These "adjustments" show up in lower income-calorie elasticities — that is, when income falls calorie acquisition falls less than food expenditure. Finally, Strauss and Thomas (1989) have suggested that the calorie-expenditure curve is kinked. Their Brazilian data suggests a positive relationship between nutrient intake and expenditures for poor households. The curve kinks between 2500 and 3000 per capita calories per day and is flatter at higher expenditure levels.

7.33 The first stage in an examination of the relationship between income and caloric acquisition should be a descriptive analysis of the data. This includes the calculation of means, standard deviations, coefficient of variations, maximum and minimum values. Doing so identifies potential problems and errors and indicates specific hypotheses for further investigation. Also, different derived variables can be assessed for their potential use in the analysis.

7.34 Frequency distributions and cross-tabulations are also useful at the preliminary stage. But it should be noted that correlation between two variables does not imply causation. Also, variables chosen for a cross-tabulation may be correlated with variables not included. A high degree of correlation between two variables may actually reflect this omitted variable. A sample cross-tabulation is shown below in Box 7.1.

7.35 The next stage is the econometric estimation of the caloric acquisition-income relationship. In general terms, this can be expressed as:

Box 7.1: Cross-tabulation of total food expenditure by expenditure group

Expenditure group	*Total expenditures*	*Total food expenditures*
1	21.0	16.0
2	29.9	22.9
3	38.7	29.4
4	51.0	38.2
5	98.9	62.6
All	47.9	33.8

Note: This box is taken from Bouis and Haddad's (1988) paper on calorie income elasticities in the Philippines. Total expenditures and total food expenditures are expressed in pesos per week per capita.

$$C = c(X, Z)$$

where: C is a measure of food or caloric acquisition;
X is a measure of income or expenditure;
Z is a vector of other household characteristics.

7.36 Prior to estimating this model, it is necessary to specify a functional form for this relationship. There are a number of possibilities and a useful theoretical review is available in Deaton and Muellbauer (1980) and Blundell (1988). A functional form suggested by Deaton (1987b) is:

$$w_i = a_i + b_i \ln(x/n) + c \ln(n) + \Sigma (d_j z_j) + u_i$$

where: w_i is the budget share of the ith commodity ($= (p_i q_i)/x$);
p_i is the price of good i;
q_i is the quantity of good i purchased;
x is total household per capita expenditure;
n is household size;
z_j is a vector of other relevant variables;
u_i is the error term; and
a_i, b_i, c, d_j are parameters to be estimated.

7.37 Although there are alternative functional forms, such as the semi-logarithmic ($p_i q_i = a + b \ln(x)$) and log reciprocal ($\ln(p_i q_i) = a - b x^{-1}$), use of the specification outlined above is preferable. An important requirement of any system of Engel curves (of which this is an example) is that they satisfy the adding up property. That is, if they are estimated for all goods, the predicted budget shares will sum to unity. Here, this is satisfied where the following conditions hold (Deaton and Case, 1987):

$$\Sigma a_i = 1 \text{ and } \Sigma b_i = 0$$

Finally, it is easy to compute elasticities. The formula is:

$$e_i = 1 + (b_i)/(w_i)$$

where: w_i is evaluated at the sample mean.

7.38 The dependent variable, household food expenditure, can be measured in a variety of ways. Ideally, individual consumption of food should be measured in order to compute caloric and protein intake as this minimises measurement

error and hence estimator bias.[5] The main problem is in measuring this variable. Accurate estimation requires the weighing of food as it is actually eaten which implies a considerable degree of intrusion by the enumerator. In addition, this requires a great deal of time, highly skilled enumerators and a high degree of cooperation by respondents. Alternatively, it can be obtained on a recall basis by interviewing the individual responsible for preparing and distributing food. The drawback to doing so is that it may greatly increase the time required to complete the interviews. These costs are such that neither method has been included in the IS questionnaire.

7.39 Alternatively, food consumption can be assessed in terms of food acquisition. This includes: consumption from own production, purchases, payment for labor in food (as opposed to cash), net food transfers to individuals not resident in the household, food consumed away from the household and free (or subsidised) distribution by the government through food aid projects and programs (for example, school meal programs, food-for-work projects) and gifts. It should be noted that food acquisition is not exactly equivalent to food consumption. Differences between them can be ascribed to: (a) changes in food stocks held in the household; (b) waste in preparation and after eating; (c) the net difference between the amount of food provided to non-household members and the amount provided to members of this household by other households; and (d) changes in food composition arising from preparation and cooking.

7.40 To measure food acquisition, a number of factors need to be specified. These include:

The time period - Food acquisition refers to a specified period of time. The enumeration plan for the SDA survey envisages that data on food consumption are collected during the second visit to the respondent households and will refer to the elapsed time since the first visit. It is intended that this period will be two weeks, but in practice it is not certain that it will be the same for all households. It may be necessary to normalise expenditure and consumption data to the same time period (14 days is probably the most appropriate). Accordingly, it will be important to include the dates of the first and second visits to each household on the data files. It is important to note where the visits fall with respect to the agricultural production cycle. Household food acquisition is often related to seasonal considerations. Finally, some commodities are purchased in bulk on an infrequent basis. Households reporting no expenditures may purchase food, but not during the reference period of the questionnaire.

The unit of measurement - Food acquisition can be expressed in either per capita value terms, as a share of the household budget or in nutritional units. It may be necessary to value commodities that have not passed through the market and do not have a price associated with them. One possibility is the consumer price prevailing in the locality at the time of the transaction. This may be obtained from the community questionnaire, or possibly by averaging over prices recorded for the same commodities that have passed through the market. However, it should be noted that different households in the same community may face different prices. For example, poorer households, who purchase food in small quantities, may pay a higher unit price than wealthier households purchasing larger amounts. Expressing food acquisition in nutritional terms requires data on the nutrient composition of food items. Both WHO and FAO have published such data for the main commodities consumed in Sub-Saharan Africa. Commodities should be disaggregated as far as possible prior to calculating caloric and nutrient values. Failure to do so may generate misleading estimates of the impact of changes in independent variables on food acquisition. Behrman (1990) and Behrman and Wolfe (1984a) suggest that nutrient-income elasticities may be overestimated when fixed conversion factors are applied to aggregate food groups.

7.41 A key independent variable is some measure of income. While it is possible to compute income from the IS questionnaire, its use is *not* recommended here. There are several reasons for this. First, income is not exogenous as it reflects decisions regarding the amount of labor supplied by the household. Secondly, nutrient intake may affect labor productivity (see Strauss, 1986 and Behrman and Deolalikar, 1989b). If this is the case, the estimated impact of income will be biased upwards. Finally, estimates of income may be liable to under-reporting by respondents and may reflect large short-run volatility.

7.42 Given the difficulties associated with the use of household income as a regressor, it is necessary to use a proxy variable. One possibility is total household per capita expenditure. This variable is less likely to have measurement errors, is subject to fewer short-term variations and can be considered exogenous. However, there

are several disadvantages in using it as a regressor. First, it weakens the link between policy changes, household income and demand for calories. Also, it does not permit the analyst to examine the effects of control of income on household expenditures. The analyst is referred to the Analysis Plan on Women for a discussion of this issue. [6]

7.43 More recently, it has been argued (Alderman, 1990) that in the context of the producer-consumer model of household behavior, per capita expenditures are a choice variable. As such, including it as a regressor will lead to biased estimates. This problem can be overcome by using two-stage least squares estimation. Initially, household per capita expenditures are regressed on variables reflecting household demographic composition and assets. [7] The predicted per capita expenditures are then included as regressors in least squares estimation of the function outlined in paragraph 7.92. However, it should be noted that within the existing literature, there is no consensus on this last point. For example, the studies by Behrman and Wolfe (1984a) and Deaton (1987a) use per capita expenditures, whereas Alderman (1990) instruments for them using the method described above. The analyst may find it useful to use both methods to see whether they lead to significantly different results.

7.44 Other characteristics to be included in the analysis will depend on local requirements. Among the variables which are commonly included in studies of this type are the following:

Household structure — All other things being equal, larger households will tend to consume more food than smaller households. In order to compare consumption levels and composition between households, it is necessary to account for differences in household size. This can be done in a number of ways. A simple way of doing so is to use a "head count" of the number of members of the household. However, this does not take into account variations in household composition. A household with six adults is likely to have quite different consumption characteristics from one with one adult and five young children. An alternative procedure is to weight individuals in the household using a weighting factor to calculate the number of adult equivalents or the number of consumption units. It may also be useful to include the age and sex of the household head.

Education levels — Education will have an impact on food acquisition through promoting a greater awareness of the importance of good nutrition. Women's education is particularly important in this regard. It also proxies for greater productivity in market and household activities and, for women, increased bargaining power within the household (Behrman and Wolfe, 1984a).

Other variables — These include variables such as household location (urban or rural).

7.45 A selection from Alderman's (1990) estimates of expenditure elasticities for Ghana is listed in Box 7.2. Alderman uses the budget share model outlined in paragraph 7.36, above. His independent variable is the predicted natural logarithm of total per capita household expenditures. In Box 7.3, details of the approach used by Bouis and Haddad are outlined. The analyst may also find it useful to consult other recent studies, including: Behrman and Deolalikar (1987), Edirisinghe (1987), Alderman (1987), Behrman and Wolfe (1984a) and Ward and Sanders (1980).

7.46 ESTIMATING PRICE-FOOD EXPENDITURE ELASTICITIES. The analysis described in the previous section highlights the consequences of changes in household income, proxied by total expenditure, on the demand for food. This section extends the analysis by introducing prices.

7.47 The simplest approach is to include a set of prices in the general model of the demand for food. That is:

$$C = c(X, P, Z)$$

where: C is a measure of food or caloric acquisition;
X is a measure of income or expenditure;
P is a vector of prices; and
Z is a vector of other household characteristics.

7.48 The relationship between food consumption, income and prices can be expressed in a number of ways. The analyst is encouraged to refer to Deaton and Muellbauer (1980) and Blundell (1988) for a detailed discussion of the properties of these models. Perhaps the simplest functional form is the double logarithmic, that is [8]:

$$\ln(q_i) = a_i + b_i \ln(x) + \Sigma \{c_{ij} \ln(p_j)\} + \Sigma \{d_{ij} Z_k\}$$

where: q_i is the quantity of food i consumed (see paragraphs 7.31 through 7.45);
x is the value of total household per cap-

Box 7.2: Expenditure elasticities of foods in Ghana

Food	Elasticity	
	Rural areas	*Urban areas*
Cereals	0.69	0.91
Maize/kenkey	0.60	0.79
Rice	1.27	1.20
Millet/sorghum	0.70	0.58
Wheat flour/pasta	1.35	1.48
Root crops/plantains	0.90	1.09
Cassava/gari/fufu	0.88	1.03
Plantain	0.49	1.10
Meats/dairy	0.97	0.90
Beef	2.62	1.31
Poultry	2.62	1.31
Fish	0.66	0.60
Dairy products	1.86	1.74
All food	0.91	0.94

Source: See text.

ita expenditures;
p_j is the price of the jth food;
Z_k is a set of characteristics of household k; and
a_i, b_i, c_{ij}, and d_{ij} are parameters to be estimated.

The own-price elasticity of demand for food i is the parameter c_{ii}. Cross-price elasticities are c_{ij}.

7.49 The measurement of x and Z_k have already been discussed. Price information is not collected as part of the household survey but is available for the community questionnaire. The dependent variable q_i can be obtained by dividing household expenditures by the cluster level prices.

7.50 While this approach is straightforward computationally, there are two drawbacks to its use. The first arises from the method used to obtain quantities. Deaton (1988) has shown that when these are obtained by dividing expenditures by cluster prices, the resulting price elasticities will be biased. There are two reasons for this, illustrated by Deaton's discussion on estimating the price elasticity of "meat". First, he notes that meat is not a homogeneous good, but rather a set of goods. Each of these will have different income elasticities. For example, prime cuts of beef are likely to have a higher income elasticity than does mutton. Consequently, the price paid for a unit of meat will reflect household characteristics such as income. Regressing the quantity of meat on its price is essentially a regression of one choice variable on another. As Deaton notes, this leads to problems of simultaneity bias. Secondly, changes in prices will not only affect the quantities purchased but also their quality. A rise in the price of beef may cause households to substitute cheaper sources of calories and protein, leaving the acquisition of calories and protein relatively unchanged. Consequently, the price elasticity will be exaggerated. Deaton then goes on to develop an alternative approach that corrects for these difficulties. The analyst is referred to this for a detailed discussion of the estimation procedure.

7.51 The second drawback arises where households are both producers and consumers of food. As noted in Box 9.1, in Chapter Nine, the price variable appears twice: as an argument itself, and indirectly through the profit effect. Consequently, it is necessary to add a term reflecting this indirect effect to the general model of the demand for food noted above:

Box 7.3 Estimating calorie-income elasticities

A recent paper that illustrates many of the problems discussed here is Bouis and Haddad (1988). Although their work is based on data from the Philippines, their analysis is applicable to SDA data that will be generated for African countries.

In one version of the model that they estimate, caloric availability is used as the dependent variable. This is calculated by applying calorie conversion factors to foods consumed by households in the previous seven days. To accomplish this, food was disaggregated into 50 categories. The figure was then calculated net of meals given to workers or as gifts (it will not be possible to make such an adjustment using SDA data). The independent variables used included total expenditure or income, average age of household members, number of adult equivalents, education of head and spouse and the retail price of maize and rice.

Bouis and Haddad use a number of estimation procedures, including OLS and 2SLS and a quadratic relationship between caloric acquisition and income/expenditure. They find that OLS tends to overestimate the elasticity, particularly when income is used as the regressor. Expenditure performs better as a regressor. They also note that using caloric availability as the dependent variable leads to estimates that are biased upwards. The SDA analyst should be cognizant of this as it is likely that this will be the variable available for analysis.

$$C = c(X, P, Z, Y^*)$$

where: Y^* is household full income as outlined in Box 9.1 (Chapter Nine).

7.52 Household full income reflects two components, net farm profits and the total value of household time. Details on calculating net farm profits are found in the chapter on the Smallholder Sector. Time can be valued at the prevailing wage in the cluster or by estimating wage equations using data on individual characteristics. The Analysis Plan on Employment and Earnings contains a discussion of this point.[9]

7.53 The next step is to specify a functional form. A relatively straightforward possibility is the linear expenditure system (LES). This has the advantage of using expenditures as the dependent variable. Consequently, it avoids the difficulties noted above that are associated with dividing expenditures by cluster prices. For example, if there are two foods whose demand parameters are to be estimated, the LES would look like the followir g:

$$\text{food } p_1 q_1 = p_1 (a_1 + t_1) + w_1 [Y^* - p_1 (a_3 + t_1) - p_2 (a_4 + t_2)]$$

$$\text{food 2 } p_2 q_2 = p_1 (a_2 + t_2) + w_2 [Y^* - p_1 (a_5 + t_1) - p_2 (a_6 + t_2)]$$

where: t_1, t_2 are taken as linear functions of household demographic characteristics; and a1-a6 are parameters to be estimated.

7.54 The LES equations are estimated using least squares regression. If there are many zero entries for a dependent variable, indicating non-purchase of an item, then least squares will produce biased parameter estimates. This difficulty can be overcome using a Tobit estimation procedure. Strauss (1984) provides an example of this.

7.55 The price elasticity of the demand for food 1 is calculated by differentiating the LES with respect to the price of food 1. As the exact functional form is partly dependent on the manner in which farm profits are calculated, the general form is presented here:

$$(dq_1/dp_1) = (\delta q_1/\delta p_1) + (\delta q_1/\delta Y^*)(\delta Y^*/\delta p_1)$$

The first term on the right hand side captures the ordinary effect of prices on demand and will be negative. The second term captures the profit effect. This illustrates a key feature of the household producer-consumer model. For households that are producers of food, estimates of price-elasticities of demand that omit the profit effect will be overstated. Indeed, inclusion of the profit effect may cause demand-price elasticities to be positive! Illustration of this is provided below in Box 7.4.

Box 7.4 Estimating price elasticities

Here, two sets of elasticities are presented. Set (a) are from Singh, Squire and Strauss (1986a, Chapter 1) and are derived using the estimation procedure described above. Set (b) are from Strauss (1986). These differ in two ways. Strauss uses a quadratic expenditure system. This allows the slope of the Engel curve to vary over different income groups. Second, he converts acquisition of food into caloric availability prior to estimating the price elasticity.

Set (a)

Country	*Crop*	*Price elasticity profits constant*	*Price elasticity profits variable*
Malaysia	Rice	-0.04	0.38
Sierra Leone	Rice	-0.74	-0.66
Nigeria	Sorghum	-0.05	0.19

Set (b)

Crop	*Expenditure group*	*Price elasticity profits constant*	*Price elasticity profits variable*
Calories from rice	Low	-0.58	0.19
	Middle	-0.38	-0.24
	High	-0.28	-0.20
	All	-0.38	-0.26

7.56 In this discussion, the dependent variable has been the level of expenditures on food items. It is possible to express these in nutritional terms. Paragraphs 7.31 through 7.45 explain how this is achieved. This is useful where the policy question relates to the acquisition of calories rather than expenditures on food.

7.57 THE IDENTIFICATION OF FOOD-INSECURE HOUSEHOLDS. A basic aim of the analysis of food security and nutrition is to identify who are food-insecure and what the prevalence of malnutrition is and where it occurs. This is a key step in translating the results of the analysis into action, both for the review and development of policy as well as for the development of more refined data collection systems. In many countries the aim

will be to establish monitoring systems through a series of Priority Surveys repeated at regular intervals. With limited resources, clearly it will be important to establish which are the key variables for monitoring food security and nutrition.

7.58 Food security is closely interrelated to poverty. Not only are the poor likely to be chronically food-insecure, they are also at much greater risk of transitory low levels of food consumption. The starting point for the analysis of food security, therefore, will be the analysis of poverty and, in particular, with the poverty profile which is described in the Poverty Analysis Plan. Although comparisons with the non-poor will be important, much of the rest of the analysis in this section is concerned with examining the food consumption characteristics of households below the poverty datum line and identifying which variables are associated with the symptoms of food insecurity.

7.59 An important first step is to examine household expenditure patterns and to classify households by the budget share they devote to food commodities. Households who devote a substantial proportion of their budget to food are likely to be food-insecure. As a rough rule of thumb, households spending more than 70 per cent of their expenditures (including the estimated value of own production consumed by the household) on food can be expected to be food-insecure. More detailed analysis can be carried out by looking at the food commodities consumed by households. Bennett's law states that the proportion of calories derived from starchy staples declines with increasing incomes. Food-insecure households are likely to spend a greater proportion of their income on basic staples than those with higher incomes.

7.60 The estimation of income elasticities for food commodities also assists in the process of identification of the food-insecure. It is expected that food-insecure households will have a high propensity to spend extra income on food. They are also likely to consume those commodities that are not preferred by the better-off. It is important to identify which foods are inferior goods and at what level of income. If there are commodities that are largely eaten by the poor, which are important in providing calories and where expenditure declines as income increases, then these could well be used to provide targeted food subsidies (Timmer et al, 1983).

7.61 An important next step is to look at sources of food, particularly for the poor and those households identified as potentially food-insecure. A key distinction is between those households (mostly rural) that provide most of their basic food from own production and possibly even sell surpluses — the net producers — and those who purchase most of their food from the market — the net purchasers. It is important for policy purposes to know if most of the food-insecure are producers or purchasers as there are direct implications for pricing policy. In many countries, the assumption is that urban households are net purchasers and rural households are net producers. Analysis of the evidence from a number of African countries, however, suggests that many of the rural poor are generally dependent on the market for their food supplies (Pinstrup-Andersen, 1989) and that price rises for basic staples may well be working to the disadvantage of the food-insecure, at least in the short term.

7.62 Relative prices will be much more important for the poor than for the more well-off. The very fact that consumers are poor and that their food security is threatened means that they have to be responsive to changes in incomes and relative prices. Indeed, Timmer at al (1983) suggest that if there is not evidence of absolutely high own and cross-price elasticities for basic staples among the poor, then there may be a relatively low incidence of food insecurity. It will be important here, however, to distinguish between net producers and net food consumers.

7.63 The next step is to compare the food security classification with certain identifiable household characteristics through the use of cross-tabulations. Relevant household characteristics include:

- the level of household income;
- the structure of income and the degree of diversification;
- household demographic structure (ages and number of males and females);
- the sex of the head of the household;
- asset holdings, e.g., total assets or the holdings of consumer durables;
- geographical location.

7.64 The aim is to identify characteristics which are correlated with food insecurity and which can be used for targeting interventions. For example, "concentration" diagrams can be constructed which allow policy makers to focus on areas which might be examined more closely or made the target of area-based interventions. Other factors for targeting could include female-headed

households or households with a specific demographic structure.

7.65 IMPLICATIONS FOR POLICY. An important application of this analysis is in the design of programs that enhance or preserve household food security during adjustment. [10] These include:

- indirect income transfers in the form of general or commodity-specific food subsidies;
- use of public employment schemes; and
- use of direct income transfers (in the form of food aid, cash, or food stamps or ration cards entitling the holder to free or subsidized food) to targeted groups.

A useful classification of food and nutrition interventions is provided by Timmer et al (1983) who distinguish between targeted and non-targeted and food and nutrition interventions. Nutrition interventions are considered to be those that affect the nutritional status of the target group without involving an overall increase in food intake. Food interventions on the other hand, include the possibility of increasing food intake among the food-insecure.

7.66 The estimates of income and price elasticities for the target groups can be used to determine the effects of different interventions. In addition, it may be possible to identify commodities suitable for price subsidisation because they are self-targeting in the sense that are mostly consumed by the poor and food-insecure.

7.67 For these interventions to be effective, they require criteria for identifying target households that are amenable to administrative selection processes. One advantage of the analysis outlined here is that it establishes links between risks to food insecurity and easily identifiable household characteristics which can be used as selection criteria. For example, dwelling structure can be used as a wealth proxy; and it can be related to levels of food insecurity.

7.68 The identification of correlations between household characteristics and food insecurity has one further important practical use. This is in the monitoring of changes in household food security as adjustment programs are implemented. It is likely to be too costly to make repeated observations of household food consumption. The best chance of establishing a feasible monitoring strategy is to focus on changes in the economic environment in which vulnerable households operate - notably their access to different markets and the prices they face. Indeed, perhaps the most crucial monitoring indicator is some expression of household terms of trade with respect to food such as an index of food prices compared with wage rates or product prices. [11] This can be constructed by comparing the cost of a basket of food commodities and the value of household income. The key variables to be observed are producer prices, wage rates and consumer food prices. All are included in both the integrated and community questionnaires.

7.69 This approach is especially valuable if it can be repeated at regular intervals. This allows changes in household terms of trade to be monitored. With respect to *producer prices*, it is important to observe both interannual and interseasonal variations in all the major producing area markets and for all main crops. It is also necessary to observe prices offered by different marketing agents together with credit arrangements that may affect the prices offered. Any delay in payment after purchase should be used to discount the price offered. Finally, nominal producer price movements should take into account prices of inputs (material inputs and labor primarily) and changes in exchange rates. From this, it should be possible to calculate indices representing producer terms of trade. This will provide an important indicator of the sum of different effects on producers.

7.70 With respect to *wage rates*, some choice will need to be made about the most important wages to monitor. Those most accessible and most significant include minimum wage rates, agricultural wages and unskilled urban wage rates.

7.71 Wages and producer prices should be compared with cost of living indices. It is unlikely that fully calculated cost of living indices will be able to keep pace with continuous devaluations and changes in the prices of consumer goods, much less be available regularly for the consumption basket of different groups of households whose consumption patterns are significantly different. Nevertheless, producer prices and wage rates need to be compared with *consumer prices* in order to express them in real terms. An alternative, albeit partial, is to make comparisons with food prices (and possibly additional important non-food items) weighted according to the composition of consumption by low income rural and urban groups. Where food purchases account for the largest share of total expenditures, an index of "food terms of trade" may be an acceptable approximation. If costs of accommodation and transport (in urban areas) and a few important manufactured items are

added, a fair indication of trends in purchasing power of poor families may be obtained.

Analysis at the individual level

Assessing the nature and extent of malnutrition

7.72 The purpose of this analysis is to identify those social and economic factors that affect individual food security. These will be largely determined by the environment provided by the household. However, as noted in the introduction, food security at the household level (as measured by a satisfactory balance between acquisition and needs) does not guarantee reliable and adequate individual access to food. This Section outlines how food security can be analysed at the individual level.

7.73 The most satisfactory measure of individual food security is individual food intake, but this is not included in the IS survey (see paragraph 7.38). Instead, anthropometric measures of children aged between 3 and 60 months have been recommended as proxies. Studies conducted in different parts of the world indicate that well nourished children tend to grow at the same rate everywhere. Certainly, it has been shown that well nourished children in Africa grow at about the same rate as their counterparts in developed countries. [12] Children who exhibit poor growth, measured either by their height or their weight are likely to be malnourished. The incidence of malnutrition can be shown by comparing the growth of children in the study with a reference population of children known to be well nourished.

7.74 Data collected in the IS survey includes measures of the age, sex, weight in kilograms and height (or length for children below 24 months) in centimeters for all children between 3 and 60 months that are resident at the time of the second visit. These data can be used to construct anthropometric measures, including:

- height (or length) for age, comparing the heights of children with the median height of children of the same age from the reference population;
- weight for height (or length), comparing the weight of the child with the median weight of a child from the reference population with the same height;
- weight for age, calculating the weight of a child as a percentage of the median of the weights of children of the same age from the reference population.

7.75 Tables of weights, heights and lengths for boys and girls of stated ages in a reference population and of weights for stated heights and lengths have been published by WHO (1983). The most widely used reference population is that observed by the National Child Center for Health Statistics (NCHS) referred to as the NCHS standard.

7.76 Height for age is considered to be a measure of nutritional history. A child who is short for his or her age is considered to be stunted. Mindful of the caveats outlined below, height for age can be considered a proxy for long-term food security. If a child is thin given his or her height, he or she is considered to be wasted. Weight for height is a measure of wasting and is thought to reflect the current nutritional status. Height for age and weight for height, therefore, measure different aspects of nutritional status and can be considered to be more or less independent. Weight for age is a composite measure which incorporates aspects of both stunting and wasting. Analysis of SDA data will benefit the most from using height for age and weight for height indices.

7.77 For each child, measures of height for age and weight for height can be expressed in three ways:

- as percentages of the median of the reference population;
- as a centile of the reference population; and
- as a number of standard deviations of the reference population above or below the median (also known as a Z-score).

7.78 These measures can be compared with a pre-determined cut-off point such as a percentage of the median, a specified centile or as a specified number of standard deviations below the median. WHO recommends the use of cut-off points based on the number of standard deviations the observation appears below the reference median. [13] Since the reference population is approximately normally distributed, a cutoff of -2 standard deviations will mean that 2.3 per cent of well nourished children will be falsely classified. With a cut-off of -3 standard deviations, the proportion of false classifications is only about one in a thousand.

7.79 In addition to the tables of reference data referred to above, algorithms have been developing describing the slopes of normal growth curves. These have been written into software packages for the calculation of anthropometric indices, as

percentiles, percent of median values and SD scores.

7.80 In assessing the nature and extent of malnutrition, it is helpful to employ the model of household behavior introduced in paragraphs 7.20 to 7.29. Here, the household maximises a utility function that includes the consumption of goods, leisure, food and health. This is maximised subject to an income and time constraint, as in paragraphs 7.20 to 7.29, and a health production function. The health production function specifies that an individual's health is a function of the consumption of nutrients, health inputs such as inoculations and preventive care, household resources that affect all members (for example, water supply) and the level and quality of child care. A fuller discussion, and a formal derivation, can be found in the Analysis Plan on Health.

7.81 One advantage of using the production-consumption model is that it suggests that the extent of growth failure should not be ascribed solely to individual food insecurity. The quality and quantity of food consumed in relation to needs for growth, activity and body maintenance is certainly one determinant of body size and mass. However, growth faltering is also a consequence of impaired health. For example, children suffering from diarrhoea will obtain fewer nutrients and calories from a given quantity of food than healthy children. The health environment, for example access to clean water and health facilities, will also affect children's growth. In addition, genetic endowments have also been shown to be an important determinant of nutritional status (see Kennedy and Cogill, 1987) for evidence from Kenya and Sahn (1990) for the Côte d'Ivoire).

7.82 Children's anthropometric status also reflects the manner in which households manage child care. There are two components to this. First, it reflects the ability of households to provide care. For example, Thomas, Strauss and Hendriques (1988), Strauss (1990) and Barrera (1990) have indicated that anthropometric status improves as mother's education increases. It is argued that this reflects better knowledge regarding child care practices. Other aspects of care which have been shown to affect anthropometric status include weaning age and duration of breast feeding. Second, time constraints may impinge on the ability of mothers to provide care. For example, in rural areas, these may be particularly acute during periods of peak agricultural activities. To some extent, this may be made up for by care provided by older siblings (Sahn, 1990).

7.83 Finally, anthropometric status will also reflect parental preferences. Again, there are two issues to consider. It may be that parents seek to equalise anthropometric measures of their children. Alternatively, they may value additional improvements equally, independent of their distribution among their offspring. Behrman (1988) provides a useful methodology for examining this issue. Related to this is the issue of sex bias. It has been argued, for example by Sen (1984) and Sen and Sengupta (1983) that in some regions of south Asia, boys are favored over girls in the allocation of nutrients. However, studies in Africa (Svedberg, 1987, Strauss, 1990), have failed to find similar biases. Also, preferences may differ between adult members of the household. In particular, it has been argued that mothers place greater weight on children's welfare. Behrman and Wolfe (1984a) and Horton and Miller (1987) present evidence that is consistent with this view.

7.84 The foregoing indicates that anthropometric status is a function, not only of food intake, but also of health, genetic background, child care and parental preferences. Accordingly, assuming that poor nutrition is a result solely of inadequate food security is incorrect. The analyst must be cognizant of this when analysing individual food security issues using SDA data.

Analyzing the determinants of malnutrition

7.85 The simplest level of analysis of this data involves tabular analysis of individual, household and community characteristics and anthropometric measures. These characteristics are described below. This should include means, standard deviations, minima and maxima. This can be followed by cross-tabulations of measures of anthropometric status with variables of interest such as age, gender, household wealth and location. These are particularly well-suited for presenting information to decision-makers who are not well versed in the analysis of nutritional data. They are also useful in suggesting whether health interventions, rather than food policy changes, will have a greater impact on anthropometric status. Another common use for seeking associations between nutritional indices and household characteristics is to establish selection criteria for targeted interventions. However, it is important

Box 7.5 Example of the analysis of nutritional data

Percentage of children stunted in rural households, by mother's education and per capita expenditure (percent)

Per capita expenditure quintile	Mother's education	
	None	Some elementary
1	24.1	10.7
2	20.7	10.9
3	17.6	8.3
4	19.4	16.8
5	23.3	18.1
All	21.1	12.9

Source: See text.

that the analyst be mindful of the caveats noted in paragraphs 7.83 to 7.85 when developing and presenting these results.

7.86 A sample cross-tabulation is shown below in Box 7.5. Here, the percentage of children stunted in rural areas of the Côte d'Ivoire is cross-tabulated against household per capita expenditure and mother's education. This is taken from Sahn (1990, Table 5).

7.87 A second type of analysis involves the use of econometric techniques. An important advantage of this approach is that it allows the analyst the control for the omitted variable problem associated with cross-tabulations. Here, it is useful to express the dependent variable in actual terms, rather than in relation to the cut-off points described in paragraph 7.78. The independent variables are derived from maximising the household utility function subject to the constraints noted in paragraph 7.23. There are five types (Strauss, 1988): individual attributes such as age and gender; parental characteristics including education, age and height; household characteristics that appear in the farm production function (such as land and capital); variables reflecting community attributes such as health facilities; and the prices of consumption goods, including food, non-food items and leisure.

7.88 As currently structured, the IS Questionnaire does not contain consumer prices. As these will be collected on a cluster basis, there will be no price variation within the cluster. Using prices under these circumstances will tend to bias downward estimated standard errors. This can be overcome by using an estimation procedure known as fixed effects. References for this are Hausman and Taylor (1981) and Hsiao (1986) and the Analysis Plan on Health. While this approach is necessary to generate unbiased standard errors, it does not permit direct measurement of the effect of price changes on nutritional status.

7.89 A second issue concerns the inclusion of some measure of individual nutrient intake. A priori, this would appear desirable given that the emphasis here is on the linkage between acquisition of food and nutritional status. However, it is not possible to include food acquisition directly as a variable. First, as noted in paragraph 7.38, this is not measured as part of the IS survey. It is necessary to proxy for this, for example by using per capita household expenditures on food. Second, in the context of the producer-consumer model of household behavior, household expenditures on food are a choice variable. As such, including it as a regressor will lead to biased estimates. This problem can be overcome through the use of an instrumental variables technique. For example, household expenditures on food are regressed on variables reflecting household demographic composition, assets and location.

7.90 These considerations indicate that the following two-stage strategy is appropriate. In the first stage, per capita food expenditures are regressed on the variables noted in the previous paragraph using a fixed effects estimation procedure. It may be advantageous to transform the dependent variable into natural logarithms as this will reduce heteroscedasticity. The independent variables will include the following.

- *Household demographic composition.* This includes the number of males and females by age group. This is found in the roster section of the household questionnaire.
- *Household assets.* This includes: wealth held in the form of human capital, specifically levels of educational attainment of adult males and females (also found in the household roster); and non-human wealth, including the size of land holdings (from the section on agriculture), the value of household capital in the form of liquid assets and machinery (from the sections on household savings, agriculture and own business activities) and the value of consumer durables (this is found in the section on possession of consumer durables).
- *Household location.* At the very least, this will include urban or rural locales. In countries with

Box 7.6: Estimating the determinants of anthropometric status in Ghana

This example is taken from a recent paper by Alderman (1990), based on LSMS data collected in Ghana. As this is comparable to the data that will be made available under the SDA project, it is particularly useful. The approach taken by Alderman is comparable to that described above. Initially, he estimates the determinants of the log of per capita expenditures and also of illness. The former is a function of the following variables:

Number of males and females by age group
Number of males and females by level of education
Value of livestock
Value of vehicles
Value of other capital
Area of land owned in different ecological zones
Cocoa area
Age of head of household
Various dummy variables to indicate where the household lived and whether the head of the household was female

The predicted per capita expenditures are included in the least squares regressions where children's height for age and weight for height are used as dependent variables. Other independent variables include:

Age of the child in months
Age of the child squared
Household size
Number of older siblings
Number of younger siblings
Dummy variables for location
Dummy variables to indicate the education level of the mother
Interaction terms between age and location
The sex of the child

Alderman obtains the following results. Height for age falls as children age, indicating that chronic malnutrition is cumulative. Mother's height has a strong and positive influence on height for age. However, the coefficient for mother's education is not significant. No gender bias is found, nor is the dummy variable for urban locations significant. Children with younger siblings are significantly shorter than those without. Higher per capita expenditures significantly improve height for age.

Similar results are found when weight for height is used as the dependent variable, though the variable for per capita expenditures is not significant. This regression does not perform as satisfactorily as height for age. This is not entirely surprising, given that weight for height is a short-term variable, and hence liable to greater random fluctuations.

differing agro-climatic zones, it may be useful to include this variable as well.
Cluster-level food prices from the community questionnaire are also included, though these drop out when the fixed effects estimation is used.

7.91 Multiplying the estimated coefficients by the value of these variables for each household generates predicted per capita expenditure on food. This is then included in the estimation of the relationship between anthropometric status and individual and parental attributes. If it is assumed that there exists a linear relationship between anthropometric status and the independent variables, then the equation to be estimated using ordinary least squares becomes:

$$N_{ij} = a_0 + a_1 X_{ij} + a_2 PXHT + a_3 X_{pj} + e_{ij}$$

where: N_{ij} is the nutritional status of the ith child in family j;
X_{ij} is a vector of characteristics of child i in family j;
PXHT is the predicted per capita expenditure on food;
X_{pj} is a vector of parental characteristics of family j;
e_{ij} is an error term; and
a_0, a_1, a_2 and a_3 are parameters to be estimated.

7.92 Before discussing the regressors to be used, it is worth noting that several important variables are not available from the SDA survey. These include mother's height, weaning ages and past breast feeding practices. Independent variables that are available and should be included are:

- *Individual characteristics.* These include age, sex, birth order and immunisation.
- *Parental characteristics.* These include education of father and mother, mother's age at birth.

Box 7.6 outlines an example of this type of analysis. The analyst may find it useful to consult other examples of this type of analysis. Recent examples include Knudsen and Scandizzo (1982), Kennedy and Cogill (1987), Sahn (1990), Barrera (1990), Strauss (1988), Pitt et al (1990) Thomas, Strauss and Hendriques (1988) and Horton (1988).

7.93 Thus far, the role of community attributes such as health facilities has been excluded. As

the Analysis Plan on Health contains a detailed description of these variables and their use, the discussion here is limited to an overview of the econometric issues. Direct inclusion of community variables, such as access to drinking water and health services, will lead to biased standard errors because they are common to all households within the cluster. This can be overcome through the use of fixed effects estimation, but this causes these variables to drop out of the estimated equation. One way of getting around this, as suggested by Strauss (1988), is to use interaction terms such as distance to doctors by mother's education. Since these vary by household, the problem with bias disappears.

Conclusion

7.94 The analysis presented in this Chapter is designed to identify the factors that affect food security at the household and individual level, to quantify these relationships, and to identify those at risk from food insecurity. Structural adjustment programs affect the prices, incomes and the institutional framework in which households operate. Consequently, the analysis of food security is necessary for the assessment of the impact of past policy reforms, for predicting the impact of future policy changes, for monitoring the well-being of vulnerable households during structural adjustment, and for assessing the costs and benefits of policy revisions, including those designed to ameliorate the impact of adjustment. As noted in this Chapter, it is necessary to specify the level and time frame when undertaking such an analysis.

