THE MEDIUM-TERM RELATIONSHIP BETWEEN PERFORMANCE INDICATORS AND POLICY: A CROSS-SECTION APPROACH

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Division Working Papers report on work in progress and are circulated for Bank staff use to stimulate discussion and comment. The views and interpretations in this document are those of the author(s). This paper reports on research undertaken on a project on "Performance indicators and policy instruments in the context of medium-term programs for debt-restructuring". A preliminary version was presented at the World Bank in October, 1985. We have benefitted both from the very useful comments received then and from ongoing conversations with members of the Bank, too numerous to be mentioned individually here. Special thanks, however, go to Ram Chopra and E. C. Hwa, who participated in the design of the project from the start, and to Bela Balassa for his constructive criticisms and his encouragement.
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I. INTRODUCTION.

Providing a framework for evaluating the adequacy of policy measures taken to improve medium-term economic performance ranks high on the agenda for policy research in the development area. Such a framework should prove useful in the definition and design of policy packages in the context of structural adjustment loans, other policy-based loans, or medium-term action programs for debt restructuring. One characteristic of these programs is their medium-term perspective, in contrast to more short-term, emergency-oriented, adjustment programs. They thus seek to reconcile payments adjustment with the continuation or resumption of economic growth, while offering sufficient reassurance about performance to allow for longer-term debt restructuring and for renewed capital inflows. The design, adoption, and successful implementation of such programs requires elucidation of, and agreement on, the nature of the relationship between economic performance and economic policy.

This paper explores one possible approach towards an empirically-based evaluation of the linkages between policy and performance in open, mainly developing, economies. Our investigation falls, broadly speaking, within the "performance indicator/monitorable policy instrument" approach to the design of policy packages, though it differs from existing studies in a number of ways. Among the distinguishing characteristics of our approach, one may mention its medium-to long-term focus, its attempt at simultaneous equation estimation, and its reliance on cross-section (cross-country) estimation. In addition, the distinction between exogenous and endogenous variables is emphasized, and medium-run controlability by the authorities
serves as the criterion of choice for policy instruments (or "indicators"). These methodological choices are motivated by the particular policy focus of the study, namely, to provide one possible general framework for the choice of policies to be included in broad, medium-term, monitorable packages that are, at least very roughly, comparable across countries.

The general choice of methodology and other conceptual issues are taken up in part II below. We begin by asking what constitutes a good indicator of economic performance and relate the choice of indicators to the use to which they are to be put. The specific focus of the study entails a choice of indicators that differs somewhat from those used in other studies, a few of which are briefly reviewed. Part II turns, next, to the definition of policy instruments and emphasizes medium-run controlability by the authorities. A number of issues concerning the relationship between instruments, targets and intermediate variables are taken up next. Part II concludes with a discussion of the type of empirically implementable framework and research strategy that is suggested by the foregoing considerations.

Part III reviews and evaluates existing evidence on the determinants of the performance indicators and "intermediate targets" selected for inclusion in the general framework to be estimated subsequently. The performance indicators include output growth, the current account, export growth, and inflation; the intermediate targets include the investment ratio, the real exchange rate, and the variability of inflation. The focus of this part of the paper is on evaluating existing evidence on the direct and indirect effects of selected "true" policy instruments on performance indicators and on assessing the robustness of this evidence. This review of existing results naturally suggests the type of equation system that is estimated in Part V. Prior to presentation of the estimation results, however, Part IV deals with the econometric issues involved. It discusses, in turn, structural vs. reduced-form estimation, endogeneity of policy indicators and instruments, cyclical vs. medium-term effects, and time-series vs. cross-section estimation.
Estimation results are presented in section V. They are based on a sample of 35 countries and on a subsample of 21 developing countries, selected on the basis of data availability. Results are presented and contrasted for performance over the 70-77 and 77-83 periods. Mainly because of unavailability of comparable series across countries for a number of variables, the specification of the estimated model falls somewhat short of the more ambitious specifications that the discussion in Section III would suggest. Nevertheless, though they point to the limitations of both the method and data of the present investigation, and of previous studies, the results are encouraging. Thus, fiscal variables appear to play an important role in determining performance, in the direction predicted by neoclassical models relevant to the medium to long run. It also appears that both inflation and variability in inflation are detrimental to growth. There appear to be no strong tradeoffs between adjustment and growth in the medium to long term. To us, these results derived from comparing the relationship between policy and performance across a group of widely differing countries lend broad support to policy packages of the "medium term action program" type.

The concluding section of the paper takes up some implications of both our negative and positive results for future research on the relationship between policy and performance, and for the use of this research in the design of policy packages. There are basically three possible approaches to the study of that relationship: cross section studies of the type presented here; looser, less structure-dependent, cross section models based on econometric methods such as Logit and Probit analysis; and detailed time series analyses of individual countries. To improve significantly on models of the first type (such as the one in this paper) would require a substantial effort at collecting data that is comparable across countries and detailed further work on the specification of individual equations. We indicate where that effort, if undertaken, should mainly bear. We also comment briefly on, and present a very preliminary
example of, the likely potential contribution of models of the Logit/Probit type. We conclude that, while these first two types of investigations can provide insights into the general strategy to be adopted in the design of policy packages across countries, there is no substitute for detailed time series investigation specific to the country for which such a policy package is being designed.
II. CONCEPTUAL ISSUES

This section discusses a number of general considerations which motivate the performance indicator approach and the type of model to be estimated in this paper. Specific current policy concerns are outlined in subsection 1 below. Some general issues in the selection and use of performance indicators and examples of previous studies of performance are taken up, respectively, in the next two sub-sections. The remaining three sub-sections deal with the choice of performance indicators, the definition of relevant policy instruments and indicators, and the implications of the discussion for our proposed framework of analysis.

1. The Policy Setting.

The simultaneous pursuit of external balance (adjustment) and internal balance (growth, employment and price stability) has long been a concern of individual countries' policy makers and of international economic agencies. Whereas the IMF has traditionally emphasized the first of these objectives rather than the second, growth through appropriate selection of investment projects and the adoption of structural adjustment programs has traditionally been the concern of international lending institutions such as the World Bank. The advent of the debt crisis, the plight of indebted developing countries, and the changing role of international agencies have heightened the need for the adoption of mutually agreed-on policy programs while changing their nature somewhat. In particular, though the short-run trade-off between growth and adjustment is the object of much current concern, emphasis has also increasingly been put on medium-run programs capable of sustaining growth while improving the long-run creditworthiness of countries. Hence the emphasis on lending based on policy packages, on medium-term action programs, and on the role of such programs in providing a "seal
of good housekeeping" to reassure financial markets in the short run as to countries' long-run creditworthiness.

Policy programs undertaken by countries to secure financial resources from international agencies in agreement with the latter and to reassure financial markets are likely to differ in design and scope from policy programs undertaken independently by individual countries. They must, in particular: a) be agreed on by both the country's authorities and the international agency; b) include standards of compliance, which implies that they must be monitorable; c) be designed in a way that insures even-handed treatment of the member countries of one and the same international agency; d) be of a medium to long-term nature if reassurance about long-run creditworthiness is to be achieved.

The first of these requirements implies that the objectives and means of the program are likely to be broadly drawn rather than detailed, both because too detailed a specification of the policy would represent an unacceptable infringement of the country's sovereignty and because the international agency is neither competent nor interested in the details of, say, the distributional goals of the government. The second implies that the program be stated in terms of performance standards (whether as to outcomes or instrument use is discussed below) that are easily monitored; this in turn means that performance indicators be measured by readily available, and timely, statistics. Thirdly, even-handedness carries with it two further requirements: that objectives and policy instruments be defined in a way that is broadly comparable across countries, which will usually mean that, in a first step, they not be too detailed and institution-specific; and that the relationship between targets and instruments that is exploited by the programs be relatively similar and stable across countries. Finally, the medium-run nature of the exercise requires that the program be stated in terms of relationships that are robust, and policy instruments that can effectively be controlled, over that run.

These requirements (and practical considerations) imply an approach to the design of policy programs that differs from that
suggested by usual theoretical formulations of the policy problem. In an ideal world with sufficient knowledge of the structure and dynamics of economies, complete structural models could be built and consistent policy packages that maximized the relevant intertemporal utility function could be designed. More modestly, one could set up the problem in terms of the targets and instruments approach pioneered by Tinbergen (1956) to offer policy makers a clear picture of the trade-offs between various targets of policy that could be achieved by the application of controllable and well-identified policy instruments. Unfortunately, the knowledge required for even this more modest approach is not readily available even on a time-series, individual country basis, much less on an internationally comparable basis. One is thus led to seek a basis for the design of policy programs that is more modest in its requirements as to data availability and detailed knowledge of structural relationships and that allows for international comparisons. It has been suggested that the analysis of the relationship between performance indicators and monitorable policy instruments may provide such a basis. The idea is to let economic performance with respect to the achievement of a given goal be proxied by some "indicator" and to relate the latter to some policy action or actions.

The empirical framework put forward in this paper relies, to some extent, on the performance indicator approach. The basic structure of our model is nevertheless rooted in the targets and instruments tradition. The discussion of the indicator approach and of individual studies in the next two sub-sections should help clarify the distinction.

2. Performance Indicators.

Performance indicators seek to measure performance with respect to the achievement of some objective. The latter can be either an ultimate goal of policy (e.g. maximization of a welfare function, or, more modestly, full employment) or a particular
policy objective that is not valued for its own sake (e.g. a certain rate of credit expansion or, perhaps, target current account). The objective with respect to whose fulfillment performance is being assessed can be quite specific (e.g. an x% rate of inflation or a y% rate of growth) or it can be quite broadly defined (e.g. efficiency or adjustment). Defining a performance indicator in the former case is relatively easy: the difference between the actual and target rate of inflation would appear to be, measurement problems apart, the best indicator of performance with respect to inflation. In fact, "performance indicator" is a basically redundant expression in this instance; target of policy would be a preferable and more accurate one. For more broadly conceived objectives of policy, such as adjustment, performance indicators are more difficult to define; it is also here that they are most useful.

Except in trivial cases, then, performance indicators are by nature short cuts. To reiterate, performance with respect to the achievement of some goal is proxied by some indicator which can then be related to some policy action. The exercise is both positive and normative. It is positive insofar as it yields estimates of the effects of various policies on various target variables (as proxied by the indicator) and thus provides evidence on the structure of an economy. It is normative since it distinguishes between good and bad performance and provides a basis both for policy advice and for the monitoring of policy actions.

In this light, it is only natural that the definition of performance indicators should depend on the purpose of the analysis and differ as between various studies. Whatever the use, however, at least four interrelated questions should be kept in mind lest performance indicators be misused:

Performance with respect to what? Macroeconomic performance has many dimensions and it is important to specify clearly with respect to what objective performance is to be assessed. The following readily come to mind: employment of resources relative
to existing potential output; growth of potential output; external adjustment towards a sustainable structure (and level) of the balance of payments in the long run; capacity to service debt; income distribution; price level and/or output stability. These are broad macroeconomic objectives which can, in turn, be broken down into finer or "intermediate" targets. Thus, measures of over-all or sectoral efficiency might be one "performance indicator" relevant to ultimate performance in terms of maximizing the growth of potential output. The preceding remarks draw attention to two points: that performance measures of necessity require identification of some target or optimum level of performance (what is potential output, maximum growth, or the sustainable current account?) and that the multiplicity of possible performance criteria may well entail some trade-offs among performance objectives in practice.

Performance in terms of "ultimate" goals (outcomes) or in terms of instrument setting (compliance)? Here we need to distinguish between performance of the economy and performance of the policy authorities. The former is, as noted above, fairly easy to define and measure when the objective is relatively specific. For instance, a good measure of growth performance is the actual rate of growth of the economy, however difficult it may be to define the optimum rate of growth with which actual growth performance is to be compared. What constitutes a good growth policy is another matter; it depends partly on the links between some identifiable intermediate target such as "pricing efficiency" and growth, and on the links between the former and some specific identifiable (monitorable) instrument of policy such as the structure of tax rates, the allocation of government spending as between consumption and investment, and/or the allocation of that investment among various sectors of the economy. The distinction between performance in terms of outcomes and in terms of compliance is important in policy discussions: for instance, should IMF conditions relate only to outcomes with respect to payments adjustment (e.g. a stated reduction in the current account deficit) or to compliance with
some performance criterion stated in terms of maintaining an instrument of policy (e.g. domestic credit growth) within a specified range? Preference for the latter is based on three observations: that reduction in the deficit may be forced on the country anyway and that more fundamental adjustment measures may not be taken if performance is stated in terms of balance-of-payments outcomes, that unforeseen external events may call for a larger or smaller reduction in the deficit than initially envisaged, and that the whole point of a program is that proper policies be undertaken in order to achieve a given outcome.

More generally, interest attaches to policy-performance indicators, (a) when outcomes are delayed or subject to a substantial margin of uncertainty since such indicators constitute one yardstick of whether a country deserves support and (b) as estimating, at least roughly, the relationship between monitorable policy indicators and economic performance indicators is an essential ingredient in the design of policy programs. For the policy performance indicators to serve as a useful element in such programs, however, it is important that they be controllable, at least roughly, by the authorities, i.e. that they be closely related to, or stated in terms of, the levels or rates of change of policy instruments actually controlled by the authorities. They should thus be as close as possible to "instruments" of policy in the traditional targets and instruments framework.

Performance as compared to time series or cross-section benchmarks? Performance must be gauged relative to some standard or benchmark. Some of the difficulties involved have been mentioned above. Beyond these, there are basically two types of benchmarks: international comparisons across countries and time series analysis for a given country. The former will be particularly useful if countries are to be ranked according to performance with respect to the achievement of some objective or policy stance, or if performance with respect to some common objective is to be related to a broad policy stance that differs across countries but is relatively stable in a given country.
through time. Such cross-country analysis is an important element in the search for norms of good behavior that are generally applicable across countries. It can thus help identify the elements of a general framework for policy programs that is applicable across countries. The design of an actual policy program for a given country, however, requires a time series investigation of that particular country and the setting up of performance criteria drawn up on the basis of measures of actual (or desirable) objectives and policy instruments specific to that country.

To what use are specific performance indicators to be put? It should be obvious that the choice and design of indicators of economic or policy performance should depend on the intended use of these indicators. For instance, an essentially qualitative indicator of trade policy stance (or "efficiency") may be appropriate to rank countries by "outwardness" versus "inwardness": such an indicator may not be appropriate to gauge the extent of a change in tariffs or the latter's effect on the balance of trade, or on some other variable. This issue will be expanded on below.

3. The Uses of Performance Indicators: Some Examples.

Performance indicators have gained some popularity in the work of the World Bank. They have been used, on the one hand, in the allocation of lending process (i.e., "country performance ratings") and in SAL reviews. They have been used, on the other hand, in more analytical work seeking (a) to measure policy performance and (b) to relate such measures either to policy instruments or to economic performance. Four such studies are of particular interest here: Balassa (1983), Balassa (1984), Balassa and McCarthy (1984) and Martin (1984).

1Hence the use of cross-section data in studies of the effects of trade barriers or other distortions on growth.
Of these, Balassa and McCarthy (1984) is perhaps the best known. It analyzes the policy response of developing countries to external shocks; to do so it develops performance indicators which indicate the extent to which a number of "policies" (export promotion, import substitution, and macroeconomic policies) have been used to adjust to external shocks to the balance of payments. An indicator of domestic adjustment to external shocks is developed and inter-country differences in this indicator of adjustment performance are explained by specific policies, namely, exchange rate, energy price, monetary and interest rate policies. The thrust of the study, then, is to relate adjustment performance to specific policies (or policy instruments). Balassa (1983), in contrast, relates inter-country differences in economic growth to differences in factor supply growth, on the one hand, and to the stance of trade policy and the type of adjustment policy pursued, on the other hand. Indicators must be developed for these last two variables: the stance of trade policy is classified as outward- or inward-oriented by means of a regression that determines "normal" levels of exports per capita as a function of a few variables; similar performance indicators as those in Balassa and McCarthy (1984) are used to measure adjustment policy. Growth performance is shown to be positively affected by outwardness in trade policy and by reliance on export promotion as an adjustment policy to unfavorable external shocks. Finally, Balassa (1984) examines the relationship between indicators of debt-servicing capacity, of debt management performance if you wish, to trade policy stance and type of adjustment strategy pursued. The results again show a positive relation between debt management performance, outward orientation and reliance on export promotion in adjustment to external shocks.

Martin's study (1984) is an attempt to relate performance indicators to policy variables (or "indicators") through pooled cross-section and time series analysis of a large sample of developed and developing economies. The method is to regress in turn five performance indicators (the rates of growth of GNP,
exports, imports, prices and the saving to GNP ratio) on a number of policy variables or indicators including fiscal variables, the ratios of import and export taxes to GNP, the ratio of money to GNP, as well as on the growth rates of several relative prices including prices of exports, imports, agricultural products and the real exchange rate. In addition, Martin attempts to obtain an estimate of the effects of trade restrictions by using an index of the extent of trade restrictions; he also adds real domestic interest rates and a ratio of domestic to international energy prices, taken from Balassa and McCarthy, to the set of policy indicators for a subsample of countries. The results are preliminary and rough but the exercise yields a number of interesting insights. Martin's motivation for his particular choice of performance indicators is worth noticing. As he puts it, his study seeks "a set of policy indicators which, supplemented with country judgement, can be used to provide a seal of good housekeeping to a country engaged in a medium-term restructuring exercise with commercial banks" (Martin (1984), p.1).

The analysis of the relationship between performance indicators and monitorable policy instruments, then, could potentially contribute to the design of so-called "medium-term programs for debt restructuring". Such programs, as defined in the introduction to this paper, seek to reconcile payments adjustment with the continuation or resumption of economic growth, while offering sufficient reassurance about performance to allow for longer-term debt restructuring and for renewed capital inflows. This definition suggests that the three "performance indicators" examined in the three Balassa papers mentioned above be investigated simultaneously, that they be related to a set of policy variables, and that the methodology suggested by Martin, suitably modified, could provide a point of departure. Such an approach may help focus on a number of monitorable policy variables that are roughly comparable across countries. It is followed in this paper. However, before proceeding further, it will be helpful to indicate how the exercise we
undertake differs from the studies referred to above, both in focus and in method.

The first contrast with at least some existing studies is the medium to long-run (rather than short-run) perspective we take. Our concern is with policies appropriate to ensure long-term growth and debt restructuring rather than with short-run adjustment to external shocks. As a consequence we are more concerned with supply than with short-run adjustments in aggregate demand and our "model" has a distinctly neo-classical flavor. In such a context, short-run conflicts and trade-offs between internal and external balance also tend to disappear.\(^2\)

Furthermore, the medium-term character of the analysis indicates the choice of the relevant policy instruments to be investigated. Specifically, variables that may be controllable in the short run (such as the real exchange rate) may not be controllable in the medium to long run and are therefore not included as policy instruments; and variables that may not be relevant policy instruments in the short run, such as tax structure or trade policy stance, may legitimately be included in the list of policy instruments in the longer run.

Second, the approach is a cross-section rather than a time series one. There are two main motivations for this choice. On the one hand, the purpose of the analysis is to search for a few broad relationships between policy tools and economic performance that appear robust across countries. On the other hand, only comparisons across countries allow you to gather evidence on the effect on performance of differing "policy regimes" that are stable in given countries.