7.95 Data collected as part of the SDA IS questionnaire are not especially suited for examining national level food security issues. However, there exists a wealth of analytical possibilities at the household and individual level. In particular, it is possible to estimate the impact of changes in incomes and prices on the acquisition of food. Comparing this against a normative measurement of requirements indicates how a household's food security is affected by policy reform. These results can also be used to inform decisions regarding the monitoring of groups vulnerable to food insecurity and policies designed to ameliorate the transitional effects of adjustment.

7.96 The IS questionnaire will also collect data on anthropometric status on children under five. This can be used as a rough proxy for individual food security, though it must be noted that other factors, such as child care and access to health services, also play an important role. The analysis of these data will provide information on the impact of adjustment on individual food security.

Notes

1. Sen (1981).
2. Devereux and Hay (1987) refer to these claims as "latent income."
3. However, few smallholder producers have access to formal credit markets (Collier and Lal 1986) and it is unclear what happens in informal credit markets when interest rates are raised or a credit squeeze imposed on formal sector markets.
4. Also see Bouis and Haddad (1988) and Behrman (1990).
5. See Bouis and Haddad (1988) for a detailed discussion of this point.
6. Studies that indicate that the distribution of income within the household affects the pattern of demand for food and other goods include those of: Guatemala (von Braun et al [1989]), Jamaica (Horton and Miller, 1987), Gambia (von Braun [1988]) and India (Kumar, 1979).
7. This aspect is also discussed in paragraphs 7.85 to 7.93.
8. It should be noted that this functional form is not appropriate when the estimation of the demand for all goods is being attempted as it violates the condition that the b_i's sum to zero. See Deaton and Muellbauer (1980) for a discussion.
9. Note that if production and consumption decisions are not separable, it is necessary to include the prices of food, non-food items, wages and crop input prices in the estimation of the demand equation. The Analysis Plan on Health provides a further discussion of this.
10. These temporary expedients should not be unduly costly nor should they become permanent welfare transfers at the expense of vigorous incomes and employment policies.
11. This is also discussed in the Analysis Plan on Employment and Earnings.
12. For example see Habicht et al (1974).
13. Because the standard deviation for the reference population increases with age, this measure, which is not age dependent, is more accurate than the cut-offs of 80% for weight for height and 90% for height for age.

8

The impact of adjustment on women

Introduction

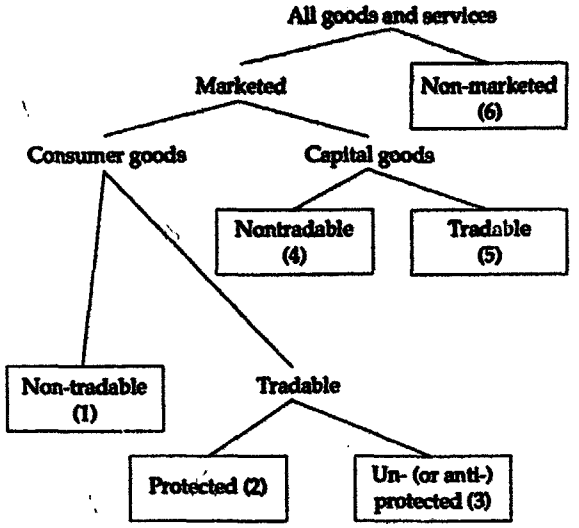
8.01 There is an important difference between this Analysis Plan, on the Role of Women, and others such as Health. A focus upon health makes obvious sense because, as an objective of development, it is of direct policy concern. Gender is one of many ways in which data can be disaggregated and the rationale for doing so is twofold. First, in earning income, women often face different constraints from men. Since structural adjustment is largely about changing constraints, if those facing women and men are sufficiently different, it is illuminating to treat the genders as distinct groups rather than studying gender-undifferentiated averages. Second, women and men often have radically different propensities to consume particular public services and so budgetary changes can have powerfully gender-differentiated effects. This Plan will give examples of how gender disaggregation can add to our understanding of particular topics such as health. It should be stressed that gender is not a topic in itself but rather a possible disaggregation to be borne in mind when studying a topic. The art of analysis is to keep disaggregation to a minimum so that it is possible to see the wood for the trees. Sometimes gender disaggregation will not add enough to be worthwhile. However, for some topics it will turn out to be useful and for others essential. With properly set up survey data the cost of fishing to see whether gender disaggregation is going to be informative is usually very low. The next section sets gender in the context of other disaggregations important for the analysis of structural adjustment. Paragraphs 8.09 through 8.29 discuss the symptoms of gender-differentiated constraints upon the generation of income. Paragraphs 8.30 through 8.33 move from the symptoms to the constraints themselves. Finally, paragraphs 8.34 through 8.43 explicitly relate gender to a series of public policies. Throughout, examples of how African survey data have been and can be used are presented in boxes.

Choosing the level of aggregation

8.02 Perhaps the most fundamental step in economic analysis is the choice of aggregation of activities and of agents. Although gender-issues concern disaggregation between agents, it is useful to begin with activities. The new macroeconomics of structural adjustment usually as a minimum distinguishes between the six activities shown in Figure 8.1 (overleaf). First, a distinction is made between marketed and non-marketed goods and services because only for the former can resources be allocated through the price mechanism. Second, within marketed activities distinctions are drawn between capital and consumer goods, and between tradables and nontradables. Finally, within tradables, a distinction is made between protected and unprotected (or anti-protected) activities.

8.03 However, there is no equivalent consensus as to the appropriate disaggregation of agents. The key determinant of this choice is whether we

Figure 8.1 Disaggregation of activities in the new macroeconomics of adjustment



are concerned primarily with the processes by which living standards are determined, or only in the outcome of those processes. That is, whether we are concerned with production or only with consumption. If the latter, then the appropriate unit of observation is self-evidently the individual person. However, in Africa although such information is useful for the improved targeting of services and transfers, of greater policy concern is the process whereby living standards are generated. A part of poverty is due to constraints upon the generation of income which are able to be alleviated by appropriate changes in policy. The primary purpose of the analysis of survey data is to assist in the identification of such policy changes.

8.04 This implies a radically different disaggregation of agents. The criterion for disaggregation now becomes the decision problem of the agent: only where decision problems differ significantly is it necessary to distinguish between agents. On this criterion three disaggregations at once suggest themselves and are commonly used: (i) by the activity(s) in which the agent is engaged (see Figure 8.1); (ii) by the location of the agent (rural/urban); and (iii) by the extent of the principal-agent problem encountered by the agent as an organization, viz:

- individual person (none)
- household (cooperative conflict)
- firm (hierarchy).

8.05 In this Chapter it is suggested that on the same criterion a fourth disaggregation, by gender, is also often appropriate since the constraints, and hence the decision problem are likely to differ substantially by gender.

8.06 A corollary of this rationale for an analysis which distinguishes between women and men is that, generally, there is not a small, self-contained set of "womens issues" which can be appended to an otherwise unaltered analysis. Rather, the claim is that many standard issues in resource allocation become better illuminated when the analysis is disaggregated by gender. When added to the above three-way disaggregation of agents we arrive at a potential disaggregation of six activities by two locations, by three organizational forms, by two genders, which is 72 classes of agent. Even this understates the potential number of agents since many agents will be engaged in multiple activities rather than being defined by a single activity. Six activities give rise to 64 different combinations of activities (ranging from doing none to doing all six). Clearly, the scope for analytically meaningful disaggregations rapidly leads us into unmanageably large numbers of different groups. The answer to this problem is to check with the data which among these groups is sufficiently large or poor to be important from a policy perspective. Box 8.1 gives an example from a survey of Central Province, Kenya, of how 64 different combinations of activities can be reduced with little loss to around 9 combinations.

8.07 To summarize, if we seek to understand the processes which generate income then our disaggregation must be based upon analytically purposive distinctions as to how income is acquired. Since there are many such distinctions this must be tempered by a scrutiny of the survey data to see which distinctions are important.

8.08 If, however, we seek to improve the targeting of public consumption services, then our disaggregations are differently motivated. We should make those distinctions which help decision-makers and administrators designing the delivery of services to identify those most in need. The most readily identifiable distinctions between people are age, location and gender. Age and location are continuous variables: that is we can go on making finer and finer distinctions and so the question will usually be at what point is it sensible to stop. There are, of course, no such problems with gender: the question is simply whether the distinction is worth making. As with all disaggregations, the test is empirical.

Box 8.1 Using survey data to re-aggregate

The data: Survey of rural households in Central Province, Kenya, 1982.

The problem: It is believed that the minimum analytic distinctions between activities are three types of farm income: food crops, non-food crops and livestock; and three types of non-farm income: business, wages and remittances. Since households undertake multiple activities this gives potentially 64 different combinations. The impact of price changes on households will differ as between these combinations. The problem is to identify which are important.

The criteria: Two criteria can be deployed to cut down the range of combinations. First, we can eliminate those in which only a few households are engaged: e.g., less than 5% of the sample. Second, we may wish to revise this on inspecting information about mean incomes. A combination with rather fewer than 5% of the sample may still be important for policy purposes if mean income is well below average. Note, however, that if the cell size is too small then the observed mean income is probably spurious as a guide to the characteristics of wider population.

Table 1 shows the distribution of the households over the 64 possible combinations of activities. From Table 1 we find that only 7 combinations meet the 5% cut off. These 7 account for 66.4% of all households. Table 2 calculates mean per capita income. Scrutinizing it suggests that the combination of food crops + livestock, which just misses the 5% cut off, should still be included because the income of this group is little more than half that for the whole sample. This group is a sizeable component of the poor. Hence, we arrive at 8 meaningful combinations plus a residual "all other combinations" which accounts for around 29% of households.

Table 1 Distribution of households by activity

		Non-farm						
Farm	*None*	*Own business only*	*Wage only*	*Remittances only*	*Own business + wages*	*Own business + remittances*	*Remittances + wages*	*All types non-farm*	*Total*
None	0.9	0.0	10.8	0.3	0.0	0.0	1.2	0.0	13.2
Food crops only	1.8	0.4	8.2	0.9	1.4	0.0	1.2	0.0	13.7
Cash crops only	0.6	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.9
Livestock only	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.5
Food and cash crops	2.6	0.0	1.2	10.0	0.6	0.0	0.4	0.0	5.9
Food crops and livestock	4.9	1.6	5.8	3.2	1.0	0.0	2.9	0.1	19.5
Cash crops and livestock	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.4
All types of farm income	16.5	1.4	9.5	9.2	0.7	1.7	6.0	0.3	45.7
Total	28.6	3.8	35.6	14.8	3.6	1.7	11.6	0.4	100.0

Table 2 Mean household per capita income by activity mix

		Non-farm						
Farm	*None*	*Own business only*	*Wage only*	*Remittances only*	*Own business + wages*	*Own business + remittances*	*Remittances + wages*	*All types non-farm*	*Total*
None	0.0	-	1,634.5	240.0	-	-	2,343.5	-	1,506.4
Food crops only	340.9	824.5	1,772.7	792.1	4318.0	-	1,252.9	-	1,923.0
Cash crops only	-106.8	9,799.4	-	732.9	-	-	-	-	2,135.3
Livestock only	40.0	970.0	1,171.0	-	-	-	-	-	945.5
Food and cash crops	484.6	-	655.9	1,170.8	4,034.5	-	2,763.4	1,889.2	1,247.7
Food crops and livestock	1,024.1	1,479.5	1,657.1	1,894.1	3,838.8	-	3,318.4	1,889.2	1,913.3
Cash crops and livestock	163.1	-	-	-	-	-	-	-	163.1
All types of farm income	1,301.2	2,257.5	1,675.8	1,623.1	1,683.3	2,526.7	1,825.6	1,696.7	1,599.9
Total	1,106.2	1,926.8	1,627.3	1,615.5	3,681.7	2,526.7	2,132.6	.,725.6	1,662.6

Source: Peasants and Governments: An Economic Analysis, D.L. Bevan, P. Collier and J.W. Gunning, Clarendon Press, Oxford, 1989; Tables 2.7 and 2.8.

However, since the gender disaggregation is so simple, it will always be worth making. Box 8.2 (overleaf) uses data from Tanzania to show that the addition of gender disaggregation makes age group and symptom disaggregations more revealing in identifying differences in the incidence of illness, and thus on the targeting of curative and preventative health services. The

Box 8.2: Presenting gender differences in illness

The data: Survey of households in rural Tanzania, 1983, information on illness during the past three months.
The problem: To identify groups of the population most prone to illness.

The table divides the population into four age groups and by gender and distinguishes between five symptoms of illness. Here the three distinctions age/gender/symptom reinforce each other. If we fail to make the age and symptom distinctions then there is little difference between the genders: 18.1% of the men and 19.4% of the women have been ill. Adding the breakdown by age, however, we find a strong and revealing gender difference. Women aged 16-49 are 33% more likely to be ill than men. This suggests the hypothesis that child bearing places a physical strain on women which adversely effects their general health. Adding the breaking down by symptom, the gender differences become larger. Women aged 16-49 are 43% more likely than men to suffer from fever, diarrhoea or vomiting but less likely to suffer from chest-based illnesses (perhaps because they smoke less?). In this example, the gender distinction makes the age and symptom distinctions more informative.

Morbidity: Percentage of population ill by age, sex and symptom

	Percent of population afflicted within each age group				
Symptom	*0-4*	*5-15*	*16-49*	*50+*	*Total*
Males					
F	14.8	9.6	9.1	20.2	11.5
DV	4.8	1.7	1.3	1.8	2.0
FDV	2.2	1.3	1.1	5.0	1.8
C	4.8	2.7	2.6	4.6	3.2
CB	0.9	0.2	0.3	2.3	0.6
Percentage ill*	25.7	14.8	13.7	32.1	18.1
Females					
F	16.7	11.9	13.0	15.4	13.4
DV	5.4	2.6	1.9	1.1	2.6
FDV	3.9	1.3	1.5	2.3	1.9
C	3.5	2.1	2.3	4.0	2.6
CB	0.4	0.5	0.4	1.1	0.5
Percentage ill*	27.2	16.5	18.2	22.9	19.4

F indicates fever.
D indicates diarrhoea.
V indicates vomiting.
C indicates cough.
B indicates blood in sputum.
* Percentage ill is less than the sum of the corresponding symptom percentages since some individuals suffer more than one symptom.
Source: Peasants and Governments: An Economic Analysis, D.L. Bevan, P. Collier and J.W. Gunning, Clarendon Press, Oxford, 1989; Table 14A6.

scope for useful descriptive statistics on well-being is considerable. However, since it is fairly straightforward the rest of this paper will concentrate upon the process of income generation. This is more complex, but probably more important.

Symptoms of gender-differentiated constraints

8.09 This section discusses how to use survey data to determine whether constraints upon economic decisions are likely to be significantly different for men and women. If they face different constraints two phenomena should be identifiable, one static and the other dynamic. First, female-controlled resources should, as a consequence, be distributed over economic activities very differently from male-controlled resources. This is because, faced with a common set of incentives and differential constraints, maximizing agents will allocate their resources differently. Second, when the structure of incentives change, so that it is optimal to reallocate resources, the process of supply response will differ systematically. Both these phenomena are of the essence for structural adjustment. Adjustment is about resource movements between activities. Changing the incentive structure is merely a necessary means by which such movements are induced. Assisting the process of adjustment therefore means identifying those types of agent who control resources in those activities which should contract, and discovering how policy changes can ease the impediments to the reallocation of those resources to other activities. If women and men are allocated very differently between sectors then a given change in the structure of incentives will imply different requirements for them to be mobile. But the differing constraints may also imply that women have less capacity to be mobile than men. For example, women might be disproportionately located in sectors which need to contract and at the same time have less capacity than men to reallocate resources to sectors which should expand.

8.10 The major resource which women control is their labor (although, as we will see, women may often not be in full control of their labor time). A simple and instructive starting point in the gender-disaggregated analysis of survey data is to compare the allocation of male and female labor. Referring back to our discussion of disaggregation, it is meaningful to do this in several different ways. First, we distinguish between farm work/wage, work/own, business/family, and services/health-related time. Box 8.3 shows that on this basis there are large differences in the

allocation of time between the genders. Women spend far more time working on the family farm, somewhat more time working on other farms, and far less time on their own businesses and in wage employment. They spend overwhelmingly more time fetching water and wood. Box 8.3 investigates this further by distinguishing between female heads of household and wives in male-headed households. Wives' time is even more skewed towards the farm and fetching water and wood, with less time being devoted to business and wage employment. It also distinguishes between women with and without education: educated women spend substantially more time in business and non-agricultural wage employment without spending less time on other forms of work. Finally, it compares boys and girls in the age group 6-15, the prime school age group. Girls spend nearly three times as long working as do boys. This surely raises the question whether it is detrimental to their performance at school.

8.11 The other important basis for disaggregating the allocation of work time is the macroeconomic sectors identified in Figure 8.1. Of the six activities previously identified, in most of Africa domestic production of tradable capital goods is sufficiently minor for the activity to be aggregated in with the rest of manufacturing as a "protected tradable" (tradable capital goods are an important category in the macroeconomics of expenditure but not of production). The task for the analyst of survey data is now to assign the activities reported in the survey to the five remaining analytic activities. This task will entail a series of choices which will differ between countries to some extent. However, in much of Africa as a first approximation the activities can be proxied as set out in Frame 8.1 (overleaf).

8.12 Of these, food production is the most problematic to allocate since it can potentially be part of either the protected or unprotected tradable sector instead of being nontradable. This is a crucial decision for the investigator: women are heavily specialized in food production and so whether, overall, women are disproportionately in the protected tradables, unprotected tradables or nontradables sectors largely depends upon it. The designation as between tradable and nontradable depends upon transport costs: often these are sufficiently high for broad self-sufficiency to be cost-minimizing in a normal year, in which case food is appropriately regarded as nontradable. If food is traded internationally, then it can be classified between protected and unprotected on the basis of the relationship of the producer price to the world price. If food is exported then the question is whether the producer price is broadly equal to the world price

Box 8.3: Gender differences in the allocation of labor time

The data: Survey of Central Province, Kenya, 1982
The problem: To identify differences in time allocation between and within the genders.

The first table identifies 12 non-leisure uses of time. Women spend far more time working on the farm, fetching water and wood, and being ill. Men spend far more time in off-farm work, in education, and as outpatients. The second table focuses on 7 of these uses of time. It first compares women who are household heads with those who are wives. It then compares women with different levels of education. Finally, it compares boys with girls. Women who have the autonomy of being household heads spend more time in non farm employment and less time fetching water and wood. Educated women spend far more time in non farm wage employment, but not at the expense of other activities. Girls spend nearly three times as many hours in these activities as boys.

	Hours per year	
Type of work	*Males*	*Females*
Own farm	227	361
Off-farm wage work	105	35
Own business	47	19
Work on estates	4	3
Work on other small farms	38	45
Fetching water	28	209
Fetching wood	21	187
Education	376	345
Outpatient time	8	4
Accompanying outpatient	1	5
Inpatient time	1	1
Other illness-related time	21	30

	Females only				*Age Group 6-15*	
	House-hold heads	*Wives*	*No edu-cation*	*Com-pleted pri-mary*	*Boys*	*Girls*
Own farm	830	897	407	408	26	54
Off-farm wage work	109	63	5	58	0	0
Own business	105	37	15	27	0	0
Work on estates	0	9	7	0	0	0
Work on other small farms	119	94	59	40	1	2
Fetching water	405	507	230	292	20	63
Fetching wood	405	470	210	210	15	47
Total					62	166

Source: *Peasants and Governments: An Economic Analysis*, D.L. Bevan, P. Collier and J.W. Gunning, Clarendon Press, Oxford, 1989 derived from Tables 14E1,2 and 3.

Frame 8.1: Relating macroeconomic sectors to activities identified in surveys

Concept			*Survey proxy*
Consumer goods:	Tradable:	Protected	Manufacturing
		Unprotected	Export crop agriculture
	Nontradable		Food agriculture
			Services, trade
Capital goods:	Nontradable		Construction
Non-marketed goods and services			Public sector employment

minus domestic transport costs. If the producer price is substantially above this then food is a protected tradable. If food is imported, then (since at the margin domestic transport costs have to be paid on imported food) the investigator should select among the locations supplied by imported food that which has the highest transport costs. The key comparison is then between the actual producer price of food and that which together with the cost of transporting it to this location would equal the cost of imported food including its transport costs. If the two prices are broadly equal, then food is unprotected. If the actual producer price is substantially the higher of the two, then food is a protected tradable. Having made these assignments, a further feasible and important disaggregation is the contractual mode by which labor is allocated to the sector: namely through the labor market, through the household, or through the individual

8.13 Two descriptive statistics are useful: the percentage of the female laborforce engaged in each sector (by contractual mode), and the percentage of the total laborforce in each such category which is female. Such an arrangement of survey data is portrayed in Box 8.4 which shows both an "ideal" disaggregation and a more limited example of what has been done on national Kenyan data. The Kenyan example demonstrates that there are large gender differences in labor allocation between the sectors derived from macroeconomic analysis. The protected tradables sector is overwhelmingly male as is the non-food nontradables sector. The food sector and small-farm export agriculture are predominantly female.

8.14 In practice it is not usually possible to distinguish between labor whose allocation is household-controlled and that which is individually controlled. However, at least as far as gender is concerned, a good proxy for the severity of the principal-agent problem is whether the household is male- or female-headed. Whether this disaggregation of household allocation is worthwhile probably varies considerably within Africa. In parts of West Africa very few households are reported as being female-headed, in parts of East Africa around 40% of households are female headed and the distinction is extremely important.

8.15 Box 8.4 tells us both where the laborforce is by gender and the relations of production by which it is there. We might find, for example:

- that women are skewed towards the nontradable sector (where they predominate);
- that women are skewed away from market allocation of labor; and
- that within household allocation, female-headed household labor is more skewed towards nontradables than that of male-headed households.

8.16 What might these findings suggest? Structural adjustment involves a reallocation of resources from the nontradable to the tradable sector. If women predominate in the nontradable sector this tells us that resource reallocation will primarily concern females. If, additionally, womens labor is allocated by the household, this tells us that we cannot rely upon the labor market to achieve this reallocation. If, within household allocation, female-headed households are skewed towards nontradables, and if such households are numerous, this suggests that the gender of the household head may currently be a significant influence upon accessibility to tradable activities.

8.17 A useful supplement to Box 8.4 is the mean wage rate in each sector (Frame 8.2). The wage rate is some guide to the marginal product of labor. Hence, pronounced differences in wage rates between sectors indicate either differential endowments of human capital or differential barriers to entry. This is of interest for gender

Box 8.4: The distribution of the labor force by macroeconomically meaningful sectors

The problem: To estimate the differing gender compositions of the sectors identified in the macroeconomic analysis.

Since this work would be new, there is no good example with which to illustrate it. Hence, an "ideal" presentation of survey data is suggested below, followed by a more limited example for Kenya.

The Kenyan example utilised both household survey data and Employment and Earnings Survey data. The latter, being an establishment-based survey, misses informal and subsistence activities but is likely to be more accurate for formal sector wage employment. Note the very large differences in the gender compositions of the various sectors. In Kenya food was judged to be nontradable in that in a normal year the country would be self-sufficient

An "ideal" portrayal of the data

	Mode of contract							
	Household							
Sector	*Female-headed*		*Male-headed*		*Wage labor*		*Total*	
Protected tradables	X	Y	X	Y	X	Y	X	Y
Unprotected tradables	X	Y	X	Y	X	Y	X	Y
Nontradable consumer goods	X	Y	X	Y	X	Y	X	Y
Nontradable capital goods	X	Y	X	Y	X	Y	X	Y
Public services	X	Y	X	Y	X	Y	X	Y

X indicates percent of total female labor force in category.
Y indicates percent of labor force in category which is female.

An actual example for Kenya, 1981

	Percent of laborforce	
Sector	*Female*	*Male*
Unprotected tradables		
Wage labor on estates	24	76
Smallholder labor	58	42
Protected tradables	12	88
Nontradables		
Food	63	37
Capital goods	4	96
Private service (wage labor)	21	79
Non-market (public services)	19	81

Source: Derived from Table 2 of "Women and Structural Adjustment" P. Collier, Women in Development Division (1989) and EDI (forthcoming).

issues if the hierarchy of wage rates by sector tends to correspond to the concentration of female labor in each sector. For example, we might find that women tend to be concentrated in those

Frame 8.2: Mean wage rates and the distribution of the labor force by gender

Sector	*Female/male mean differential*	
Protected tradables	-	-
Unprotected tradables	-	-
Nontradable consumer goods	-	-
Nontradable capital goods	-	-
Public services	-	-
Total	-	-

X indicates percent of female total labor force in category.
Y indicates percent of labor force in category which if female.

sectors in which mean wage rates are lowest. This implies either that women have differentially lower rates of accumulation of human capital, or that they face differentially high entry barriers to the more remunerative sectors (or both).

8.18 A further supplement is to disaggregate wage rate information by gender (where sample sizes permit). Controlling for human capital, differences in wage rates by gender seem to be rather small relative to the very large gender differences in labor allocation by sector. However, this remains uncertain and so it is worth getting direct evidence upon it where this can be achieved at low cost. The two supplementary analyses are summarized in Box 8.4.

8.19 Box 8.4 and Frame 8.2 take us quite a long way in determining whether gender is likely to be a significant issue in structural adjustment (from the viewpoint of production). For example, they might between them suggest:

- that most of the labor that must reallocate from nontradables is female;
- that this labor is not allocated through the market;
- that this labor appears to be locked into the sector in that it already has a typically low earnings; and that the problem (if any) in the labor market appears to be one of differential access rather than of differential earnings once in the market.

8.20 The construction of the tables should be feasible on many sets of survey data. The only disaggregation which will sometimes be problematic is the allocation of labor by gender between food and export crop agriculture. In cases where surveys do not record labor allocation by crop, a proxy can still be achieved by investigating whether, for each of male and female headed

households, there is a correlation between the proportion of crop output which is export crops, and the proportion of the household laborforce which is male. A useful technique for investigating this sort of question is a regression. In this case the regression would be:

$$y_i = a + b x_i$$

where y_i is the proportion (by value) of farm output attributable to export crops in household i and x_i is the proportion of the household i labor force which is female.

8.21 Two things should be stressed about this regression. First, it is very "reduced form." That is, it investigates something which is the outcome of a more complex, but unmodelled, process. Activity choices can be presumed to reflect considerations of factor endowments other than labor, such as land and credit, and also considerations of risk. Potentially, the regression can be expanded to include such influences. Second, much choice remains open to the analyst: for example, how to define the labor force; whether to use gross output or net income.

8.22 Non-labor factors of production are usually more difficult to disaggregate by gender from survey data. As an approximation the agent who controls the allocation of land as between food and export crops can be taken to be the head of the household, although the extent to which this is inaccurate will need to be checked from non-survey sources. In this case the relevant gender disaggregation for land is between male and female-headed households as shown in Frame 8.3.

8.23 Control of capital disaggregated by sector and gender is not usually identifiable from survey data.

8.24 So far the analysis has concerned the static picture of resource allocation. We now advance to the analysis of resource mobility. A particularly interesting aspect of resource mobility from the view point of gender is the process of entry into economic activities which the agent has not previously undertaken. This is likely to be of importance where women are heavily concentrated in those activities which need to decline relatively. In much of Africa the central process of resource allocation is the expansion of export agriculture. We first give an example which suggests that there can be a substantial, gender-related problem in this expansion. The example concerns tea-growing in Kenya.

8.25 Recent work on the adoption of tea in tea-growing parts of Kenya during 1975-82 has compared male and female-headed households. Tea is arguably the most important export activity with potential for expansion in Kenya, since unlike coffee it is not subject to international quotas. Hence, in investigating the determinants of tea adoption we are at the heart of impediments to appropriate resource mobility. The study found that female-headed households had only half the propensity of male-headed households to adopt tea. Since in Kenya around a third of rural households are female-headed this diminished propensity is in aggregate substantial. Further, the case of Kenyan tea is particularly revealing because most of the tea picking is done by females. This is reflected in the effects of the household labor endowment on the propensity to adopt tea. Holding other household characteristics constant, extra male labor has no effect upon the propensity to adopt tea whereas extra female labor leads to a statistically significant increase. An additional female adult in an otherwise average household raises the propensity to adopt by around a quarter. Thus, in Kenya the key sector of tea is characterized by three apparently incompatible facts. Women do most of the work on tea, households with more women are more likely to adopt the crop, yet households headed by women are far less likely to do so. The implication is that female-headed households face some severe constraints additional to those faced by male-headed households which prevents them from entering what would otherwise be a natural activity for female-headed households.

8.26 How can the policy analyst study this sort of phenomenon? The most straightforward technique is tabular and this is the technique which we have relied upon so far. Box 8.5 shows how tables might be used to investigate gender effects in tea adoption. However, the difficulty with using tables for this sort of question is that sev-

Frame 8.3: The allocation of land by sector and gender

	Male-headed households	*Female-headed households*
Food crops	X	X
Export crops	X	X
Other uses	X	X

X indicates percentages of land used for this purpose.

Box 8.5: Investigating gender influences on tea adoption using tables

A hypothetical example

The problem: To investigate by tabular means whether gender is a significant influence on the adoption of tea.

The limitation of using tables is that there are likely to be several influences on tea adoption. Suppose we start with the hypothesis that the age and gender of the household are likely to matter as are the household's endowments of male and female labor. Tables can then be used to see whether there are substantial differences in the proportion of households adopting tea by breaking the sample down into "cells" within households have the same age group and gender of the head, the same male labor endowments are each divided into three groups. With 3 age groups, 2 genders, 3 male labor groups and 3 female labor groups there are therefore 3X2X3X3 = 54 cells. We then compare the proportion of households adopting tea in these cells. The tabular approach rapidly hits the limits of sample size if there are several influences to be investigated as in the present example. The four influences can only be handled together by breaking the sample down into 54 cells, but then there must be enough observations in each cell for a proportion of adopters to be a meaningful figure. For samples in the 1,000 to 2,000 range breaking the sample down much beyond 50 cells is unlikely to yield reliable information. Hence, in the above example, if there were more than four important influences on tea adoption it would be difficult to investigate the effects of gender using only tables. The alternative approach in such a situation is discussed in Box 8.6.

An example of a tabular approach to tea adoption

Age group of head	*under 30*	*30-49*	*50+*
Male labor endowment 1 adult or less			
Female labor endowment 1 adult or less			
Male-headed	X	X	X
Female-headed	X	X	X
Female labor endowment 2 or 3			
Male-headed	X	X	X
Female-headed	X	X	X
Female labor endowment more than 3			
Male-headed	X	X	X
Female-headed	X	X	X
Male labor endowment 2 or 3 adults			
Female labor endowment 1 adult or less			
Male-headed	X	X	X
Female-headed	X	X	X
Female labor endowment 2 or 3			
Male-headed	X	X	X
Female-headed	X	X	X
Female labor endowment more than 3			
Male-headed	X	X	X
Female-headed	X	X	X
Male labor endowment more than 3 adults			
Female labor endowment 1 adult or less			
Male-headed	X	X	X
Female-headed	X	X	X
Female labor endowment 2 or 3			
Male-headed	X	X	X
Female-headed	X	X	X
Female labor endowment more than 3			
Male-headed	X	X	X
Female-headed	X	X	X

X indicates percent of those households which, while not growing tea in 1975, adopted it during 1975-82.

eral different influences need to be disentangled. Tea adoption is, by hypothesis, influenced by the gender of the household head, by the male and female labor endowments, and probably by other factors such as the age of the head. Each time an influence is added requires a further breakdown of the sample and this rapidly exhausts the sample size because the number of observations remaining in each cell become too few to be a reliable guide. Hence, economists tend to use more powerful techniques than tables when confronted by more than a few potential influences. Two highly useful techniques are regressions and logits. Regressions are appropriate where the phenomenon to be explained can potentially take on any value (such as income). Logits are appropriate where the phenomenon to be explained can only take on two or three values. For example, in the present case there can only be two possible outcomes: either the household does or does not adopt tea. The appropriate technique is therefore a logit rather than a regression, although a regression can be used if no software is available to run a logit. Regression software is universal and the results are straightforward to interpret. Logit results are more difficult to interpret. Box 8.6 (overleaf) sets out, using Kenyan data, a logit analysis of tea adoption.

8.27 Logit analysis is appropriate wherever the dependent variable can only take two or three values. However, some processes are a mixture of this and a continuous regression. An important example is earnings in the labor market. Such earnings reflect two inter-related processes: gaining access to a wage job and getting a particular wage rate in that job. To analyse gender issues in the labor market these two processes are best investigated simultaneously. The appropriate methodology is a tobit, which combines the discrete outcomes modelled by a logit with the more common continuous dependent variable regression analysis. For an example of such a gender-

Box 8.6: Gender effects on tea adoption: The logit approach

Where there are several influences on tea adoption the tabular approach encounters its limits and more powerful techniques are needed. When the phenomenon to be explained can take many values the normal technique is regression. Tea adoption, however, is not like this: we are investigating only two states, adoption or non-adoption. The technique which deals with such a problem is termed a logit: it available on many statistical soft-ware packages. Here we explain how to use it and how to interpret the results. We illustrate with Kenyan data.

The data: Rural Kenya, 1982

The hypothesis: Tea adoption is influenced by the age and gender of the household head, the male and female labor endowments of the household, the proportion of neighboring households adopting tea and whether the household is already growing coffee.

The results:

Variable	*Coefficient*	*T-ratio*
Household head		
Gender	-1.03	2.15
Age	-0.05	1.47
Age squared	0.0004	1.06
Labor endowment		
Males	0.10	0.57
Females	0.42	2.05
Neighboring households	4.20	4.55
Already growing coffee	-0.88	2.15

Interpreting the results: The coefficients show the effect of gender etc. on the likelihood that the household adopts tea. In total 47% of the sample adopted tea during the period so for the average household the probability is 0.47. In order to interpret the coefficients it is necessary to allow for the transformations which this probability goes through in a logit. First, the probability of adoption can only vary between 0 and 1 but for statistical purposes it is better for the "dependent variable" to be able to vary between - infinity and + infinity. A logit achieves this by explaining not the probability, P, but P/(1-P). For the average household in our Kenyan sample this was 0.47/0.53 = 0.89. Second, a logit works with logarithms, so for the average household, the dependent variable is the logarithm of 0.89, which is -0.12. Now we are ready to interpret the gender coefficient. From the results column we see that this is -1.03. This tells us that for a household with otherwise average characteristics, if it is female-headed instead of being male-headed, ln[P(1-P)] instead of being - 0.12 will be reduced by 1.03, that is it will be -1.15. We now work back to the probability of adoption which this implies. First, we move from the logarithm P/(1-P) back to P/(1-P). The antilog of -1.15 is 0.31. Second, we move back from P/(1-P) to P. Since P/(1-P) is 0.31, P is 0.24. This tells us that otherwise average households, female headedness lowers the likelihood of adoption of team from 47% to 24%, an enormous reduction. The effect of adding one more female adult to the average household is to raise ln[P/(1-P)] by 0.42, so it rises from -0.12 to +0.30. The antilog of 0.30 is 1.35; so with P/(1-P) = 1.35, P = 0.57. The extra female adult thus increases the likelihood of adoption of team from 47% to 57%. Both of these effects are statistically significant as can be seen from the t-ratios. By contrast, the endowment of male labor has no effect upon adoption (the t-ratio is insignificant).

The logit approach is a much more sophisticated procedure than tabular analysis. It requires better software and more thought but it is justified when there are too many important influences to incorporate into tabular breakdowns.

focused analysis using SDA data for the Côte d'Ivoire see Appleton, Collier and Horsnell (1990). That analysis found that once in the labor market women received the same wages as men, controlling for their educational characteristics, but that even among those already in the labor force, women were radically less likely than men to enter wage employment, and that their participation was far more sensitive to wage rates.

8.28 In some respects, the ideal for a gender-focused analysis is that as other explanatory variables are added, gender gradually ceases to be a significant disaggregation. The hypothesis is not that women and men have intrinsically different economic attitudes but rather that they tend to face different constraints. Hence, we were able to get satisfactory empirical measures of these differences, for example, better access on the part of men to credit, we would then fully account for the observed differences in behavior. In practice, however, our measures of differential constraints are unlikely to be sufficient fully to account for the effect of gender. Hence, what this stage of the analysis can accomplish is primarily to establish whether the symptoms of gender-differentiated constraints are present and important. If they are, there is at least prima facie a case for investigation of likely constraints and how policies bear on them. This is taken up in the next section.

Four gender-differentiated processes

8.29 Four distinct processes account for why women face differential constraints upon economic activity. First, women may encounter discrimination outside the household. In developed

countries the most emphasized example has probably been differential wage rates. In developing countries, however, discrimination in the labor market appears more to take the form of differential access to wage employment. For example, in rural Tanzania (where formal sector employment is an elite occupation) men with secondary education had a 3-in-4 chance of such a job whereas women with the same education had only half that chance.[1] Often a more important instance of discrimination is the credit market. Because usually women do not own marketable land rights and as subordinates in the household cannot establish reputations for credit-worthiness, they tend to have markedly worse access to credit. This is especially severe in economies subject to financial repression where credit markets are rationed by risk-bearing ability, women are particularly disadvantaged.

8.30 The second process, which also operates outside the household, is the different directions in which the tendency to imitate or copy role models attracts men and women. The tendency to let decisions be influenced by what other similar or admired agents have chosen is a universal feature of human behavior. It is a key way in which innovations spread over the population. There is now some evidence that role models are gender-specific: girls copy women, boys copy men. For example, in urban Côte d'Ivoire people have been found much more likely to enter formal wage employment if their parents had been so occupied (controlling for other characteristics), but there is some indication that females were not influenced by their fathers occupation and boys not by their mothers: each tended to copy the parent of their own gender. An implication of this is that if some new economic opportunity is initially taken up by men it may automatically be diffused over the male population by a mechanism which will not transmit it to the female population (Appleton, Collier and Horsnell, 1990).

8.31 The third process is that within the household there are asymmetric rights and obligations. For example, in rural Africa women incur obligations to grow food crops for subsistence, to gather fuel and water, to cook, and to rear children. In return, men meet certain cash needs of the household and usually are responsible for the allocation of land. This pattern of reciprocal obligations is often unequal. In rural Africa women work for considerably longer hours than men. Part of this work is on holdings the output of which is controlled by men. This gives rise to a classic "principal-agent" problem: the woman has little incentive to work well. For example, Ongaro (1988) used a recent Kenyan sample survey to compare the effectiveness of weeding (a female obligation) on maize yields in male and female-headed households. He specified a regression of maize yields per hectare in which the number of weedings was one of the explanatory variables and then fitted the regression separately for male and female-headed households. In both types of household there were two weedings per season and each weeding significantly raised yields. However, whereas in female-headed households these weedings raised yields by 56 per cent, in male-headed households the increase in yield was only 15 per cent. Since other differences were controlled for, the most likely explanation is a systematic difference in effort due to differential incentives. Thus the "incentives" argument, now so familiar in the World Bank, does not stop at the door of the household. To put this in perspective, if Ongaros sample is representative of rural Kenya, the national maize loss from this disincentive effect is about equal to the maize gain from the application of phosphate and nitrogen fertilizers.

8.32 The fourth process is the burden of reproduction. Because there is a phase during mid-life in which womens time is pre-committed, certain activities are precluded. Skills decumulate, and long term contracts such as are common in the labor market are terminated. The physical demands of child bearing and breast feeding strain health: recent studies (Bevan et al, 1989) show that female health relative to male health goes through a trough in the child rearing years. This health deterioration rebounds upon income earning opportunities, especially due to the uncertain discontinuities in the availability of labor. Women become confined to a range of economic activities in which such discontinuities are relatively unimportant.

8.33 Between them, these four differences from men tend to skew female labor allocation to different sectors from men, and to impair female mobility between sectors, the symptoms suggested in paragraphs 8.09 through 8.28.

How public policies relate

8.34 There is a case for skewing the provision of certain public services towards women, because private substitutes tend to be skewed

against them. However, currently public provision itself often tends to be skewed against women. In several key processes private market and non-market access mechanisms tend to favor men over women and these differences are reinforced by public allocation. Women of childbearing age have a markedly higher incidence of illness than men, yet a markedly lower propensity to use public health facilities. In their work on the adoption of new activities, Bevan, Collier and Gunning (1989) found a powerful local copying effect: households imitate what others are doing. If each gender tends to follow its own role models, women have fewer opportunities to learn through imitation since the new activities are primarily the preserve of men. Yet the public extension service is usually directed mainly towards men. The propensity of parents to pay for the private secondary education of daughters appears to be substantially less than that for sons. Yet the majority of public secondary school places are allocated to boys. We will explain below how to quantify the effect upon the private demand for secondary school places of a marginal reallocation of public places from boys to girls. Turning from the distribution of goods and services to inputs, women work markedly longer hours than men and yet bear the primary obligation to provide common-use inputs to the household (water and fuel). This obligation can be extremely time consuming: whether it is, depends heavily upon public infrastructure policies. Women, lacking autonomy and land rights, face greater difficulty in building creditworthiness reputations and offering collateral. Hence, they are at a disadvantage in private credit markets. Yet public credit programs tend to be orientated towards men.

8.35 The generalization from the above examples is that a key distinction as to service provision is between those services which are in rationed supply (generally public) and those which are cleared by the market. Secondary education, information about techniques, health care, water supplies, and credit are all partly rationed and partly provided privately. The SDA datasets can be used to identify the gender-specific determinants of access to services, both the direct determinants of rationed and non-rationed access, and the interactions between rationed and unrationed provision.

Extension services and copying of techniques

8.36 Only some farmers have access to individual extension visits, but most farmers have the chance to attend group demonstrations (which involve significant time and transport costs), and to copy their neighbors. The determinants of access to each information channel can be investigated independently and, more importantly, their interactions can be studied. The public information channel, extension, needs to be investigated in conjunction with the private information channel, the copying of other households, which is probably more powerful. The SDA surveys can provide both subjective and objective information on learning from the extension service and from neighbors. Subjective information can be gathered on the respondents stated sources of the information on which changes in agricultural techniques were based. Objective data are available on contacts with the extension agents. It is also possible to use the cluster-feature of the samples to investigate the effects of neighbors, a cluster being a contiguous group. Hence, it is possible to use information on other households in the cluster to investigate copying of neighbors.

8.37 It is then possible to analyse whether there are gender biases in the processes of information acquisition. If there are, the biases in private and in public processes can be compared.

Health services

8.38 The location of households relative to health clinics varies so that some households will face prohibitive costs of access. Public and private clinics also coexist, with differences in user charges, time costs and quality. With individual data on symptoms, actions (including treatment), user costs and the duration of illness, it is possible to estimate gender-specific utilization of health service functions. It is also possible to investigate the determinants of child-access to health care, in particular the effects of policy-dependent maternal characteristics. The immediate policy questions are:

(a) Are women less likely than men to make use of health services for a common level of sickness?

(b) If so, do policy variables such as distance to facility and the level of user charges have differential gender effects which would enable this bias against women to be offset?

(c) What are the interactions between health care provision and other policies? For example, is child use of (girls/boys distinguished) health services increased more by a greater geographic density of health clinics or by a wider spread of

female education?

Birth control

8.39 The burden of reproduction and child-rearing is usually measured in terms of the number of children in the household. However, it may also be a contingent liability. Households in which women of child-bearing age do not have access to reliable methods of birth control face a probability distribution of the numbers and timing of future children. A potentially important contribution of birth control is that, by making these risks controllable, the household is freed from the need to guard against uncertain future liabilities. Hence, birth control, by reducing risk, can alter current investment strategies. Its effects can therefore be immediate rather than being only long term. For example, one influence on investment which has recently been investigated using African survey data has been the effect of future birth liabilities on the decision of the household to invest in the private secondary education of its current children. It was found that, controlling for the number of current children, the age of the husband and household income, the future birth liabilities of the household powerfully reduced the willingness to invest in the education of children. Similar powerful effects may well influence other household investments such as improved livestock, tree crops or non-farm enterprises. These can be investigated along the same lines.

8.40 The expected future birth liabilities of the household are not directly observed in surveys but can be readily proxied by the age of the wife. It is possible to investigate this effect by using tables. Using the same technique as in Box 8.5, households can be grouped into those in which the wife is still of child-bearing age and those in which the wife is above that age (in households with multiple wives it is the age of the youngest which matters). These groups can then be further divided as in Box 8.5 by the age group of the household head, labor endowments and whatever else is considered to be important and feasible given the sample size. Having split the sample into groups which are comparable in respects other than child-bearing, the effect of child-bearing can be discerned from the different propensities to invest. Again, more powerful techniques than tables can make the analysis more reliable and take it further.

Piped water

8.41 Some surveys have detailed information upon wet and dry season water supplies. Some households have access to communally piped water, others to a private tap, and others only to traditional sources. Piped water can have powerful consequences for both female labor supply and family health. Hence, its distribution is of some importance. While access to private piped water can be viewed as exogenous, access to communal piped water is to some extent determined by the household, although households will differ as to the time costs of access. The relative effects upon use and time saved of differing piped water strategies constitute an important policy issue (use is measured in terms of both of time spent collecting water and the quantity of water consumed).

Credit

8.42 The SDA surveys include some information on credit. Assuming that this information is at the household rather than the individual level, gender issues can only be investigated through a comparison of female and male-headed households. The information can be used to analyse the determinants of access to both private and public credit (and their interaction). Policy issues include:

(a) Do female-headed households have differentially poor access to the private credit market?

(b) Do they have differentially poor access to public credit?

(c) What characteristics enable female-headed households to gain access to public (private) credit? Are they the same, or is public credit being targeted to those shut out of the private credit market?

Education

8.43 National educational enrollment figures are usually available by gender, and these provide a starting point for the investigation of gender differences. However, they can be quite misleading and household survey data can be particularly useful. Take access to primary schooling. Data on school enrollments will typically show that boys outnumber girls but not by a wide margin. For example, in Côte

Box 8.7: Gender and access to primary schooling

The data: SDA survey of Côte d'Ivoire
The problem: To investigate the different influences on access to primary schooling for boys and girls.
The technique: A logit analysis (see Box 8.6) was used. Because it was important to identify differences in how income affected the access of boys and girls, the sample of children was split into a sample of boys and sample of girls and the logit estimated separately for each sample. The results are shown in the table below. Although the table contains valuable information, it is a very poor way to present that information: the coefficients cannot directly be interpreted and there is too much information for the policy maker to see what is important. Figure 8.2, however, represents part of the information in a much more digestible way. It shows how the probability of non-enrollment is related to household income for each gender. It is calculated for the otherwise average child. That is, we set all other variables, such as the age of the household head, equal to the average for the sample, and vary only household income. The coefficients on household income are used (in the way described in Box 8.6) to calculate how the probability changes. As incomes rise, boys become almost certain to be sent to school. Girls from very low-income households have a 33% chance of not going to school. At very high income this is reduced to about 22%, but beyond that it does not fall further (according to the data it actually rises again though the researcher could probably dismiss this as reflecting the few observations among very rich households). This tells us that income alone was not going to solve the Ivorian problem of uneducated children.

Logit estimates of determinants of enrolling in primary school ages 11-18 years, by sex

	Boys only		*Girls only*	
Variable	*Coefficient*	*T-ratio*	*Coefficient*	*T-ratio*
Constant	-5.523	-1.464	-6.294	-1.988
Age	0.8410	1.633	0.8318	1.890
Age squared	-0.3003e-01	-1.692	-0.3113e-01	-2.056
Nonivorian	-1.765	-7.613	-1.005	-4.669
North	-1.314	-4.902	-1.544	-4.231
Urban	0.6507	3.264	0.3474	2.222
Mother educated	0.7456	1.194	1.659	3.105
Father educated	1.4733	4.350	1.593	1.524
Government job	15.6512	0.011	0.6835	2.673
Private job	-0.2379e-01	-0.070	0.6897	2.673
Income per capita	0.33153e-01	0.538	0.4998e-01	2.339
Squared	0.8316e-04	0.066	-0.5513e-03	-1.912
Cubed	-0.2304e-06	-0.030	-0.1626e-05	1.547
Livestock per capita	-0.6745e-02	-3.720	-0.2450e-02	-0.984

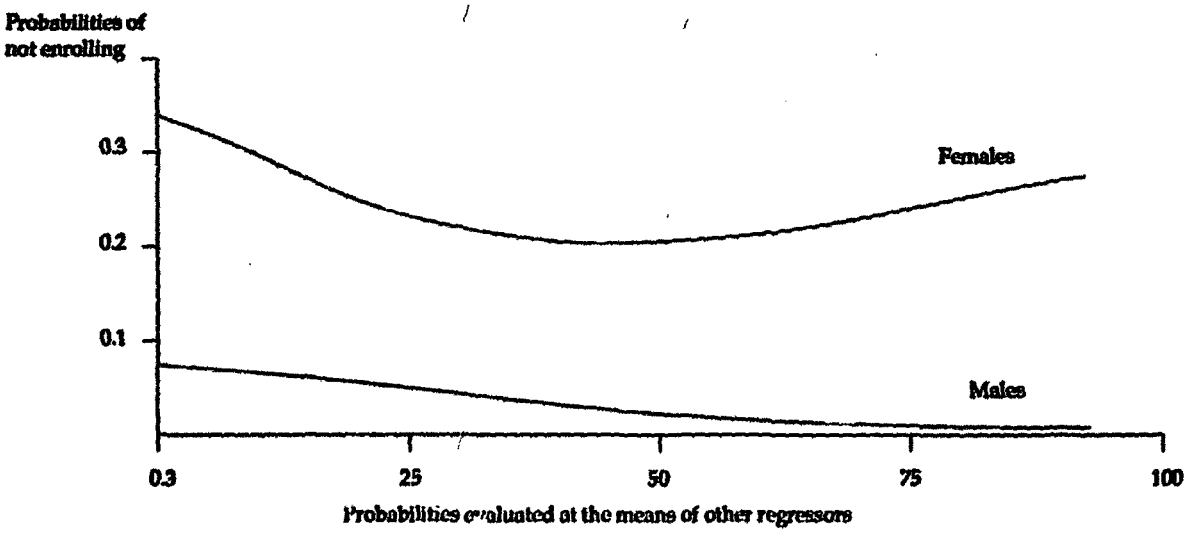
Source: Appleton S., P. Collier and P. Horsnell, Gender Differences in Educational Attainment and in Labor Market Participation: An Analysis of the Côte d'Ivoire, SDA, World Bank, 1990, Table 3.5.

d'Ivoire about 44% of enrollments are girls, 56% boys. However, since most children go to school, these fairly small differences in enrollment figures hide large gender differences in non-enrollment. Among those who never go to school girls make up 66% and boys 34%. A 12% difference in enrollment rates hides a 32% difference in non-enrollment rates. Clearly, the policy maker concerned with extending educational access needs to focus upon those children not going to school, and most of these are girls. The policy maker next needs to ask why these children are not going to school. A particularly important question is whether it is mainly a matter of low income, in which case the problem is part of the much wider one of poverty, or whether it is more specific. Since there are many influences upon whether a child is enrolled, the tabular approach is not likely to prove very useful. As with tea adoption, since the event we are analyzing is "discrete" (either the child does, or does not, go to school) the appropriate technique is a logit. Box 8.7 shows how data for the Côte d'Ivoire were analyzed using a logit and the results turned into a simple chart. The key result shown by the chart was that if incomes rise sufficiently virtually all boys go to school but around a quarter of girls remain uneducated. The problem of uneducated children ends up being entirely one of gender as development proceeds. Since income was not going to solve the Ivorian problem of uneducated children, the government was probably right to make primary education compulsory (a decision taken after this survey): otherwise many girls would grow up to be uneducated mothers which we now know has deleterious effects for their children.

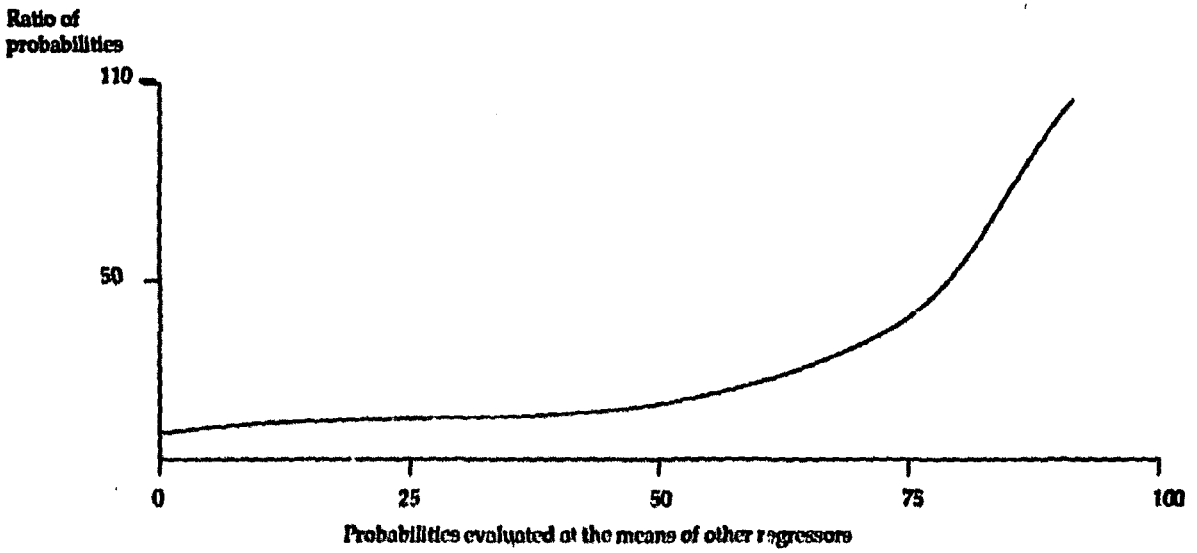
8.44 Survey data can also be used to investigate the whole educational hierarchy. For example, in the Côte d'Ivoire, there are also large differences in the chances of boys and girls who complete primary schooling advancing to government secondary school. Places are rationed by an examination. Appleton, Collier and Horsnell (1990) split the problem of access into two stages: performance in the examination and being sent to school conditional upon examination performance. They found that the lower chances of girls were entirely explained by their worse performance in the examination. Knowing this, the policy maker would then need to find out why girls were learning less in primary school than boys. The answer might be related with the school teaching system or it might be a

Figure 8.2 Income and primary school non-enrollment

Probability of non-enrollment by gender



Ratios of probabilities of non-enrollment girls to boys



Source Appleton S., P. Collier and P. Hamancil, Gender Differences in Educational Attainment and in Labor Market Participation: An Analysis of the Côte d'Ivoire, SDA, World Bank, 1990. Figure 3.1.

problem at home. Recall from Box 8.3 that in Kenya school-age girls were spending far more time than boys contributing to household income.

Notes

1. See Collier, Radwan, and Wangwe (1986).

9

Smallholders and structural adjustment

Introduction

9.01 Agricultural performance in the great majority of countries in sub-saharan Africa has, in recent years, been a source of concern both to governments and international institutions. The combination of inclement climate, fragile ecology, unstable world markets plus, in some cases, the negative thrust of past policies, has produced, with some notable exceptions, the disturbing scenario of diminishing exports and escalating imports of agricultural commodities. In per capita terms there has been an overall decline in production, and, in some instances, the proportion of output marketed has fallen.

9.02 The overwhelming majority of agricultural producers, and indeed the major part of the rural and total population, can be classified as smallholders, ie. peasants whose main resource is their own labor and whose plot sizes are in many African settings determined by family labor constraints rather than access to land. Thus, any changes in the economic and social welfare of this sector have a profound impact on the long-term performance of national economies. A special interest in smallholders is justified because they constitute the bulk of the poor in Africa and because of the potential significance of their contribution to successful adjustment through a supply response.

9.03 From a social dimensions point of view the broad analytical issues to be addressed in the smallholder context are unchanged relative to other groups. They include the effects of macro- and meso-economic changes on smallholders as producers, laborers and consumers. The analysis of food consumption and nutrition, and access to health care and education offered in other Chapters in this Volume applies to the case of smallholders and need not be recapitulated here. The same is true for the poverty profile and the analysis developed in Chapter Four on wage employment and rural non-farm household enterprises. However, smallholders are typically both producers and laborers, and they produce partly for sale and partly for subsistence consumption.

9.04 Agricultural production activities are not studied in any of the Analysis Plans reported so far, nor is the interdependence of decisions to allocate labor to the family plot as opposed to off-farm employment. (The simultaneous determination of subsistence consumption and purchases of food was mentioned in Chapter Seven). This Chapter, therefore, focuses on (i) the relative contribution of agricultural (or crop and livestock) production activities and wage labor to household income and (ii) alterations in the allocation of time to on-farm and off-farm employment owing to labor, product and input market changes associated with adjustment. Different responses in terms of the household's allocation of its labor resources naturally lead to differences in consumption and welfare indicators.

9.05 As discussed in Chapter One, it is important to recognize that the SDA Integrated Survey is not a dedicated agricultural survey designed to obtain detailed, year-round farm management data and crop-specific input-output (including

labor use) information. It is therefore not an appropriate source to study the agricultural supply response under adjustment. It does, however, permit analysis of labor allocation between off-farm and aggregate on-farm employment, farm profit, the use of purchased inputs (an important predictor of agricultural productivity) and changes in assets and the subsistence ratio in response to appropriate household characteristics and meso-economic changes. Thus, the Chapter is structured as follows. Paragraphs 9.05 through 9.16 summarizes key macro-meso linkages as they pertain to smallholders. Paragraphs 9.17 through 9.68, on meso-micro analysis consists of sub-sections on the classification of smallholders, the analysis of access to productive resources, the analysis of smallholder terms of trade and coefficients of net protection, the demand for agricultural inputs, the analysis of farm profits, and the simultaneous determination of on-farm and off-farm labor supply. A brief conclusion is offered in paragraphs 9.69 through 9.73. Throughout, smallholders are treated in gender-undifferentiated fashion, since approaches to gender differentiation were the subject of Chapter Eight.

Macro-meso linkages [1]

9.05 There is wide agreement nowadays that the causes of Africa's agricultural difficulties include inadequate price and institutional policies of the kind which structural adjustment programs seek to correct. Agriculture is the main sector producing tradables in most African economies, in the form of export crops and food commodities partly for export and partly for import substitution. "Urban-biased" development policies aiming to promote industrial import-substitution through trade restrictions tend to discriminate against agriculture by "closing" the national economy and raising the price of nontradables relative to that of tradables (an appreciation of the real exchange rate). Indirect agricultural taxation associated with overvalued exchange rates in Africa has often been accompanied by high levels of foreign trade taxation in the form of export levies and monopsonistic, state-controlled food procurement. The disincentive effects associated with these price policies have been reinforced by the low priority accorded agriculture in public investment policies, particularly in the areas of transport, appropriately-scaled irrigation, and agricultural research and extension.

9.06 Structural adjustment, as described in this Volume, aims to depreciate the real exchange rate by reducing import restrictions, nominal devaluation and reducing inflation. Devaluation and exchange unification are expected to help reduce the tax implicit in the exchange rate regime when farmers are forced to sell at an official, overvalued rate, while buying consumer goods and inputs at prices reflecting dearer parallel market rates. Trade liberalization can be expected to lead to an increase in the availability of consumer or 'incentive' goods, and thus a higher supply response (Bevan et al 1989 show that rationing of consumer goods severely constrains peasants' ability and willingness to produce a marketable surplus). Adjustment may, therefore, be considered a necessary condition to reverse the process of agricultural decline referred to in the previous section and to improve the income opportunities of smallholders, as long as cost increases do not outweigh producer price increases and an adequate share of devaluation-related price gains are passed on to farmers. Producers are, of course, negatively affected by devaluation-induced increases in the cost of imported inputs. But against this should be set the cost of overvaluation, including long-run resource misallocation and shortages of consumer goods and inputs resulting from chronic foreign exchange shortages. Because of the low import content of their input mix, smallholders would seem to benefit disproportionately from devaluation relative to larger farmers. On the other hand, risk-averse producers may perceive increases in the prices of purchased inputs as increasing the risk of innovations capable of enhancing productivity. This would, however, appear to be the case only where nominal devaluation does not translate into real devaluation, for example, owing to insufficient monetary and fiscal restraint.

9.07 This being said, it is important to point out that adjustment in terms of the variables which affect the real exchange rate is far from sufficient for agricultural recovery and rural poverty alleviation. It must be accompanied by public investment in agriculture and the development of institutions capable of serving the needs of rural people in the areas of input distribution, credit, product marketing and social services — all these serving to provide an "enabling environment." These measures take time to implement. A discussion of the short-run prospects of the rural poor under adjustment is, therefore, in order. It

is appropriately developed with reference to rural labor markets, the degree of tradability of food crops, access to productive assets and infrastructure, market imperfections distorting the price signals of adjustment, and the factors which inhibit the adoption of high-return activities. A word of caution is however necessary from the outset. The discussions below present the more general scenario and it is very likely that there could be anomalous cases which need to be identified and supported by countervailing policy to bridge households over the unintended and unexpected consequences of policy reform.

9.08 As wage earners, smallholders are likely to gain in the medium to longer term as the demand for their labor (in the cultivation of tradable crops) rises. Rural labor may well have a low supply elasticity in many African countries because of the relative absence of landless laborers. The seasonality of agriculture forces the wage up at the busiest times when everyone has a labor shortage. The real wage effect for rural wage-earners of devaluation would thus tend to be beneficial over the longer term. This is especially true where the adjustment program induces sustained agricultural growth.

9.09 In the short term, however, rural wage labor might suffer a real-wage fall. This would occur if estate production is slow to expand and/or if nominal wages rise less, in the short run, than the cost of key wage goods. This is an empirical matter. There is anecdotal evidence also supporting short-run real wage deterioration mediated in a slightly different way. Relatively rapid estate response to incentives has been accompanied by increased demand for labor and higher nominal wages, but immediately offset by escalations in the cost of living. By and large, it is uncertain whether smallholders would require a real-wage fall to induce their expansion of tradable production (this is complicated by the fact that they supply part of their wage labor to each other). The short-term effects of devaluation on real wages are therefore ambiguous. Some food intervention to the rural poor or other compensatory assistance may be needed, especially on estates, and to the net-buying smallholders and to rural labor. The scale of this will be less than that which is called for in urban areas and donors such as the World Food Program have extensive experience in food assistance to estate workers. Their programs may therefore provide appropriate avenues for food assistance to smallholders and/or rural laborers under adjustment.

9.10 In remote areas, food crops may be nontradable due to a lack of transport infrastructure and further exacerbation due to lack of repair and maintenance of the existing stock following short-term fiscal retrenchment. The chronic poor in these areas who produce nontraded foods will see no improvement in their prices resulting from devaluation, but no decline either. As investments under adjustment improve the meso-economy in the medium to long term gradually, remote regions will be drawn into national markets. Local prices will increasingly be affected by national (and world) market conditions. As a result, nontradable foods will become more tradable in character, and the chronic poor should benefit from devaluation as producers, if they can market some surplus.

9.11 This assumes, of course, that the poor have access to land and security of tenure remains in tact. Securing the claims to ownership that poor people have over their assets is an important first step to ensuring that poorer rural groups benefit from an adjustment program (Chambers, 1988:3). Land rights are often tenuous in customary areas, and the poor frequently have few channels for redressing their grievances. Unless policy reform is accompanied by measures ensuring the right to land by poor households, large estates mainly growing tradables and benefiting from policy reform start a spree of encroachment and land hoarding for speculative purposes. This will lead to a gradual diminution of land cultivated by the smallholder sector. Thus, extending property rights to smallholder households, in addition to ensuring their subsistence, will raise their incentives to maintain and improve those assets. When land tenure interventions are made, care must be taken to protect the traditional rights of women to cultivate land for food. Such measures in the past have often designated men in the household as title holders, thus weakening the claims of women. Côte d'Ivoire, Ethiopia, Kenya and Zimbabwe have now given women the right to inherit and own property (World Bank, 1986d:40).[2]

9.12 Improving the access of poor groups to infrastructure can be as beneficial in many cases as increasing their productive assets. Infrastructure investments often bypass areas containing high concentrations of poor people. This raises their production costs, and acts as a barrier to gains from greater specialization. For example while adjustment programs in Ghana and Kenya have sent out clear signals for the expansion of

tradable activities, many of the poorest farmers have faced difficulties in achieving this because of their location (Heller et al, 1988:20). In making new infrastructural investments, policy-makers need to give more weight to actions which assist the poor and open access to them. In many areas transport infrastructure has broken down, so that some local markets are poorly integrated with the national market, leading to large regional price differences (Ahmed and Rustagi, 1987:109) which is further compounded by administrative restriction on the flow of products. In designing a program of infrastructure, opening access and rehabilitation with greater priority for areas ill-served by transport infrastructure, but with a high concentration of poor people, may be called for.

9.13 Another set of issues is raised when the failure of poor groups to benefit from adjustment arises from weak price signals. In cases when this is due to weak marketing structures, the terms of trade facing poor farmers may be raised through improving the efficiency of official marketing organizations. In Asia, for example, 75-90% of the consumer price of food grains is paid to the farmer, while in Africa the proportion is only 35-60% (Ahmed and Rustagi, 1987: 115). Nearly 30% of the difference in margins is due to the lower efficiency of African marketing organizations. In many countries the growth of marketing costs has been as important as currency overvaluation in causing low producer prices (see Harvey, 1988: 221 on Tanzania and Zambia, for example). Through the integration of smallholders into the mainstream, marketing reforms may now begin to benefit poor farmers. In Mali, for instance, a restructuring of the marketing system has shifted output and input prices in favor of farmers (Tuinenburg, 1987: 503). Improvements in the efficiency of marketing organizations can reduce the conflict of interest that exists between poor food producers and poor consumers over food prices. One study found that, for a sample of African countries, reducing the marketing margin by 25% would result in a 49% increase in farm prices and a 13% fall in food prices, given reasonable assumptions about demand and supply elasticities (Ahmed and Rustagi, 1987).

9.14 If smallholders produce nontradables, or if they make intensive use of imported intermediate inputs such as fertilizers (as stated above, an unlikely event), they will be adversely affected by devaluation. The key to raising their incomes lies in creating alternative production patterns, which may require complementary policies, such as targeted extension services encouraging farmers to change crop mixes. It is possible that some smallholders fail to benefit from adjustment simply because they do not switch production towards high-return activities instantaneously. This may arise initially from a perception lag — farmers may take time to observe relative price changes, and to expect them to continue. Or the failure to change output patterns may be more deep-seated, arising from either ecological constraints or risk aversion. The participation of poor households in the most profitable cash crops is usually below average. Such participation is a strong determinant of income differences across households in most countries. In Tanzania, for example, the income of the poorest 50% of the village studies by Collier et al (1986: 75) were dependent on subsistence crops for 70% of their income — this is double the share for the better-off half. In Côte d'Ivoire approximately 44% of the rural poor cultivate cocoa or coffee, compared to 65% of the rural population as a whole (Glewwe and de Tray, 1987: 20). In Kenya the probability of a household being poor falls if it grows tea and coffee — the main export crops (Greer and Thorbecke, 1986). Although cotton is mainly grown by poor households in Côte d'Ivoire, their participation in other, more profitable crops, is lower (Glewwe and de Tray, 1987: 14). Overall, female-headed households are less likely to cultivate cash crops because the allocation of the necessary land, credit and inputs does not favor women. Altering the product-mix of female target groups will necessitate conscious effort and interventions in the supply of factors of production to them.

9.15 In summary, raising cash-cropping by farmers offers an important way in which their benefits from adjustment and growth can be increased. A number of recent studies have confirmed that export cropping can lead to significant gains (offsetting any unfavorable impacts) in smallholder income and nutrition (von Braun, 1989; von Braun et al, 1989). Kennedy and Cogill (1989) have shown that agricultural commercialization in Kenya has had a favorable impact on landless agricultural workers, and has led to improved family nutrition and reduced hours of work for women owing to reductions in the food crop acreage and increases in family income. In some cases the investments in infrastructure and the improvements in marketing discussed above may be adequate enough for target groups to

raise their incomes sufficiently. In such instances, policy interventions must clearly be directed at the micro level. In other cases a more comprehensive package of measures involving marketing and infrastructural services may be needed. Higher cash-cropping may be dependent on access to productive assets being increased in the ways discussed previously and on the extent to which the market infrastructure is developed to enable smallholders change their perception. Specialization is a slow process but can take a strong footing in the medium to long term.

9.16 In the foregoing, the most likely scenario to emerge from policy reform and complementary policy measures required to safeguard the rural poor has been identified. But, the extent to which these measures are likely to materialize is contingent upon political economic considerations which have not been dealt with above. Where the political elite have a vested interest in the growth of the tradable producing and estate sectors, and less so in the nontradable food sector, land concentration may well emerge. The changes required in the distribution of fiscal resources and the employment creation abilities of tradable agriculture are affected by pre-existing conditions and political economy considerations. Thus, a case can be made for policy modification or supplementation even though particular groups of smallholders are becoming better off under the policy reform. Where land is already scarce and the tendency towards concentration high, it may be necessary to make a case for policy interventions designed directly to stimulate employment creating opportunities within the rural informal sector. Food and input subsidies may have to be removed gradually rather than abruptly, but need to be much more targeted towards nontradable food producers. Thus, in general, some compromise needs to be struck between the optimum policy and a reform that takes into account the political economic considerations and the anti-poverty implications.

Micro-meso analysis

The classification of smallholder households

9.17 An Analysis Plan for smallholders should define smallholders at the outset and clarify how the rural population can be usefully broken down into constituent sub-groups for policy purposes. This is the objective of the present section. The sources of labor (family or hired) and the application of labor (on-farm or off-farm) are obvious defining and classification characteristics. Both affect the level of income, while the composition of income is influenced by on-farm/off-farm labor use decisions and crop choice (tradable or nontradable). The identification of feasible and effective policy interventions to raise smallholder income requires an understanding of the composition of their income. Under circumstances of relatively inflexible factor proportions and unhindered access to land, [3] the quantity of labor available to the agricultural household will be a significant determinant of farm income. In many cases, therefore, the possibility of, and the necessity for, hiring outside labor exists, and consequently the opportunity to augment household income through hiring or selling labor. A relevant criterion in differentiating between groups of farmers, therefore, is the proportion of household to total labor used in production. In most cases the employment of outside labor will involve the payment of wages, in cash or in kind, in advance of harvest. But the poorer smallholders will neither have the reserves from which to pay wages on a substantial scale, nor access to credit facilities at rates of interest which make such investment worthwhile.

9.18 A key defining characteristic of smallholders is that they will be more disposed to supplement income through selling labor, rather than through labor hire. What is relevant when defining a smallholder household, therefore, is the net quantity of labor hired, ie. the hours of outside labor purchased by the household, minus the quantity of household labor sold off the farm. If this is expressed as a ratio, ie. as labor hired divided by labor sold, then an agricultural household would have to register a value equal to, or less than, one to be included in the smallholder category.[4]

9.19 At the same time, because factor proportions are generally unchanging, and total labor use will largely determine the area of land holding, there will be a close correlation between the proportion of household to total labor and farm size, assuming a general uniformity in household size and structure. Within the boundaries outlined above, therefore, the size of holding can provide a broad indicator of income. While some information is generally accessible, however, the delineation of smallholder groups by size of holding requires explicit assumptions regarding appropriate farm size categories (information on plot sizes per se is obtained in the SDA Inte-

grated Survey). One method for approaching this issue is to use average yield and price data to estimate hypothetical income levels per hectare based on "typical" cropping patterns. If a target farm income is hypothesized, [5] implying that all households which fail to realize this income merit concern in the form of policy assistance, then the holding size necessary to produce this income level can be calculated. The latter would provide the upward limit of the smallholder category as defined in terms of holding size.

9.20 This method of categorization is only valid in so far as it is conducted for specific farming systems (this may be approximated on the basis of locational information available in the SDA surveys). Variations in the level of technology employed as well as in the agro-climatic conditions must also be taken into account if the area criterion is to be used effectively. For example, small-scale farms operating with a high degree of capital intensity may not always be usefully classified as smallholders, [6] and the minimum area necessary to provide "adequate" income may vary widely within countries due to different regional rain fall patterns and soil types. In addition, if there are regional variations in household size, holding size limits should be adjusted accordingly. Thus, although land holding size provides a promising bases of classification, the limitations enunciated above make the importance of wage-labor a relatively better distinction criteria.

9.21 Turning now to the classification of smallholders on the basis of the composition of their income, measures of the importance of wage labor relative to agricultural production activities and measures of the degree of market orientation of households as producers of export crops and food commodities are called for. [7] An understanding of the extent of smallholders' dependence on the labor market for a livelihood has been shown, above, to be important in our analytical context because of the possibility of a short-run real wage decline relative to agricultural product prices as a result of structural adjustment. Indeed, market orientation will be manifested both voluntarily (as witnessed by the decision to grow particular crops) and involuntarily (as in the case of the household which is forced to sell a high proportion of household labor to make essential purchases). Furthermore, the basis of classification should be operationally simple and unambiguously understandable and applicable uniformly to all conditions. An arbitrary cut-off point of the proportion of income originating from farm and off-farm activities, as opposed to land size criteria, provides the first yardstick of classification.

9.22 Thus, a useful first distinction is between those households which achieve the bulk (more than 50%) of household income from off-farm activities (rural laborers), and those whose primary source of income is the family holding (smallholders proper). [8] Those falling in the latter category can be divided further into a subsistence-oriented group (subsistence farmers) and a market-oriented group. The market-oriented groups grow tradable produce (see paragraphs 9.26 to 9.34 below and Chapter Two on the definition of tradables and nontradables) for export or import-substitution (export crop producers and producers of tradable food). The definition of the subsistence-oriented group is again arbitrary (for example, no tradable commodities produced; or: less than 10% of total income derived from the sale of tradable commodities), but it is worth recalling that all rural households are engaged in some form of exchange, including the sale of labor, and that there is no such phenomenon as a fully self-sufficient household in autarky.

9.23 In addition to rural households involved principally (the peasants) or marginally (the laborers) in agricultural production on the family farm, there are those who derive a large proportion of their income from non-agricultural non-wage labor activities. [9] The great majority of these are likely to be involved mainly in informal sector activities. Typically these activities involve artisanal or trading skills, and generate production of both consumption and simple investment goods from locally produced or acquired raw materials, to meet locally expressed demands. (Blacksmiths who produce and repair the modest capital equipment essential to smallholder operations are an example.) Growth within this sector (induced by agricultural production growth) is of crucial importance if adjustment measures are to succeed in stemming the tide of rural-urban migration and, more broadly, if they are to activate intersectoral growth linkages.

9.24 Thus, as indicated above, the following classification of the smallholder population can be proposed (this is similar to proposals regarding the classification of the rural population made in Chapters Three and Ten in this Volume): [10]

A. Export crop producers

B. Producers of tradable food (import-substitution)

C. Rural laborers

D. Subsistence farmers
E. Rural non-farming non-wage informal sector workers.

9.25 The aim of the above classification is to gain an initial understanding of the constraints and opportunities facing various segments of the smallholder population, later to be refined on the basis of multivariate analysis using a household model capable of treating alternative production and consumption activities simultaneously. Analysts would start by setting up the above categories of smallholders and studying between-class differences in incomes, expenditures and standard of living indicators. A lot of lessons can be gained by using cross tabulations and frequency distributions as well as means, standard deviations and coefficients of variation of these "dependent" variables.

Classification of products

9.26 Rural households, particularly smallholder households, will often be simultaneously involved in the production of both tradables and non-tradables. Nevertheless, a response eliciting a shift in emphasis between these categories is likely to occur sooner or later in the wake of adjustment. Categorization of agricultural commodities into tradables and nontradables is therefore a necessary first step in the analysis.