Third, simultaneous equation rather than reduced-form methods of estimation are used. This derives partly from the need to distinguish more clearly than is sometimes done those

\(^2\)It is interesting to note here that the Balassa and Balassa and McCarthy studies referred to above indicate that at least some policies have a favorable impact on all three performance indicators (adjustment, debt management and growth).
variables that are exogenous from those that are endogenous, especially from the point of view of the policy process. It should also shed more light on the structure of the relationship between target and instrument variables, help to avoid mistaking statistical relationships between instruments and targets for causal ones, and allow for some appreciation of trade-offs among various targets or performance indicators. It is, finally, the appropriate method for policy exercises that rely on the targets and instruments tradition.

Our investigation does, broadly speaking, fall into that tradition. We do not, as is sometimes done in the indicator approach, attempt to rank countries on a scale of good to dismal performance with respect to any single indicator. Rather, we try to relate policy instruments to performance indicators as if the latter were actual targets of policy, which they may or may not be. The choice of indicators is, in turn, based on the broad view of the variables relevant to the ultimate goal of "growth consistent with external balance and long-run creditworthiness" which emerges from the considerations mentioned in the next two sub-sections and from the literature discussed in Part III.

To conclude this discussion, it may be worth indicating the role that investigations of the present type can play in the policy advice process. Policy advice usually involves specifying a policy package designed to reach some agreed-on goals on the basis of an understanding of the relationships linking policy actions to economic outcomes. In the present context, it involves, in addition, the possibility of monitoring the implementation of the package and the exercise of conditionality in an internationally even-handed way. To recommend with any confidence that a country should, say, lower its corporate tax rate and/or food subsidies while expanding domestic credit by no more than ten per cent per annum requires a country-specific, time-series model, if only to gain some insight into the trade-offs
that are involved for that specific country.³ A cross-country study is no substitute. But it would be comforting to have some estimate of the type of relationships between these variables that holds across countries if only to be able to answer the question "what international evidence do you have that this broad type of policy package may actually work".

4. The Choice of Performance Indicators.

To each concept of performance there correspond many potential indicators.⁴ Narrowing the choice requires that the performance to be evaluated, the policy package that is to be designed, and the purposes of the analysis be specified. In the present context, the purpose is to gain some understanding of the relationship between policy and medium-term performance with respect to growth and debt restructuring. The discussion that follows is designed to narrow down the list of variables that might serve as performance indicators to manageable proportions. The list that is retained is discussed further and refined in Part III in the light of the existing literature on each of the retained variables.

A country's capacity to manage and restructure its external debt is constrained, in the first instance, by two inter-related factors: servicing its existing debt requires either that it generate a current account surplus or that it be able to increase its existing debt without violating intertemporal budget constraints. With much of the existing debt being the liabilities of central governments, debt service also becomes a fiscal problem in that part of current tax and non-tax revenues must be

³See Yagci, Kamin, and Rosenbaum (1984) for an ambitious view of what the design of medium-term policy packages (e.g. SAL programs) should ideally involve.

⁴For a lengthy shopping list of performance and policy indicators in the context of World Bank programs, see Clague (1984).
devoted to interest and amortization payments. This suggests that both the current account and the budget balance be considered as performance indicators. Hence one can place both

(1) the current account change, and
(2) the government budget balance

in the category of performance indicators.\(^5\)

The capacity of a country to increase its debt depends importantly on its ability to service that increased debt in the future. This in turn is likely to be greater the larger the expected level of output and exports in the future. Following this line of argument, it thus seems appropriate to include

(3) the rate of growth of output, and
(4) the rate of growth of exports

in the list of performance indicators. Other variables indicative of general economic health may also be important determinants of subjective evaluations of a country's capacity to carry debt. Examples might include:

(5) the rate of price inflation, and
(6) the degree of structural distortions in the economy, to mention only two.

In addition to the above indicators of performance a number of variables might be of interest because of their direct or indirect influence on the former. Among these, sometimes dubbed intermediate targets, one might mention in particular

(7) the rate of investment, and
(8) the real exchange rate.

\(^5\)It should be noted, however, that the current account is an ambiguous indicator: an improvement in that account may be forced on a country by its inability to restructure or increase its current debt. Thus, one would want to use some measure of current account performance adjusted for unfavourable changes in debt service, due, for instance, to world-wide increases in interest rates. It should also be noted that while the budget balance is a measure of performance, for reasons described in Part IV we shall treat it as an exogenously determined variable under the control of the government in the empirical part of the paper.
How to treat such intermediate variables in the type of model to be estimated here is discussed further below.

5. Relevant Policy Instruments and Indicators.

A policy instrument must have the property of being directly controllable by the relevant policy authority. To be of interest in the current context it must also have a significant direct or indirect effect on one or more performance indicators. The former requirement as well as our medium-term perspective implies that a number of variables that are commonly assumed to be instruments of policy turn out not to be. Examples that come to mind are the real interest rate, the real money supply, and the real volume of domestic credit outstanding. Similarly, the real exchange rate may or may not be a policy instrument depending on the specific nominal exchange-rate and monetary policies pursued. While fluctuations in these variables may be dominated by government policy actions in the short run, it is likely that they contain a substantial endogenous element in the medium run. What can be directly influenced in this case are the nominal values of these variables and, for instance, the share of domestic credit that is absorbed by the government sector.

Related comments apply to variables such as government revenues and taxes. In the short run at least, these variables are determined to a large extent endogenously by business cycle fluctuations. A medium-term focus is likely to make them behave more like true instruments of policy, but care should nevertheless be exercised in employing them.

In addition, some variables commonly assumed to be policy instruments may often not be independent of each other. For instance, in a country where the real exchange rate is kept fairly constant through a passive crawling peg policy, the rate of growth of the money stock cannot be assumed to be an independently controllable instrument. Again, in the medium to long run the nominal exchange rate and the money stock are not independently manipulable instruments.
An indicator of government policy need not be directly controllable by the authorities. It should, however, be highly correlated with policy instruments, and influences from other sources should either be small or susceptible to removal by statistical methods. Examples of indicators may be the money supply (when the central bank controls only the monetary base), tax revenue (when the government sets tax rates), or the difference between official and black market exchange rates (where exchange controls drive a wedge between them). There are two senses in which such policy indicators can be used in the analysis. To borrow a leaf from the instruments and targets of policy literature as applied to monetary policy, they can be considered as intermediate targets of policy or as indicators of the stance of policy. While the former may be useful in the presence of limited information, it is not clear that indicators of policy stance have a useful role to play in the policy-making process itself though they may help in the monitoring process.6

Which specific policy instrument is likely to be important in a given context can only be determined by careful consideration of the determinants of the performance indicator at hand. Our choice will be made on the basis of the review of the literature in Part III.


The preceding discussion suggests that one might be able to define a number of performance indicators, intermediate targets, policy indicators, and policy instruments relevant to the particular policy problem of interest. In addition, exogenous variables other than policy instruments and endogenous variables other than performance indicators or intermediate targets will influence the level of and relationship between targets and

6See Friedman (1975) for a very useful discussion and survey of the targets-instruments approach and a discussion of the indicator problem that is relevant here, even though it is developed in the context of monetary policy.
instruments. To put the matter somewhat formally, consider the following definitions where each variable name should be thought of as representing a vector of variables and not just a single one:

\[
\begin{align*}
Y_1 &= \text{performance indicators} \\
Y_2 &= \text{intermediate targets} \\
Y_3 &= \text{policy indicators} \\
Y_4 &= \text{other endogenous variables} \\
\end{align*}
\]

\[
\begin{align*}
X_1 &= \text{policy instruments} \\
X_2 &= \text{other exogenous variables} \\
\end{align*}
\]

The vector of other exogenous variables would include such variables as the terms of trade, foreign output growth, foreign interest rates, etc. A "structural" model linking all six of these types of variables will in general take the stylized form

\[
\begin{align*}
Y_1 &= F_1(Y_2, Y_3, Y_4, X_1, X_2) \\
Y_2 &= F_2(Y_1, Y_3, Y_4, X_1, X_2) \\
Y_3 &= F_3(Y_1, Y_2, Y_4, X_1, X_2) \\
Y_4 &= F_4(Y_1, Y_2, Y_3, X_1, X_2) \\
\end{align*}
\]

From a policy point of view, it is the relationship between \(X_1\) and \(Y_1\) that is of principal interest. In fact, the "structural" model above is cast in the same form as the statement of the target-instrument approach to policy proposed by Tinbergen, where variables are divided into four categories: target variables (our performance indicators); remaining endogenous or "irrelevant" variables \((Y_2, Y_3, Y_4)\); instrument variables \((X_1)\); and other pre-determined or exogenous variables, dubbed "data" \((X_2)\). 7 Though it is the relationship between \(Y_1\) and \(X_1\) that is of primary interest, derivation of policy multi-

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7 See Friedman (1975) for a discussion.
pliers requires knowledge of the relationship between all four (or six) types of variables.

The problem is of course to estimate these relationships empirically. This is the task of Part V.
III. A SELECTIVE REVIEW OF THE LITERATURE.

The previous section has identified a number of relevant performance indicators, intermediate targets, and policy instruments. The empirical part of this study will attempt to identify the main relationships between these groups of variables to help evaluate the contribution of policy measures to economic performance. The design of the econometric model is influenced by the evidence presented in previous studies of several of the relationships involved. In this section we review this evidence to provide answers to two main questions: (i) which specifications appear to receive strong enough support that they should be retained in an overall model, and (ii) what are the crucial additional equations that must be included in a reasonably comprehensive view of the links between policy instruments and economic performance. Studies dealing directly with our performance indicators will be taken up first, followed by a review of the empirical work relating to intermediate target variables.