9.27 Theoretically a tradable commodity is one which will be profitable to either import or export given (a) the current level of world prices, (b) the exchange rate, (c) domestic price levels and (d) transport costs involved in internal distribution.

9.28 A formula can be constructed, based on these variables, which will demonstrate whether the commodity in question is an importable, exportable or nontradable (see Chapter Two). Thus a commodity is considered:

an importable if: $P > P^*(1+t)$;
an exportable if: $P < P^*/(1+t)$;
a nontradable if: $P^*/(1+t) < P < P^*(1+t)$.

Where P is the domestic price, P^* is the world price at the official exchange rate and t is the rate of transport cost.

9.29 This classification is extremely sensitive to each of the variables described. Apart from the obvious influence of transport costs, commodities may cross from one classification to the other in response to changes in world market prices (which are not under the control of national governments), and in response to a variety of measures taken under adjustment programs, particularly those engendering movements in currency values or domestic price levels. Given the volatility of this type of classification there are grounds for suggesting that its usefulness is limited. Indeed, when account is taken of the source of inputs used in the production of a particular commodity, i.e. whether the inputs involved are tradables or nontradables, it becomes more sensible to speak in terms of the degree of tradability.

9.30 The degree of tradability is a hypothetical concept reflecting trade patterns that would emerge in the absence of quantitative restrictions in the product, factor and foreign exchange markets. In practice, however, the prices economic agents observe do not reflect domestic demand and supply characteristics or international prices. Instead, prices are a result of government interventions. Thus, the types and magnitudes of tradable goods are likely to be different from the goods that are actually traded. In sub-saharan Africa, it is common to observe parallel (black) markets and smuggling, causing the existence of more than one regionally differentiated price for the same product. The domestic price referred to above should therefore be re-defined to accommodate such country specific market intervention effects. The computation suggested above needs to be done on the basis of the government price, the parallel market price and some weighted average price (using quantities marketed through different channels as weights). As will be evident from the discussion below, additional complications arise from differences in transportation cost and the point of geographical reference that further complicate the analysis.

9.31 The tradable/nontradable classification of products is useful in tracing the impact of structural adjustment. A further distinction can also be made between protected and non-protected tradables, since the effects of liberalization, i.e. the prices of imports, and therefore of import substitutes, can be expected to fall further following adjustment if domestic prices were previously inflated by tariffs as well as overvalued exchange rates (Chapter Eight). At the same time given the importance of transport costs in these calculations, the analysis should take into account the locational disparities in classifications which may result, and the consequent differential influ-

ence which adjustment programs may have on households ability to respond to changes in the general pattern of incentives. Thus a commodity can be an importable in regions in the vicinity of a port, but become a nontradable in an interior town where domestic transport costs make imports non-viable. Those in remote areas, therefore, will not have the same incentive to adapt their cropping or output pattern towards the types of commodity currently in favor elsewhere.

9.32 These circumstances can have considerable implications for the overall impact of adjustment programs. In countries where communications are very uneven, and where in consequence large numbers of rural producers remain isolated from international markets, a substantial proportion of the population may not be able to take advantage of the potential benefits of adjustment. This problem is compounded if, as a result of expenditure cuts and other measures, the purchase price of both inputs and necessary household purchases rises more than proportionately in these remote areas.

9.33 A tabular presentation of the results, which would illustrate the tradable/nontradable dichotomy and the effect of transport costs on the classification process and the potential disadvantages faced by producers in the more remote locations, is useful. Based on this knowledge and information of local cropping patterns/output patterns, a table can be constructed which illustrates the extent to which different household groups are involved in tradable or nontradable production, and the extent to which this varies by location.

9.34 It will be useful for policy purposes to note the extent to which the different groups of households are involved in production of tradable commodities. Although, it is to be expected that, in general, the proportion will be higher among market oriented producers, the extent may vary across regions as may the proportion in each category of household. The inferences to be drawn from this table relate to the likelihood that the greater the proportion of tradable commodities in household production, the more potential benefit households will derive from the adjustment program. Of course the information gained from a one-point survey will not take account of household responses such as changes in cropping pattern. To have an understanding of the dynamic effects, measurement of supply response is required. Before such an endeavor however assessing nominal and real price differential and levels of protection are a necessary supplement to product classification.

Market intervention effects

9.35 Among the major economic phenomena that characterize African economies is the pervasive intervention of governments in product and factor markets. Direct and indirect interventions have been particularly wide-spread in agricultural product markets, thus generating significant price disparities across regions. Price disparities are also due to a lack of infrastructure. Policy reform and infrastructural development aim at unifying markets and reducing the disparity in farm gate prices in different regions. To assess the progress made in this respect following policy reform, it will be useful to collect and monitor changes in farm gate prices. A farm-gate price series should be constructed for different agro-climatic regions which can be compared with the average national producer price. Over-time or regional divergences or narrowing of the gap between these series can then serve as a measure of the extent to which markets have been unified and the extent to which macroeconomic policies have impacted regionally. The interest in this exercise is in monitoring not only the absolute levels, but also relative prices and the direction of price changes resulting from policy reform. The sources of these price data are published series and/or the SDA Community Survey.

9.36 Apart from giving an indication of the extent to which farm-gate prices are responding to macroeconomic initiatives, such a price series can also be used to indicate regional differences in the change of price signals. For example, any regional difference in price changes could be attributed either to a concomitant change in the physical infrastructure and thus in communications and marketing costs, or to distributional arrangements associated with institutional reform. In general in Sub-Saharan Africa, costs associated with transport and distribution account for a disproportionate part of the final price, and provide for very substantial locational disparities. Any variations in market access as a result of government expenditure policy or institutional reform will therefore have a substantial impact on local prices.

9.37 Thus price data can be used in two ways: (a) to demonstrate the changes in local prices, and therefore price incentives, which have occurred following the introduction of the adjustment program; and (b) to allow for a comparison

of price information across different locations and thus to study the extent to which programs designed to improve the infrastructure, or conversely cut-backs in government spending, have influenced regional price disparities.

9.38 Real price series should be calculated on the basis of the compiled nominal series. The calculation of a time series of real output prices however requires an appropriate deflator depending upon the question the analyst desires to answer. Indices of consumer prices, prices of non-agricultural products, or prices of inputs or international price can be used to reflect different aspects of the price study and to address different types of issues. It is unlikely that localized price series are available for the latter indices, but in as much as possible deflators reflecting rural conditions are the most appropriate. If these calculations are carried out for each commodity, an average for each household group can be estimated, weighted by the significance of each commodity in the respective production patterns. The results will give some indication of changes in local prices by household classification.

9.39 An important real price series, which has remained as the focal point of policy concern for a long time, is the terms of trade between agricultural and non-agricultural products. The agricultural section of the SDA Integrated Survey collects data concerning the prices of inputs and outputs used in agricultural production and the prices of consumer goods purchased by the household. It thus provides the possibility of calculating terms of trade indices for each subcategory of households. These data refer to one point in time. Trends in these indices give an indication of changes in the purchasing power of households in the context of price shifts brought about by adjustment programs. Trends could be established on the basis of repeated integrated surveys. Repeat IS's however, are not expected to be available, except at considerable intervals. But community surveys could be repeated at little cost year-after-year, as could the SDA Priority Survey (see Chapter Ten).

9.40 There are a number of possible measures of the terms of trade.[11] Of interest here are: (a) the net barter, (b) the income and (c) the household terms of trade. The net barter terms of trade is a ratio of two weighted price series (P_a/P_m) such as prices for agricultural output and prices of non-agricultural products (for instance manufactured goods). The denominator can describe a number of price series depending on the objectives of the researcher. The most commonly used are the weighted price of purchased inputs, to give the input-output terms of trade; and the weighted price of all purchased commodities to describe the full net-barter terms of trade. Both these measures are useful in the current context, the former to describe how price shifts have impacted specifically on agricultural resource allocation, and to highlight the differences in this respect between different groups of smallholders; the latter to describe the shifts in price patterns facing rural households.

9.41 In calculating the numerator, however, the researcher must decide whether the weights used in averaging prices (for estimation of a price for a composite agricultural produce) should refer to quantities produced or to quantities marketed. While it is true that it is the purchasing power of marketed output which will, in reality, determine the volume of purchases, it is also likely that for some groups of smallholders, the quantities marketed will be very small and variable, being only that quantity "accidentally" surplus to household requirements. It is pertinent, therefore, to attach a market value to auto-consumption and include it in the calculations. To be considered, however, these commodities should be included in the composite index of purchased goods appearing in the denominator.

9.42 The discussion with regard to nominal prices, for differentiating the results by location, apply even more forcefully with regard to terms of trade data since prices of inputs and consumption goods are likely to vary as output prices. Terms of trade indices should therefore be calculated and presented for each household category in each location. In making these calculations it is useful to develop consumption profiles of the different households groups. This is especially relevant with regard to monitoring changes in response to relative price movements. The construction of a consumer price index by sub-category should also be undertaken as illustrated in the Technical Appendix.

9.43 The income and household terms of trade are closely related. Conceptually, the two indices aim to introduce the quantity changes that accompany price changes. However, while the income terms of trade introduce the changes in the value of the agricultural produce, resulting from both price and quantity changes, the household terms of trade extend the argument to include all income generating activities in the numerator, and the changes in the non-agricultural products

in the denominator. By definition, therefore, the income terms of trade are a ratio of the index of the value of agricultural sales to the index of non-agricultural prices. More formally, it is $[(P_a{}^*Q_a)/P_m]$. The household terms of trade, on the other hand, describe the ratio of a weighted index of all prices associated with household income, farm and wage income, and a weighted index of the prices of all expenditures. The household terms of trade provides a complete index of the net impact of price changes on household income, including imputed family labor income.

9.44 It is highly probable that regional wage differentials will be altered by adjustment programs, as areas most able to increase the supply of tradable commodities demonstrate an increase in demand for labor. While a one-point survey will not necessarily capture this, it may be possible to use other data sources to supplement the survey information and thus gain insight into the changes taking place. In addition, the survey does present the opportunity to undertake analysis of the informal credit sector, since it includes questions relating to the extent of loans by source, and the rates of interest paid.

9.45 The analysis of nominal prices allows to measure the extent to which regional price disparities have been altered in response to adjustment initiatives. But it does not relay much information on the extent to which distortions, creating a wedge in domestic and international prices, have been removed. The various terms of trade measures have also similar weaknesses since they are only comparisons of domestic prices. These, again, do not inform us on the extent to which domestic price have been aligned with international prices or the extent of adjustment required in the future. The latter can be achieved through calculation of crop-specific nominal protection co-efficients (NPC) which is basically the ratio of domestic prices to border prices minus one. More formally and in its simplest form NPC is computed as follows:

$$NPC = \frac{P_d}{P_{d'}} - 1$$

where P_d is the actual domestic farm-gate price and $P_{d'}$ is the international price (in domestic currency) at the farm-gate.

9.46 NPC [12] require separate calculations using both official and shadow (or equilibrium) exchange rates, the difference between the two providing an indication of levels of implicit taxation resulting from exchange rate distortions. Similarly, the nominal rate of protection can be compared with the official tariff rate, the difference being attributable to quantitative restrictions. The interpretation of the NPC is rather simple. In general, NPC > 0 indicates that the product in question receives protection and therefore its domestic production is encouraged; NPC < 0 indicates that the product is taxed and its domestic production discouraged. The extent of resource pull (or push) however depends on the elasticities and the length of time policy reform has been allowed to impact on investment and resource re-allocation. Issues in elasticities measurement and the dynamic effects of policy reform will be discussed in the next section.

9.47 In modified form (Krueger, et al, 1988), the NPC is a comprehensive concept for measuring the impact of direct and indirect government price interventions in the market of agricultural products. [13] This measure takes into account the effects of direct price interventions, quantitative restrictions, exchange rate distortions and terms of trade effects. The key elements of the measure are an estimate of the equilibrium exchange rate, and a disaggregation of the price of agricultural and non-agricultural products into the traded and non-traded components. The formulae using the new approach will be presented below but analysts are advised to refer to Krueger et al for the estimation of the equilibrium exchange rate. The NPC can be computed as follows:

$$NRPT = [(P_d/P_m)/(P_d{}^*/P_m{}^*)] - 1$$
$$nrpd = [(P_d - P_{d'})/P_m]/(P_d{}^*/P_m{}^*)$$
$$NRPI = [P_{d'}/P_m)/(P_d{}^*/P_m{}^*)] - 1$$

where: $P_{d'}$, $(P_d{}^*)$ is the international price at official (equilibrium) exchange rate less transport and handling costs to farm site; $P_m{}^*$ is the international price of nontraded good valued at equilibrium exchange rate; $P_{d'}$, P_m is as defined above; NRPT is the total effect NPC; nrpd is the direct effect NPC and NRPI is the indirect effect NPC.

9.48 The new measure breaks down the total NPC into a direct and an indirect effect resulting from macroeconomic policies. The comprehensiveness of the modified measure is apparent in several respects. For instance, the numerator in NRPT is essentially the domestic barter terms of trade discussed earlier. Similarly, the same equation reduces to the simple NPC described above

if the denominator in NRPT reduces to 1. The limitation of the NPC in its traditional or modified form lies in the fact that it does not account for distortions arising from the price of imported intermediate inputs. The latter effect can be captured using the concept of the effective protection coefficient (EPC). The advance to EPC is beyond the scope of this study, but it should be noted that due to the limited purchased input use in smallholder agriculture in Africa, NPC and EPC yield very close values.

9.49 The results of analyses on prices, terms of trade, factor prices and NPCs can be readily presented in tabular form. A series of tables can be constructed along the following lines of (a) output price changes, (b) NPCs, (c) net barter terms of trade, (d) household terms of trade, (e) agricultural wages and (f) wage trends for different smallholder categories.

9.50 A word of caution is appropriate regarding the use of price indices. In many circumstances the official prices of consumer and investment goods will have been largely irrelevant for many households, since supplies would not have been sufficient to meet demand at these prices. Indeed, in many cases, local supplies may have been entirely absent and official prices meaningless. The consequent rationing of goods markets can distort analyses unless allowance is made for this phenomenon. This caveat is particularly relevant with regard to expenditures on non-agricultural products, agricultural inputs and social facilities such as health and education, supplies of which have frequently disappeared from rural areas prior to adjustment programs.

9.51 Price analysis in its various forms, whether it includes official as well as parallel markets, is very much partial and static in approach. To be of value for prescriptive purposes, it should be supplemented by elasticity estimates and should proceed from examining individual products to understanding the effect of policy on the enterprise, that is, the smallholder household. Thus, the next section aims to incorporate the discussion regarding prices into a household model.

Household models

9.52 The methods of analysis and presentation described above are perfectly adequate for ex post description and explanation of a given situation. The objective of the Analysis Plans, however, is to make predictions concerning household responses to policy changes, and therefore to go some way towards attributing causes to effect. Given that the SDA surveys will provide cross-sectional information and that some farm management and time-series data are likely to be available from other sources, more sophisticated forms of analysis are necessary if predictions are to be made concerning the future impact of adjustment programs on household incomes and production.

9.53 The analytical approach most appropriate in these circumstances is to model household activity. Household models account for the inter-relationships of production, consumption and labor use. The use of agricultural household models is well documented[14] and there are a variety of examples for researchers to draw upon. It is appropriate here to outline the main characteristics of the model, discuss the validity of the underlying assumptions, and suggest the policy outcomes which it might be used to predict. A more technical discussion is presented in Box 9.1 (overleaf).

9.54 Household models combine many of the attributes of production functions, labor market equations and demand or expenditure functions. They are either recursive, in which case the decisions regarding production, labor supply and consumption are made sequentially, with the former influencing the latter, or they are non-separable, and each decision affects all the others. Recursive models are most commonly used, partly because the assumption of separability (i.e. that outcomes within different markets are not interdependent) is reasonable under many circumstances, and partly because they are simpler and more straightforward to estimate. Consequently, in many circumstances a recursive model is likely to produce useful results. Although the model described in Box 9.1 is very simplified, it is easily adaptable to describe the economic activities of a variety of non-farm households. Thus a representative household for each smallholder and informal sector group can be modelled based on the mean observations in each category. If time and data permit, the exercise can be further disaggregated by sub-divisions based on location and smallholder classifications.

9.55 The household model, presented in the Box, is based on the underlying premise of utility maximization, where utility is derived from three goods or sets of goods; namely, retained household production, purchased commodities, and leisure. Utility is maximized subject to a number

Box 9.1: Household models

The basis of the household model is a conventional utility function, such that the maximization of utility involves the consumption of three goods or sets of goods: farm produce (G_a), purchased commodities (G_m), and leisure (G_l). Household consumption, in addition, is affected by household specific characteristics such as demographic factors, taste, etc. Such exogenously determined factors are taken care of by (D).

$$U = U(G_a, G_m, G_l : D) \quad (1)$$

Utility maximization takes place subject to the limitations imposed by the prevailing production technology, a time constraint and a cash income constraint. The farm production function, which is typically of the Cobb-Douglas form, can be described by the following equation:

$$Q_a = Q(A,L,K,V : B) \quad (2)$$

where Q_a = output of farm produce (a); A = land area cultivated; L = the total labor input; K = fixed capital; V = variable input and B = represents exogenous variables affecting farm production, such as weather, access to infrastructure, information, education, etc. The function can be extended to account for multiple outputs without loss of validity. Family and hired labor are assumed to be homogenous and easily inter-changeable, thus the two are valued at the market wage rate. Both land and capital stock are assumed fixed. The time constraint is given by the total time available (T) to the members of the household:

$$G_l + F = T \quad (3)$$

It is assumed that all available time is utilized either as a consumer good in the form of leisure and in self- or off-farm employment (F). In this case the production of household goods such as home-making and child nurturing (often referred to as Z-goods) are subsumed under the leisure term, but the model and easily be modified to account for the latter separately.

The cash income constraint, or the limitation of market purchases of consumption goods, is described by the difference between the value of farm produce sold, wage-income received (or paid), variable inputs purchased, plus any external sources of income such as state transfers and remittances. Thus:

$$P_m G_m = P_a(Q_a - G_a) - P_l(L - F) - P_v V + E \quad (4)$$

where P = price; a depicts outputs and m purchased commodities; F = family labor and E = external sources of income.

The basic equation of the model, combines all three constraints into one equation such that utility is maximized subject to the following constraint:

$$P_a G_a + P_m G_m + P_l G_l = P_l T + \Pi + E \quad (5)$$

The expression Π represents a profit function, i.e:

$$\Pi = P_a Q_a - P_l L - P_v V \quad (6)$$

of constraints such as (a) the amount of time available to the household,[15] (b) the prevailing technology and availability of productive resources, (c) a cash income constraint limiting the purchases of commodities designated for consumption to the value of produce sold and labor income less the cost of purchased inputs.

9.56 Thus the parameters of the model are the quantity of time available, the available resources and their technical coefficients, and the prices of outputs and inputs. In addition, to validate the recursive property, the following assumptions are made: (1) The household is a price-taker, i.e. it is unable to influence the prices with which it is confronted; (2) family and hired labor are interchangeable, and both can be valued at the prevailing market wage rate; and (3) markets for both inputs and outputs exist and are competitive. Researchers must judge each situation on its own merits and should verify whether individual country circumstances satisfy these assumptions. If the assumptions are not satisfied appropriate changes will have to be made to the basic model.

9.57 The principal advantage of modelling is that it allows predictions to be made on the responses of the endogenous variables of policy interest to changes in the parameters,[16] ie. in the policy variables such as output price or resource access. The household model can therefore be used to predict:

(1) Changes in the economic well-being of households, as measured by the likely impact of policy shifts on consumption, profits and leisure. For example, the response to a shift in output price consequent upon depreciation of the exchange rate can be captured, and the implications for household resource use and consumption levels estimated.

(2) The implications for factor markets: For ex-

The right-hand side of equation (5) represents the concept of full income (Y^*), based on the market value of household time, adapted to include enterprise (in this case farm) profit (assuming profit maximizing behavior), while the left hand side represents the expenditure on the three sources of household utility. Given that the full income expression includes expression for the three sources of income, profit from own production, the sale of labor and remittances, the model can be used to monitor how income from each source is likely to respond to a given change in a policy variable or parameter.

To facilitate estimation and policy discussion, the above set of equations have to be re-written in the reduced form. By so doing, the variables that can be endogenously determined can be expressed as explicit functions of all the exogenously given variables (right hand variables). For that purpose, first substitute equation (2) into equation (6) and then equation (6) into equation (5). Transfer all the left-hand terms of the expanded equation (5) to the right hand side and set the equation equal to zero. Taking equation (1) and the modified equation (5), set the Lagrangian equation as follows:

$$L = U(G_a, G_m, G_l : D) + \lambda[P_a[Q(A, L, K, V : B) - G_a] - P_m G_m + P_l(T - L - G_l) - P_v V + E] \quad (7)$$

The endogenous variables in equation (7) are farm-level retained agricultural produce used in household consumption (G_a), purchased commodities (G_m), time spent for leisure, demand for labor (L) and demand for variable inputs (V). At equilibrium, these variables are expressed as a function of all the exogenous variables. Using the demand for farm produce (G_a), for instance, the function can be formally defined as follows:

$$G_a = f(P_a, P_m, P_l, P_v, A, K, E, T, D, B) \quad (8)$$

The use of the model in estimating the impact of policy interventions can be demonstrated by consideration of the following example. Assuming that the farm produce is tradable, currency depreciation causes its price (P_a) to rise. This will have an impact on both production and consumption. Traditional economic theory would suggest that output and marketed surplus will both rise and consumption fall in response to the price increase. Because higher output price implies greater profit, however, and greater profit (income) imply (for a normal good) increased on-farm consumption. Thus, the impact on marketed surplus will be ambiguous. Given equation (5), the consumption effect can be deduced from:

$$dG_a/dP_a = (\delta G_a / \delta P_a) + (\delta G_a / \delta Y)(\delta Y / \delta P_a) \quad (9)$$

where dG_a/dP_a is the aggregate change of consumption of the farm produce "a" with respect to own price.[17] The two partial derivatives on the right-hand side represent the price and profit (income) effects which contribute to the total change in demand due to a change in own-price. Similar equations can be derived to predict a variety of direct and indirect changes (also the corresponding elasticities and cross-elasticities), and thus allowing predictions regarding the impact of any particular policy shift.

ample, the consequences for labor demand and therefore wages can be predicted through estimating labor demand and supply elasticities.

(3) The consequences for rural input and output markets by estimating demand equations, eg. for locally produced goods and services.

(4) The macro-economic implications of policy changes can be estimated through aggregation of household responses: For example, the consequences for the foreign exchange position of an increase in the marketed surplus of an otherwise imported staple food.

9.58 Current evidence suggests that in the context of sub-saharan Africa, it is inaccurate to accept some of the assumptions made above regarding the operation of the product and factor markets. Thus, the household model defined in the Box should be modified to accommodate the country-specific circumstances under which smallholder households operate. As discussed earlier, government restrictions in factor and product markets affect the prices faced by economic decision-makers and condition private production and consumption behavior. In the definition of the model, although prices are assumed to be determined exogenously, allowance has not been made for the role of state marketing agencies (SMA) and quantitative restrictions. In many countries, smallholder producers face two prices at the same time. First, SMA offer different prices from those that would emerge under market clearing conditions. Furthermore, these prices are differentiated for consumers and producers and are concurrently supplemented by requisitioning from producers and/or rationing to consumers. This requires to modify the utility and production functions as well as the time allocation constraint.

9.59 The utility function contains three sets of consumer goods and is defined on the assump-

tion that households can purchase any amount of the set or subset of the products at the going price. In practice however it is frequently the case that household choice is circumscribed by a binding ration level. Restrictions have been common in many African countries in recent years particularly for manufactured goods due to the foreign exchange shortages limiting the capacity to import manufactured consumer goods and/or intermediate inputs and spare parts for domestic production. Thus, households have had no or limited choices other than amounts made available to them by state-run marketing or rural development agencies. These are in some cases supplemented by purchases from parallel markets and smuggled products. But, most smallholder households have not had such supplementary sources. Therefore, in order to take account of such binding restrictions, constraints need to be imposed on the total amount of the set or subset of products available for consumption. This fact limits the choices open to households. The utility function has to be re-defined accordingly. This issue is relevant in determining the right hand variables in the reduced-form equations of the household model. In cases where binding quantitative restrictions are important, the ration level enters on the right hand side together with the other exogenously determined prices, and becomes an important policy instrument.

9.60 Similarly, the assumption of perfect substitution between family and hired labor is untenable. Restrictions exist in the labor market particularly in those countries that have at one time or another followed socialist paths of development. Although structural adjustment will have removed such restrictions and begun creating the environment for a free flow of resources and labor in many cases, some vestiges of past practices affecting the labor market are likely to exist in some countries. An assessment of the existence or absence of labor market constraints is necessary even if restrictions have recently been completely removed. This is particularly useful if time series data are used for estimation. In countries with labor market restrictions, household labor use is limited to only own-productive activities with any shortage remaining unfulfilled and surplus being only used to increase leisure. This has an important bearing on the structure of the household model since it determines whether the model can be solved recursively. Thus, careful country-level assessment of the functioning of the labor market is called for in defining the time allocation constraint.

9.61 Input use by smallholder households, other than labor and land, is usually limited. Very scant amounts of fertilizer and pesticides are used by households, for example those who obtain these inputs as part of agricultural development programs. The prices farmers pay are often subsidized and removal of these subsidies may be an important component of policy reform. Even if farmers are willing to pay higher prices, however, the amount of inputs that they can use is often determined exogenously, for instance, by an extension agent. In such cases, an additional equation or inequality should be included to reflect such constraints. This modification to the simplified model in the Box 9.1 will make the amount of fertilizer an additional right hand variable in the reduced-form equation. In extreme cases, farmers operating outside of government initiated programs do not use such inputs at all. For those households who do not use any chemical inputs, production in the short run is affected by the fixed land, capital and the variable factor input of labor. Thus, specification of the production function should reflect the circumstances of different types of smallholder households.

9.62 In cases where the functioning of markets for factors and products is restricted and prices at which resources are transacted are not market clearing prices, it is suggested to use virtual (or shadow) prices. From the foregoing discussion, the need to estimate and use such shadow prices is inescapable in the cases of the manufactured goods, labor and variable input markets. The existence of quantitative restrictions and other product and factor market imperfections can be incorporated in the stylized model in Box 9.1 in either of the following two ways. First, in cases where rationing is pervasive shadow prices that induce the same impact as the ration can be estimated, and it will be appropriate to use those prices in the household model. In these cases, since prices are estimated endogenously, it is no longer possible to maintain that production decisions are made independently of those concerning leisure or consumption and the recursive nature of the model must be amended. An adaptation of the household model to allow for simultaneous decision-making therefore becomes necessary. Although this situation can be handled using household modelling techniques, the appropriate models are more complex and the data requirements more intensive.[18] Second, in cases

where it is difficult to estimate such prices, both the price at which the product is rationed and the amount of ration enter in the reduced form equations. These are important departures from the standard household model described in the Box and call for the modification of the standard model.

9.63 In many African countries, the smallholder sector operates in parallel with large-scale estate agriculture, the latter using modern technology and largely producing traded goods. The two sectors are either interdependent and/or competitive in factor and product markets. Since policy measures directed towards the estate sector affect the operations of the smallholder sector, it is necessary to study the two sectors concurrently. Consequently, identifying the type and taking their relationship into account in the definition of the smallholder model, is indispensable. In recent experience, the variable input (fertilizer, in particular) and the labor markets have demonstrated the existing intimate relationship, thus stressing the need for a joint analysis of the two production modes. The relationship can be easily illustrated by taking fertilizer as an example. Often smallholder households receive their fertilizer at subsidized prices while large-scale estates are subject to full-cost pricing. But, smallholder households may sell the fertilizer to the estates instead of using it on their own farms. A diversion of fertilizer, in full or in part, from smallholder households to the estates, creates an additional dimension to the production and consumption decisions the household makes. To the extent that fertilizer use on smallholder farms is lower than it would be in the absence of these transactions, smallholder production is undermined. But, the loss in production is compensated by an income transfer generated in return. Thus, the analysis of policy reform on smallholder household's production and consumption decisions should take into account not only the effects of policies directly addressed to the smallholder sector but also their effect on estate fertilizer delivery.

9.64 Similar interactions exist in the labor market. For instance, an increase in the relative price between the estate and smallholder produce, induces an upward pressure on labor demand and the rural wage rate. This is likely to create a flow of labor from the smallholder to the estate sector which may ultimately result in labor shortages in the smallholder sector and affect its production adversely. This effect is indeed captured by the movement in the wage rate, which is considered to be exogenous to the smallholder household. But, it will be more appropriate to solve the two together particularly as the analysis shifts from single household to the smallholder sector as a whole and when labor market conditions are examined.

9.65 The simplified household model in Box 9.1 together with the suggested modifications is useful in identifying the right hand variable, as shown in equation (8), that should appear in the reduced form equations. This approach is more comprehensive than ad hoc supply and factor demand specifications. Nevertheless, to be useful for policy analysis and prescription, the coefficients for each rhv need to be quantified. This requires a correspondingly comprehensive data set covering the various attributes of the household. The Integrated Survey (IS) and the Community Survey (CS), while not designed to facilitate a disaggregated supply side analysis due to the absence of questions aiming at relating inputs to outputs, are adequate to estimate aggregate demand equations both for consumer goods and intermediate inputs.

9.66 The data specifically related to smallholder productive activities appear in the agriculture section of the SDA IS. The questionnaire will collect data on agricultural assets (including land, livestock and equipment), plot details, harvest and disposal of crops (including staples, field, root and cash crops, and fruits), seasonality of sales and purchases of selected crops, other sources of agricultural revenue, agricultural costs and expenses, processing of agricultural products and consumption of own produce. The data may be inappropriate for estimating annual aggregate crop production, yield levels, input-output ratios, crop-specific production and supply functions. It is however useful to estimate aggregate farm income from different crops, aggregate factor and input demand, volume and value of sales and purchases from different channels.

9.67 The lack of disaggregation and the failure to capture cross-price elasticities however is likely to pose difficulties in attempts to understand the effects of crop specific policy reforms. To introduce these latter effects adequately, the SDA data instruments will have to be supplemented by farm management data or analysis based on time series data if the latter already exist in a fairly disaggregated form. Caution should however be exercised in using time series data since the variables that are assumed to be fixed in the short-

run in the production function are no more so in the long run. Similarly, as the data are generated from economic conditions at particular times in the past, any change in economic policy regime over the period will affect the data and require a corresponding modification in the specification and estimation of the equations. This, therefore requires a clear understanding of the economic regime(s) for the period to which the data belong.

9.68 The need to re-specify the model to reflect realities of specific countries and the compromise resulting from data limitations is compounded by technical difficulties in aggregation and parameter estimation. Firstly, modeling based on a representative household is risky due to the failure of such a unitary classification to capture the effect of income transfer across households. Such shortcomings are also likely to occur at the aggregate smallholder level, and in using time-series data, since for a given level of income its distribution to one or the other segment of the smallholder sector produces significant departure than would be the case based on a representative household. Secondly, given the cross-section nature of the data, it could be difficult to capture the effect of price changes on the endogenous variables of policy concern if difference in price across regions or seasons is insignificant. This is true in the case of pan-territorial pricing. In those countries where pan-territorial pricing has been the rule and fully enforced, the absence of variation in price across households, regions or seasons will make it almost impossible to estimate price-related elasticities. But, the failure of enforcement and, in parallel, the segmentation of product and factor markets has in many countries produced highly differentiated regional prices. This latter development will perhaps accord a promising opportunity to adequately capture price effects in a cross-section data. The third issue relates to prices. In the stylized smallholder household model, the household is assumed to be a price-taker, as mentioned earlier. If households are aggregated regionally or sectorally, price cannot anymore be considered exogenous. Instead, it becomes endogenous to the sector. Thus, country-level analysts need to be aware of the implications of the various assumptions they make for parameter estimation.

Policy perspective

9.69 In reviewing the policy implications of adjustment programs, it is important for researchers to keep in mind the broad context in which the responses to policy changes are taking place. Given the often radical nature of the programs, and the likelihood that they carry potential implications for almost all aspects of the social and economic life of many rural households, it is important that attention is not unduly focussed on a minority of variables, such that only a partial view is obtained.

9.70 The first set of policy implications to be drawn stems from the ramifications of adjustment programs for households' capacity to generate income. The extent to which access to assets, inputs and employment opportunities is being influenced by policy changes will ultimately be a key determinant of success or failure, and therefore provide guidance to future policy. Thus, changes in access to credit facilities, the availability and access to land and developments regarding rural employment opportunities need to be monitored and appropriate policies initiated.

9.71 The second focus of attention has to address the implications of policy changes for farm profit. The outcomes in this respect may well vary considerably among the different smallholder categories, depending on the extent to which (a) the household is engaged in the production of tradable and nontradable products, (b) the existence or absence of competition in export and domestic markets (the latter applying to import substituting products), (c) output price adjustments and the ability to switch to more remunerative products, (d) use of non-labor purchased inputs and (e) the extent to which the price of purchased inputs has been affected by subsidy removal and other policy reform. It is possible that a locational dichotomy emerges, between regions where tradable production, particularly of exports, is feasible, and those regions suitable only for production of nontradables or non-protected imports. It is equally possible that a proportion of households may be bypassed by policy reform. In either case researchers are encouraged to suggest policy modifications which would enhance farm profit among disadvantaged groups.

9.72 Furthermore, a more complete indication of the impact of adjustment programs is provided by assessment of modifications in household expenditure behavior. To this effect, indicators combining information on income generation with data on consumer prices and expenditure profiles, provide a comprehensive means of evaluating the impact of the programs on the

various household categories. An essential part of any evaluation must also include an attempt to estimate the implications of the program for access to economic and social infrastructure. Easy and affordable access to markets and social services such as education and health facilities constitute an essential component of household income. Whether such access is improving or deteriorating, researchers are encouraged to incorporate such information in their overall appraisal of programs implications.

9.73 When interpreting the results of the SDA surveys, therefore, researchers are encouraged to take account of the social and economic context which shapes household welfare. Concentration on the more easily quantifiable indicators to the exclusion of others may result in misleading conclusions. The notion of household income must be interpreted in its broadest sense if the ramifications of adjustment programs are to be fully understood.

Notes

1. This section is based on a companion volume, World Bank (1990: 159-168).

2. Land reforms have not in general been associated with adjustment lending because their time frame has usually been larger than the adjustment program. An exception is their incorporation in SAL agreements with Kenya, with the intention of giving land rights to squatters.

3 Although there are pockets of land scarcity in Sub-Saharan Africa, the major constraint to production (as stated in paragraphs 9.01 to 9.04) is not access to land, but the availability of labor. Any useful definition of the smallholder population must therefore take into account this overriding constraint to household income.

4. There is a danger in this definition, however, that the labor needs of some groups of very poor households are ignored. For example, if the household head is a woman and land preparation involves a substantial amount of heavy work which she is unable to undertake. Analysts should be cognizant of this possibility.

5. A target income would be based on the estimated value of an essential household consumption profile. Analysts should use their knowledge of local conditions and assumptions regarding per capita calorie and nutrient requirements (coupled with average family size data observed in the SDA survey in deriving such an estimate.

6. Thus, a farmer operating a small area and employing little non-household labor, but at the same time using methods involving a high degree of mechanization and/or the extensive use of purchased chemical inputs, is unlikely to be amongst the rural poor. (Data on farm equipment and purchased inputs are available from the SDA Integrated Survey.)

7. As is evident from the foregoing and subsequent sections, the smallholder concept is at times rather loosely applied. In some sections, the discussion encompasses the rural sector at large, including farmers, laborers, livestock raisers and non-farming non-wage rural informal labor under the general rubric of smallholder. Thus, the smallholder discussion should be put in a much broader context as and when necessary.

8. Livestock plays an integral part of the smallholder economy and is, in some areas, the principal focus of production. While pastoralists cannot be defined as smallholders in the conventional sense, they are frequently among the poorest of rural populations and possess many of the same broad characteristics with respect to their exiguous and fragile resource base and low levels of consumption. Thus, local researchers must answer whether pastoralists should be treated as a separate group, or be subsumed under one or more of the other categories.

9. It is likely that the majority of rural households would meet the income criterion for inclusion among the rural poor. Nevertheless, there will be a minority, such as professionals, government employees and those involved in large distribution and marketing activities, with which the SDA Program will not be concerned.

10. The list is tentative, and researchers may wish to extend or reduce the number of groups involved. It may be pertinent in some countries to create a sub-category of smallholders according to ethnic origin, especially when particular ethnic groups have restricted access to land.

11. For a useful empirical review of appropriate techniques for calculating terms of trade, researchers are referred to FAO, 1986.

12. Two articles which illustrate well both the usefulness and potential pitfalls of NPCs are: M.J. Westlake, 1987; and W. Jaeger and C. Humphreys, 1988.

13. The recent development in the concept and its empirical applications in many developing countries, including Côte d'Ivoire, Ghana and Zambia in Sub-Saharan Africa, can be found in Anne O. Krueger, Maurice Schiff and Alberto Valdes, 1988.

14. For a detailed outline of a basic agricultural household model, and examples of the use of these models in practice, the researcher is referred to I. Singh, L. Squire, J. Strauss (eds), 1986.

15. It is possible to attribute a value to all available time, since time spent in leisure or production of household goods such as home-making and child nurturing, has an opportunity cost in terms of the income foregone through not utilizing that hour in farm (or off-farm enterprise) production or the sale of wage labor.

16. It is noteworthy that weather variability and its predictability are important considerations in farmers' choice of cropping pattern. In as much as price and infrastructural

changes determine cropping pattern and allocation of agricultural resources, farmers' perception of likely weather conditions could act to complement, retard or even reverse the impact of policy reform.

17. Note that it can easily be expressed in elasticity form, in which case, the term represents the own-price elasticity of demand for the farm produce.

18. The basic model also assumes that households are risk-neutral. While risk averse behavior can be accommodated within these models, the consequent properties of the model is again more complex. The publication edited by Singh, Squire and Strauss (op cit) contains a number of chapters which describe how the basic model can be adapted in practice to take account of contexts where the above assumptions are not appropriate. An additional publication by the same authors is also recommended, Singh, Squire and Strauss, 1986. For modeling under quantity rationing, refer to Neary and Roberts, 1980.

10

An analysis plan for the SDA priority survey

Introduction

10.01 The SDA Priority Survey is part of the information system proposed under the SDA Program and is aimed at providing, in participating countries, the empirical basis to assess the social impact of structural adjustment programs. The SDA information system is described in Chapter One of this Volume and, in greater detail, in World Bank (1990). A basic premise is that any single survey would not be able to meet all data requirements, but that instead a hierarchical and integrated data system is needed. The system would need to include surveys capable of providing the extensive data required for in-depth policy analysis, as well as the more urgent data needs for short-term policy decisions, particularly on trends in "dependent" variables. As stated in Chapter One, the Priority Survey (PS) aims to identify target groups for social aspects of adjustment programs and to establish for such groups key indicators on welfare and basic needs fulfillment.

10.02 This Analysis Plan focuses on the PS in its primary role of identifying target groups and establishing for them indicators through which the impact of adjustment can be recorded. While we shall occasionally refer to the importance of specific tables for monitoring purposes, in general we shall not discuss in this document the analysis of PS data for monitoring. This is because the PS questionnaire may be somewhat different in its monitoring version and because the statistical analysis of changes in indicators over time is different from analyzing cross-section variations. The first use of the PS in a country will inevitably be for the latter purpose, hence this receives the bulk of our attention in this Chapter.

10.03 This Plan is different from the others in this Volume in three respects:

(i) It covers all sectors and target groups, in contrast to, for example, the plans on health and education. This stems from the limited data content of the PS. The survey, however, should not be regarded as a "mini" version of the IS. Indeed, the PS offers its own analytic possibilities, e.g., those based on the inclusion of direct retrospective questions on change. Hence the analysis presented here is not simply a sub-set of the IS analyses — which is why there is a separate PS Analysis Plan.

(ii) The analysis is applied only at the micro-level: the orientation of the PS is towards providing a set of indicators of how structural adjustment may affect the selected target groups, and these are at the micro-level. When combined with a CS, the PS can of course be used to study meso-micro links, in which case the nature of these links is much the same as that described in the IS analysis plans (although the amount of feasible analysis will be less than in the case of the IS-CS combination).

(iii) The analysis is mostly confined to tabulations. This also stems from the restricted data content of the PS, which permits the construction of a set of useful indicators and their cross-tabulation with relevant target group identifiers.

However, by and large, the variables needed to explain these indicators, in a modelling sense, are missing in the PS. They are present in the IS as explanatory variables to model household behavior.

10.04 PS analysis is particularly questionnaire-dependent — more so than IS analysis — in that even minor modifications will alter the analytic potential of the instrument. This Analysis Plan must therefore be read in close conjunction with the PS annotated questionnaire (World Bank, forthcoming, 1990a). The latter discusses a number of choices and trade-offs with respect to questionnaire content and field application and incorporates the experience of a PS field test conducted in Ghana in early 1990. Since the questionnaire on which this Analysis Plan is based is a prototype version, the analysis proposed here is also prototypical, and both will be adapted and amended to take into consideration country situations and priorities.

10.05 The text below will not discuss all possible tabulations, but focus on a few key tables on each topic by way of examples of how to construct and interpret tables. In the next section the data content of the PS is discussed in more detail. The issue of socio-economic classification and its relation to the target group concept is explored in paragraphs 10.12 through 10.23. Paragraphs 10.24 through 10.92 constitute the Analysis Plan proper, covering basic needs, employment, and income and assets. A concluding section rounds off the text.

Data content

10.06 The overriding characteristic of the PS in the SDA information system is its ability to provide rapid information on key variables to policy makers. This determines the data content and field organization of the survey. In contrast to the IS, in which data collection is spread over one year, the PS is to be conducted over a 2-3 month period at maximum. In order to permit sufficient sample sizes within such a short period (and keep the number of enumeration teams reasonable), interview time must be kept short — the goal is a maximum of one hour per household. The field test of the PS in Ghana has indicated that a country adaptation of the prototype questionnaire on which this Analysis Plan is based can be administered in about 30 minutes per household. There is thus scope for expanding the content of the PS if countries wish to do so to put more emphasis on local policy priorities.

10.07 The in-depth analysis made possible by the IS will, quite reasonably, take a significant amount of time, which is acceptable given its focus on medium- and long-term planning and policy design. In contrast, the PS information is aimed at policy interventions which are needed in the near term, and the results must therefore be available within weeks of data collection. This is of course one of the several aspects of the complementary roles played by IS and PS in the SDA information system.

10.08 This near-term focus of the PS immediately eliminates several items from the data content, such as the capturing of seasonality, full income and expenditure accounting and interviews with all adult household members (all of these features figure of course in the IS). In addition, for the PS to fulfil its role properly, the information collected must be easily measurable and obtainable from one, or at most two, respondents per household. This is necessary to keep the total interview time per household to within one hour, by avoiding time-consuming re-visits to contact different members. An immediate implication is that the focus of the PS will have to be on household-level variables. Information at the individual level generally requires interviews with all the individuals concerned (as is the practice in the IS), since proxy responses are usually not reliable. Ideally, the PS questions are addressed to the head of household only — but on occasion the spouse will serve as back-up or supplementary respondent.

10.09 From an analytic point of view, the variables in the PS must be proxies for direct welfare measurement and be sensitive to changes in the economy. The need for proxies stems from the fact that the complete recording of income and expenditures cannot be done in the time span of one hour (and would require interviews with many household members at any rate). The selection of such proxy variables is in fact the single most important (and difficult) task in the design of a PS. Moreover, the proxies must be chosen so that they are able to reflect the impact of adjustment or other macro-policies. For example, one might argue that the literacy rate in a country is one of the most important indicators of advances in human capital accumulation, and that literacy is an important ingredient of personal welfare. However, the literacy rate has a significant momentum component, and will not change much in the short run, say, as a result of a drop in

educational expenditures. On the other hand, the student drop-out rate will quickly respond to changes in the monetary and/or opportunity cost of schooling that can occur under adjustment. The PS should not therefore, in this example, measure the literacy rate, but focus on such variables as primary school enrolment and recent changes in it. Relevant indicators can then be constructed, such as the drop-out rate among primary school children and the (mis)match between age and grade attended. Such indicators will readily reflect undesirable effects from adjustment in the area of education. Similarly, as far as farm enterprises are concerned, the PS cannot attempt to construct the income from such activities (this is an important role of the IS) but must focus on those aspects of operating a farm which can be influenced by adjustment, e.g., price changes of crops, price increases and/or changes in availability of imported fertilizer and the like.

10.10 A key function of the PS is to record undesirable changes in key indicators. In its monitoring role, this can be done by comparing results from successive surveys. However, even when undertaken for a first time, the PS has the potential to record change directly. This is achieved by direct retrospective questioning on topics for which the respondent can reasonably be expected to recall the situation of, say, a year ago. This function is in fact more important in the PS than in the IS, and is one of the reasons why the PS is not a "mini-IS" and permits analysis beyond what is possible with the IS. Such retrospective questions are less useful in the IS because its interviews are spread over 12 months, which makes the comparison of two points in time more difficult. In the PS, direct questions on change are incorporated, regarding occupation, agricultural production, crop area, hiring of workers in household enterprises, access to housing amenities, migration, expenditures, income and assets. The latter deserve special attention. While the amount and value of household assets are important welfare indicators (and are collected in the IS), changes in assets play a special role in evaluating trends in household welfare. Decreases in particular assets often reflect distress sales and may reflect increasing difficulties in generating household income. The PS therefore has a set of questions on changes in the past year in the household's holding of livestock, housing, productive assets and household durables.

10.11 A detailed discussion and justification of what is included in the PS can be found in the annotation to the questionnaire (World Bank, forthcoming, 1990a). The explanation of the use of these data form the task of this document. In the meantime, Box 10.1 summarizes the data content of the PS.

Target groups and socio-economic groups

10.12 The primary objective of the PS is to identify target groups for social policy interventions

Box 10.1: PS data content

1. Household roster (list of all de facto household members):
   - demography: relation to head of household, age, sex
   - education: current attendance, educational achievement
   - health: recent health consultation and related expenses
   - employment: main activity status, job search
2. Housing and amenities:
   - occupancy status and change
   - access to water and fuel and change in access
3. Employment (for head of household and spouse only):
   - presence in household
   - main occupation, work status, industry, wage
   - second occupation
   - previous occupation
4. Migration:
   - recent migration of household
   - work-related migration of household members
5. Agricultural enterprises (including livestock and fisheries):
   - ownership of land
   - for 5 main crops: production, sales, outlets, change in production
   - use of fertilizer, credit, extension services
   - hiring of workers and changes in hirings
   - main livestock and change in stock
6. Non-farm enterprises (up to 3 per household):
   - gross income
   - type, duration of operation
   - person responsible
   - number of employees and changes
7. Household expenditures:
   - expenditures and direction of change for 5 key foods and major categories of non-food items
8. Income by source:
   - income and direction of change of major sources of income
9. Assets:
   - ownership and change in ownership of major productive asset and consumer durables
10. Anthropometrics:
   - weight and height of children 3-60 months of age

in the context of adjustment. This means that the PS must contain the necessary identifiers to define such groups from a policy-relevant perspective. The first task of PS analysis is hence to set up a classification of socio-economic groups (SEGs). These groups are meant to be as homogenous as possible from the point of view of the impact of adjustment on their welfare through the production and income-generation mechanisms of the economy. Moreover, such groups must be defined along dimensions which can become criteria for the implementation and targeting of government policy.

10.13 A priori, two major criteria can be put forward to define SEGs in that perspective:

(i) Location: this refers in first instance to the urban/rural distinction. Where possible each can be broken down further, e.g., rural areas can be split by agronomic or ecological zones, and within urban areas the capital city can be distinguished. It is generally not desirable to present results according to administrative entities (provinces, districts) because these rarely represent economic entities. Also, it is inadvisable to use "survey regions," i.e., the territories covered by the survey teams, because this holds the danger that enumerator effects unduly affect comparisons across regions.

(ii) Assets/sources of income: this is clearly the prime classifying variable if economic homogeneity is strived for, since this is the main mechanism through which adjustment affects household welfare. In rural areas, the classification can be made according to whether the household owns a farm (and the size of it) and its major crop or type of crops (export versus subsistence crops). In some cases the institutional arrangement under which the farm is operated can be part of the classification (e.g., share-cropping). In urban areas, the work status of the household head and/or the sector providing the household's main source of income can be used (e.g., government, parastatal enterprises, formal private sector, informal private sector).

10.14 In some cases the classification can further be refined by certain sociological criteria such as ethnicity, religion and language, in countries where this is deemed appropriate and policy relevant. As a general point it needs to be emphasized that the SEG classification will be country-specific and needs to be built so that it can reflect local conditions and policy issues. Therefore, as an illustration — although perhaps one with fairly wide applicability — the following classification is offered:

1. rural – export-oriented farmers (medium and large holdings)
2. rural – export-oriented smallholders
3. rural – food/subsistence farmers
4. rural – pastoralists
5. rural – landless agricultural workers
6. rural – non-agricultural workers
7. urban – skilled public sector employees
8. urban – unskilled public sector employees
9. urban – formal private sector workers
10. urban – informal private sector workers
11. urban – inactive or unemployed.

10.15 An important variant of this classification would be to distinguish between the capital city and other urban areas in the country. This is warranted if, as is the case in many African countries, the population of the capital city is a multiple of that of the next largest city. The capital city then often displays many economic characteristics as well as problems which are unique to it. For example, the concentration of economic activities (government, export businesses) may mean that the capital's economy will respond very differently to adjustment than other urban areas. However, splitting the urban SEGs in this fashion may lead to a small number of sample observations per SEG, unless the sample size of the PS is very large. In general, a trade-off will be necessary by aggregating along another dimension. For example, instead of simply doubling the number of urban SEGs in the above example classification from 5 to 10, one can propose an increase to only 6 groups by using the following scheme:

7. urban – capital city – public sector employees
8. urban – capital city – formal private sector workers
9. urban – capital city – informal private sector workers
10. urban – other cities – formal sector workers (public and private)
11. urban – other cities – informal sector workers
12. urban – inactive or unemployed

10.16 It is recommended that the SEG classification be determined a priori, at the stage of survey design, for the following two reasons: (i) the PS sample can be made more efficient if it is stratified along some of the retained SEG criteria; and (ii) a clear idea on the SEG classification is neces-

sary to determine the precise data content of the PS.

10.17 It is of course possible, and in most cases likely, that as a result of actual analysis, the classification will be amended because some groups are found to be very similar to one another, and can thus be aggregated, and/or others are found to be too heterogenous and need to be split.

10.18 In the PS data base, several sections need to be relied upon to construct the SEG classification:

- the urban/rural information, as well as the possible distinction between the capital city and other urban areas, is derived from the questionnaire cover sheet which identifies the cluster;
- the classification of different types of farmers uses the crop and ownership of land information in the PS;
- the distinction between agricultural and non-agricultural workers in rural areas, as well as the breakdown of urban workers, is derived from the occupation information in the PS.

10.19 Once the basic SEG classification has been established, it becomes a major dimension of PS analysis. The majority of tables will have SEG as a dimension and the basic description of the sample population can usefully be done by SEG (see below).

10.20 Prior to starting tabulations, however, it is important to clarify the relationship between target groups and SEGs. The way they are defined, SEGs form a mutually exclusive and exhaustive classification of households in society. They are fairly homogenous internally with respect to major economic parameters. Target groups, on the other hand, are selected sub-groups of the population of concern to policy makers, and are defined along various economic and non-economic criteria. Target groups can overlap with one another so that one individual or household can belong to several target groups (or, of course, to none at all). For example, the poor, female-headed households, malnourished children, smallholders, coffee farmers, etc., can be target groups. Target groups need not necessarily be defined at the household level (e.g., malnourished children) and can be quite heterogenous (e.g., the poor). In many instances the targeting of policies needs to rely on socio-economic criteria which make it possible to identify in practice the target group. To identify the poor, for example, one might examine location, lack of assets, certain activities, etc. In other words, the poor are identified in relation to the socio-economic group(s) to which they belong.

10.21 There are three types of relation possible between target groups and socio-economic groups:

(i) a target group equals a SEG (e.g., export-oriented smallholders); (ii) a target group is a part of a SEG (e.g., laid-off, unskilled public sector employees); and (iii) a target group overlaps different SEGs (e.g., female-headed households).

An important task of PS (as well as IS) analysis, therefore, is to show the incidence of target groups within the different SEGs. This is essential to assess the efficiency and leakages of programs which are targeted according to SEG criteria. This task (in addition to the display of the overall population distribution across SEGs) is the first step in PS analysis, to which we now turn. The main information source is the household roster.

10.22 Frame 10.1 shows the distribution of individuals by age and sex across SEGs, as well as the total population distribution. This is a basic demographic table which can be checked with other sources of information if they are available (such as a recent census) to assess survey reliability. The details of the age/sex distribution can reveal important differences in demographic patterns: for example, some SEGs may have less than the average share of adult males, perhaps as a result of migration.

10.23 Frame 10.2 (overleaf) tabulates, at the household level, the relative importance of the SEGs in the overall population. This is the key table to show the correspondence between target groups and SEGs. For example, if female-headed households are a target group, their distribution is shown in line 2 (which sums horizontally to 100%). Line 3 then shows the percentage of female-headed households within each SEG, i.e., the incidence of the target group within the SEGs

Frame 10.1: The distribution of the population by age, sex and SEG
(percent)

Age	*Sex*	*SEG 1* ..... *SEG 11*	*Total*
0-5	M		
	F		
6-10	M		
	F		
.....			
65+	M		
	F		
Total		100% 100%	100%

Frame 10.2: Distribution of households across SEGs
(percent)

	SEG 1.....SEG 1	Total
All households		100%
Female-headed households		100%
Percent of female-headed households		

(together with male-headed households, this sums to 100% vertically). The table thus indicates the extent to which the target group is concentrated in a few SEGs and to which SEGs any interventions need to be targeted in order to minimize leakage.

Basic needs

10.24 As we have already indicated, the SDA Priority Survey places some emphasis on basic needs indicators and obtains information on the education and health status of all members of the household. Indicators of nutrition and housing are also obtained in the PS. The reasons for this are evident. First, these variables are important indicators of welfare, tracing both short- and long-run effects. Indications of morbidity and malnutrition, for example, are evidence of immediate stress among the population. But basic needs indicators also suggest long-run implications, simply because they are important inputs into human capital, and thus influence income-earning capacity (and welfare) in the future. Secondly, they are relatively easy to measure (at least as compared with income- and expenditure-based indicators). We can be reasonably confident that the household head (or responsible respondent) will be aware of the education status of each household member and the health contacts each has made. Thirdly, structural adjustment typically involves fiscal policy reforms, which seek to reduce the fiscal deficit through cuts in government expenditure. In many countries, expenditures in the health, education and housing sectors are cut, whilst at the same time, subsidies of important food items are reduced (or removed entirely). These austerity measures can seriously impinge on the access of households to basic needs services, and thereby adversely affect household members. At the same time, changes in the income-earning opportunities of households are likely to change the opportunity costs of health and education activities, and thereby to affect the demand for these services. As a monitoring instrument, the priority survey will provide policy makers with the information to judge the extent to which the policy reforms that are implemented are having real effects on the basic needs status of the various regions and socio-economic groups. The tabulations presented here are disaggregated by socio-economic group. The socio-economic disaggregation is the main feature of the PS data analysis. These tabulations may also be disaggregated by region should policy priorities suggest this would be useful.

10.25 The PS focuses on four main areas of basic needs: education, health, nutrition and housing. Each of these is considered in turn.

Education

10.26 One of the problems with education indicators is that many of them have a momentum which changes only gradually. The literacy and numeracy rates are examples of such variables. These are generally "outcome" variables — the outputs of the education system. The main concern of the survey is with the inputs of the education system, tracing the numbers of the school-age population currently receiving education. The basic indicator which underpins most of the education analysis of the PS is the enrolment rate. This is defined as the number of children attending school (in the PS the definition is "regularly attending school during the current school year") divided by the total number of children of school age. Enrolment rates should be calculated for various levels of schooling, highlighting primary (aged 5-11) and secondary (12-15) education. Unless there are special policy considerations which suggest otherwise, the analysis of the PS should not deal with tertiary levels. Only a small proportion of the population will be attending at this level, and the majority of these will be from better-off households. Moreover, it is likely that the number of observations in some of the cells will be too low to draw meaningful inference. These rates should be calculated for each socio-economic group (and for each region if this is considered important for policy purposes). These calculations would yield tables following the structure of Frame 10.3.

10.27 Comparisons between the socio-economic groups will not only be interesting in and of themselves, they will also provide some initial clues about the underlying factors that might be

Frame 10.3: School enrolment rates by level of schooling, sex and SEG

	SEG 1	SEG 11	*Total*
Primary enrolment rates			
M			
F			
T			
Secondary enrolment rates			
M			
F			
T			

Frame 10.4: Educational drop-out rates by socio-economic group

	SEG 1	SEG 11	*Total*
Primary-level drop-out rates:			
M			
F			
T			
Secondary-level drop-out rates:			
M			
F			
T			

Frame 10.5: Percentage of children not currently attending school for financial and logistic reasons, by level of schooling and socio-economic group
(percent)

	SEG 1	SEG 11	*Total*
Primary education			
Financial constraints			
Distance from school			
Secondary education			
Financial constraints			
Distance from school			

responsible for the variations in enrolment. For example, differences between rural- and urban-based households might suggest variations in the availability of schooling. On the other hand, low levels of enrolment among farming households may well indicate high returns to child labor in the agricultural enterprise. The differences in household income between SEGs will also explain some of the variation in enrolment. This is not to suggest that such differences will in any way prove such causal links, but they may provide some initial guidance to policy makers. Some preliminary multivariate analysis may be feasible with the PS data, and this is discussed briefly below. Notice that such tabulations should distinguish the sex of the children. In this way, the analyst can gain some understanding of any gender bias in school enrolment among the socio-economic groups.

10.28 One of the problems with the enrolment rate is that it may not be a sufficiently sensitive indicator to capture the effects of recent policy changes. It should therefore be supplemented with some analysis of recent drop-out rates from the education system. The PS obtains information on all individuals in the household who have left school during the current year, and the reasons for so doing. This is certain to be a more sensitive indicator than the enrolment rate. Thus, a tabulation along the lines of Frame 10.4 would be particularly useful for policy makers. The drop-out rate is defined as the number of children who left school in the current school year divided by the total number of children enrolled in the current year (plus the dropouts). Again, the tabulations should be prepared separately for primary and secondary schooling and disaggregated by sex.

10.29 The PS gives an opportunity for the analyst to explore why some school-age children are not currently attending school. For those not in attendance, the reasons for non-attendance are obtained. Of particular interest to the social dimensions of structural adjustment are the responses which report "finance" and "distance to the school" as reasons for non-attendance. Both are factors which are affected by government policy, and which can potentially be corrected (at least given time). Thus Frames 10.3 and 10.4 should be supplemented with tabulations indicating the main reasons for non-attendance — as for example in Frame 10.5. This table can be prepared for all individuals of school age not attending school, and also for those individuals who have left school in the current school year, that is, for recent dropouts.

10.30 One final educational indicator which can be computed from the PS is the relation between age and school grade. In each country, there is an accepted relation between the age of the child and his or her school grade. If children have dropped out of education for periods in the past, or if they have been obliged to repeat grades, they may find themselves in school grades which

Frame 10.6: Age/grade mismatches as a proportion of total enrolments, by SEG, education levels and sex

	SEG 1	...	SEG 11	Total
Primary level				
M				
F				
T				
Secondary level				
M				
F				
T				

Note: These mismatches are only for children aged above that indicated for the grade.

Frame 10.7: Age-grade matrix for SEG 1

	Primary education grade						
	1	2	3	4	5	6	7
Age							
5							
6							
7							
8							
9							
10							
11							
12	Cells comprise numbers in sample						
13							
14							
15							

Frame 10.8: Mean household education expenditure per currently enrolled child, by socio-economic group and region

	SEG 1	...	SEG 11	Total
Region				
1.				
2.	Cells contain mean expenditure values			
3.				
4.				
Total				

are inappropriate for their age. This indicator is a further refinement of the enrolment and drop-out indicators, since it reveals weaknesses in the education experience of those that are currently enrolled and attending school. For example, the enrolment and drop-out rates will not pick up changes in the incidence of repeats, which reflect some educational stress. So for every child of school age and currently attending school, this age/grade assessment must be made. There are two broad approaches to tabulating data in order to reveal differences in age/grade experiences across socio-economic groups. The first is to compute for each SEG the number of children whose age is above that for their current grade as a proportion of the total number of enrolled children. This is shown in Frame 10.6.

10.31 Alternatively, a matrix can be prepared for each socio-economic group, distributing the sample by age and grade. Such a matrix is illustrated in Frame 10.7. If there were no age-grade slippage in the socio-economic group, all the sample would be across the diagonal. But with temporary absences and repeats, some children will be observed to the south-west of the diagonal. Only a few children in grades ahead of their age would appear to the north-east of the diagonal. A matrix such as Frame 10.7 should be prepared for each SEG. Note, however, that the relation between grade and age is likely to be country-specific. Frame 10.7 reports only mismatch for primary education, since this is likely to be a sensitive indicator, and to signal early educational problems for the households concerned. Moreover, mismatch is more common in secondary schooling in much of Africa.

10.32 The PS questionnaire obtains information for the household as a whole on school-fee expenditures. This can be used to identify differences across socio-economic groups in expenditure on education. Education expenditure in each household should be normalized by the number of children of school age in the household. These data can be presented along the lines of Frame 10.8. An alternative to Frame 10.8 would be to present the share of education in total expenditures, which some analysts may prefer. Notice that the results should be disaggregated by region, since it is likely that expenditures will be higher in urban areas (especially in the capital city) where private schooling is more readily available.

10.33 In many countries, policy reforms include elements of cost recovery in the public sector, and these are often applied to the education sector. To what extent can households afford to pay for the education of their children? How willing are households to do so? These issues are vital, since they determine whether cost recovery in education will lead to lower enrolment rates and increased dropouts among some socio-economic

groups. The information on education expenditures will give governments some preliminary indication of the types of household which commit resources to the education of their children and the significance of such costs in their overall household budgets. The indications are preliminary since a more detailed investigation (of the sort proposed in the IS) would be required for a thorough-going analysis (for example, the PS does not obtain information on whether the schooling of each child is public or private). To account for variations in the numbers of children at school, household expenditures should be divided by the number of currently enrolled children in the household, and the mean values reported in the table. The questionnaire also obtains information on whether education expenditure has changed over the previous year. Appropriate tabulations should identify the incidence of increases and decreases in expenditure across socio-economic groups.

10.34 The data obtained in the PS will permit some multivariate analysis, although it should be emphasized that this is likely to be of a preliminary nature. Chapter Six reviews the main considerations which are applied in specifying an estimation model for education analysis, and we shall not repeat this here. However, it is worth noting the data in the PS which can be utilized for such estimation. Our main interest is in identifying the dependent and explanatory variables available from the PS which can be used in Ordinary Least Squares (OLS) estimation. Three dependent variables are available. First, the proportion of children of school age in each household currently enrolled; second, the proportion of dropouts in each household; and third, the share of household expenditure spent on education. The occupation, education and income levels of the household head and spouse are generally found to be important explanatory variables, and these are available in the PS. Household assets (and income) can also be used as explanatory variables. Regional dummy variables may be used to capture the effects of variations in educational services.

Health

10.35 The focus of the PS is on the use of health services by the household, rather than the health status of its members. Information is obtained on health consultations of each household member over the two weeks prior to the survey. The PS also establishes the type of consultation that is made — whether it is through traditional or modern health services. Health status is a more responsive indicator than education performance variables. The health of a population can deteriorate relatively quickly, as compared with literacy or numeracy rates, for example. The main problem with health indicators, however, lies in obtaining reasonably accurate information in a survey of the PS type. This is because only one respondent is selected per household, and it is unlikely that he or she will be familiar with the health condition of all household members. Moreover, since illness and injury have to be self-reported in such household surveys, indicators of health status tend to be relatively unreliable. For example, better-educated households tend to report more illness than poorer and less well-educated households. The PS therefore does not attempt to obtain information on the health of the members of the household, but concentrates on their recent health consultations. Clearly, some members will have been ill or injured even though they have not had a health consultation during the reference period, and these will be missed in the survey. This focus is also justified on the grounds that health consultations may be influenced by policy reforms under a structural adjustment program. Whether these reforms involve significant cuts in programs, or the re-structuring of health services, it is certain that they will change the access of the various socio-economic groups to health care. The PS questionnaire is therefore designed to pick up these changes.

10.36 Two broad types of analysis of these data are required. First, the incidence of health consultations must be computed and compared across the SEGs. The problem here lies in interpreting the data, since it is not possible to obtain information on the incidence of illness. Frame 10.9 (overleaf) gives some indication of what is required. By incidence is meant simply the numbers of persons who had a health consultation during the past two weeks divided by the total population in each group. Notice that Frame 10.9 disaggregates by age and sex in order to isolate demographic effects. Three of these are noteworthy: infants and young children are more likely to receive medical attention than older children and adults; child-bearing women are more likely to have medical consultations; and older age-groups will probably make greater calls on the medical services.

Frame 10.9: Incidence of health consultations by SEG, age and sex

		SEG 1	.....	*SEG 11*	*Total*
0-5	M				
	F				
6-15	M				
	F				
16-45	M				
	F				
46-60	M				
	F				
> 60	M				
	F				
Total					

Frame 10.10: Distribution of health consultations by type of consultation and socio-economic group
(percent)

	SEG 1	.....	*SEG 11*	*Total*
Traditional healer				
Health assistant				
Midwife/nurse				
Doctor				
Other				
Total	100		100	100

10.37 The second type of analysis permitted by the PS concerns the type of consultation that is made. This is particularly relevant in situations of structural adjustment, since this analysis should give some indication of the availability of modern health services to households. Differences in the type of consultation will reflect, inter alia, the availability of medical services. As a monitoring instrument, therefore, the PS can signal any noticeable deterioration in the use and (by implication) the availability of modern health services. Frame 10.10 outlines how this analysis may be presented.

10.38 Finally, health analysis of the PS should utilize information on health expenditures by the household. There are two estimates of health expenditure recorded through the PS questionnaire. First, as with education, the questionnaire obtains information on total household medical expenses incurred over the past 10 months. Frame 10.11 shows how these data should be tabulated. And as with education, other tabulations showing the incidence of changes in expenditure (over the previous year) should also be prepared. Second, the costs associated with the last health consultation by each household member are recorded in Section 1 of the questionnaire. This information will establish more directly what each type of health consultation costs the household.

Frame 10.11: Mean per capita household expenditure on health by socio-economic group and region

	SEG 1	.....	*SEG 11*	*Total*
Region:				
1.				
2.				
3.	Cells contain expenditure values			
4.				
Total				

10.39 Frame 10.12 provides some important information about the supply-side of household health expenditures. The costs of health consultations will be expected to vary across types of consultation, so variations down the columns of Frame 10.12 are to be expected. However, variations across socio-economic groups for each type of consultation will have greater significance, since they will reflect how accessible the services are in economic terms. Simply because health facilities are available does not imply that they are accessible to all households. The table will show whether health costs are such as to enable poorer groups to have effective access to them. Changes in these costs measured over time with repeated priority surveys will help monitor changes in health costs, and how these changes are affecting each of the socio-economic groups.

10.40 PS data will also permit some preliminary multivariate analysis of health. Chapter Five of this Volume reviews the types of behavioral relations that might be estimated for health, and there is little point in repeating this here. Dependent variables for the analysis of health using the PS data may be defined at the individual and the household levels. The individual-level dependent variable corresponds to the demand for health inputs discussed in Chapter Five, this being whether the individual has consulted a health practitioner during the reference week. This is a dichotomous variable, taking the value of 0 for individuals who have not consulted a practitioner and 1 for those who have. Multivariate analysis therefore requires binary logit estimation methods. Using per capita household health expenditure (or its share in total expenditure) is an alternative dependent variable, though this is defined at the household level. As this is a con-

Frame 10.12: Average health costs per consultation by type of consultation and socio-economic group

Type of consultation	*SEG 1* ..... *SEG 11*	*Total*
Traditional healer		
Health assistant	Cells contain average costs	
Midwife/nurse		
Doctor		
Other		
Total		

Frame 10.13: Percentage of children (aged 3-60 months) indicating significantly low weight for height, by SEG and region
(percent)

	SEG 1 ..... *SEG 11*	*Total*
Region		
1.		
2.		
3.		
4.		
Total		

Note: The cut-off chosen for the table should be 75% of standard weight. Alternative cut-offs may be selected (for example, 85% to indicate moderate wasting).

tinuous variable, ordinary least squares procedures will generally apply.

10.41 The selection of regressors will depend on the level of analysis. With an individual-level dependent variable (i.e., consultation with practitioner), explanatory variables will be of three types:

- first, there are the characteristics of the individual concerned, such as age, sex, relationship to household head, work status, etc.;
- second, household-level variables should be specified (including education/employment of household head and spouse, wages/incomes of household head/spouse and household, landholding, expenditures on food, water source used by household);
- and third, a set of variables which are external to the household, ideally including prices of foods, costs of health consultations and access to infrastructural services, such as health-care facilities.

Most of these variables are available in the PS, the major exceptions being some of those that are external to the household. Health costs are available, but information on infrastructural services would only be available if a community survey is also conducted. Alternatively, regional dummies might be used as proxies for these influences.

10.42 With a household-level dependent variable (health expenditure), the individual-level regressors would be dropped. However, variables reflecting the age/sex structure of the household (such as the dependency ratio) might be included among the household-level regressors to take account of the demographic determinants of health expenditure. The household and external independent variables specified above should be retained for the household-level analysis.

Nutrition

10.43 Although it was stated that the PS cannot obtain reliable information on illness and injury of each household member, there is one aspect of health which the PS is designed to monitor, this being nutrition. This is one of the "outcome" indicators that can be readily measured in a one-visit survey of the PS type. Anthropometric information is obtained in the PS questionnaire on all children aged 3 to 60 months. These data cover age, height and weight and can be used to assess the extent of malnutrition, reflecting both stunting and wasting. Again, the analytical underpinnings of data analysis on nutrition are discussed in Chapter Seven of this Volume, and there is little advantage in repeating the discussion here. Two broad indicators should be computed from these data — height for age and weight for height. The former measures the degree of stunting, and the latter measures wasting. A child can be considered severely stunted if his or her height is less than 85% of the standard height for his or her age (the standard being drawn from a reference population — see Chapter Seven). Similarly, a child can be considered severely wasted if his or her weight is less than 75% of the standard weight for his or her height. Such children can be considered moderately malnourished.

10.44 PS data analysis requires that evidence of malnutrition is identified for each of the socio-economic groups, preferably by region, using both height-for-age and weight-for-height indicators. Of all indicators in the PS, this requires an immediate policy response if there are problems signaled in the indicator. The regional disaggregation will give more precise clues to policy makers about the specific groups which are in need of food targeting. Frame 10.13 reports the sort of tabulation that is required for wasting. The same

Frame 10.14: Distribution of households by house tenure and socio-economic group
(percent)

Dwelling arrangements	*SEG 1*	*SEG 11*	*Total*
Owner-occupier			
Tenant			
Rent-free accommodation			
Squatting			

Frame 10.15: Distribution of changes in tenurial arrangements for household dwelling by socio-economic group
(percent)

Tenurial change	*SEG 1*	*SEG 11*	*Total*
From owner-occupier to tenancy			
From tenancy to owner-occupier			
Other changes			
No changes			
Total	100	100	100

table should also be computed for stunting.

10.45 As with education and health, some multivariate analysis should be possible for nutrition using the PS data. The dependent variable in this case would be the weight-for-height and height-for-age indicators already discussed, and these of course are defined at the individual level. In general, the set of explanatory variables defined for health analysis (in paragraphs 10.34 through 10.41) should be retained here — these being individual-level, household-level and external categories of regressors.

Housing

10.46 The final basic needs variable that is covered in the PS concerns housing. The PS questionnaire obtains information on the tenure arrangements for the dwelling and the utilities that are available. Concerning the dwelling itself, the PS obtains retrospective information on the tenurial arrangements 12 months previously. Thus, tabulations on the current situation and the change over the previous 12 months should be prepared. These are illustrated in Frames 10.14 and 10.15.

10.47 Clearly, any significant change from owner-occupation to tenancies indicates some economic stress on the part of the household. On the other hand, households buying previously rented accommodation are likely to be in increasingly favorable economic circumstances. However, the interpretation of this table is certain to be country-specific. In some African countries, rented accommodation is chosen mainly by the wealthy, so that changes toward renting may not indicate economic stress.

10.48 Finally, the PS obtains information on the access of the household to certain basic amenities. Again, the survey obtains retrospective data on the situation 12 months previously. Frames 10.16, 10.17, 10.18 and 10.19 report the relevant tabulations. For each of the amenities covered by the PS, an attempt must be made to identify changes which indicate improvements and deteriorations in the living standards of the households. Much of this is country-specific, although the Frames 10.16-10.19 illustrate some of the aggregations that may prove useful.

Employment

10.49 Employment information is obtained in the PS at different levels:

(i) The most important information — main economic activity and job search — is collected for each household member in the roster.

(ii) A more detailed description of the main job (including wages), as well as information on the secondary and previous jobs, is obtained for the head of household and the spouse.

(iii) Information on migration and total wage earnings is collected at the household level.

10.50 One of the major ways through which structural adjustment affects households is by altering their employment opportunities, which then induces changes in the time allocation of household members across different types of employment and different sectors of the economy. Such changes will not be the same across all households because different SEGs have different endowments, which will influence their ability to respond to a new incentive structure. The pattern of economic activity across SEGs, and how it changes, is thus one of the key tables in assessing the impact of adjustment.

10.51 Frame 10.20 lays out for each SEG and for the country as a whole the distribution of individuals over broadly defined economic activities. Since the SEGs (the columns of the table) have been defined partly by the main economic activity of the head of household and since the rows

Frame 10.16: Distribution of households by source of water and socio-economic group
(percent)

Water source	*SEG 1*		*SEG 11*	*Total*
River/lake				
Well				
Public tap				
Own tap				
Other				
Total	100	100	100	

Frame 10.17: Distribution of changes in water sources by socio-economic group
(percent)

Water source change	*SEG 1*		*SEG 11*	*Total*
From river/lake/well to public/private tap				
From public/private tap to river/lake/well				
From public tap to private tap				
From private tap to public tap				
Other changes				
No changes				
Total	100		100	100

are activity categories for all household members (older than 7), the table directly shows the extent to which the household has differentiated its activities relative to that of the head. For example, one may find that among the rural SEGs, food/subsistence farm households have very few members who do not work as farmers or unpaid family workers, whilst among export-oriented farmers a greater percentage of household members have other activities. Such a finding would imply that the latter group has a better chance of withstanding an economic shock in the agricultural sector and/or has more successfully adapted to past shocks.

10.52 In urban areas, the table may reveal, for example, in which SEGs formal sector employment has diminished (a frequent result of adjustment) and where a growing number of people have been able to switch to self-employment. To the extent that full-time employment is used as a row category, the table may also give a first indication of low school attendance in certain groups.