1. The Growth Rate of Output.

When the purpose of the analysis is to investigate sources of medium-term movements in output rather than short-run fluctuations, a natural framework is one based on conditions of supply, i.e. on aggregate production functions. Factors related to aggregate demand can reasonably be ignored for two reasons. In the first place, they are relevant mainly to explain deviations from trend (i.e. cyclical movements) in output. In the medium- to long run these deviations will be unimportant. Secondly, to the extent that world-wide demand fluctuations are the main source of cyclical movements in output, cross-country comparisons will be
independent of demand factors. Several relatively recent studies have used the production function approach in cross-country comparisons of the sources of growth.

The point of departure of these studies is a production function of the general form (III.1).

\[ y = F(K, L, O) \]  

(III.1)

where,

\[ y \]  - the level of real output
\[ K \]  - the existing capital stock in the economy
\[ L \]  - the labor force
\[ O \]  - other variables affecting output.

Differentiation yields

\[ dy = F_k dK + F_L dL + F_O dO \]  

(III.2)

or,

\[ \frac{dy}{y} = a_0 + a_1 (I/y) + a_2 (dL/L) + a_3 (dO/O) \]  

(III.3)

where,

\[ I = dK \]  - the rate of (net) investment in the economy
\[ a_0 \]  - a constant
\[ a_1 = F_K \]

It will be true, however, that a general change in foreign demand will have differentiated impact on various countries' exports to the extent that the composition of exports and the share of the latter in output differ across these countries. This factor is taken up in our discussion of export demand and in the specification and estimation of the model in Section V.

See, for instance, Feder(1982), Hwa(1983), Kormendi and Meguire(1984), Marsden(1983), and Robinson(1971). Further references can be found in these studies.
The studies cited in footnote 1 have quantified the relationship between output growth and the independent variables in (III.1) by estimating the parameters in equation (III.3) with time series as well as cross-country data. In so doing, a number of "other variables" were included since the use of only the investment ratio and the growth of the labor force leave large unexplained residuals. We shall list the most important (in the sense of contributing significantly to the explanation of the dependent variable) of these and indicate briefly the justification for their inclusion.

Growth of exports. To the extent that trade restrictions result in a pattern of specialization that does not exploit a country's comparative advantage, output will be lower than it otherwise would be. In this case shifting resources to the export sector increases the aggregate level of output. The rates of growth of exports and total output will be positively correlated. Feder (1982) formalizes this argument by considering a two-sector economy, exportables and goods for the home market, and hypothesizing, on the one hand, that marginal productivities of factors of production are higher in the export sector than in the home-goods sector and, on the other hand, that export production gives rise to external economies in the home-goods sector. The latter effect acts much like neutral technological progress in that it increases production without affecting the marginal products of factors.

Feder's empirical results based on cross-section regression analysis of 31 countries reveal a strong positive effect of export growth on overall GDP growth and give statistically
significant estimates of both the externality effect and the intersectoral difference in factor productivities.\footnote{The validity of the inference one can draw from the regression estimates is unfortunately called into question by the fact that one of the regressors, the rate of growth of exports, is almost certain to be correlated with the error term in the equation rendering the coefficient estimates based on the ordinary least squares method inconsistent. It is difficult to evaluate the quantitative or qualitative importance of this problem. Our estimation technique is chosen so as to avoid this problem.}

Growth of agriculture. Using an argument similar to that described above, Hwa (1983) hypothesizes that the rate of growth of agricultural output should influence the overall rate of growth in the economy through its effect on productivity change. The latter effect is said to exist for two different reasons. On the one hand, a high rate of growth of agricultural output is necessary to support an increasing population involved in high-productivity industrial activity. On the other hand, rapid growth in agriculture is likely to be a reflection of high quality of human and physical capital resources in the rural sector; the process of transfer of resources from the agricultural to the industrial sector in the course of the development process is thus likely to involve higher-skilled labor and hence be more conducive to growth.

In cross-country regression analysis (56 countries of which 41 developing) for the decades of the sixties and the seventies Hwa finds a strong effect of agricultural growth on overall GDP growth.

Factor transfers. Robinson (1971) made use of the hypothesis that there are differences in factor productivities between sectors of the economy to derive an equation in which the overall rate of growth depends positively on the speed of factor transfer from the backward (agricultural in his classification) sector to the modern (industrial) sector. In the empirical tests, the rate of factor transfer was measured by the change in the share of the
population living in cities and by the change in the share of output originating in non-agricultural sectors. Only the former of these two variables provided a statistically significant explanation of cross-country growth patterns.

**Foreign exchange.** It is common to argue that the availability of foreign exchange limits the ability of an economy to accumulate capital when investment goods are imported, and that therefore the existing stock of foreign exchange should appear in the production function. However, if the investment ratio is already present as an explanatory variable (cf. eqn. III.3) then such an effect will already be captured. To the extent that the availability of foreign exchange does possess some explanatory power, it may be because the marginal efficiency of investment is improved if more foreign exchange is available to purchase foreign-produced rather than domestically-produced capital goods.

Measurement problems are likely to be severe for this variable, particularly if there exists at least some possibility for external borrowing to finance imports of investment goods. Thus it would seem that some measure of the potential availability of foreign exchange should be used. Robinson's (op.cit.) use of the ratio of the current account balance to GNP may be justified on these grounds. He found that this variable entered his output regressions significantly and with a positive sign.

**Variability of monetary policy.** Recent research on the effects of monetary shocks on prices and output has stressed the possibility that variability of monetary policy reduces the efficiency of an economy by making it more difficult for economic agents to extract the correct relative price signals that underlie efficient resource allocation. Barro(1980) suggests that this problem may be particularly pronounced in the case of the real returns on alternative investment projects. The added uncertainty brought about by monetary variability should thus
lead to less investment and hence less growth. The increased likelihood of misperception of relative prices and returns should lower the efficiency of the economy and lower its rate of growth for any given rate of investment. Kormendi and Meguire (1984) find evidence for the existence of both effects in a cross-section study of 47 countries.

**Inflation.** For reasons similar to those mentioned in the case of monetary variability, it might be expected that inflation will have a negative influence on economic growth. It is well established that increased inflation is associated with increased variability of relative prices and therefore presumably with increased uncertainty and decreased efficiency of the economy. Hwa (op.cit.) furthermore suggests that high inflation is likely to be accompanied by government controls on nominal interest rates, giving rise to credit rationing at below-equilibrium real rates and a misallocation of capital. Against these effects that predict a negative relationship between inflation and growth must be mentioned the so-called Tobin-Mundell effect, which predicts that higher inflation will lead to a substitution away from real money balances toward real capital, and hence will induce more rapid economic growth. Theoretically the net effect of inflation is thus ambiguous. Empirically, however, the negative influence seems to dominate.\(^{11}\)

**Taxes.** Taxes influence economic behavior in a number of ways, depending on the type of tax that is considered. The corporate income tax is likely to have a restraining influence on investment, whereas a payroll tax creates disincentives for employment. Similarly, export taxes and import tariffs work to

\(^{11}\)In both the Hwa and the Kormendy-Meguire studies the negative effect dominates although in the latter the coefficient is not statistically significant. The stronger effect found by Hwa is probably due to the fact that his sample contains a larger proportion of developing countries for which the distorting effects of government controls on interest rates in the case of high inflation are stronger.
switch production patterns toward import-competing goods. Although the channel of influence differs from one tax to another, the end result in all cases is a misallocation of resources and reduced economic growth. In a study of 20 countries for the period 1970-79, Marsden (1983) finds statistically significant evidence that the tax-to-GPD ratio reduces economic growth. In addition, Marsden finds that the tax ratio influences factor productivities as well as the growth rates of capital and labor. A recent study by Martin (1985), however, casts doubt on the robustness of Marsden's results.

On the basis of the evidence reviewed, there is no doubt that the investment ratio and the rate of growth of the labor force constitute important sources of inter-country differences in growth rates of GNP (or GDP). Likewise, the empirical evidence suggests that inflation, monetary variability, and the Tax/GNP ratio retard growth as predicted by theory. Although the studies by Feder and Hwa also find strong relationships between export growth and agricultural growth, respectively, and overall GNP growth, one should be cautious in interpreting these as causal relationships. In addition to the doubts already raised concerning the consistency of the coefficient estimates in the Feder study, it should be kept in mind that since agricultural output and output from the export sector constitute sub-components of GNP, there exists a direct link between these variables, irrespective of the validity of the hypothesis being investigated. The econometric technique used to estimate the proposed relationships should thus take into account the existence of simultaneity and feedback between output growth, the investment ratio, agricultural growth, and the growth of exports.

Finally, it is useful for future reference to establish how, if at all, directly controllable policy instruments affect growth. Among the many explanatory factors tried, only the Tax/GNP ratio can be said to be a true policy variable. Many of the other variables are themselves influenced by policy, however, leading to the potential for indirect effects of policy on growth. These indirect effects will be discussed below.
2. The Growth Rate of Exports.

The rate of export growth is the outcome of an interaction between factors influencing foreign demand for domestic goods and factors affecting domestic supply. We shall discuss each of these in turn.

a. Export demand.

The simplest demand function for aggregate exports that incorporates both relative price and income effects is

\[ X^D = X^D( Y^*, P_X/E, P^*) \]  

where \( Y^* \) stands for foreign real income, \( P_X \) for the domestic price of exports, \( E \) for the nominal exchange rate, and \( P^* \) for the foreign-currency price of foreign goods competing for foreign markets with domestic goods. In a recent survey Goldstein and Khan (1985) report that substantial empirical support for this general specification can be found in time-series studies. We shall consequently adopt it here.

b. Export supply.