Frame 10.18: Distribution of households by type of cooking fuel and socio-economic group
(percent)

Cooking fuel	*SEG 1*		*SEG 11*	*Total*
Wood/charcoal				
Kerosene				
Gas				
Electricity				
Other				
Total	100		100	100

Frame 10.19: Distribution of changes in cooking fuel by socio-economic group
(percent)

Fuel change	*SEG 1*		*SEG 11*	*Total*
From wood/kerosene/charcoal to gas/electricity				
From gas/electricity to wood/kerosene/charcoal				
Other changes				
No changes				
Total	100		100	100

Frame 10.20: Distribution of individuals (age 7 and older) by main economic activity and SEG
(percent)

Activity	*SEG 1*		*SEG 11*	*Total*
Farmer				
Other self-employed				
Unpaid family worker				
Government employee				
Private sector employee				
Student				
Housekeeper				
No economic activity				
Total	100		100	100

10.53 A useful extension of Frame 10.20 is to split each row according to gender. There are strong arguments to expect that structural adjustment affects men and women differently. A detailed analysis of how and to what extent this occurs can only be done with the IS (see Chapter Eight), but the PS can provide a first insight on major differences in economic activity patterns between men and women, and in which SEGs these differences are most pronounced.

Frame 10.21: Unemployment rate by age, sex and SEG

		SEG 1 ..... SEG 11	Total
15-20	M		
	F		
21-25	M		
	F		
26-30	M		
	F		
31-40	M		
	F		
41-60	M		
	F		
Total	M		
	F		
Total			

10.54 If the PS is used in its monitoring version, the changes in the patterns of activity from one year to the next can be shown for each SEG, by repeating the columns of Frame 10.20 — both in its basic and gender-differentiated versions — for the second year.

10.55 Since structural adjustment induces resource switching, it is important to identify types of individuals and households who have failed to make such a switch successfully, and as a result have become unemployed. This can be achieved with the roster questions on lack of work and job search in the last seven days (which together define unemployment according to the ILO definition). Frame 10.21 shows a useful display of this information, allowing the pinpointing of the age/sex groups as well as the SEGs within which unemployment is a problem.

10.56 The row totals give the demographic dispersion of unemployment, while the column totals give the incidence of unemployment in each SEG as well as for the country as a whole. In the monitoring PS, this table would be able to show where unemployment is worsening or improving. A useful refinement of Frame 10.21 is to further split each row (but especially the rows pertaining to young adults) according to the level of education achieved. This would then indicate whether the unemployment problem is more or less severe for well-educated people (especially recent graduates). This is important information for the design of employment and re-training programs. These will be very different indeed if, for example, the majority of unemployed are recent technical school graduates as opposed to people past age 40, with skills mainly acquired on the job, who have lost employment because of re-structuring.

10.57 The SDA prototype PS seeks more detail on the employment pattern of the head and spouse — presumed to be the main earners in the household and the critical persons whose employment must be watched for any adverse effects from adjustment. One effect may be that they cannot find employment at the place of residence and have to be away for extended periods of time to work or to look for work. Such a situation may be socially disruptive and have adverse side-effects on the education and health of children. Analysts should investigate the incidence and distribution of this effect through tabular analysis.

10.58 The occupational classification used in the PS is more detailed than the one that was possible in the household roster, and the first analytic task is to tabulate the occupational distribution within each SEG, separately for the head of household and the spouse. Even though, strictly speaking, this tabulation is not representative for the population at large, it is potentially very useful to observe the extent to which the resource shifts aimed for by adjustment are actually taking place, and whether they take place within all SEGs. Ideally, therefore, the occupation list should reflect the tradables/nontradables distinction across which major resource shifts occur under adjustment.

10.59 For a survey of this type, the occupation list will perhaps distinguish 50-75 occupations (i.e., a level of disaggregation corresponding roughly to the 2-digit classification of occupations in ISOC), the bulk of which will be non-agricultural occupations. Within agriculture, the occupations will be similar to the SEG classification, e.g., farmer, pastoralist, and agricultural worker will be among the occupations, and these form also part of the SEG criteria. Similarly, within the category "farmer," the occupation list will differentiate according to major crop, which is also part of the SEG scheme. In other words, a table cross-classifying the occupation of the head of household with SEG will be largely tautological in rural areas. In contrast, in urban areas the occupation list will provide much refinement within the SEGs. Consequently, different occupational tables for rural and urban areas are called for. Frame 10.22a shows the distribution of the spouse's main occupation for rural SEGs (which — we remind — were defined on the basis of the head's occupation), indicating the extent to which

Frame 10.22a: Main occupation of the spouse in rural SEGs
(percent)

	SEG 1 ..... *SEG 6*	*Total*
Occupation 1		
Occupation 2		
.....		
Total	100 100	100

Frame 10.22b: Main occupation of the head of household and spouse in urban SEGs
(percent)

	SEG 7 ..... *SEG 11*				*Total*	
	Head	*Spouse*	*Head*	*Spouse*	*Head*	*Spouse*
Occupation j						
Occupation j+1						
.....						
Total	100	100	100	100	100	100

the spouse's work is different from the head's main activities. As argued above, differentiated work patterns within the household provide more protection against changes in the economic environment. An alternative to Frame 10.22a would be to cross-tabulate directly the occupation of the head of household with that of the spouse, although then the formal link with the SEG classification is lost.

10.60 For urban areas, Frame 10.22b shows the main occupation of head of household and spouse by SEG. Several alternative versions of this frame are possible, replacing (or combining) occupation with work status or industry.

10.61 The PS also seeks data to assess shifts in occupation even without having a monitoring PS available. Since it is asked how long a person has been engaged in his current main occupation and what the previous occupation was, the two can be combined in a table, using a relevant time cut-off point of x years ago. The cut-off point can be so chosen that it corresponds to an event relating to structural adjustment, such as the launching of an economic recovery program. If such a period is too distant in the past, the table could also be constructed for a more recent period (say, the last one or two years) to show more recent job turnover. The information can be displayed in two ways.

10.62 In Frame 10.23 the current occupation is

Frame 10.23: Patterns of occupational changes in the last x years, by occupation
(percent)

	Current main occupation 1	2	3	.....	*Total*
Previous occupation					
1					
2					
3					
.....					
No previous occupation					
Total	100				100

Frame 10.24: Incidence of occupational changes in the last x years, by current main occupation and SEG

Current main occupation	*SEG 1*.....*SEG 11*	*All*
1		
2		
3		
.....		
All		

cross-tabulated against the previous one; in order to be of manageable size this table has to be aggregated across occupations. The entries are, for each current main occupation, the distribution of people (i.e., heads of household and spouses) according to their previous occupation — allowing of course for the possibility that there was no previous occupation. Job mobility is indicated by non-zero off-diagonal cells (the main diagonal is empty by definition). The advantage of this presentation is that it shows the occupational flows. On the other hand, it lacks the link to SEGs. For that reason, an additional table is in order (Frame 10.24) to show, for each SEG, the percentage of people who have been in their current occupation for less than the chosen cut-off number of years. This brings out which occupations have had recent accruals and in which SEGs this occurred. The "all" column shows total recent accruals for each occupation, and the "all" row shows average job mobility for each SEG, i.e., the percentage of heads of household and spouses who changed jobs in the last x years. A complement to this table would be to use previous occupations as rows and show which occupations have been abandoned.

Frame 10.25: Incidence of secondary job holding, by SEG and current main occupation

Current main occupation	*SEG 1* ..... *SEG 11*	*All*
Occupation 1		
Occupation 2		
.....		
All		

Frame 10.26: Pattern of secondary job holding, by current main occupation
(percent)

	Current main occupation				
Secondary occupation	*1*	*2*	*3*	.....	*All*
1					
2					
3					
.....					
Total	100				100

Note: This table is calculated only over those individuals with a secondary job.

10.63 It has been argued that structural adjustment does not only increase job mobility but also job insecurity, thereby inducing people to hold more secondary jobs. PS data permit the construction of tables which display the extent to which this occurs, and in which occupations and SEGs this is concentrated. Frame 10.25 indicates the incidence of secondary job holdings both by SEG and current main occupation. This table can pertain to the head of household and spouse combined, but it is recommended to also construct separate tables for the head and for the spouse because the incidence of second job holdings is likely to be quite different. The presentation in Frame 10.25 is SEG-specific, but it does not identify the prevalent primary-secondary job combinations. The latter is achieved by Frame 10.26 which cross-tabulates main with secondary occupation. (To keep the size of this table manageable some aggregation, particularly of main occupations, will be necessary.) As with Frame 10.24, we recommend also constructing separate tables for head and spouse since prevailing job combinations will not necessarily be the same.

10.64 A final element of mobility which could be related to structural adjustment is geographical, i.e., migration. In the PS only a very limited amount of information can be collected on this topic focusing on whether the household has migrated in the last 12 months (and if so, where it came from), and/or whether more recently, say, in the last 3 months, a household member has left the household to look for work. Especially the latter variable can be seen as a distress variable in that, ceteris paribus, people would prefer to obtain jobs near their place of residence. The incidence of this variable across SEGs can give an indication of the extent to which local employment opportunities are missing for some SEGs.

10.65 The tables discussed above are examples of how the PS information can be used to investigate how structural adjustment affects the patterns of employment. Box 10.2 provides a more complete set of tables concerned with this issue.

10.66 The employment section is one of the few in the PS which lends itself to multivariate analysis, in addition to the tabulations suggested above. In particular, the following variables — important indicators of the employment situation — can be used as dependent variables in simple models of household behavior:

- labor force participation (all members)
- recent occupational change (head and spouse)
- secondary job holding (head and spouse)
- wage earnings (head and spouse)
- absence from the household for job search (head and spouse; household).

With the information available in the PS, each of these variables can be the subject of a simple multivariate model which may throw more light on the determinants of the phenomenon. Several of these models are also discussed, in a more complete way, in the IS-based Analysis Plan on Employment and Earnings (Chapter Four). The discussion there on econometric issues of estimating models with binary dependent variables, and selectivity bias in the estimation of earnings functions, is also relevant here (see also Grootaert (1986) for a more detailed discussion). Here we limit ourselves to a brief description of the estimating equations based on the variables at hand in the PS.

10.67 Only one model can be estimated for all household members, namely, the labor force participation (LFP). This model is usually estimated over all household members who are 7 years of age or older (this age cut-off can be changed in the light of specific country situations) and who are not full-time students. The latter exclusion is necessary because otherwise the model would confuse labor force participation with the schooling decision. The dependent variable is binary: it

Box 10.2: Tabulation plan — employment and migration

- distribution of individuals by main economic activity and SEG
- distribution of individuals by main economic activity and age/sex
- distribution of individuals by main economic activity and education level
- unemployment rate by age/sex and SEG
- unemployment rate by education level and SEG
- average wage income and direction of change by SEG
- share of wages in total income by SEG
- absence of head of household and spouse by reason and SEG
- main occupation of head of household and spouse by SEG
- work status of head of household and spouse by SEG
- industry of head of household and spouse by SEG
- average wages of head of household and spouse by occupation/SEG
- recent occupational changes by current occupation
- recent occupational changes by SEG
- incidence of secondary job holding by SEG and current main occupation
- patterns of secondary job holdings by current main occupation
- duration of main occupation and previous occupation of head of household and spouse by SEG
- main occupation of head of household and spouse by previous occupation
- recent migration by place of origin and SEG
- number of household members who left household for job search by SEG

Note: All tables pertaining to the head of household and spouse may also be tabulated separately for head and spouse, in order to highlight gender differences.

takes a value of zero if the roster question on main activity was answered with "housekeeping" or "no occupation," and a value of one otherwise. In other words, labor force participation is defined to include work for wages, self-employment and unpaid family work. The explanatory variables consist of the demographic and education characteristics of the individual (taken from the roster), as well as selected household characteristics which may influence the decision to participate in the labor market, such as region (employment opportunities may vary significantly across different parts of the country), and the holding of farm or non-farm enterprises in the household itself (these providing ready access to unpaid family work). These household characteristics can be entered in the equation as regressors separately or combined through the SEG classification, which in fact summarizes them. In practice we recommend that analysts test both specifications to see which gives the most meaningful results.

10.68 The estimating equation thus looks as follows:

LFP = f(age, gender, relation to head of household, education; region, household enterprises) or

LFP = f(age, gender, relation to head of household, education; SEG).

Except for age, all the explanatory variables are discontinuous and thus enter the regression as sets of categorical (dummy) variables.

10.69 Two alternatives to this model are feasible (with the same set of explanatory variables). Instead of explaining the participation/non-participation decision, one may single out a particular mode of participation and examine its determinants, for example, comparing wage employment to other forms of participation. A second alternative is to focus on unemployment and define the dependent variable as unemployed = 1, employed = 0. This model would provide a better explanation of unemployment than was possible in Frame 10.21, by controlling at the same time for various personal and household characteristics.

10.70 The next set of models pertains to the head of household and the spouse and derives the bulk of the information from the PS questionnaire. The most important dependent variables are occupational change, the holding of a secondary job, wage earnings, and absence from the household for work reasons. All of these models (except wage earnings) will include the basic demographic variables, although the relationship variable is of course limited here to one dummy variable (spouse = 1, head = 0). In the case of wage earnings, the best specification is provided by the human capital model, which explains wages as a function of education and job experience.

10.71 The dependent variable of the occupational change model is binary and equals one if an occupational change occurred in the last x years, with x being defined in the same way as for

Frames 10.23 and 10.24. This ensures that the regression is consistent with the tables and provides a further explanation. A major determinant of occupational change will be the situation prior to the change, in particular, the previous occupation, which is also recorded in the PS. Another relevant factor is whether the household has migrated. However, the PS only asks for migrations that occurred in the past 12 months, hence this variable can only be included if the model pertains to occupational changes within the past year. Since migration is an easily remembered event, it is definitely an option for questionnaire design to extend the recall period, which would permit studying the link between occupational change and migration over a longer period. The estimating equation is the following:

> Occupational change = f(age, gender, relation, education, previous occupation; [migration]).

10.72 Whether a person holds a second job depends mainly upon his personal characteristics as well as upon the nature of the main job he/she currently holds (especially the earnings from that job). In addition, the socio-economic status of the household can determine the access to a second job, for example, the place of residence and whether the household owns an enterprise. These features are of course captured by the SEG classification. The second-job model has a binary dependent variable, equalling one if a second job is held and zero otherwise. This model complements the tabulations in Frames 10.25 and 10.26. The estimating equation is:

> Second job = f(age, gender, relation, education; current main occupation, duration, work status, industry, wage; SEG).

10.73 The final model pertaining to the head of household and the spouse serves to explain whether either has been absent from the household for more than 3 months during the past year. The binary dependent variable can be constructed either to distinguish absence/presence, or to focus on absence for work reasons only. The variables influencing this are the personal characteristics as well as the characteristics of the job currently held. In addition, the absence can be motivated by specific recent economic events such as the loss of a job or of assets. It can be anticipated that the socio-economic status of the household would also be relevant in determining an absence. The estimating equation is as follows:

> Absence = f(age, gender, relation, education; occupation, work status, industry; occupational change, migration, change in assets; SEG).

10.74 A model similar to the one above would be based on the household-level variable from the PS, indicating the number of household members who have been away for work reasons. The differences are that here the dependent variable is continuous and the explanatory variables are limited to the household level. Of specific relevance could be the asset situation of the household, especially with respect to productive assets. As an option the personal and occupational characteristics of the head of household could be included. The basic estimating equations would be as follows:

> Number of absent household members = f(agricultural enterprise, number of non-agricultural enterprises, assets, change in assets, migration; SEG).

Income and assets

10.75 Income is an important variable in the analysis of social welfare, particularly during periods of structural adjustment. Not only is there every prospect of change in real incomes during adjustment, but the sources of income are also likely to shift significantly as policy reforms change the structure of incentives in the economy. Households previously relying on non-tradable sectors for a livelihood will be obliged to switch into tradable sectors as the adjustment policies take effect. Yet income is known to be a difficult variable to obtain through household surveys. It is typically under-reported in most surveys for a number of reasons. Respondents may not fully know the incomes of all household members, they may deliberately understate income for fear of taxation implications, and they simply find it difficult to recall income over the specified reference period. Income is also subject to seasonal and other types of variation, so that its measurement becomes particularly difficult in a PS-type survey, involving as it does only 2-3 months of fieldwork.

10.76 That income is an important variable during structural adjustment and yet is difficult to measure, represents a challenge for the PS. It is important for it to be covered in the survey, but it

is difficult to obtain reliable estimates. The solution to this dilemma adopted in the PS is to include income, but not to emphasize its precise measurement as such. The focus of the PS is on the sources of income and how these may change in response to adjustment. There is an attempt to obtain an approximation to income (mainly because this may be a useful classifier and explanatory variable in other parts of the analysis), but this will not be emphasized greatly here.

10.77 Income data are available at a number of levels in the PS:

- at the most general level, sources of income are obtained in the PS questionnaire; income sources are obtained in order of importance, and some estimate of the amount of income over the past year is obtained for each source; this section also identifies whether income from each source is greater or less than that of the previous year;
- more specific treatment of income is obtained from three sources:
  - wage income of household head/spouse;
  - gross revenue of agricultural enterprises;
  - gross revenue from non-farm enterprises.

10.78 The analysis of PS data should begin with a general assessment of the main sources of income of the household, establishing which are the major changes observed. This should then be complemented with somewhat more detailed analysis of three principal components of this income — wage income of the household head and spouse, revenue from agricultural enterprises and revenue from non-agricultural enterprises. Finally, an analysis of the asset holdings of the household, and their recent changes, rounds off this discussion.

Sources of income

10.79 The household is permitted to list up to 11 primary sources of income, and these are divided according to pre-coded classifications. The respondent is asked to give an estimate of the income from each source. Although the precise value of this estimate is not to be taken too seriously, its order of magnitude should be useful enough to make some assessment of the importance of various income sources. Frame 10.27 should be computed from the PS data, indicating the relative importance of each of the income sources in the incomes of each socio-economic group. Frame 10.27 will assess three major issues. First, to what extent do households diversify their income sources? This is critical for the analysis of the social dimensions of adjustment. Periods of policy reform and austerity frequently lead to household members working in multiple jobs (as discussed above), and cropping patterns might also become increasingly diversified. It is particularly important to establish whether the diversification of income sources is greater for some groups than others. Is there evidence, for example, that urban-based households previously relying on wage employment diversify towards agricultural activities — such as food production for own-consumption?

Frame 10.27: Mean shares of income source by socio-economic group
(percent)

	SEG 1	.....	*SEG 11*	*Total*
Agriculture				
Export crops				
Food crops				
Livestock				
Other products				
Non-farm enterprises				
Wage employment				
Public sector				
Formal private				
Informal				
Rents				
State and private Transfers				
Total	100		100	100

10.80 Second, to what extent is the occupational status of the household head (or possibly spouse as well) a useful indicator of the income source of the family? In most cases, the socio-economic classifications will use the characteristics of the household head, but this may not be a useful representation if the household earns a significant proportion of its income in activities outside those typically associated with the socio-economic group. For example, farming households as a group may earn a non-trivial proportion of their total income outside farming — either from non-farm enterprises or from wage labor. Frame 10.27 will provide a basis for making some assessment of this. Finally, Frame 10.27 will provide clues about how the poorer socio-economic groups are likely to be affected by policy reforms. If such groups rely entirely on income from food crops, and if the latter are nontraded, it is likely that such groups will suffer during periods of adjustment.

10.81 The PS prototype questionnaire also obtains some useful information on whether the

Frame 10.28: Proportion of households experiencing changes in income by income source and socio-economic group
(percent)

	SEG 1.....SEG 11	Total
Income source		
Agriculture		
Export crops		
Increase		
Decrease		
Food crops		
Increase		
Decrease		
Livestock		
Increase		
Decrease		
Other products		
Increase		
Decrease		
Non-farm enterprises		
Increase		
Decrease		
Wage employment		
Public sector		
Increase		
Decrease		
Formal private		
Increase		
Decrease		
Informal		
Increase		
Decrease		
Rents		
Increase		
Decrease		
State transfers		
Increase		
Decrease		
Private transfers		
Increase		
Decrease		

Frame 10.29: Mean income-change scores by socio-economic group

	SEG 1.....SEG 11
Unweighted scores	
Weighted scores	
(+ means gain, - means loss)	

income from each source has increased or decreased since the previous year. The analysis of this information can follow two tracks. The first involves the separate analysis of each source of income. Thus, for each socio-economic group, an assessment is made of the direction of change in income by source, as shown in Frame 10.28.

10.82 With income from some sources expected to fall and from others to rise during the structural changes brought about by policy reform, we would expect to find some patterns emerging from Frame 10.28. An attempt should be made to make sense of these responses in terms of the economy-wide changes that have occurred during the recent past. Some impression may be gained from the table about which of the socio-economic groups appear to be losing out and which (if any) seem to be gaining as a result of adjustment. This, however, may be better assessed through the second type of analysis. This involves computing scores, in which +1 indicates a gain in income and -1 a loss (no change is indicated by 0). These scores should be aggregated for each household and mean scores derived for each socio-economic group. This would give some indication of the change in overall incomes being experienced by the socio-economic groups over the past year (see Frame 10.29). A refinement would be to weight the score with the shares of the income in total household income. Thus, a -1 would count more for a principal source of income than a secondary source.

Wage income

10.83 Information on the wage earnings of both the household head and spouse is reported in the PS questionnaire. Income from own-account work is not covered in this section — only from wage employment. The questionnaire permits a division of wage income between state and private sectors. This information should be tabulated along the lines of Frame 10.30. This reports the average wage that is earned by the household head and the spouse from public and private sources, the latter by industry. The sectoral origin of wage income can be derived from appropriate questions in the PS questionnaire. In computing the wage, care should be taken to ensure that the time period used is constant across all observations. Re-computations are usually required to recast the wage data into a common time unit. The data of Frame 10.30 can be used to assess whether labor-market signals are in line with the main objectives of the structural adjustment program. In the very short run, wage dif-

Frame 10.30: Mean wage income of household head and spouse, by SEG and sector

	SEG 1.....SEG 11	Total
Household head		
Private sector		
1		
2		
.....		
State		
Total		
Spouse	Cells contain values	
Private sector		
1		
2		
.....		
State		
Total		

Frame 10.31: Proportion of farmers experiencing changes in production and area planted by crop
(percent)

	Production		Area planted	
	Increase	Decrease	Increase	Decrease
Maize				
Yam				
Plantain				
Cocoa				
Coffee				
Livestock*			not applicable	

* Changes in the number of livestock over the 12 months prior to the PS.

ferences can be expected, encouraging labor to move into tradable-oriented employment. Thus, private sector wages should (ceteris paribus) be higher than state sector wages, and within the private sector, wages in exportables and importables should be expected to gain relative to those in nontradables. The table also identifies wage variations across the socio-economic groups. Clearly, these differences will depend on the characteristics of the workers concerned — particularly their human capital. Thus, for example, wages may be higher in one SEG than another simply because wage-earners are better educated. Tabulations of this sort can only be indicative of such effects. The application of multivariate techniques, however, may unravel some of the mystery.

10.84 The estimation of a simple wage-earnings model, based on the human capital theory, is useful to assess whether the relative returns to education and work experience have changed during an adjustment period. In the PS, total work experience is not available, but the experience in the current occupation is known. As this is the most relevant in determining current earnings, it is a suitable variable for estimation. Many labor markets in developing countries are segmented: workers cannot easily move between different sections of the market (e.g., between the informal and formal sectors, between regions) and/or different types of workers are not considered substitutes for one another by employers (e.g., male and female workers). The human capital model allows the inclusion of such variables to test for the presence of such segmentation. It must be noted that variables related to occupation should not be included for this purpose as they represent factors subject to choice by household members. For actual estimation, the dependent variable (wages) needs to be converted to a common time unit and is best expressed in natural logarithm form:

Ln(wages) = f(education, experience, experience squared; gender, region).

Agricultural activities

10.85 More detailed analysis of the agricultural activities of the household is possible through the responses to the PS questionnaire. These cover production of the main food and export crops, changes in this production and the gross sales. The section also ascertains whether the area planted to each of the crops has increased or decreased and why this change has occurred. Periods of structural adjustment are usually characterized by rapid changes in relative prices and in the incentive structure. Whether farmers respond to these changes has been a subject of much debate. The PS can provide some preliminary evidence of recent changes in production. Again, in a survey of this kind, the analytical focus should be on the change in the levels of production and areas planted to each crop. This information is summarized in Frame 10.31. The table shows the proportion of each of the crop producers which experience changes in production and area planted (the denominator being the total number of households producing the crop in question — that is, the denominator will be different for each row). Frame 10.31 will give fur-

ther clues about the income changes observed in Frames 10.28 and 10.29, at least for agricultural households. It will show which crops are becoming less or more profitable. It is also proposed that livestock be included in this table, though here the measure relates to the change in the stock of livestock over the past 12 months.

10.86 The respondent is also asked for reasons why the area planted has changed since the last season. From this, some assessment can be made about the underlying factors behind the changes in crop production and area planted. This information ought to be tabulated along the lines of Frame 10.32. Of the households reporting changes in each crop area planted, the proportions giving each of the stipulated reasons are computed. In this way, the table provides some indication of the predominant factors leading to changes in crop area (and by implication, production). These reasons given (which are pre-coded in the questionnaire) will to some extent be country-specific, but it is clear that some will relate to price changes, and others to the liberalization of markets and the improved access to productive factors. These factors are likely to be particularly subject to change as a result of structural adjustment. For example, an adjustment program which liberalizes imports may lead to an improvement in the availability of fertilizers, and a consequent increase in the rate of return to fertilizer-responsive crops. Alternatively, it may reduce subsidies on agricultural inputs, which reduce rates of return. Thus area planted may increase or decrease during adjustment, depending on the induced changes in output prices and on the availability (and prices) of inputs.

10.87 The PS questionnaire also offers the opportunity for a more detailed analysis of the changes experienced by farmers in the use of inputs — such as fertilizer, credit, extension services and labor. It is possible to compile responses to these questions by principal crop. In this way, Frame 10.33 tabulates the use of these inputs by main crop produced. Farmers are simply asked whether they purchased fertilizer, obtained credit or received an extension visit during the previous planting season. They are also questioned about the use of labor on the farm and its change over the past season. Their responses give some indication of how readily available and how profitable such inputs are. We have already reviewed how adjustment can improve the access of farmers to fertilizers (and also change their price). But it can also change the availability of credit and extension services, the direction of change depending on the details of the adjustment package. It can also tighten (or slacken) the labor market, thus changing the availability (and profitability) of labor services. Farmers employing more labor than previously are likely to be benefiting from recent policy changes and expanding their operations. These inputs are all brought together in Frame 10.33.

Frame 10.32: Reasons for change in area planted by direction of change and crop
(percent)

	Maize		*Coffee*	
Reason	*Increase*	*Decrease*	*Increase*	*Decrease*
Price change				
Fertilizer availability				
Labor availability				
Marketing opportunities				
Credit availability				
Other				
Total increases/ decreases	100	100	100	100

Frame 10.33: Proportion of farming households using inputs by type of input and main crop produced
(percent)

Main crop	*Fertilizer*	*Credit*	*Extension services*	*Labor*
Maize				
Yam				
...				
Coffee				

Fertilizer: farmers having obtained fertilizer last season.
Credit: farmers having obtained credit for farming during last season.
Extension: farmers visited by extension worker during last season.
Labor: farmers hiring more workers in last season than season before.

Non-farm enterprises

10.88 The PS design also permits an assessment of changes occurring in non-farm enterprises (the current prototype questionnaire provides for up to three such changes to be enumerated for each household). As with agricultural activities, non-farm enterprises are certain to face changing con-

straints and opportunities as a result of the adjustment effort. Market opportunities will open up for tradables, and decline for nontradables. Infrastructural changes may improve access to product, factor and credit markets. These will combine to change the profitability of non-farm activities, so that some will expand and others decline. A critical first stage of the analysis is the classification of these activities into exportables, importables and nontradables, since this forms a vital link back to adjustment policy reforms. A code is recorded for each enterprise which should reflect these distinctions. These codes are inevitably country-specific. The next task is purely descriptive — to identify which groups operate enterprises in each of the sectors. Frame 10.34 shows the type of tabulation that is useful. Its purpose is to identify which SEGs are most involved in household-based non-farm enterprise, and in which sectors are they active. Some judgement can be made from the table about which groups are likely to gain from adjustment — these groups being those that are particularly active in sectors likely to gain as a result of policy reforms.

10.89 Whether or not an activity benefits from adjustment can be assessed from the PS findings themselves. The questionnaire identifies which enterprises have increased the value of the gross output during the past 12 months and which have increased the numbers employed. These are useful indicators of which sectors are expanding as a result of the adjustment reforms and are illustrated in Frame 10.35. The interpretation of the tabulation is self-evident — sectors in which output and/or employment is expanding are likely to be benefiting from policy reforms. These findings should be cross-checked against expectations arising from macro-meso analysis. The combined evidence of Frames 10.34 and 10.35 will enable policy makers to make some judgement about how policy reforms have affected the different socio-economic groups, at least as far as their non-farm enterprises are concerned.

Frame 10.34: Number of non-farm enterprises by sector and SEG

Sector	*SEG 1*.....*SEG 11*	*Total*
1		
2	Cells contain total	
3	number of enterprises identified	
.....		
Total		

Frame 10.35: Proportion of enterprises experiencing output and employment changes by sector

	Output			*Employment*		
Sector	*Increase*	*Decrease*	*No change*	*Increase*	*Decrease*	*No change*
1						
2						
3						
.....						

Assets

10.90 Assets occupy a special place in the PS because they provide the only direct measure of economic welfare and of change in it. For reasons of time and sensitivity no attempt is made in the PS to obtain an exhaustive list of household assets. Instead, the list is limited to selected productive assets (land, farm equipment, etc.) and consumer durables (car, bicycle, etc.). The items to be included in the list are of course country-specific and should be judiciously chosen so as to represent the best possible proxies for total household welfare. Since the IS contains a more complete list of assets and also requests respondents to provide a valuation, IS results will permit the refining of the asset list for later priority surveys, by calculating correlations between specific assets or sets of assets and total household income or expenditures.

10.91 Experience has shown that valuation questions are difficult and time-consuming and are not an appropriate type of question for the PS. Moreover, value information really needs to be combined with information on the age of the asset in order to calculate depreciation. The latter is an analytic procedure which does not fit with the rest of the PS analysis. For those reasons, the PS questions on assets are limited to two very simple questions: does the household own the asset, and has there been any increase or decrease in ownership over the past year. The second question is meant to provide a direct indicator of change in welfare. In the case of decreases, this can be an alarm signal that the household is forced to dispose of its assets in order to meet current consumption needs — a situation which is dangerous for the household's future income-earning abilities.

10.92 Any one asset is not likely to be a sufficiently reliable proxy for welfare or change of

welfare, but if a buy or sell trend is observed over several assets, the interpretation is strengthened. For that reason we do not propose tabulating results by asset, but rather calculating a simple score consisting of the number of categories of assets owned by the household (proxy for welfare level) and a net change score, i.e., the number of categories with an increase minus the number of categories with a decrease (proxy for welfare changes). Two exceptions to this treatment can be made for land and cattle, which in rural settings are of greater importance than other assets, and which therefore merit being shown separately. The asset score will range from zero (no assets owned) to the number of items in the list (all assets owned). In the case of this prototype questionnaire the score's maximum value is 10 (there are 11 items listed in the questionnaire but land is not included in the score calculation). The net change score in principle can range from -10 (a decrease in all assets) to +10 (an increase in all assets) but in practice it will vary in a narrower range around zero.

Frame 10.36: Asset ownership

	SEG 1 ..... SEG 11
Ownership	
Score of assets owned	
Percentage of households who own land	
Percentage of households who own cattle	
Change in ownership	
Net change score of assets owned	
Percentage of households who lost land	
Percentage of households who gained land	
Percentage of households who lost cattle	
Percentage of households who gained cattle	

Conclusion

10.93 The priority survey of the SDA is designed to obtain priority information as expeditiously as possible. This has obvious implications for the Analysis Plan presented above. First, the range of data that is obtained is certain to be somewhat restricted, and the analysis has inevitably to rely more on the use of proxies than in other Analysis Plans. Second, the critical need to produce policy research documents quickly restricts the time that the analyst has to prepare the data and undertake his analysis. The presentation therefore has relied to a large extent on the use of selected cross-tabulations. In only a few instances (for example, in the case of employment, wages and education) has there been any attempt to suggest multivariate analysis. This is quite deliberate, but does not imply that no further multivariate and more detailed analysis is possible (and desirable) with the data set generated by the PS. Rather, what has been suggested here should be interpreted as a basic agenda for PS analysis. It is hoped that this Chapter will prove to be fruitful in country applications and will stimulate extensions beyond the cross-tabulations and limited multivariate analysis suggested here.

Technical appendix: Concepts and estimation of household incomes and expenditures within a system of household accounts

Introduction

A.01 Most analyses concerning the impact of adjustment on the living standards of individuals in society utilize, or rely on, measures of household incomes and expenditures. The conceptual basis for these measurements is broad and far-reaching (Grootaert, 1983), not least because the terms "income" and "expenditure" can have markedly different meanings in different contexts. In some instances it might simply involve relating analysis to quite specific components such as "expenditure on food" or "wage income," but in others it might require the identification of much broader measures of "total" income or expenditure, perhaps stretching as far as full income, where even leisure is assigned a monetary value (Kusnic and da Vanzo, 1980).

A.02 The SDA survey instruments, and in particular the Integrated Survey, contain a potentially rich source of information relating to the measurement of both monetary and non-monetary variables. There is, however, a clear need to distil and organize the complex responses that have to do with the monetary variables before analysis can proceed. In view of the wide range of interpretations and the different needs for subsequent analysis, there is a strong case for organizing these data within the context of a coherent yet flexible framework. The most appropriate framework relating to the aggregates of household incomes and expenditures is provided by a set of household accounts. In this Appendix it will be demonstrated how the household accounts can be constructed to include the revenues and costs of household production activity (the production account), household incomes, consumption expenditures and transfers (the current account) and savings and the acquisition of real and financial assets (the capital account). Records of household assets and liabilities may be incorporated as an extension. The obvious attractions of expressing these variables in an accounting framework are that it imposes a conceptual discipline, it makes the relationships between the components explicit and it enables error assessment to be based on the size of the inevitable discrepancies.

A.03 A number of issues need to be addressed in the calculation of household accounts from the Integrated Survey (IS). First and foremost it is important to have clear conceptual definitions of the components of the accounts, a task which is far less straightforward than it appears at first sight. These conceptual issues are discussed in detail in paragraphs A.04 through A.35. Secondly, it is necessary to fit the available information as closely as possible to these idealized concepts. Thus it is necessary to transform and aggregate the variables in the questionnaire to build up estimates of these concepts, which should also correspond closely with concepts required for purposes of analysis. Nevertheless, it is desirable to incorporate sufficient flexibility to enable slightly different measures to be calculated if required. Paragraphs A.36 through A.96 discuss the major issues and difficulties involved in producing these estimates from the IS questionnaire.

A detailed proposal for estimating current account aggregates is set out in the Annex.

Household accounts: Conceptual basis

The household unit

A.04 Individuals can, and usually do, belong to several overlapping networks of social units, at the same time (World Bank, 1990: 98-100). Nuclear and extended families are two such units and the household is another. From the point of view of micro-level inquiry, commonly utilized criteria for defining a household unit include: members who have a common source of major income, live under the same roof or within the same compound and have a common provision for other essentials of living (Casley and Lury, 1987; United Nations NHSCP, 1989). In practice, the precise set of criteria used to identify households is chosen to suit the local situation so that the size and characteristics of households can show wide variation by locality and country. However, a basic distinction can be drawn between the household and the family unit, where for the latter there would need to be an additional criterion of kinship. Households could consist of a single family, but commonly in Africa they consist of several families, whether they are of the same kin or have no kin relationship. Also, it is possible for families to be spread between households either temporarily or permanently. For example, a married woman while young may continue to live in her father's household, while the husband lives under a separate roof; or a son may work in the mines or an urban area and return to the family home for only short periods each year.

A.05 The basic United Nations definition of a household, used in many surveys, is a "group of people who live and eat together." While this is clear as regards the distinction between households and families, there are significant problems concerning individuals who just board (eat with the household) or only lodge (live with the household). The United Nations guidelines suggest that a boarder who does not lodge should be included but the lodger who does not board should be excluded, suggesting that the "common pot" dominates the "common roof" for household membership purposes. A further consequence is that those who board and lodge, such as domestic servants, should be regarded as household members. For SDA purposes, such a household unit could be too heterogenous in its composition, and may not in any sense be a single economic and social unit. Furthermore, the degree of intra-household inequality (of all kinds of variables) could be too great. So a further criterion is added for survey and analytical purposes, which is that all persons living and eating together should acknowledge the authority of a single head of household, regardless of whether the latter is living with the other household members or living away. Hence, servants and lodgers may or may not belong to a household depending on whether or not they accept the authority of a household head; if not, they should be treated and listed as a separate household. In the African context the situation of polygamous households can present problems depending on whether each wife is treated as a separate household or as part of one large household. There is no easy answer to many of the definitional problems and in practice, the definition is subject to a degree of arbitrariness, at the margin, not least because household membership is dynamic and therefore could vary during the time interval to which a survey or measurements relate.[1]

A.06 The household is an important social and economic unit because:

(i) within it many of the decisions concerning individual members' activities and their consumption (and hence their welfare) are made, and

(ii) its physical properties — the fact that it is a collection of individuals with an identifiable location — make it a useful sample unit in survey work.

The first of these reasons, the decision-making role, is most important from the conceptual standpoint. The criteria for defining household membership are broadly sufficient to ensure its role as a social unit, although a household might well contain a hierarchy of subunits and could inter-penetrate other households through the extended family. However, the household may not always coincide with a single economic unit. In this regard we can distinguish two kinds of economic unit, one relating to the activity of consumption and the other to production. A third unit relating to the accumulation and ownership of assets could also be considered if it differs from either of the other two. The household definition modified and adopted above predominantly recognizes the household's function as a consuming unit and, to a lesser extent, as an asset-owning unit. However, living and eating

together might not imply the pooling of all incomes and the sharing of all expenditures. Even if it does, and the household constitutes a family unit, two possible concepts of household decision-making based on the "glued-together" or "despotic" family unit could lead to widely different intra-household allocations of resources and individual well-being. Furthermore, the major household assets are usually formally owned by a single household member or a small subset of the total household membership.