In the absence of detailed identification of the exact sources of aggregate GNP growth in each country one would expect that growth of export supply would proceed at the same rate as GNP growth. In particular cases a number of possibilities exist that would bias the growth process to a more or less large extent in favor of or against exports.\(^1\) In the Heckscher-Ohlin-Samuelson framework, the relative factor intensity of the export sector, the change in the country's overall factor-endowment ratio, the factor-bias in the rate of technological advance, and the income elasticity of domestic demand for exportables are all important variables. In an aggregative cross-country study like the present one, these

\(^1\)See, for instance, H. G. Johnson (1962) for a clear classification of various forms of biases.
variables cannot be easily measured and will be neglected in the following. As a basic determinant of export supply we shall therefore use domestic real GDP.

Given the level of GDP, the size of the export sector depends on the internal terms of trade between exportables and other sectors of the economy. These internal terms of trade are in turn dependent on the external terms of trade, as well as on domestic trade policy measures. For instance, import tariffs will increase the internal price of import-competing goods, $P_M$, relative to both non-traded goods, $P_N$, and exportables, $P_X$. While the change in $P_M$ depends only on the size of the tariff (assuming, realistically in our context, that the country in question does not have any monopsony power in the market for its import goods), the increase in $P_N$ depends in a complicated way on the substitutability relationships that exist in consumption as well as in production between the three goods.\(^{13}\) Empirical estimates for a number of developing countries indicate that between 50 and 70 percent of a tariff-induced increase in import prices will be shifted onward to non-traded goods and will in the process reduce the price of exportables relative to non-traded goods by somewhere between 30 and 50 percent.\(^{14}\) Export production is thus doubly hurt by restrictions on imports.

In order to raise revenue, governments sometimes impose export taxes in addition to import tariffs. This would increase the disincentives for export production even further. One would thus expect that countries that have relatively high foreign trade taxes should show a comparatively poor export performance. Marsden\((\text{op.cit.})\) indeed finds empirical evidence supporting this hypothesis in his cross-country regression analysis.

These types of considerations suggest that the relationship between taxes and export performance must be extended in a more detailed analysis. First of all, looking only at total import and export tax revenue does not show the additional distortions

\(^{13}\)See Sjaastad\((1980)\) for details.

\(^{14}\)Clements and Sjaastad\((1984)\).
brought about by highly differentiated tax rates on different industries. Similarly, the possibly very uneven rates of effective protection are not captured by the total tax measure. Secondly, even if one considers total exports and imports, one should ideally focus on tax rates (and tariff rate equivalents for quotas) rather than on tax revenues as a proportion of GNP, as a prohibitive tariff yields no revenue but is highly distortive. Thirdly, it is of course possible that various forms of export incentives re-establish a more even incentive structure between import-competing and export production. Thus, Balassa (1978) presents evidence showing that export incentives in eleven major developing countries can explain certain aspects of differences in their export performance.

Based on the above discussion, an export supply equation should, at the least, take the form

\[ X^S = X^S(Y, P_X , E^p , P_N , TRTAX) \] (III.5)

where TRTAX = (Trade tax revenue/Value of trade).\(^{15}\) If available, a measure of the size of export incentives and a measure of the dispersion of import- and export taxes across industries could also be taken into account. Since all these variables are under the control of the government, we have a direct link between policy variables and a performance indicator.

\(^{15}\) Ideally, the export supply equation should take the form

\[ X^S = X^S(Y, EP_X^*(1+s), EP_m^*(1+t), P_N) \]

where \(s\) is the rate of subsidy (or tax if negative) on exports, \(t\) is the tax rate on imports, \(P_X^*\) and \(P_m^*\) are the world market prices of exports and imports respectively. Problems of data availability and comparability lead us to substitute \(P_X\) for the second argument in this function and to add the TRTAX term to capture the effect of export taxes and subsidies. Similarly, \(E^p\) is included rather than \(P_m\) because of data problems.
Equilibrium in the export market will determine both the price and the quantity of exports as functions of import prices adjusted for exchange rate movements, the size of trade taxes, domestic and foreign real income, and the price of non-traded goods. This last variable is itself influenced by import prices as well as factors influencing the demand and supply of non-traded goods. In our empirical work we attempt to identify both demand and supply functions for exports as well as an equation for the relative price of non-traded goods. As we shall see, only the first of these attempts will give satisfactory results.\textsuperscript{16}

3. The Current Account Balance.

The current account of the balance of payments must \textit{ex post} be equal to the fiscal surplus of the government plus the difference between private saving and investment, national income accounting identities oblige. Introducing the following notation:

- \( CA \) = Current account surplus
- \( G \) = Government expenditures
- \( T \) = Government revenues
- \( S \) = Private sector saving
- \( I \) = Private sector investment

we have,

\[
CA = (T - G) + (S - I). \tag{III.6}
\]

\textsuperscript{16}Lack of success in identifying the export supply function is perhaps not surprising. As Goldstein and Khan (op.cit.) indicate, such supply functions have been identified only for industrial countries and in a time-series setting. Moreover, these few estimates have been obtained for disaggregated export categories and vary widely across studies and countries.
In view of this relationship, and in view of the fact that the current account also represents the difference between an economy's exports of goods and services and its imports of goods and services, two distinct approaches to the determination of the current account can be found in the literature. On the one hand, those who think in terms of the difference between exports and imports are naturally led to consider relative prices such as the terms of trade and the (real) exchange rate as crucial variables. On the other hand, those who look at the right-hand-side of (III.6) are more prone to concentrate on macroeconomic factors that may influence aggregate spending and income in a country. Within the latter group, an important strand of the literature has recently emphasized and made explicit use of the fact that saving and investment choices by definition have an intertemporal dimension. As a consequence, the determination of these variables is considered in an intertemporal maximization framework. One is thus naturally led to incorporate into the analysis the economy's intertemporal budget constraint that states that the present value of national consumption plus the current value of net foreign liabilities cannot exceed the present value of national income. Denoting the "permanent" or "perpetuity equivalent" value of a variable by the superscript P, Sachs (1982) shows that the current account can be written:

\[
CA = (Y - Y^P) - (C - C^P) - (G - G^P) \tag{III.7}
\]

where \( Y \) stands for national income, and \( C \) stands for private consumption. According to this equation the current account will tend to be in surplus when income is temporarily high, when private consumption is temporarily low, and when government expenditures are temporarily low. Under the hypothesis that consumers tend to smoothe their consumption streams over time so that \( C = C^P \), and neglecting the role of the government, the equation can be used as a basis for a theory of "stages" of the balance of payments in the development process as current income moves through different phases in relation to permanent income.
In a recent review of the empirical evidence relative to this theory, Genberg and Swoboda (1984) concluded that it can account for only a limited part of cross-country current account behavior. As we shall see below, the neglect of the government's spending pattern may be a particularly serious omission.

Empirical testing of the hypotheses underlying (III.7) is difficult because the "permanent" values of the variables on the right hand side are not observable. In the context of cross-country analysis this problem is even more serious since it is unlikely that the permanent values of Y, C, and G will be equal across countries in which case they could have been treated as a constant term in a regression. However, on the assumption that adequate measures of the permanent growth rates of output and government spending can be found, a testable implication of the intertemporal theory would be that a relatively high growth rate of income in a country should be associated with an improvement in the current account. Similarly, a relatively high growth rate of government spending should result in a deterioration of a country's current account. Accordingly, in an equation of the form\(^{17}\)

\[
\frac{\text{CA}/\text{Y}}{} = c_0 + c_1(\text{DY}-\text{DY}^P) + c_2(\text{DG}-\text{DG}^P) \tag{III.8}
\]

the theory implies \(c_1 > 0\) and \(c_2 < 0\).

Recent theoretical work on government budget decisions (see Barro(1979)) suggests that temporary increases in government spending are likely to be financed by increases in the public debt (i.e., be associated with deficits in the government budget) whereas permanent increases in spending will be financed by tax increases (i.e., they will not lead to budget deficits). According to this view and in our notation, \(G-G^P\) should be positively related to the government budget deficit and the term \(DG-DG^P\) in (III.8) can be replaced with the change in the

\(^{17}\)Note that the current account variable is scaled by the value of GDP in order to make cross-country comparisons feasible.
government budget deficit which is thus seen to have a negative influence on the current account balance. Extending the analysis further by considering the possible impact of government deficits on real interest rates and hence on private saving and investment decisions, it is possible that the negative influence measured by the reduced form coefficient \( c_2 \) diminishes and even disappears. This would occur if government spending crowds out private spending either by reducing investment or increasing saving. In our empirical work we shall attempt to measure the importance of these crowding-out effects.

In a recent study of the determinants of current account balances of a group of developing countries, Khan and Knight (1983) propose and estimate an equation that contains several of the factors discussed above. Their model, which is developed essentially along traditional lines focusing on the determinants of exports and imports, contains the following independent variables:

The fiscal deficit, \( \text{DEF} \), of the government. The reason for including this variable follows directly from equation III.6 and needs no further explanation.

The terms of trade. An improvement in the terms of trade implies an increase in domestic real income. To the extent that this increase is at least partly viewed as temporary, it should provoke an improvement in the current account according to equation III.7.18

The real exchange rate. An increase in the real exchange rate, defined as the home country's consumer price index relative to the exchange-rate-adjusted consumer price index abroad can be interpreted in two different ways. On the one hand, it can be a

18 See Persson and Svensson (1985) for a recent theoretical discussion of the relationship between the terms of trade and the current account that emphasizes intertemporal aspects.
reflection of an increase in spending relative to output at home leading to an increase in the relative price of home goods in the domestic economy. Such an increase in spending should also result in a deterioration of the current account balance. On the other hand, it can be viewed as a disequilibrium phenomenon in which domestic inflation has been larger than foreign inflation without the necessary exchange-rate adjustment taking place. In this case the increase in the real exchange rate is a sign of deteriorating international competitiveness of domestic industry, and one would also expect the current account to deteriorate.

The foreign real rate of interest. An increase in the rate of interest is likely to have two effects on the current account. First, there is the direct influence on debt service payments. The size of this effect is proportional to the net foreign asset position, NFA, of the home country. Secondly, there is the indirect effect due to changes in saving and investment brought about by the interest rate change: in a time series context, the current account should improve as a result of an increased interest rate. In a pure cross-country analysis, however, the saving- and investment effect will not be discernible since all countries face the same interest rate change and since not all current accounts can improve simultaneously. We are thus left with the direct influence on the debt service account as the only consequence of interest rate changes.

Growth in industrial countries should be expected to improve the current account of developing countries due to the increase in exports it would generate. Khan and Knight do indeed find a statistically significant positive effect of this variable in their pooled time-series and cross-section analysis. As in the case of foreign interest rate changes, however, one should not expect to find any significant results in a pure cross-section

\[19\] We refer here to the well-known Salter-Swan effect.
analysis which, in addition, includes the majority of important industrial countries.

Without dwelling on the details of the regression results of Khan and Knight, it is noteworthy that all of the above five variables turn out to have a statistically significant influence in the direction suggested by the theory. In the minimal model below, however, only the difference between actual and permanent output and the government deficit enter as determinants of the current account. This is in keeping with the saving-investment approach to the current account, and with the fact that the relative price variables, as well as the foreign demand factors suggested by Khan and Knight, enter our model through the export equations, and the world interest rate drops out in a cross-section approach.

4. Inflation, variability of inflation, and monetary growth.

One of the best established empirical regularities in economics is the long-run relationship between the rate of monetary growth and the rate of inflation. Neutrality of money implies that there is a one-to-one relationship between inflation and money growth adjusted for growth of output. In an international context, neutrality furthermore implies that exchange rate changes should be equal to inter-country inflation differentials and to inter-country differentials in money growth adjusted for output growth. As a consequence, real exchange rates should be independent of monetary growth. Although substantial evidence exists showing that these neutrality propositions do not hold in the short run, Saidi(1981) presents cross-country regression results that indicate beyond any reasonable doubt that they are valid in the long run.

20The regression analysis was based on annual data for the period 1973-80 for 32 non-oil developing countries. The time series for each country were pooled to form one combined sample.
Recognizing the close relationship between money growth and inflation is not of course the same as asserting that domestic money growth is necessarily the cause of inflation. The exchange rate regime that is adopted by a country is of paramount importance in deciding this question. In a country that has a rigidly fixed exchange rate, monetary policy will have to be used to defend that rate. Inflation will be externally determined and the domestic money supply will adjust to it. Where the exchange rate is floating or frequently adjusted, on the other hand, the growth of domestic money is likely to depend on other factors than the balance of payments. It thus becomes more of a causal factor in the determination of domestic inflation even if it may still contain a substantial degree of endogeneity as a result, for example, of the need to finance part of the fiscal deficit of the treasury by monetary expansion.

Although an ideal econometric study would attempt to endogenize the degree of exchange-rate flexibility, we cannot follow this route here. We shall instead proceed as if enough exchange rate flexibility was in fact present during our sample period to allow us to treat intercountry differences in inflation as having domestic origins. The rate of inflation will thus be related to the rate of output growth and the rate of monetary expansion. The latter will in turn be related to the fiscal deficit of the government and to the current account balance in an attempt to capture the pressures the central bank might be under to subordinate its monetary policy to the needs of deficit finance or external balance.

In section 1 we argued that variability of inflation may have an adverse effect on output growth due to the uncertainty it creates concerning relative prices. We shall investigate this possibility in our empirical work by including a measure of inflation variability in our output equation. Inflation variability itself, however, is likely to depend positively on
the actual level of inflation as research on the relationship between inflation and relative price variability suggests.\(^{21}\) This potential endogeneity of inflation variability will be allowed for in our regression analysis.

This concludes the discussion of the determinants of our four performance indicators as they have been presented and tested in the literature. We now turn briefly to two variables that we have identified as intermediate targets, the real exchange rate and the investment/output ratio.

5. The real exchange rate.

In addition to the terms of trade, the relative price of home goods is an important determinant of resource allocation and structural change in an open economy. Like other relative prices, it will depend on the prices of substitutes and complements (both in production and in consumption) and on the aggregate level of spending. In the context of open economy models the relevant substitutes or complements are importables and exportables. In section 2 above we referred to evidence from a number of countries that indicates that an increase in export prices of 10\% (holding import prices constant) will increase prices of non-traded goods by between 3 and 5\%. An improvement in the terms of trade will thus increase the price of home goods relative to import prices.

The Salter-Swan effect implies that an increase in aggregate domestic spending relative to domestic output should increase the relative price of home goods. As we have already noted, the current account balance is one indicator of excess domestic spending. The government's fiscal deficit is another. Growth in government spending or in tax revenue might in addition have independent influences.

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\(^{21}\) See, for instance, Parks(1978) and Taylor(1981).
Based on these considerations, the following equation would be appropriate as a minimal specification:

\[
\left( \frac{P_N}{E P^*} \right) = a_0 + a_1 \left( \frac{P_X}{E P^*} \right) + a_2 CA + a_3 D(G/Y) \tag{III.9}
\]

where all three coefficients are expected to be positive.

The fact that the nominal exchange rate appears in the definition of the real exchange rate as defined here has often led to the belief that policy-determined devaluations or revaluations will succeed in altering the "real exchange rate". While this may well be true in the short run when nominal prices are slow to adjust, it is unlikely to be the case in the medium- to long run. Thinking in terms of the relative price of home goods instead of the "real exchange rate" should make this an obvious proposition. By the same token, domestic monetary policy, or domestic general inflation, should not have any influence on the real exchange rate. The evidence by Saidi cited above is consistent with this view. If we add terms like \(\frac{dP}{P}\) or \(\frac{dM}{M}\) to the right hand side of (III.9) we should thus find that they have no explanatory power.

6. The Investment Ratio.

In a recent study, M. Blejer and M. Khan (Blejer and Khan(1984)) investigate empirically a number of alternative specifications of investment functions using data for 24 developing countries for the period 1971-79. Their theoretical framework is the flexible accelerator model modified to incorporate some special characteristics of developing countries. In this model investment is undertaken in order to close the gap between a desired level of the capital stock in the economy and the actual level. Both the desired capital stock and speed of adjustment may depend on policy measures and other influences. The variables that enter the empirical specification
of Blejer and Khan are discussed briefly below together with the results.

**Expected output.** On the assumption that the desired long-run capital-to-output ratio is constant, the desired capital stock will be proportional to the expected level of output. In the empirical application the latter is assumed to be determined according to an error-learning process implying that the desired capital stock will depend on a distributed lag of past output levels. This variable is highly significant in the empirical estimations.

**Credit to the private sector.** An increase in the real value of credit extended by banks to the private sector, or an increase in credit coming from abroad, is expected to increase the adjustment coefficient relating investment to a gap between the desired and the actual capital stock. The credit variable is especially likely to be important in countries where capital markets are not well developed. Since our concern in this study is to investigate potential links between policy instruments and target variables, it is important to emphasize that Blejer and Khan use the real value of credit in their analysis as theory suggests. This is of course an endogenous variable not under the direct control of any policy authority, especially in the medium-to long run.

**Government capital formation.** To the extent that complete crowding out does not take place, an increase in investment spending by the government will lead to an increase in total investment. One would expect that the larger the share of infrastructure investment in total government investment, the smaller will be the crowding out effect. This is exactly what emerges from the regression results of Blejer and Kahn if one accepts their proxy measure (essentially a time trend) of infrastructure investment. This variable has a significantly positive influence on private investment, while other types of
government investments tend to reduce it (although by less than one-for-one).

The above discussion implies an investment function that depends on some measure of expected output growth, on a measure of real domestic credit creation, and on the volume of government investment. In addition to these variables we shall include in our empirical specification the government budget deficit (in order to test for the possibility of more general crowding out effects), various tax measures (in order to test for possible dis-incentive effects of distortionary taxes), and the current account balance (in order to test for foreign-exchange constraints on investment).

6. Implications for Model Specification.

Combining the results from the studies that we have reviewed with suggestions based on theoretical considerations, we obtain the following minimal model of the determinants of the performance indicators that we have chosen:22

Output growth, DY:

\[ \text{DY} = F_1(I, IG, DPOP, DX, DA, VDP, TAX, YPOP) \]

Export supply, DXS:

\[ \text{DXS} = F_2(DY, PXE, PNE, TRTAX) \]

22See Table III.1 for a complete list of variable abbreviations. In the equations that follow, a D as a prefix indicates a proportional growth rate. Thus, DY stands for the rate of growth of real GDP. Note that various modifications in the definition of variables and more precise specification of equation forms will be made to obtain the specific model estimated in Part V.
Export demand, $DX^D$:

$$DX^D = F3(DRYW, PXE)$$

Inflation, $DP$:

$$DP = F4(DY, DM)$$

Current account, $CA$:

$$CA = F5(DY-DYP, DEF)$$

Growth of the "real" exchange rate, $DPNE$:

$$DPNE = F6(PXE, CA, DGY, TRTAX)$$

Private investment, $I$:

$$I = F7(DY, IG, DEF, CA, TRTAX, RDC)$$

Money growth, $DM$:

$$DM = F8(DC, CA)$$

Growth of domestic credit, $DDC$:

$$DDC = F9(DEF, CA)$$

Variability of inflation, $VDP$:

$$VDP = F10(DP).$$
Instead of repeating the arguments underlying the specification of each individual equation, we would like to discuss briefly what the overall structure of the model implies for empirical estimation and how links between policy variables and performance indicators are incorporated into it.
As is clear from the list of equations, there is a substantial amount of direct simultaneity between the growth of output and several other variables such as the growth of exports, the current account, the investment ratio and the rate of inflation. There are also a number of channels of indirect interaction. For instance, a government budget deficit increases the growth of domestic credit which in turn affects the rate of growth of money and inflation. Higher inflation means greater variability of inflation, which has a negative influence on output growth. Lower output growth finally feeds back on inflation. Further examples could be given of the complex relationships that exist between variables in the proposed model, even though it is small and obviously very simplified. The ones provided are however sufficient to indicate that empirical analysis of the relationships in the model must be adapted to its simultaneous nature. Ordinary least squares estimates, for instance, are likely to be biased and inconsistent, possibly giving rise to erroneous inferences. In the work that we present and discuss in part V we thus rely on instrumental variable estimation techniques. It turns out in some instances that this yields different results from what is found in the literature.