A.07 The problems stemming from the household's role as a production unit can be even more problematic and of a different kind. This is largely due to the fact that those production units usually considered as household-level activities (small-scale agricultural holdings or non-farm enterprises) may not match the household unit. There is no problem in those instances where the production activity is wholly operated by a subset of household members and engages the assets of labor and capital owned by that household unit. Indeed it may not even be managed by the designated household head or decision-maker. But there are problems if a production unit is operated by more than one household unit and if there is any difficulty in identifying and apportioning the incomes generated. In some instances, difficulties on the production side have led investigators to prefer a broader institutional unit than the household for survey purposes — for example, a group of individuals living in a hut in the village or cattle post (Botswana), and a homestead (Swaziland). In general, however, there is no reason to expect the consumption and production units to match.

A.08 At the macro level the national economy consists of a number of institutional sectors. These are designated classes of transactor or "resident economic agent" and are usually grouped for national accounts and analytical purposes according to their similarity of function. In the United Nations System of National Accounts (SNA) (UNSO, 1968) two main classes of transactor are distinguished. The first class consists of producing units while the second class deals with financing units, that is, units in which financing decisions are taken, relating to both current and capital outlays. Financing units include households as a group and are distinct from corporations (defined according to their legal status, usually relating to corporate ownership of assets) and government. The definitional classification of production units usually includes unincorporated business activity. Therefore this exemplifies the earlier point that the appropriate conceptual and statistical unit of account from the point of view of production may not coincide with the household as a financing and consuming unit. There are also inevitable problems with taxonomy and the classification of institutional units at the macro level which serve to emphasize the need to define "household" units sufficiently broadly to include all persons who are inmates of institutions such as prisons, asylums or hospitals on a long-term basis (common roof), who share their meals (common pot) and respond to a common authority.

Production boundary and households

A.09 Measures of household incomes and expenditures can be approached from different perspectives, but traditionally the most tractable starting point is to consider household activity in relation to the boundary of production. This is the demarcation line between those activities regarded as being productive and those which are non-productive. Some might argue that the distinction is arbitrary, but it does have a direct bearing on output and income measurement and our ability to define aggregates at the micro level and, moreover, on the relationship of these micro aggregates to (and consistency with) the aggregates for households as a whole at the macro or economy-wide level. Various formal definitions of "production" exist. Hicks (1971) defined it as "any activity directed to the satisfaction of other people's wants through exchange", a definition which has been a fundamental tenet of national income methodology for over fifty years. The strict interpretation of this definition would exclude a whole range of own-account activities on the grounds that they are not formally exchanged.

A.10 However, "exchange" has not always been interpreted in the strict sense, and productive activities do include many of those which are not marketed. Indeed, more recently, Hill (1979) has suggested a very broad definition whereby an activity is considered as being productive if it could be carried out with comparable results by an economic unit other than that which actually performs it. Hence, eating and sleeping would be non-productive, but many other personal and household activities, such as washing and cooking, would be considered productive regardless of the quality of the result achieved (Chadeau and Roy, 1986).

A.11 The definition of the production boundary adopted from the national accounts standpoint usually falls far short of the broader definition suggested by Hill. Marketed goods and services are always included, but quite difficult questions surround the extent to which non-marketed goods and services should be included, as well as the decision on the appropriate imputations that should be attached.

A.12 Goods are different from services. Goods are physical or tangible objects for which a demand exists, which are appropriable and therefore are transferable between persons or other economic units (Hill, 1977). In principle all goods produced should be included within the production boundary, although in practice there are significant difficulties in actually doing so. The problems are almost exclusively confined to household-level activities where certain informal activities related to own-account agricultural, primary or manufactured goods are not often captured. The main argument for including all goods in this way is that at the time of production it is not always known whether the goods are destined for the market or home use, these two uses being close substitutes in general. Hence, in a strict sense, the following activities, whether marketed or not, would all count as being productive:

(i) production of agricultural goods: including storage of crops; gathering of uncultivated crops; forestry, wood-cutting and collection of firewood; hunting and fishing; etc.

(ii) production of other primary goods: mining salt; cutting peat; carrying of water; etc.

(iii) processing of agricultural goods: production and preservation of meat and fish products, crushing oil seeds, weaving baskets; etc.

(iv) other processing: weaving cloth; making footwear; making furniture; etc.

A.13 However, in practice, most countries limit the scope of estimating the output of non-marketed goods to the activity of farmers producing agricultural products which they consume, valued at farm gate prices (Ruggles and Ruggles, 1986). This is for the simple reason of practical expediency, and which serves as a first indication of the anomalies in estimating incomes and expenditures at the micro or macro level. Some African countries do not even include these limited imputations in their national accounts.

A.14 The definition of productive services has proved to be far more debatable. Some activities, such as maintenance and repair of dwellings and durables lie on the borderline between being goods or services and, indeed, on the production boundary itself. Decoration and minor repairs ("do-it-yourself" activities) are considered productive if they are carried out by an owner of a dwelling to maintain or add to its value, but not otherwise. In a strict sense services can affect either people or goods and are usually associated with a change in condition brought about by the activity of some other economic unit (Hill, 1977). Hence, the essence of a service is that one economic unit "serves" another. There are no established principles on the general treatment of non-marketed services and, unlike non-marketed goods, they do not tend to arise in the context of imputations at the household level. One significant exception is the concept of the production of dwelling services for owner-occupiers, whereby a service is considered to be both produced and consumed within the household unit. As no cash transaction takes place, in common with other non-marketed products, the main problem is to derive an imputation for this output. But the inclusion of dwelling services does differ significantly from other household services in that it is attributable to the household by virtue of the household's status as an owner of a productive asset rather than as a household activity per se (Chadeau and Roy, 1986).

A.15 One other category of non-marketed services that affects households is the provision of collective services (public education and health) and pure public services (public administration and defense). Although these are not produced within the household unit, incomes generated in their production are directly attributable to households according to the labor services they provide, in just the same way as they do for the production of all other goods and marketed services. But it is usual to record outlays on such services as government expenditures even though they materially affect the well-being of household members.

A.16 The main point to note in the present context is the extent to which national accounts conventions that underlie the concept of production, the production boundary and, hence, of income and expenditure, depend so crucially upon the notion of the household unit. At least in principle, virtually all goods produced on own account (non-marketed) can be included within the boundary of production on the grounds that they could have been produced by some other household. The same is not necessarily true in regard

to the distinction between produced services and the range of other activities performed by household members within the household unit. The convention here — and it is basically a convention — is that the kinds of activities performed for one household member by another (but still within the household unit) such as cooking, cleaning, teaching children, etc., are not considered as being productive. Had the "individual" been selected as the economic unit instead of the "household," then, according to the strict conventions, the situation would be different (Hill, 1979; Hawrylyshyn, 1977). Only at the individual level does it become possible to set a precise boundary. Non-service activities such as eating, drinking and sleeping simply cannot be undertaken by one individual on behalf of another, even though many other activities can. Hence, by taking the household as the economic unit, the boundary is drawn to exclude many individual level activities from the scope of imputation, and this has a direct bearing on the types of measures that can be adopted at both the micro and macro levels of analysis.

A.17 This is not, however, to say that service activities conducted within the household by one member for others (such as housework) are worthless. On the contrary, there is an opportunity cost associated with these activities. One means of recognizing this would be to construct time use accounts for each individual, that is to determine and, hence, value the pattern of time use for each individual in society (Becker, 1965; Pyatt, 1990). In this way activities could be distinguished between the production of tradable goods and services and nontradables (such as leisure and other personal activities). All activities have an associated price, tradables being valued at their market prices and nontradables valued at their opportunity cost; the latter will differ between individuals. This is probably an area of work for the future, but is highly relevant because it extends to the very limit the notions underlying the concept of production. Furthermore, accounts of time use and estimates of the associated opportunity costs are relevant to determining how household members are likely to respond to the changing economic environment under adjustment.

The household economy

A.18 At the macro level the nation can be subdivided into mutually exclusive and exhaustive sets of institutions, or groups of transactors, chosen on the basis of their economic functions, legal status or other characteristics. Each institution can be viewed as an economic system, which interacts with other institutions both within and outside of the national economy and its boundaries. Taken to the limit each household can be viewed as a minuscule economy engaging in the economic activities of production, consumption and accumulation to either a greater or a lesser extent, and interacting with the rest of the nation (and the rest of the world) through its trade in commodities and factor services and its accumulation of assets and liabilities, both real and financial. If a household does not engage in household production, then all of its income must be derived from outside in the form of factor income, in respect of, say, the supply of labor services its members provide, and of non-factor or transfer income. Similarly, its expenditure out of incomes received would be on goods and services produced outside the household. On the other hand, if it does engage in production of marketed goods and services, then the incomes generated inside the household would be derived from the disposal of the product to users outside. Production on own account would be internal to the household. Usually no actual transaction takes place between household members, and the implicit income and expenditure that arises has to be imputed.

A.19 In an entirely analogous way to the standard accounting constructs for the nation as a whole, it is conceptually possible and, indeed, with the appropriate survey capability, feasible, to assemble a set of economic accounts at the household level. The discipline one derives from an accounting framework helps in several key respects with the problems encountered in choosing the appropriate aggregates of incomes and expenditures. But the accounting framework does not and cannot alleviate all the conceptual difficulties, some of which are beyond immediate resolution and are still the subject of considerable debate. The basic accounting structure is the assembly of separate accounts for each of the economic activities of production, consumption (income and outlay accounts) and accumulation (capital transactions accounts). The principle focus for much of the SDA analysis is on particular aggregates to do with household consumption and income, and hence on estimates derived from the income and outlay accounts, but it is clear that the interdependence between the three

principal accounts means that the way in which the elements are defined and estimated depend crucially upon what goes into the other accounts of the complete system. Some of the components of the other accounts are also of direct interest in their own right.

A.20 The production account for an individual household should set out the operating balance sheet for all activities deemed to be productive. In principle this should involve a valuation of the output of non-marketed goods and services as well as marketed output. The incomes derived from each activity would then result from the difference between gross output and the total input costs incurred, including an allowance for the depreciation of capital assets used in production. Household-level production activity is necessarily unincorporated and is often informal. Some labor is hired, and wage income is paid (either to household members or outside), but frequently it involves remuneration to a member of a household who is either an employer or own-account worker, in which case the income represents the return to both labor and capital employed. This constitutes at least part of the household's income, therefore it is represented as an outlay from the production account and as a receipt by the household current account. In arriving at the estimates the accounting discipline means that all inputs and their associated costs have to be properly identified. In many cases this is not problematic, but there are a significant number of instances in practice where it is difficult to distinguish (even on conceptual grounds) between inputs into household production and the consumption outlays by household members. Quite simply, this is often because of the physical congruence of the dwelling and production units, and because separate accounts are rarely assembled for them.

A.21 In principle, the household income and outlay account is distinguishable from the production account at the level of the individual household (the micro level) in much the same way as it is distinguished for any institutional group at the macro level. Incomes are received from various sources, including from the production account to finance expenditures and other outlays, and this account sets out the balance sheet for the individual household. These incomes fall into the two basic categories of factor and transfer income.

A.22 Factor incomes are derived from the use of the productive assets owned by the household (labor and capital including land) and supplied both to own-account production and to production activities of other institutions. As already indicated, factor incomes may be generated in two particular ways. First, household members sell their labor services to production units and receive wages or salaries in return, either in cash or in kind. Secondly, they may receive income from productive assets which they own. In practice a major source of this income is rent from the ownership of dwellings; either actual rent or, in the case of owner-occupied dwellings, imputed rent. Income generated by the household's own production activity, referred to earlier, has to be included in factor income components but, being in general a return to both labor and capital, it does not comfortably fit into either and so may be added as a separate, third category.

A.23 Non-factor, or transfer, income can arise as transfers between households or as a receipt from other institutions such as government (e.g., educational scholarships). Such income receipts may be highly transient and it may be difficult to distinguish them from capital transfers at the margin (e.g., gifts received, dowry). So just as there are boundary problems in defining the extent of production, there are significant problems in defining the boundary between current and capital items in a household's account.

A.24 On the outlay side of the household's current account, in addition to cash expenditures by household members, there will appear "in-kind" expenditures corresponding to "in-kind" income. Clearly, this is especially important in respect of subsistence agriculture, but it is conceptually no different for home consumption of non-farm production. Likewise, non-cash incomes in kind (e.g., housing subsidies) should be included as imputed expenditure. Besides expenditures on goods and services, a household may make certain transfer payments to other households or to other institutions (e.g., direct taxes). Adding together all such outlays, the balance between this and total income would yield gross savings for that household, which would simultaneously appear on the household's capital account.

A.25 The capital account for a household completes the description of its economic activity. There are various possible arrangements, and it harbors a number of difficult conceptual problems to do with valuation and inclusion. Essentially, however, the capital account serves to balance household savings against the net acquisition of real and financial assets. National ac-

counting conventions treat expenditures on consumer durables as a part of (current) consumption expenditure and not as part of the assets of households. But this treatment is increasingly difficult to justify (Ruggles and Ruggles, 1986), especially for long-lived items. Furthermore, some durable items double up as capital equipment in household production as well as satisfying household needs (e.g., vehicles and other transport equipment). There are two problems here. One is the asymmetry in the treatment of essentially the same good as a capital item in production and as a current item in the institutional account. The second is the difficulty in apportioning outlays between the two uses and the respective accounts. The outcome of both of these issues materially affects our estimates of the various aggregates and, in particular, consumers' expenditure.

A.26 Formally, to complete the system of household accounts, some recognition should be made of the level as well as the change in household's assets and liabilities. Household wealth accumulation (which may be negative) and asset ownership are also central to individuals' well-being. There are significant conceptual difficulties here too, not least in deciding how to value assets and how to record capital gains and losses (revaluations). In the United States it has been estimated (Ruggles and Ruggles, 1986) that revaluations account for more than two thirds of the increase in household wealth over a thirty-year period. The process of adjustment will inevitably lead to marked changes in the cross-household asset distribution, but this will not be covered by the existing methodology.

Transactions, imputations and attributions

A.27 The core of any set of estimates of household incomes and expenditures is represented by the observed transactions in goods and services arising in the market economy. [2] The market valuation is often subject to a range of distortions (e.g., taxes and duties) whose incidence could materially affect the comparability of the estimates across households or household groups. Nevertheless, market price measurement tends to be the only feasible option in computing estimates based on marketed output. But beyond marketed output there are non-marketed components which result in both actual and implicit incomes and expenditures. These were briefly referred to earlier in connection with our discussion of the boundary of production in the household context. A significant issue on both conceptual and empirical grounds is related to imputation. Many of the basic problems are already recognized in compiling the national accounts and, just as there is a long-standing debate about the extent of imputation, so there is considerable controversy about the most appropriate methods of valuation that should be applied. There are, however, significant strategic differences in the methods of imputing incomes and expenditures from micro data files compared with those at the macro level. Certainly the existing custom and practice in relation to earlier household surveys has differed markedly from those of the national accounts in a number of key respects (Ruggles and Ruggles, 1986). For present purposes some of the issues can be highlighted under two main categories.

A.28 The first and perhaps most tractable group of imputations relates to the consumption of non-marketed goods and the corresponding payment of income in kind. As noted earlier, this is not formally restricted to farm produce, although in practice it does account for most of the imputed output in this category, due especially to the item "consumption of own produce." This type of imputation is readily achieved if a valuation of the product can be obtained from the survey response by the individual household. [3] Of course the same could be true of certain non-marketed services, but examples in practice are relatively few.

A.29 A second category of imputations relate to those non-marketed goods and services for which no direct valuation can be obtained from a given household survey return, but for which an imputation is nevertheless required for comparability with custom and national accounting practice. A classic example of this would be the imputed rent of owner-occupied dwellings. Although there is sometimes an attempt to elicit a valuation directly from the respondent, it is often unreliable, and hence it is more usual to impute a rental income based on the characteristics of the dwelling and knowledge of market rents for comparable dwelling characteristics.

A.30 These are clear-cut cases of imputation, but there also exist instances where there is some conceptual ambiguity about the appropriate attribution of certain incomes and expenditures and about whether further imputations may be necessary. An example is provided by the treatment of employers' contributions to social security,

pensions and insurance schemes. There are several technical issues here. National accounts conventions usually impute an income and an outlay to households even though, by definition, households do not receive or make these contributions. Benefits from pension and insurance funds are then treated as a change in the form of household assets; otherwise income is counted twice. However, at the micro level the usual convention has been to count the benefits as income and to disregard the employers' contributions for household account purposes. Clearly, to do otherwise would necessitate seeking information about such contributions from sources other than the household respondent. It is an area of unresolved conceptual difficulty.

A.31 The distinction between current and capital items in the complete household accounting scheme is crucial to the determination of the income and expenditure aggregates. A classic debate surrounds the treatment of consumer durables (Katz, 1983). National accounting convention has always been to count expenditures on consumer durables as part of current consumption, completely written off at the time of purchase. But this is difficult to justify in view of the services that consumer durables provide to the household over a long period. The distinction between dwellings, which count as a capital asset, and durables, which do not, is not clear-cut. Indeed, at the micro level it is not even possible to argue that such expenditures smooth out across an aggregation of households. Overall, the balance of the debate on conceptual grounds is now towards a new treatment, but there are two views as to how this should be done. Some argue that the purchase of consumer durables equivalent to an increase in stocks, and the actual use should be apportioned over their lifetime. Others argue that the production boundary should be enlarged, by treating durables as though they generate consumption services. In the latter case some allowance has to be made for the depreciation of the capital stock in common with all other productive assets, plus an interest opportunity cost element, unlike producer durables. The main obstacle to a solution of the problem is obtaining a feasible estimation procedure. Once again imputations are involved, and there ought to be no fundamental difference in the conventions at the macro or micro levels. In each case imputations have to be based on information about the levels and changes in the stocks of consumer durables. In view of its particular importance at the micro level it is suggested that an attempt is made to impute "use values" in line with the depreciation of durables over time. (Katz and Peskin, 1980, have produced estimates of this nature for the United States.)

A.32 A final area of concern in estimating aggregates of the household accounts is with the important distinction between household consumption and measures of consumers' expenditure. They are not synonymous concepts, and this is best exemplified by the provision of public goods and collective services. Households benefit collectively from defense and individually from the provision of health and education services, but both items would be excluded from consumers' expenditure. This problem has been brought sharply into focus with the interest in aligning the material product system (MPS) for Eastern European countries with the Western accounting system (Saunders, 1980). There is no fundamental problem about imputation: such goods and services fall within the existing boundary of production so that income is generated and recorded accordingly. But there is a problem about valuation, and whether the present valuation "at cost" is really appropriate in these circumstances. However, the main problem is one of attribution. These services are not "consumed" by the state but by households, so it might be logical to attribute the product as an imputed income and expenditure to households in accordance with their use. Conceptually, it would be possible to do this for, say, education and health but infeasible for public administration and defense. In practice it is difficult to achieve this for most public services although attempts have been made (Meerman, 1978) which might make this a fruitful extension to explore. As in the case of durables, the problem becomes more acute, and yet more difficult to solve, at the micro level. At the macro level the number of options to facilitate appropriate attribution in the national accounts is so much greater.

Household accounts within an integrated system

A.33 The household accounts have been viewed as a coherent representation of the household economy, stressing the importance of considering measures of incomes and expenditures as part of a structure that recognizes the fundamental economic activities of production, consumption and the accumulation of assets and liabilities. The overriding message that emerges is that

whatever is included as income and expenditure depends crucially upon what is defined as product, in what sense it is consumed and whether or not it is included in the measurement of well-being in some subsequent period.

A.34 Equally, the household economy is not, in general, independent of the rest of the economic system, and hence the household accounts are not to be treated separately from those depicting activity in the economy as a whole. This is the discipline afforded by the macro-level national accounts, in which similar sets of accounts are also constructed for the other institutions of the economy (companies, government, overseas sector) and which make the interrelations explicit. The neatest and most policy-relevant means to represent this is in terms of a social accounting matrix (SAM). However, for the household accounts estimates to be incorporated within an economy-wide data framework such as a SAM, it is important that they are made conceptually compatible with the national accounts estimates. Some of the discrepancies are noted above; but while there are notable attempts to harmonize these practices (Ruggles and Ruggles, 1986), the remaining difficulties are formidable.

A.35 In an obvious sense, one advantage afforded by the national accounts is that it provides a consistency framework for data from independent and quite disparate sources. At the micro level only very limited consistency checks are available; in general one has to rely upon the accuracy and integrity of the survey respondents. Inevitable problems result, and these are manifested, for example, in the under-recording of incomes relative to expenditure. There is simply no check on this, and it is a deficiency that cannot easily be overcome in micro accounting. A broader framework makes the extent of the discrepancies explicit and may possibly be used as a basis for an attempted elimination of these inconsistencies.

The estimation of household accounts from the SDA Integrated Survey

A.36 Estimates of the components of the household accounts should be viewed as intermediate rather than final products of the Integrated Survey. In other words, they are of interest primarily as inputs to studies of policy issues at the household level, such as those represented by the SDA Analysis Plans. This is not, however, to suggest that the issues and problems inherent at both the conceptual and practical level in the estimation of household accounts are either trivial or unimportant. On the contrary, it is imperative that the estimates of the household accounts are constructed in such a manner and level of detail as to anticipate the needs of subsequent analysis based on these data. Similarly, plans for analysis must define precise concepts of the household variables they require, subject to the constraints imposed by data availability and data quality.

A.37 It is, of course, difficult to anticipate the needs of all studies for which the household accounts estimates may be used, and in any case different authors may wish to adopt different definitions. It is therefore important to incorporate flexibility into the calculation of the various estimates. Such flexibility may be achieved by constructing a hierarchical data set relating to the household accounts, with at least three levels to the hierarchy. At the lowest level (the "variable" level) would be those survey responses of direct relevance to the household accounts, each expressed on an annual basis for consistency. The next level (the "sub-aggregate" level) would comprise aggregations of a small number of these annualized variables which are very similar in nature. At the highest level (the "aggregate" level) these sub-aggregates would be aggregated into a small number of totals, each of which are conceptually distinct. Thus, for example, at the lowest level one might have the variable "Annual Expenditure on Rice"; at the next level, the sub-aggregate "Annual Expenditure on Staple Grains"; and at the highest level, the aggregate "Annual Expenditure on Food and Drink." This three-level hierarchy could be expanded to include more than one intermediate level if desired.

A.38 This Appendix concentrates primarily on the highest and lowest level of this hierarchy. This is not, however, to suggest that the intermediate levels are unimportant; on the contrary, the sub-aggregates ought to be computed as part of the same calculation process. However, it is difficult to make general recommendations about what the precise definition of the sub-aggregates should be, and certainly much more difficult than in the case of the aggregates. The choice of sub-aggregates will need to be country-specific (because of differences across countries in the particular categories of expenditure, sources of income, etc.) and made with more explicit reference to the particular studies for which the data will be used.

A.39 The feasibility of constructing the entire household accounts from the SDA Integrated Survey is examined in this section. Nevertheless, for purposes of analysis some parts of the accounts are more relevant than others, and some parts can be estimated with more reliability than others. For most analyses the most important information is contained in the household current account, so that estimation of the current account is of greatest importance. The household production accounts are also important in that they generate incomes which enter into the current account. The capital account is generally less important for analytic purposes, and furthermore, in many cases serious difficulties arise in estimating many of its components with any degree of accuracy. Similar remarks apply to extensions of the conventional household accounts, such as time use accounts and records of household assets and liabilities. Nevertheless, the feasibility of estimating these components of the accounts from the IS is discussed below.

The choice of current account aggregates

A.40 As explained above, the aggregates of the household current accounts should be chosen in such a manner that their constituent components are conceptually similar, but are distinct from the components of other aggregates. A second guiding principle for the choice of aggregates is that they should conform as closely as possible to aggregative measures which might be used in analysis. Taking these principles into account, twelve aggregates are proposed, as set out in Frame A.1; six of these are aggregates of household incomes, and six are aggregates of household expenditures. [4]

A.41 To some extent the choice of the aggregates reflects some of the general conceptual issues discussed in paragraphs A.04 through A.35 above. On the income side the distinction between factor and non-factor income is made explicit. The factor incomes are distinguished according to the factor remunerated, thus giving income from employment (returns from labor supply), rental income (returns from the ownership and supply of capital, including land) and self-employment income (a joint return to labor and capital supplied by the household in which the separate contributions of labor and capital cannot easily be identified). Self-employment income, being by far the most important overall source of income in the majority of African countries, is separated into self-employment income from agricultural activity (including the processing of crops) and self-employment income from non-agricultural activity. The remaining income aggregates cover non-factor incomes and various miscellaneous incomes, the majority of which are ill-defined. Remittances received by the household as current transfers from other households are separately identified as an aggregate; the remaining incomes, which include non-factor income received by the household as current transfers from government, income from insurance and pension schemes and various other unclearly identified sources of income, comprise the sixth income aggregate.

Frame A.1: Aggregates of the household current account

(a)	Incomes
	Income from employment
	Household agricultural income
	Non-farm self-employment income
	Income from rent
	Remittances received
	Other income
	Total income
(b)	Expenditures
	Consumers' expenditure on food
	Non-food consumption expenditure
	Remittances paid out
	Consumption of home production: food
	Consumption of home production: non-food
	Imputed expenditure of wage income in kind
	Total expenditure

A.42 On the expenditure side the main conceptual distinction is between monetary transactions and imputations. The monetary transactions are subdivided according to the type of expenditure, thus giving food expenditure, non-food expenditure (including services as well as goods) and remittances. The last covers transfers that are similar to the analogous income aggregate, except that in this case the current transfer is being made from the household in question to other households. The remaining expenditure aggregates are all imputations, each of which has an equal counterpart embedded within the income aggregates. Thus there is the expenditure counterpart to wage income paid in kind and the value of domestic consumption of the output of household production enterprises, the latter being subdivided between food and non-food con-

sumption in parallel with the monetary expenditures.

A.43 Given these aggregates, totals of incomes and expenditures may be calculated as the sum of the respective aggregates. The difference between total income and total expenditure is, of course, household savings over the year. This savings estimate also appears as a receipt in the household capital account and is used to finance the household's net acquisition of financial and of physical assets.

Estimation of the current account aggregates

A.44 It is necessary to develop the above very cursory explanations of the aggregates chosen by defining them precisely and relating the definitions to the information available in the survey. Such an exercise is necessarily one of compromise, trying to conform the available information as closely as possible to the idealized ex ante theoretical concepts. In addition, difficulties arise in classifying and interpreting the responses to particular questions and in identifying instances of double-counting. The former problem arises, for example, with some of the "miscellaneous incomes" in knowing whether the responses relate to current or capital receipts or to both. As an example of the latter problem, consider remittances paid in kind, which will in general be classified as an expenditure. However, there would be double-counting if the acquisition of the remitted goods was included in one of the other expenditure components. Finally, conceptual difficulties arise in classifying items at the margin, and this has the consequence that even the idealized concepts are not uncontroversial.

A.45 The detailed suggested procedures for the calculation of the aggregates are set out in the Annex. This section concentrates on the definition of the aggregates and on discussing the main conceptual issues and problems involved in their calculation from the survey.

INCOME AGGREGATES

(i) Income from employment and self-employment

A.46 All individuals in the responding household aged 7 years and above are asked about their economic activities in the past twelve months, covering up to five occupations in total. These responses form the basis for the estimation of income from employment; however, it is first necessary to distinguish occupations in which the respondent was a wage employee from those in which the respondent was self-employed. Income from employment relates only to the former, that is, to situations in which the individual was an employee of an institution other than the household in question. [5] The same section of the questionnaire may also be used to provide estimates of self-employment income, which in turn may be used to construct alternative estimates of incomes from household enterprises.

A.47 Focusing initially on wage employment situations, the income from employment aggregate includes not only the obvious element of wage payment in a monetary form, but also any bonuses, tips, gratuities, etc., received in the job(s) in question plus the value of payments received in kind (e.g., payment in the form of food or the provision of subsidized housing). As explained in paragraphs A.04 through A.35 above, such "in kind" payment should be imputed as both income and expenditure because in its absence the household would need a higher monetary income in order to be able to buy the quantity of the goods or services supplied as wage payment.

A.48 Respondents are asked to value these in kind payments and, although no explicit instruction is given, presumably do so at market prices. Valuing payments in kind at market prices is appropriate either if the individuals in question have a right to sell the goods and services to others on the market or if the quantity they receive is less than or equal to the quantity the household would itself choose to consume in an unconstrained situation in which all incomes and expenditure are in money terms. If the quantity is greater than the amount the household would freely choose, and the members do not have the right to sell the excess, then the situation is one of constrained consumption in which the market price overstates the benefit of the payment to the household. Unfortunately, there is no means of identifying this situation and, even if it could be identified, no means of correcting for it.

A.49 For each individual, and for each of the five occupations which relate to wage employment, income from employment is therefore calculated as the sum of monetary payments, payments in kind at their market values and bonuses received. One issue which remains is the treatment of taxes and social security contributions relating to wage employment. In the case of the two main occupations, respondents are given flexibility by being able to quote their monetary payments either pre- or post-tax, so that the responses will presumably be a mixture of pre- and

post-tax rates. Clearly, all employment income must be expressed on a consistent basis, either pre-tax for all households (with the associated tax payments included among the expenditures) or post-tax for all households. The former approach is preferred because of its greater flexibility — the pre-tax income can be converted into post-tax income if required.

A.50 However, estimating tax and social security contributions paid by those employees who quote their wages post-tax is far from straightforward, and, in particular, there is no information in the survey enabling this conversion to be carried out. Although a question is asked about taxes in the IS prototype questionnaire, this is of little value for the present purposes; it relates to taxes paid by the household rather than by individuals and may cover other taxes in addition to those on employment income. To estimate payments at the individual level requires detailed information on the tax and social security system in the country in question. Estimating pre-tax income in this manner is very complex as the circumstances and characteristics of the household must be taken into account, and in general there will not be a one-to-one correspondence between post-tax and pre-tax incomes. These problems could be circumvented by adding to the questionnaire at the implementation stage a question asking those respondents who indicate that their quoted wage is post-tax to estimate the tax and employees' social security payments they have made. Such a question is unlikely to be especially sensitive as it would only be asked of those respondents who have already implicitly admitted paying tax. Finally, it should be noted that employers' social security contributions are not added to the employment income figures to avoid double-counting, because income from social security and unemployment benefits is included elsewhere (see paragraphs A.27 through A.33).

A.51 In the case of the third and other occupations, respondents are not asked whether their wages are quoted pre- or post-tax. Given that the majority of such occupations is likely to be in the informal sector, it is reasonable to assume that all wages are pre-tax and/or that the respondents are unlikely to have to pay taxes.

A.52 As pointed out above, the information in the employment section of the questionnaire may also be used to build up estimates of self-employment income. The procedure in this case is more straightforward in that, having identified occupations in which the respondent was self-employed, information is collected only on the monetary payments received. Bonuses tips are likely to be zero or small in most instances of self-employment, and payment in kind is most likely to take the form of consumption of own output, on which information is collected elsewhere. The questionnaire also does not inquire as to whether quoted money payments in self-employment occupations are pre- or post-tax; it is assumed here that the former is the case and/or that the majority of individuals do not pay tax on self-employment income.

A.53 Both income from employment and self-employment income may be estimated at the individual level (unlike the other aggregates) by summing over all their relevant occupations. Household-level estimates are easily calculated by aggregating over all individuals in the household.

A.54 Self-employment income should not be viewed as a complete aggregate in its own right, as it does not include payments in kind (consumption of own production). However, as explained below, it may be used to calculate alternative estimates of the incomes from household farm and non-farm production activities.

(ii) Household agricultural income

A.55 The obvious approach to the estimation of household agricultural income is to build up the agricultural production account, the balance of which gives the estimate of this income component. A schematic representation of the agricultural production account used to derive this estimate is set out in Frame A.2. While the revenues and costs components of the account are not of direct interest from the point of view of current account aggregates, they are of importance for other purposes and ought therefore to be included among the sub-aggregates calculated.

A.56 Considering the items on the revenue side, revenue from the sale of crops is estimated together with imputations for the value of crops paid to factors or kept as inputs (e.g., seeds); these imputations are also included among the input costs. Processed crop products refer to food products subject to further transformation after harvesting, e.g., maize flour or shelled groundnuts. The raw material inputs for processing may be supplied by the household itself or from other sources. The component "Other Agricultural Revenue" includes mostly revenue from the sale of livestock products, fishing and

Frame A.2: The agricultural production account in schematic form

Revenues	*Costs*
Revenue from sale of crops	Expenditure on crop inputs
Revenue from sale of processed crop products	Expenditure on inputs for crop processing
Other agricultural revenue	Expenditure on livestock inputs
Value of consumption of home-produced food	Expenditure on land
	Depreciation of agricultural equipment
Balance: Revenues - Costs = Household Agricultural Income	

hunting, plus some miscellaneous items, e.g., sales of palm wine. Finally, consumption of home production is included among the revenues, valued at farm-gate prices (the opportunity cost).

A.57 The cost side of the production account comprises both factor payments to non-household members and raw material purchases, though without explicitly distinguishing them (if this distinction was required, it could be achieved — up to a point — by judicious choice of the sub-aggregates). However, in some instances it is not clear how a particular cost should be classified. Payments made in the form of crops are given imputed values equal to the imputed values on the revenue side. Otherwise the costs are mostly self-explanatory. Expenditure on land includes both rental payments and the value of crops supplied by share-cropping households. One element of costs is, however, not captured by the questionnaire: expenditure on crop inputs for processing in the situation where these are purchased from another household.

A.58 Note that only current costs should be included in the production; the purchases and sales of assets, including agricultural equipment and livestock, belong in the capital account. Nevertheless, depreciation of capital assets should be included in the current account. It is necessary to make provision for depreciation; this need is reflected by expressing household agricultural income net rather than gross.

A.59 The estimation of these elements of the agricultural production account is relatively straightforward, as described in the Annex. In many instances the recall period on which the annual estimates are based is short, namely the interval between the enumerator's two visits (typically two weeks); the consequences of this need to be noted for purposes of analysis. The recall error may be quite small and, although large errors may occur in grossing up for any one individual household (Scott, 1988), the cross-household mean is unlikely to suffer from serious bias. On the other hand, if the variable in question is erratic throughout the year, because of seasonality, for example, the cross-household variance may be overestimated. This problem of variance overestimation is potentially serious (in theory at least) for studies looking at distributional issues. (See Box A.1, overleaf.)

A.60 The imputed revenues and costs corresponding to the use of agricultural output as factor payments or as inputs are based on the quantities involved as well as the opportunity cost. The other major imputation, consumption of own agricultural output, is based on grossing up the experience over a short period, making allowance for the fact that consumption may be seasonal and so only taking place in certain months of the year; the necessary valuations are supplied by the respondents. Countries conducting multiple visit surveys will hopefully obtain more accurate estimates (less recall error) for this component.

A.61 The remaining elements of the agricultural production account are directly estimated from the questionnaire, with the exception of depreciation. The balance of the account gives an estimate of net household agricultural income. However, as observed above, it is possible to use the direct estimates of self-employment income to construct a second estimate of household agricultural income. Clearly, it is necessary to use the industry code of the self-employment occupations to select only those relating to agricultural activity. Household agricultural self-employment income is calculated as the sum of individual self-employment income over all individuals in the household; individual self employment income is the sum over all agricultural self-employment occupations recorded for that individual.

A.62 A serious difficulty in using this estimate of household agricultural self-employment in-

Box A.1: Depreciation of productive capital assets

The purchase of capital equipment for use in household production activities represents the acquisition of a durable asset with a lifetime of several years, and so should clearly be accounted for as an outlay in the household capital account. However, throughout the period in which the household owns the asset, its value in real terms will deteriorate, irrespective of whether or not it is used in production. This deterioration in value, or depreciation, is the result of wear and tear plus possibly some technological obsolescence. Thus, capital consumption is occurring and some allowance should be included in the household current account. In practice this is achieved by including the value of depreciation among the current costs in the production account. Consequently, the balance of the household current account becomes net saving, that is, saving after provision for depreciation or a measure of the additional capital resources over which the household has free disposal while maintaining its capital stock intact.

The estimation of depreciation is based on the fact that the value of the asset is known at two points whose separation in time is known. Once these values are expressed in real terms, it is then necessary to make an assumption about the time profile of depreciation. Two common assumptions are:

(i) Straight line depreciation, that the absolute value of capital consumption is the same each year (in real terms);

(ii) Geometric depreciation, that depreciation occurs to the same proportionate extent each year.

Whichever assumption is made, the depreciation rate may be estimated given that two co-ordinates on the depreciation curve are known. If the value of asset j is currently V_{tj} (in real terms) and was V_{oj} when purchased t years ago, then its depreciation rate δ_j may be estimated as

$$\delta_j = \frac{V_{oj} - V_{tj}}{t} \qquad \text{(straight line depreciation)}$$

$$\delta_j = 1 - \left(\frac{V_{tj}}{V_{oj}}\right)^{1/t} \qquad \text{(geometric depreciation)}$$

In general, geometric depreciation would seem to more closely approximate reality, as one can note from the prices of second-hand capital assets of different vintages.

In this way a value of δ_j can be estimated for each asset of type j possessed by surveyed households. However, rather than using a different depreciation rate for each individual asset of a given asset type, it makes more sense to estimate an average depreciation rate over all households for each asset type, $\bar{\delta}_j$ say, which will be used to estimate the value of depreciation for all assets in category j. This is particularly advisable given the difficulty respondents will have in answering accurately questions on purchase values. Given $\bar{\delta}_j$, the value of depreciation of an asset in category j, D_j may be estimated as

$$D_j = \frac{\bar{\delta}_j}{1 - \bar{\delta}_j} \times \text{Current value of asset}$$

come is that it is not clear what elements of the production account this estimate encapsulates. As it relates to monetary payment only it will not include consumption of own output, and it is highly unlikely that it will be adjusted for depreciation of equipment. The assumption is that all the remaining elements are accounted for in the responses in the employment section of the Integrated Survey (except the imputed elements which appear on both sides).