As it stands, the model contains three types of fiscal policy variables; tax rates, the level and composition of government spending, and the government budget deficit. Tax variables enter the model to capture the distortionary impact on resource allocation that has been studied and documented empirically in the work of Marsden (op. cit.). Trade taxes, for instance, are likely to alter domestic relative prices in a way that discriminates against export production. They are also likely to modify the relative price of home goods, which in turn has an impact on the current account balance. The overall tax-to-income ratio is intended to capture the disincentive effects of taxation more generally. It thus appears in the equation for output growth and investment.

There are two types of government spending variables in the model, two that are expected to capture the influence of the
level of spending, and one that captures the influence of its composition. The growth rate of real government spending influences the current account balance, and the change in the share of government spending in GNP affects the relative price of non-traded good. For a given level of total government spending, an increase in government investment increases the growth of output. Directly or indirectly, each of these variables will of course affect other variables in the model.

Finally, the model contains a monetary policy instrument in the form of the rate of domestic credit creation. This variable has potentially real as well as purely nominal effects. It will naturally help determine the rate of inflation through its impact on the money supply. But it may also influence investment, and hence growth, along the lines suggested in the study by Blejer and Khan. Inflation itself may furthermore affect growth negatively as a result of the increase in variability of relative prices it engenders.

This concludes our selective review of the literature and the presentation of the minimal model that seems to be implied by this literature. After the empirical work is presented we shall return to the theoretical model and discuss whether it contains any potential conflicts and trade-offs between the performance indicators. We shall argue that such conflicts and trade-offs are more likely to be present between short-run stabilization efforts and medium- to long-term performance than among medium-term performance indicators themselves.
IV. ECONOMETRIC ISSUES.

Before describing the results of the empirical estimation of the model presented in the previous section it is useful to clarify some of the econometric issues involved. The discussion, which intentionally will be kept brief, will focus on five points: the choice between structural and reduced-form models, the econometric implications of the endogeneity of policy indicators and policy instruments, the merits of focusing on medium-term rather than cyclical effects, time-series versus cross-section estimation, and possible alternatives to traditional regression methods.

1. Structural versus reduced-form models.

Ideally one would want to investigate the relationship between policy instruments and performance indicators in a fully specified structural general-equilibrium model of an economy. In practice this is likely not to be feasible due to uncertainty about the form of the "true" model and to the unavailability of detailed enough data. A consequence of not knowing the nature of the true model of the economy when a full structural system is specified is that some potentially important linkages between variables may be overlooked. The result may then be that a policy variable fails to show its full impact in the empirical estimation. An example in our context might be the relationship between government budget deficits and private aggregate demand. In a full model the links between these variables could be many: from the deficit to increased borrowing of the government resulting in higher real interest rates that increase the cost of capital and therefore curtail private investment, or from the deficit to expected increases in future taxes that result in increased current saving. Omitting one of these channels from the empirical specification could result in the deficit not appearing to have an important influence on private
spending, even when it in fact does. A reduced-form approach might in this case be capable of capturing that influence since it implicitly allows for all possible transmission mechanisms.

Unavailability of data is another reason why estimation of a full structural model would be impossible. In the example just given, the real interest rate and expected future tax rates are unobservable and would need to be proxied by other variables. The errors this might introduce could influence the estimated relationship between government deficits and investment.

Some disadvantages of structural models can be overcome by estimation of reduced-form relationships in which the final performance indicators are regressed on the policy instruments directly. The advantage of this procedure is that the full effect of policy on a variable is captured regardless of the channels of transmission. This advantage is however gained at some cost. First of all, policy instruments that are endogenously determined due, for instance, to the requirement of financing government deficits would not appear in the reduced form directly. Their independent influence could thus not be measured. Secondly, if a policy instrument has not been utilized during a specific period its influence can obviously not be measured directly in a reduced form equation. In a structural equation its potential effect might be deduced if it were known a priori that the influence of the policy variable has an effect similar to that of another variable. An example of this would be the influence of a tariff on export supply. In a structural equation one could in principle measure the effect of terms of trade changes on export supply. A tariff would alter the internal terms of trade between exportables and other goods. Its potential influence on export supply could thus be estimated even if it were not used during a particular sample period. A third problem with reduced form modeling is that forces offsetting the influence of a policy instrument may be at work and may lead to the conclusion that the instrument is ineffective when it in fact is not. An example would be when a policy variable influences two intermediate variables simultaneously in such a way that the
final impact through these variables on the performance indicator is nil. For instance, an increase in government investment increases the economy's capital stock which in and of itself should increase output. However, as a result of financing the increased government investment a certain amount of private investment may be curtailed. The net effect may thus be to leave output unchanged leading to the conclusion that government investment is of no use when the appropriate inference would be that an alternative mode of financing this investment would have yielded different results.

In order to try to avoid the problems involved both in structural and reduced-form modeling we have steered a middle course by specifying a semi-reduced form of a structural model. How successful we have been will have to be judged by the results we obtain.

2. Endogeneity of policy indicators and policy instruments.

It is important to recognize that a number of variables that are often treated as instruments of policy are really endogenously determined. We have already alluded to this fact when discussing the determinants of the real exchange rate (i.e. the relative price of non-traded goods). Domestic credit growth and growth of the money supply are also likely to be endogenously determined either as a consequence of financing government budget deficits or as a result of balance of payments effects on foreign exchange reserves. We shall attempt to take account of these linkages in our empirical work in order to avoid biases and inconsistency in our coefficient estimates.

In a fundamental sense even other variables that we and others treat as exogenous policy tools are in fact determined as a function of economic and political developments. Agricultural support programs, unemployment benefits, tariffs and quotas on imported goods are likely to be adopted in response to perceived needs, or political pressures, of specific segments of the
economy. As a result the corresponding policy changes are endogenously determined in the wider context of political economy interaction. For the purpose of the present study, this type of endogeneity can safely be ignored for two reasons. First, insofar as the policy response is endogenized due to business cycle developments (as in the case of changes in income-tax revenues or unemployment benefits), our results, with their emphasis on medium-term relationships, should be unaffected. Second, the crucial point for the validity of econometric procedures is whether there is a direct enough feedback from our endogenous variables to the policy instruments to lead to simultaneous equation bias in our estimates. There is, for instance, undoubtedly some dependence of government expenditure, tax, and tariff policy on the output growth performance of the economy. We feel, however, that this is of a sufficiently indirect nature, as well as sufficiently unsystematic across countries, to justify our treating these policy variables as exogenous for the purpose of our empirical work.

3. Cyclical versus medium-term effects.

As the present study focuses on medium-term economic performance, it is necessary to separate out the cyclical influences that might exist between economic policy and performance. One way of doing so would be to specify a model in which short- medium- and long-run effects can be measured by the corresponding multipliers. This would require detailed attention to the dynamic adjustment processes that characterize the economy. Another way of eliminating cyclical effects would be to aggregate the statistical observations in such a way that only medium- and long-run movements are reflected in the data. There is of course no perfect method for performing such an aggregation, which means that either information on medium-term relationships will be lost (too much aggregation) or some cyclical effects will remain (too little aggregation). We have
opted for the second of these methods despite its drawbacks for
two reasons. In the first place, dynamic processes are
notoriously difficult to model explicitly. Economic theory
provides relatively little guidance in this respect compared to
what it suggests concerning longer-run relationships. We thus
feel more confident with an approach focusing on a longer time
horizon.

Secondly, the focus on medium-term rather than cyclical
effects is desirable in a model applicable across countries since
the relationships that we specify must not differ significantly
from one country to another. We suspect that short-run adjustment
processes do not satisfy this requirement as they depend on
factors specific to each economy.

Our precise method for singling out medium-term phenomena
has been to split the available sample which covers the period
1970-83 into two sub-periods, 1970-77 and 1977-83. For variables
that enter our model in level form, their average value in each
period was used. For variables that appear as growth rates, we
used the average growth rate over the corresponding period. We
thus get two observations per country per variable, one for the
period 1970-77 and one for 1977-83.