A.63 In this manner two estimates of net household agricultural income may be made. Order of magnitude comparisons may be made between them to check their consistency, though the ambiguity in the definition of the second estimate means that rigorous comparisons cannot be made.

(iii) Non-farm self-employment income

A.64 The estimation of net non-farm self-employment income is computed in a manner similar to the agricultural equivalent. Thus estimates can be made by constructing the production accounts of the businesses and alternatively based on estimates of self-employment income from non-agricultural activity. But a third estimate can be constructed on the basis of the response to direct questions on profits of the enterprises.

A.65 Questions in the survey relate to up to three enterprises owned and operated by the household. For each enterprise, production accounts can be built up along the lines of Frame A.3. The contents of these accounts exactly parallel those of the agricultural production accounts; in addition to explicit costs and revenues in cash and kind, the value of consumption of own output is included among revenues (the counterpart being included among the expenditure aggregates) and the value of depreciation of capital assets among costs. The balance of these accounts gives the net profit of the enterprise, and the aggregate is calculated as the sum of these net profits over all enterprises owned and operated by the household.

A.66 Estimation of the revenue components is based on grossing up the experience of a two-week period, using specific recall for enterprises

Frame A.3: The production account of a non-farm enterprise

Revenues	*Costs*
Revenue received in money	Current expenditure on inputs
Revenue received in kind	Depreciation of capital assets
Value of domestic consumption of output	
Balance: Revenues - Costs = Net non-farm self-employment income	

which have been operational in the period since the enumerator's last visit and "normative" estimates based on typical experience otherwise. Current input expenditure is estimated in a similar manner, except that in this case respondents are given greater flexibility in the reference period of the response according to the frequency of purchase. In both cases it is necessary to take into account the fact that the enterprise may only have been operational for a fraction of the year.

A.67 The balance of the production account provides an estimate of net non-farm self-employment income. While conceptually correct, in practice, estimates based on this method were found to be very unsatisfactory in the Living Standard Measurement Study (LSMS) questionnaires; in each of the countries concerned the vast majority of enterprises appeared to be making substantial negative net profits. As such the results were not credible, and it was clear that either significant overstatement of costs and/or significant understatement of revenues were occurring. There are a number of reasons why this might occur: double-counting of expenditures made jointly for more than one enterprise or of consumption expenditures and production input expenditures; capital purchases being inadvertently included among current expenditures (for example, under the "Other Expenses" category); revenues being quoted post-tax while the taxes paid are included among input expenditures; and traders quoting their margins rather than gross revenues but still reporting the expenditure on the items purchased for resale. Most obviously, revenues may be deliberately understated because of fear of taxation.

A.68 To some extent these problems may be endemic, but it is likely that they could be reduced by better design and administration of the survey. It is difficult to tell ex ante whether the SDA Integrated Survey is significantly less likely to suffer from bias than the LSMS questionnaire. Certainly a more comprehensive attempt is made to collect information on the revenues of enterprises not operating in the period between the enumerator's visits, and the more flexible approach to the collection of expenditure data means that the resulting figures are likely to be more reliable. On balance, however, it seems that, although the accuracy of the estimate may be increased (that is, its mean square error reduced), it is not self-evident that the bias will fall significantly. Consequently, it is important to derive alternative estimates wherever possible.

A.69 A second estimate of household non-farm self-employment income may be constructed in an exactly analogous manner to the agricultural estimate, based on all self-employment occupations except those in agriculture. Finally, a third estimate can be constructed based on the direct responses on profits, comprising the sum of profits used for own and other household purposes, transfers to other households and saving. In both cases, while it is not clear exactly what elements of the business account this figure is meant to represent, it may be assumed that both of these figures cover only cash revenue and input expenditure; consequently revenue in kind plus the value of domestic consumption of output is added, and the value of depreciation subtracted.

A.70 As with household agricultural income above, it is probably appropriate to make only order of magnitude comparisons between the alternative estimates. The definitions are too vague to enable precise and detailed comparisons to be made.

(iv) Income from rent

A.71 In common with most of the other income aggregates, rental income comprises both monetary and imputed elements. Rent accrues to households through their ownership and supply of assets of various descriptions. Considering actual rents (in money or in kind), the questionnaire permits estimation of income from the leasing of the following assets: land (by means of either rental or sharecropping arrangements), draught animals, agricultural equipment, assets

Box A.2: Estimating the imputed rent of owner-occupied dwellings

It is conventional accounting practice to view the inhabitants of owner-occupied housing as the owners of a productive asset from which they derive consumption value. As such, an imputed rent representing the potential market rental value of the dwelling is added to both the income and expenditure sides of the current account.

Unlike some of the LSMS questionnaires, the IS prototype questionnaire does not include explicit questions on the potential rental value of owner-occupied dwellings. Hence, imputed rent must be estimated indirectly based on a hedonic relationship estimated for rented housing, relating the annual rental value to the characteristics and amenities of the dwelling. Such an equation may be used to impute rental values to owner-occupied housing, that is, to use their characteristics to predict from the equation what additional income and expenditure would be necessary in order that the household could rent a dwelling of comparable characteristics.

The appropriate explanatory variables are mostly contained in the Housing Section of the Integrated Survey, such as dwelling size, quality of construction, access to amenities; characteristics of the household may also be relevant, for example, if a different rent is charged to foreigners. Although some of these variables are continuous, the majority are discrete. It is therefore necessary in the latter instances to construct dummy variables (e.g., a variable taking the value 1 for a "good quality" construction of the walls and 0 for "low quality" construction. The equation may be estimated by ordinary least squares methods, although in this case there is a possibility of sample selection bias (Maddala, 1983, ch. 9). This is because the estimated equation represents the preferences of renting households, but is used to impute rental values for the dwellings of owner-occupiers. Households who are owner-occupiers may have different preferences from renting households (e.g., in Africa the former are more likely to be rural and the latter to be urban). In practice this bias may not be important, and in any case may be small relative to the other errors in this procedure.

A possible difficulty with this procedure for imputing rents to owner-occupied dwellings may arise in rural areas if there are insufficient rented dwellings to enable a proper specification of the hedonic equation. If this is so the consequences may be quite serious, as the majority of owner-occupied dwellings are in rural areas. To avoid this possibility there is a strong case for including direct estimates of potential rental value in the questionnaire, the estimates being provided either by the respondents or by the enumerators.

of non-farm enterprises. One obvious omission is the income from renting dwellings (including income from tenants living in the same dwelling as the household), to which the questionnaire does not refer. While it is conceivable that the respondent would include such income among miscellaneous "Other Incomes" categories, there is no means of knowing whether this has occurred, and it seems unlikely in practice. Hence, in modifying the questionnaire for implementation, there is still a need to include a specific question on rental income from this source (in section 7 or 11, for example).

A.72 To these actual rental incomes (some of which may be received in kind) should be added the imputed rental value of owner-occupied dwellings. Estimation of this imputed rent should be based on the characteristics and amenities of the dwelling. Given this estimate, the aggregate rental income figure is simply the sum of the actual and imputed components. (See Box A.2.)

(v) Remittances received

A.73 Remittances received relates to current transfers from other households, which may be in the form of money or in kind (in particular food). The aggregate is the sum of such transfers received in the past twelve months. The only issue which arises in its calculation is the need to distinguish current and capital remittances. In the case of capital remittances, payment of the transfer implies an economic obligation for repayment; that is, from the point of view of the recipient household, a financial liability is established. Capital and current remittances can be distinguished using the questionnaire; the former should of course be included in the household capital account.

(vi) Other income

A.74 This is an amalgamation of various, mainly non-factor, incomes. Many of the transfers in question are received from government, e.g., unemployment benefits and educational scholarships. A number of the items of miscellaneous receipts are hard to classify at the margin, i.e., whether they should be included in the current or capital accounts. For example, should income from dowry or inheritance be classified as an infrequent, non-factor income or as a capital receipt? (The former assumption has been made here.) The contents of the "income from other sources" questions in section 11C are particularly difficult to classify.

A.75 In general, there is a danger of understatement of miscellaneous incomes, due to the fact that only a few categories are included in section

Frame A.4: Schematic representation of the household capital account

Receipts	*Outlays*
Savings (balance of current account)	Net acquisition of physical assets
	Land
	Livestock
	Agricultural equipment
	Business assets
	Durable goods
	Inventories
	Net acquisition of financial assets
	Repayment of loans
	Capital remittances
	Paid
Balance: Zero	

Note: The capital account as presented here includes the capital finance account.

AC and some of these are not very specific. Consequently, respondents may forget to report some miscellaneous incomes in the residual categories. There is a case for including additional specific questions on items such as the following: interest on bank accounts, dividends income from gambling. While only a very small number of households will have these income sources, they may be significant for those who do.

A.76 EXPENDITURE AGGREGATES. Information on the main items of household expenditure is collected by the survey at a highly disaggregated level and with flexibility in the reference period. Both of these factors, plus the fact that there is less incentive to understate because of fear of taxation, should imply that, in general, the expenditure estimates will be more accurate and less subject to bias than the income estimates (though it should be remembered that some elements are common to both sides of the account).

(i) Consumers' expenditure on food

A.77 Food expenditure (that is, market purchases of food) is estimated by summing annual expenditures at the individual commodity level. The latter is estimated from information based on fairly short recall periods: the interval between the two visits for frequent purchase and the preceding three months for less frequent purchases. Annual estimates are derived by grossing up in the usual way, taking into account the fraction of the year in which the item is not purchased. Thus the responses are based on recall of actual experience (rather than "typical" figures), but the potential problem of seasonality which gives rise to overestimation of cross-household variance is rendered less serious due to the flexibility in the recall period. Finally, in countries undertaking multiple-visit surveys, expenditure between the first and last visit could probably be estimated more accurately than the single recall, the resulting estimate being grossed up in the same manner.

(ii) Consumption of home production: food

A.78 Consumption of home-produced food is presented as a separate aggregate, calculated in exactly the same manner as on the income side (see above).

(iii) Consumption of home production: non-food

A.79 Similarly, consumption of home-produced non-food items also appears as an expenditure, again calculated as described above.

(iv) Non-food consumption expenditure

A.80 This aggregate includes a wide range of goods and services. More disaggregated estimates will be required for many purposes, and this should be reflected in the choice of the sub-aggregates. The majority of the non-food items are included in the household expenditures module (section 9A). The estimation of expenditure on any item is conducted in a similar manner to food items (see above); as with food expenditures there is a variable reference period according to the frequency of purchases, and for the most frequently purchased items the number of months in which, not consumed is also recorded.

A.81 This section, however, does not cover all the expenditures of the household on non-food items; specifically, the following items need to be estimated from elsewhere in the questionnaire: expenditure on housing (rent, imputed rent of owner-occupied dwellings and repairs or maintenance costs), expenditure on household utilities (water, electricity, etc.), expenditure on edu-

Box A.3: Estimating consumption flows from durable goods

Various approaches may be taken to the estimation of the consumption flows, or "use values," a household receives by virtue of its ownership of a durable consumer good (Katz, 1983). One approach is to proceed analogously to the estimation of imputed rents of owner-occupied dwellings, that is, to base the estimate on the market rental value of the good. However, in practice the necessary information is not usually available to make this approach operational, and in any case consumer durable goods, even of a particular type, are generally very heterogenous in nature. An alternative, more feasible approach is based on the opportunity cost of owning the durable good. In general this will be comprised of two elements:

(i) the value of depreciation over the year in question; and

(ii) an imputed net return, that is the maximum rate of return which could have been obtained on some alternative investment.

The depreciation rate, δ_j is calculated in the same manner as for producer durables. The calculation of the interest opportunity cost, r, is more problematic. In Africa many rural households may not effectively have access to interest-bearing savings accounts and other financial assets, and so the opportunity cost for such a household may be zero. For many households in urban areas there may be a genuine opportunity cost, but it will be difficult to identify such households as well as to determine the appropriate interest rate. If this could be done, and assuming geometric depreciation, the consumption flow, c_j from a durable good of current value V_{jt} may be estimated as

$$c_j = V_{jt}(\delta_j + r)/(1 - \delta_j)$$

with r being set to zero in appropriate instances. As discussed above, it may be necessary in practice to assume r is zero for all households.

cation, the imputed flow of consumption from durable goods and various miscellaneous expenditures. Imputed rent of owner-occupied dwellings is included in expenditure on housing as the counterpart to the identical item on the income side (see above). Expenditure on utilities covers water, electricity and garbage disposal; annual estimates are derived by grossing up on the basis of the most recent bill. In the case of the water bill it is necessary also to take into account private purchases of water from other households and to subtract the value of income from private sales to other households. Expenditure on education comprises both direct costs (such as fees) and indirect costs (such as transport to school); inclusion of the latter may mean that some double-counting is introduced, but there is no means of checking for this. (See Box A.3.)

A.82 The remaining items are slightly less straightforward. As explained in paragraphs A.04 through A.35 above, acquisition of durable goods has been treated as the purchase of a capital asset and as such is included as an outlay in the capital account. The durable goods are, however, perceived as generating a flow of consumption services to the household which owns them, estimated based on depreciation and the interest opportunity cost. Finally, with the miscellaneous items of expenditure in section 11D of the questionnaire, a problem arises analogous to that occurring with miscellaneous incomes, that is, the distinction between current and capital purchases. Presumably "contributions to self-help projects" will be capital outlays, but it is less clear how to classify "gifts and presents" or "weddings, dowry, funerals etc." One of the categories, "expenditure on transportation," is covered elsewhere in the questionnaire and is in any case ambiguous; respondents will not know whether it is intended to relate to consumption or production expenditure (or both).

(v) Remittances paid out

A.83 This aggregate includes payments in money terms and in kind; as with the corresponding income aggregate, it is important that only current transfers are included. In the case of remittances paid in kind there is the possibility of some double-counting if the expenditures (actual or imputed) involved in acquiring the remitted goods are quoted elsewhere in the questionnaire.

(vi) Imputed expenditure of wage income in kind

A.84 This is an aggregation of the various forms of payment in kind received as wage income in each of the occupations undertaken by each member of the household. As with remittances, it is assumed that these imputed expenditures are not covered by the other expenditure aggregates.

A.85 This completes the estimation of the household current accounts, summarized in the twelve aggregates referred to above. Clearly there is no single unambiguously correct definition of these aggregates, and different users may wish to calculate slightly different aggregates (in particular, perhaps differing in the treatment of marginal items); this may be achieved by making slight modifications to the procedures listed in the Annex. Clearly, the aggregates also need to be supplemented with a large number of more

detailed and specific sub-aggregates.

Capital accounts, assets and liabilities and time use

A.86 In addition to the information on incomes and expenditures, as discussed above, the Integrated Survey also collects information on the capital transactions of households, on household assets and liabilities and on time use of household members. Thus, the issue arises of whether it is possible and worthwhile to construct a complete set of household accounts comprising, in addition to the current account, a household capital (including capital finance) account, a record of beginning and end-of-period assets and liabilities and an account on time use for individual household members. However, should such an ambitious objective prove to be infeasible, it will still generally be desirable to estimate some of the components for policy purposes (e.g., to identify households which are net purchasers and net sellers of land).

A.87 Considering initially the capital account, which is represented in stylized form in Frame A.4, household savings is estimated as the balance of the household current account. Although there are direct questions on household savings over the year, these relate only to savings in formal financial institutions. Having to estimate savings as the balance of the current account is problematic, in the sense that any errors which affect one side of the account but not the other will cumulate in the savings estimate. Furthermore, the capital account is unlikely to balance. Hence, the savings estimate which results is likely to be highly inaccurate, and, to the extent that incomes are likely to be underestimated significantly more than expenditures, it is likely to be downward biased.

A.88 In the capital account, savings (which may be negative) are allocated either to the net acquisition of physical assets (net new investment in fixed capital or inventories) or of financial assets, either or both of which may be negative. Because of the treatment adopted above, purchases and sales of durable goods are regarded as positive and negative net investment in fixed assets respectively. And the fact that profits of household self-employment production activities are measured net means that net acquisition of physical assets in the capital account should be measured after depreciation. Finally, net acquisition of financial assets includes net capital remittances paid out by the household and net repayment of outstanding loans.

A.89 Unfortunately, not all of these capital transactions can be estimated from the information provided by the IS. Purchases and sales of the following assets are recorded: land, livestock, agricultural equipment and the business assets of non-farm enterprises. Estimates of depreciation are available for the last two categories of assets, and it is not unreasonable to set the depreciation of the first two assets to zero. Thus net acquisition of assets in these categories may be estimated. However, neither net acquisition of durable goods nor stockbuilding (except for a limited number of agricultural staples) can be estimated from the information provided. Turning to financial assets, net capital remittances paid out to other households may be straightforwardly estimated once current and capital inter-household transfers have been distinguished. However, a much greater difficulty arises in the estimation of net loan repayments, because respondents are not asked to separately identify repayment of principal (which should be included in this item) and interest payments (which ought to be included in current account transfers).

A.90 The fact that complete capital accounts cannot be constructed for households implies that it will not in general be possible to build up a complete record of households' holdings of assets and liabilities at the beginning and end of the period. The picture is, however, more complete on assets than on liabilities. The value of the following assets owned by the household may be estimated: land, livestock, agricultural equipment, stocks of key agricultural staples, assets of non-farm enterprises, savings held in formal financial institutions (for each of which the value at the beginning and end of the year may be estimated) and consumer durable goods (for which only the end-of-period value may be estimated). On the other hand, there are a number of assets which cannot be valued, such as stocks of most agricultural products, the value of owner-occupied housing and of informal savings. Unfortunately, liabilities cannot be estimated at all; households with outstanding loans can be identified, but the value outstanding is not known. Thus, in summary, as with the capital account, only a partial picture of households' ownership of assets and liabilities can be assembled; however, this does not mean that the estimates which can be made are worthless. In fact, those assets which can be valued are some of the more important from the perspective of SDA analysis (land, livestock) in

which, for example, the extent of asset ownership might be used in conjunction with other variables in classifying households into groups along socio-economic and other lines.

A.91 Similarly, in the case of time use accounts, only a partial picture can be built up, this being based on the experience of individuals in the seven days prior to the interview. As before, however, the information which is available remains of interest for several purposes, such as measuring the opportunity cost of older children attending school. For each individual the time devoted over the past seven days to the following activities may be estimated: the primary occupation of the week (for those who were employed), the time devoted to collecting wood, collecting water and housework. The time devoted to activities in a typical week can also be estimated: time devoted to the more important economic occupations, travelling to work (main job only), travelling to school and the number of hours of school missed. In addition, the time taken by some one-off activities such as attending health consultations is also known. In general, therefore, it is clear that an individual's time use can only be partially accounted for by using the Integrated Survey.

Practical issues: Zero values, missing values and outliers

A.92 The discussion above and in Annex 1 sets out the theoretical procedures for calculating aggregates in the household accounts. However, it needs to be supplemented by a brief discussion of the inevitable and complicated problems which will arise in practice. Two of these practical issues are endemic, and consequently their treatment needs to be made a central part of the calculation procedure. These are (i) the problem that instances of missing values will occur, in which respondents are either unable or unwilling to provide an answer to a question; and (ii) the fact that the responses provided may contain outliers which need to be detected and then replaced, that is, values which deviate so much from the other values as to raise the suspicion that they are erroneous. Possible methods for identifying and dealing with these problems are summarized below.

A.93 The difficulty in identifying missing values is that they are only a small subset of instances of non-response to a question. Apparent non-response will also arise if the question has been identified earlier in the questionnaire as non-applicable and so skipped. In other words, the response is not missing but zero. These two types of non-response must be distinguished, because their interpretation and treatment is quite different. Fortunately this may be achieved by carefully following through the "skip pattern" in the questionnaire in order to identify individuals of whom the question was not asked; in such cases the response to the question must be explicitly set equal to zero. Note, however, that this procedure does not necessarily identify all zero values. For some households the skip pattern will ensure that they are not asked any questions in a particular module; for example, households who indicate that they do not own any non-farm enterprises are not asked any further questions related to this topic. Such households will not have a record in the questionnaire section on non-farm enterprises: absence of a record indicates zero values for questions of direct relevance to the estimation of household accounts aggregates.

A.94 Having identified the zero values using the conditional "skip" pattern, the remaining instances of non-response must be genuine missing values. The extent of the problem caused by missing values, and hence the importance of re-estimating them, is dependent on the number of missing values (i.e., whether the number of non-missing, non-zero values is sufficient for the envisaged analysis) and on whether the households affected are considered to be a random or systematic sample (the latter might occur if higher income households are more likely than lower income households to refuse to answer sensitive questions). If re-estimation is considered necessary, the appropriate procedure depends on the statistical process which is believed to be generating the variable in question. If, for example, it is believed that the variable is normally, independently and identically distributed (perhaps within an exogenously determined group of households), then the optimal estimate is the mean of the distribution in question. If, however, it is believed to have been generated by a general linear process relating it to one or more auxiliary variables, then the optimal prediction may be made given the estimated equation for the process and the values of the auxiliary variables for the household in question (assuming the latter are not missing).

A.95 The second problem, the identification of outliers, is controversial but important; if an out-

lier is not identified as such, and consequently not re-estimated, the impact on analysis based on the variable could be serious. However, extreme values may arise for genuine reasons as well as because of errors, and it is important that these two cases are distinguished as far as possible. The procedures for identification of outliers depend again on the statistical process believed to be generating the variable. If the variable is believed to be normally, independently and identically distributed, then a simple criterion might be values lying more than a certain number (e.g., five) of standard deviations from the mean value (both mean and standard deviation being calculated only over non-zero values). The optimal re-estimate for values identified as outliers is the mean value (after the elimination of outliers). If the variable is believed to be generated by a linear relationship with one or more auxiliary variables, then standard methods for identifying outliers from regression residuals may be employed, the outliers being re-estimated using the predicted value of the equation for the household in question. [6]

A.96 The identification and re-estimation of outliers should be conducted at each level, starting initially at the annualized variable level (which should remove most of the outliers), then at the sub-aggregate(s) and aggregates level, adopting the same criterion in each case. Unfortunately, however, this does have the effect that in one or two instances the value of an aggregate may be inconsistent with the values of the sub-aggregates and annualized variables.

Conclusions

A.97 It should be clear by now that the estimation of superficially straightforward concepts such as "income" and "expenditure" is by no means a trivial exercise. Many significant and not completely resolved difficulties arise in defining precise concepts of income, expenditure and other household accounts variables. At a more practical level, the information provided by household surveys must be appropriately transformed and aggregated to build up as close an approximation as possible to the desired concepts. At an even more practical level, problems caused by missing observations and outliers must be tackled.

A.98 This chapter has discussed these problems and set out a suggested procedure for conducting this exercise of estimating household accounts from the SDA Integrated Survey. Nevertheless, it is recognized that analysts may wish to adopt slightly different procedures and, in particular, different definitions for the variables to be calculated. Consequently, a key element of this proposal has been to highlight the flexibility implicit in constructing a hierarchical data set comprising variables at three or more levels of aggregation but subsumed within a common household accounting structure.

A.99 Analysts wishing to use variables derived from the household accounts either as explanatory or dependent variables must define very precisely the concepts they require, bearing in mind the information that is available in the survey. A second important issue is the need for analysts to assess the reliability of the estimates they wish to use. While there are no objective means of assessing error available, some principles can at least be set out. Unfortunately, few instances of alternative estimates exist, although comparisons between total income and total expenditure can be used to provide an order of magnitude assessment. The danger of overestimation of the cross-household variance of an annual variable estimated by grossing up an estimate based on recall over short periods has been noted above. Items based on typical values can be expected to give less accurate estimates of the cross-household mean than items based on recall relating to a specific period. Also, items derived as a residual, such as saving, can be expected to be highly inaccurate.

A.100 As explained above, it is not possible to construct a complete and comprehensive set of household accounts estimates based on the Integrated Survey. In particular, several items in the capital account cannot be estimated, only very incomplete time use accounts can be constructed and the stock of outstanding household liabilities cannot be estimated at all. This may not be too serious, however; the problems may be endemic in that respondents may not be able to provide the requisite information, and, in any case, these items which cannot be estimated are generally not crucial for SDA purposes. The most important items are generally those contained in the household current account, the components of which can be estimated more or less from the questionnaire. However, there are some omissions which could be remedied in a straightforward way by adding a small number of questions to the draft questionnaire when it is being modified for implementation.

Annex: Detailed methodology for current account aggregates

The discussion in the text of this Appendix has stressed that in general there will be no single, unambiguously correct definition of measures of household incomes and expenditures. Ambiguities will arise both at the conceptual level and, much more significantly, in determining the concepts which respondents have in mind when providing monetary responses to questions. Nevertheless, a suggested definitional and methodological framework for the calculation of household current account aggregates is set out below.

The constituent components of each aggregate are set out along with an indication of the generic type of calculation used in transforming the variables into the measures required for inclusion in the aggregates. There is a limited number of such generic calculation procedures; thus these are represented by the letters a, b ... h, each referring to a particular category of calculation as defined at the end of this Appendix. Absence of a letter indicates that the questionnaire response may be used directly without any further calculation being necessary.

(1) Income from employment (and self-employment income)

A. Income from employment

(a) Main occupation	
Payment in money	a*
Value of bonuses received (if additional to money payment)	a
Value of payment in form of food, crops, animals	a
Value of payment in form of subsidized housing	a
Value of payment in form of subsidized transport	a
Value of payment in other forms	a
Estimated taxes and social security contributions paid (if wage quoted post-tax)	
(a) Income from main occupation	
(b) Secondary occupation	
Payment in money, including bonuses	a
Value of payment in form of food, crops, animals	a
Value of payment in other forms	a
Estimated taxes and social security contributions paid (if wage quoted post-tax)	b
(b) Income from secondary occupation	
(c) Third occupation	
Payment in money, including bonuses	a
Value of payment in kind	a
(c) Income from third occupation	
(d) Fourth occupation	
Payment in money, including bonuses	a
Value of payment in kind	a
(d) Income from fourth occupation	
(e) Fifth occupation	
Payment in money, including bonuses	a
Value of payment in kind	a
(e) Income from fifth occupation	

* This refers to the definition of the types of calculation that are performed on the responses derived from the IS questionnaire (see the end of the Table).

To calculate (IA) income from employment, the income from occupations in which the individual in question was self employed rather than a wage employee must be set to zero. Having done so

Income from Employment = (a) + (b) + (c) + (d) + (e)

To calculate employment income at a household level this should be aggregated over all individuals in the household.

B. Self employment income

(a) Main occupation

Payment in money	a
Value of bonuses received (if additional to money payment)	a
Estimated taxes and social security contributions paid (if wage quoted post-tax)	b
(a) Cash income from main occupation	

(b) Secondary occupation

Payment in money, including bonuses	a
Estimated taxes and social security contributions paid (if wage quoted post-tax)	b
(b) Cash income from secondary occupation	

(c) Third occupation

Payment in money, including bonuses	a
(c) Cash income from third occupation	

(d) Fourth occupation

Payment in money, including bonuses	a
(d) Cash income from fourth occupation	

(e) Fifth occupation

Payment in money, including bonuses	a
(e) Cash income from fifth occupation	

To calculate self-employment income, the cash income from occupations in which the individual in question worked as a wage employee as opposed to being self-employed must be set to zero. Having done so

Self-employment income = (a) + (b) + (c) + (d) + (e)

To calculate self-employment income at a household level this should be aggregated over all individuals in the household.

(2) Household agricultural income

(a) Revenue from sale of crops
(i) Staple grains, field crops and cash crops
Sales revenue through main outlet
Sales revenue through other sources
Value of crops given to landlord c
Value of crops used in processing c
Value of crops kept for seed c
Value of crops paid to labor c

Revenue from sale of crop,
aggregated over all crops in category

(a) (i) Revenue from sale of staple grains,
field crops and cash crops

(ii) Roots, fruits, vegetables and other crops harvested piece meal
Estimated annual sales revenue
Estimated value of crops paid to landlord c
Estimated value of crops used for processing c
Estimated value of crops paid to labor c

Revenue from sale of crop, aggregated over all crops in category

(a) (ii) Revenue from sale of roots, fruit, vegetables and other
crops harvested piecemeal

(b) Revenue from sale of processed or transformed crop products
Estimated value of sales of processed crops, d
aggregated over all categories

(b) Revenue from sale of processed or transformed crop products

(c) Other agricultural revenue
Value of sales of product, aggregated over all commodities

(c) Other agricultural revenue

(d) Consumption of own agricultural produce
(i) Grains and flours; roots and tubers; pulses, nuts and seeds; fruit
Estimated value of annual consumption, e
aggregated over appropriate commodities

(d) (i) Consumption of own agricultural produce I

(ii) Vegetables; meat and fish; livestock products; drinks
Estimated value of annual consumption, e
aggregated over appropriate commodities

(d) (ii) Consumption of own agricultural produce II

(e) Expenditure on crop inputs

Expenditure in cash and kind on crop inputs, aggregated over all input types	
Value of crops used as seeds I: staple grains etc., aggregated over appropriate commodities	c
Value of crops paid to labor I: staple grains etc., aggregated over appropriate commodities	c
Value of crops paid to labor II: roots etc., aggregated over all crops in category	c

(e) Expenditure on crop inputs

(f) Expenditure on inputs for transforming/processing crops

Value of crops used in processing I: staple grains etc., aggregated over all crops in category	c
Value of crops used in processing II: roots etc., aggregated over all crops in category	c
Labor costs, aggregated over all products	d
Other costs, aggregated over all products	d

(f) Expenditure on inputs for transforming/processing crops

(g) Expenditure on livestock inputs

Expenditure on livestock inputs, aggregated over all input types	

(g) Expenditure on livestock inputs

(h) Expenditure on land

Payment for renting plots, aggregated over all plots	
Value of crops paid to landlord I: staple grains etc., aggregated over all crops in category	c
Value of crops paid to landlord II: aggregated over all crops in category	c

(h) Expenditure on land

(i) Depreciation of agricultural capital assets

Estimated annual depreciation of assets, aggregated over all categories of asset	f

(i) Depreciation of agricultural capital assets

(j) Agricultural self-employment income in cash

Self-employment income calculated over agricultural activities only, summed over all individuals in household	

(j) Agricultural self-employment income in cash

Household agricultural income (estimate I)

= (a) + (b) + (c) + (d) - (e) - (f) - (g) - (h) - (i)

Household agricultural income (estimate II)

= (j) + (d) - (i)

(3) Net non-farm self-employment income

(a) Revenue received in cash

(i) Enterprise operating since last visit

Revenue received in cash, aggregated over all enterprises — g

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(a) (i) Revenue received in cash I

(ii) Enterprise not operating since last visit

Estimated revenue received in cash, aggregated over all enterprises — g

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(a) (ii) Revenue received in cash II

(b) Revenue received in kind

(i) Enterprise operating since last visit

Revenue received in goods and services, aggregated over all enterprises — g

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(b) (i) Revenue received in kind I

(ii) Enterprise not operating since last visit

Estimated revenue received in goods and services, aggregated over all enterprises — g

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(b) (ii) Revenue received in kind II

(c) Value of domestic consumption of output

(i) Enterprise operating since last visit

Value of domestic consumption, aggregated over all enterprises — g

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(c) (i) Value of domestic consumption of output I

(ii) Enterprise not operating since last visit

Estimated value of domestic consumption, aggregated over all enterprises — g

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(c) (ii) Value of domestic consumption of output II

(d) Current expenditure on inputs

(i) Enterprise operating since last visit

Annual expenditure on item, aggregated over all items and all expenditures — g

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(d) (i) Current expenditure on inputs I

(ii) Enterprise not operating since last visit

Estimated annual expenditure on item, aggregated over all items and all enterprises — g

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(d) (ii) Current expenditure on inputs II

(e) Depreciation of capital assets of non-farm enterprises

Estimated value of depreciation of asset, aggregated over all categories and all enterprises — f

---

(e) Depreciation of capital assets of non-farm enterprises

(f) Gross profit of non-farm enterprises
Annual value of profit used for own purposes, aggregated over all enterprises — g
Annual value of profit used for household purposes, aggregated over all enterprises — g
Annual value of additional profit, aggregated over all enterprises — g

(f) Gross profit of non-farm enterprises

(g) Non-farm self-employment income in cash
Self-employment income calculated over non-agricultural activities only, summed over all individuals in the household

(g) Non-farm self-employment income in cash

Net non-farm self-employment income (estimate I)
= (a) + (b) + (c) - (d) - (e)

Net non-farm self-employment income (estimate II)
= (f) + (b) + (c) - (e)

Net non-farm self-employment income (estimate III)
= (g) + (b) + (c) - (e)

(4) Actual and imputed rent

(a) Actual rent
Income from renting land
Income from giving land out for share-cropping
Income from renting draught animals
Income from renting agricultural equipment, aggregated over different items
Income from renting assets of non-farm enterprises aggregated over all enterprises

(a) Actual rent

(b) Imputed rent of owner-occupied dwellings
Imputed rent of owner-occupied dwelling — h

(b) Imputed rent of owner-occupied dwellings

Actual and imputed rent = (a) + (b)

(5) Remittances received

Current remittances received in cash, aggregated over all donors
Current remittances received as food, aggregated over all donors
Other current remittances received in kind, aggregated over all donors

(5) Remittances received

(6) Other income

Value of educational scholarship,
aggregated over all individuals
Income from social security/unemployment benefit
Income from state pension
Other income from government sources
Income from private pension/insurance
Income from dowry/inheritance
Other income

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(6) Other income

(7) Consumers' expenditure on food

Annual expenditure on commodity, aggregated over all commodities — g

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(7) Consumers' expenditure on food

(8) Consumption of home produced food

This is the counterpart of the corresponding income item (see 2(d) above) and is calculated in the same way.

(9) Consumption of home-produced non-food items

As with aggregate (8), this is the counterpart of the corresponding income item (3(c) above) and is calculated in the same manner.

(10) Non-food consumption expenditure

(a) Expenditure on education
School and registration fees
Contributions to parents' associations
Uniforms and sports clothes
Books and school supplies
Transportation to school
Food, board and lodging at school
Other expenses (clubs, extra classes)
Other in kind expenses

Expenditure on individual's education,
aggregated over all individuals

(a) expenditure on education

(b) Expenditure on housing
Rent paid in cash d
Rent paid in kind d
Imputed rent of owner-occupied dwellings

(b) Expenditure on housing

(c) Expenditure on household utilities
Annual value of water bills d
Private purchases less sales of water d
Annual expenditure on electricity d
Annual expenditure on garbage disposal d

(c) Expenditure on household utilities

(d) Other non-food household expenditures
Expenditure on taxes
Expenditure on weddings, dowry, funerals, other ceremonies
Expenditure on gifts and presents
Other miscellaneous expenditures
Annual expenditure on household item, aggregated over all categories g

(d) Other non-food household expenditures

(e) Use value of durable goods
Estimated use value of category of durables, aggregated over all categories j

(e) Use value of durable goods

Non-food consumption expenditure
= (a) + (b) + (c) + (d) + (e)

(11) Remittances paid out

Current remittances paid out in cash, aggregated over all recipients
Current remittances paid out as food, aggregated over all recipients
Other current remittances paid out in kind, aggregated over all recipients

(11) Remittances paid out

(12) Expenditure corresponding to employment income paid in kind

(a) Main occupation

Value of payment in form of food, crops, animals	a
Value of payment in form of subsidized housing	a
Value of payment in form of subsidized transport	a
Value of payment in other forms	a
(a) Employment income paid in kind, main occupation	

(b) Secondary occupation

Value of payment in form of food, crops, animals	a
Value of payment in other forms	a
(b) Employment income paid in kind, secondary occupation	

(c) Other occupations

Value of payment in kind: third occupation	a
Value of payment in kind: fourth occupation	a
Value of payment in kind: fifth occupation	a
(c) Employment income paid in kind, other occupations	

Expenditure corresponding to employment income paid in kind
= (a) + (b) + (c)

Definition of the calculation categories

a. Relates to the calculation of most of the employment income categories, where the wage rate (in cash or kind) is converted into a weekly rate and multiplied by the number of weeks the respondent worked in the past year. However, if the wage rate is expressed on an annual basis, no further transformation is required.

b. Relates to components calculated using information not included in the questionnaire. In practice this relates to estimates of taxes and employees' social security payments made by those quoting their wages post-tax.

c. Relates to the valuation of harvested crops used in payment, kept as seed, used for processing, etc. The quantity in a specific reference period is multiplied by a unit value and by 365 and divided by the number of days in the reference period. The unit value is estimated for each household by dividing sales revenue by the quantity of the crop sold.

d. Relates to the calculation of a number of revenues or expenditures in which payment in a specified reference period is multiplied by 365 divided by the number of days in the reference period.

e. Relates to the valuation of the consumption of domestic output of food, in which the frequency of consumption in a specified reference period is multiplied by the typical value of consumption on each occasion and by 365 and divided by the number of days in the reference period and by the number of months in which an item is consumed, expressed as a proportion of 12.

f. Relates to the estimation of the value of depreciation of producer durable goods based on their current value and the estimated depreciation rate. Specific methods of undertaking this are described in the text.

g. Relates to many of items in the production account of non-farm enterprises and to the majority of expenditures. The calculation is of the same type as 'd' above except that, additionally, an allowance for seasonality is made by multiplying by the number of months

in which the enterprise operated or in which a particular consumer item was purchased, expressed as a proportion of 12.

h. Relates to the estimation of imputed rent for owner-occupied dwellings based on hedonic equations relating the annual value of rent in cash and kind to the characteristics and amenities of the dwelling. See text for further details.

j. Relates the estimation of "use values" or imputed consumption flows of durable goods. This may be estimated as 'f' above, although in principle an interest opportunity cost should be introduced. See text for further details.

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