4. Time-series versus cross-section estimation.

Focusing on medium-term relationships by aggregating data
over time implies that we must resort to cross-section
regressions to estimate the parameters in our model. The
consequences for the properties of the coefficient estimates can
be explained by means of a stylized example in the form of
equations (IV.1) - (IV.4), in which a relationship between a
variable \( Y \) and a variable \( X \) is specified for each of two time
periods, \( t_1 \) and \( t_2 \), and for each of two countries (countries 1
and 2).
A time series regression for country 1 would combine eqns. (IV.1) and (IV.3) to estimate $c_0$ and $c_1$ provided these coefficients do not change over time. If structural change has taken place then the resulting estimates will be weighted averages of the true coefficients in each of the two periods. A pure cross-section regression for period $t_1$ would combine (IV.1) and (IV.2) and would be appropriate if $c_{01} = d_{01}$ and $c_{11} = d_{11}$, i.e. if the relationship between $Y$ and $X$ was the same in each of the countries. A pooled time-series and cross-section regression would make use of all four equations and would be appropriate if coefficients were stable over time and across countries. Pooling the samples would in this case increase the accuracy of the estimates since they would be based on more observations. A fourth possible combination of the equations would be appropriate if it were believed that the slope coefficients are the same over time and across countries, but that each country had a different constant term. Thus $c_{11} = d_{11} = c_{12} = d_{12} = c$, and $c_{01} = c_{02} = c_0$ and $d_{01} = d_{02} = d_0$. Subtracting (IV.1) from (IV.3) and (IV.2) from (IV.4) would then yield

\[
Y_{1,t2} - Y_{1,t1} = c (X_{1,t2} - X_{1,t1}) + u_{1,t2} - u_{1,t1} \tag{IV.5}
\]

\[
Y_{2,t2} - Y_{2,t1} = c (X_{1,t2} - X_{2,t1}) + u_{2,t2} - u_{2,t1} \tag{IV.6}
\]

relationships that could be used in a cross-section regression to estimate $c$. This last method allows for some limited differences between countries but requires constancy of parameters over time.

It is not possible to be certain a priori which of the above methods will be most correct in any given application. In section V we shall present results for each of the last three, i.e. all
but the pure time-series regression. As we shall see, there is evidence of both differences between countries and over time in our data.

5. Analysis not based on traditional regression methods.

The empirical work in this study is based on regression analysis. This is clearly appropriate when it is possible to express the relationships of interest in the form of structural or reduced-form equations quantifying the linkages between performance indicators and policy instruments. Suppose, instead, one were to consider less precise relationships between these variables and argue that the only distinction that one could hope to make was between countries that performed "well" on some criterion and those that performed less well. In other words, one might argue that a growth rate of 6% above the average for all countries is not twice as good as a growth rate of 3% above average. In fact such growth performance might be regarded as "good" for both countries in contrast with countries that grow at a slower pace than the average. Similarly, countries that reduce their government budget deficits could receive a "good" for their policy regardless of the size of the reduction of the deficit.

Would it, in the context of these binary classifications, be possible to explain good performance with respect to a "performance variable" by "good" performance with respect to a policy variable? One way to answer this question would be to use a regression technique that is adapted to the fact that the dependent variable is binary. Probit or logit analysis would be strong candidates. In an appendix to section V we shall report the results from an illustrative examples where we have used these methods.

23In the tables the three methods will be identified by the sample period (i.e. 1970-77 or 1977-83) for the pure cross-section, by the word "Pooled" for the pooled time-series and cross-section, and by "Diff" for the procedure defined in equations (IV.5) and (IV.6).
V. EMPIRICAL RESULTS.

The estimation of the model presented in Part III was undertaken for a group of 35 countries of which 21 are classified as developing. Data obtained from World Bank and IMF sources and spanning the period 1970-1983 were used. In order to investigate possible changes over time in the relationships between economic policy and economic performance the sample was divided into two sub-periods, 1970-77 and 1977-83 associated with the first and second oil shock respectively and with very different external debt developments. Growth rates of variables were calculated from regressions on linear time trends over each sample. For "level" variables such as the deficit-to-output ratio we used average values for the corresponding period.

Following the discussion in Parts III and IV the instrumental variable technique of estimation was used. The endogenous variables were:

- **DY** = growth rate of real GDP
- **DX** = growth rate of real exports
- **CA** = current account net of total debt service payments as a proportion of GDP
- **DPXE** = D(PX/E) = rate of change of the terms of trade
- **DPNE** = D(PN/E) = the rate of change in the real exchange rate
- **DP** = inflation rate based on the GDP deflator
- **VDP** = variance of the inflation rate
- **DM** = growth of the money supply
- **DDC** = growth of domestic credit
- **INV** = real investment as a proportion of real GDP

---

24 See the data appendix for a list of countries.

25 The National Accounts tape from the Bank and the IFS, GFS, and BOP tapes from the Fund.

26 As in the case of the real exchange rate we use only the nominal exchange rate in the denominator in this expression instead of the nominal exchange rate multiplied by an index of dollar prices of imported goods. To the extent that the latter variable is similar for each country this simplification is of no great consequence in a cross-country regression analysis. **PN**, the price of non-traded goods, is measured as a weighted average of the implicit price deflators of agriculture, manufacturing, and mining where the weights are the GDP shares.
Exogenous variables were:

- DA = growth rate of agricultural production
- DEF = government budget deficit as a proportion of GDP
- TAX = total tax revenue divided by GDP
- TRTAX = revenue from trade taxes as a proportion of total trade
- G = total government expenditures as a proportion of GDP
- IG = real government capital expenditures divided by GDP
- DG = growth of real government expenditures
- DGY = growth rate of the share of govt expenditures in GDP
- DPOP = growth rate of population
- DRYW = growth of foreign real income

Predetermined27 variables were:

- YPOP = real per capita GDP
- X = real exports as a share of real GDP
- A = real agricultural output as a share of real GDP

In the discussion that follows we shall comment on the estimation results equation by equation before we consider the relationship between economic performance and policy within the model taken as a whole. Only the estimates of the structural equations will be presented. A full list of the instruments in the first stage of the estimation is given only for the output equation to save space. A list of the instruments, chosen on a priori grounds, used in each of the other equations is available from the authors on request.

Growth of output. GDP growth was specified to depend on the following variables:
- population growth (DPOP). Due to unavailability of data for all countries, it was not possible to use the theoretically preferable growth rate of the labor force. For the same reason, it was not possible to investigate possible disincentive effects of taxation on labor force participation rates.
- the ratio of private investment to GDP (INV). As this is an endogenous variable, it was regressed in a first stage on a set

27These variables were measured by their "initial" values which were defined as their average values in the first three years of each sub-sample.
of instruments that included DRYW, IG, DGY, YPOP, TRTAX, EX, and A.
- the ratio of government investment to GDP (IG).
- the growth of exports (DX). This variable was first regressed on the same set of instruments as INV.
- the growth of agricultural production (DA).
- the variability of inflation (VDP). Several related variables thought to capture uncertainty associated with high and variable inflation were also tried, among them the rate of inflation itself, the rate of monetary expansion, and the variability of the growth rate of the money supply.
- the ratio of government spending to GDP (G). In the theoretical discussion in part III it was suggested that the total tax burden in the economy may have a negative influence on growth. It can be argued that the tax burden is best measured by government expenditures since these will have to be financed somehow, either by explicit current taxes, by the inflation tax, or by future taxes (debt issue). Other variables than the government spending-GDP ratio were also tried: the total taxes-GDP ratio, the change in government spending/GDP, the change in taxes/GDP, and TRTAX.

The regression results are presented in TABLE V.1. Estimates are reported for four different data sets, the 1970-77 period, the 1977-83 period, a pooled sample of these two periods, and a sample derived from changes in the variables from the first to the second period\(^28\). In each case regressions were estimated for both the entire sample of countries and for the developing country sub-group. In addition, results are also reported for the case where DA is omitted on the grounds that this variable may cause simultaneous equation bias. Using the standard error of estimate (SEE) as the criterion, the preferred combination of variables was that given in the table with VDP representing monetary uncertainty, and G representing the tax burden effect. For the sample consisting of all countries and for the

\(^{28}\)The corresponding equations are denoted "DIFF." in the table.
<table>
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<th>Eqn.</th>
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<td>(3.21 )</td>
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Notes:  * = estimated by OLS
first period, all coefficient estimates have their predicted sign and the numerical values are reasonable. Judging by the "t-values" given in parentheses the majority of the estimates are furthermore statistically significant. For this time period then, and for the full group of countries, the theoretical specification seems to find strong support in the data.

Several interesting features of the equation for all countries and the first period are worth pointing out. One is that when G is removed from the list of independent variables, IG loses some of its explanatory power (the estimation results are not shown to save space). This suggests that the composition of government spending is an important factor for the growth performance of an economy. A second noteworthy feature of the results is the strong negative effect of inflation variability on growth. When other measures such as the inflation rate or the rate of money growth were tried in place of VDP similar negative coefficients were obtained suggesting that the result is a robust one. When both the rate of inflation and its variability were included in the regression, only the latter turned out significant. A final feature worth singling out is that the statistical significance of the coefficients seems to increase substantially when the equation is estimated with ordinary least squares (OLS). The word "seems" is chosen deliberately to emphasize the fact that OLS is an inappropriate method given the simultaneous nature of the model. It appears that ignoring this simultaneity exaggerates the significance of the results, a possibility that should be kept in mind when other results in the literature are evaluated.

Turning to the developing-country sample (equations 4 - 6) we notice a certain deterioration of the significance levels of the coefficients, although when DA is excluded (which may be

29 A "t-value" greater than 1.7 indicates statistical significance at, or greater than the 10% level.

30 The same conclusion is warranted with respect to equation 2 in the table in which DA is removed on the grounds that it might be a source of simultaneous equation bias.
justified in order to avoid simultaneity bias) three of six coefficients are highly significant and a fourth is marginally so. The signs and the sizes of the estimates continue to correspond to what theory predicts.

When the sample is changed to the 1977-83 period, the results are less encouraging. As we shall see further down, this problem is not specific to the output equation but affects other relationships as well. The instrumental-variables estimates are particularly affected by the change in sample period whereas the OLS results continue to appear satisfactory (cf. equations 9 and 12, especially the former). This suggests that the nature of the feedback relationships between the variables of the model has changed from the first to the second period.

Given the change in structure that appears to have taken place between the two periods it is not necessary to dwell on the results of the pooled sample (eqns. 13-18). Two points are, however, worth making about the results in which the variables are measured as changes from the first to the second period (eqns. 19-24). The first is that private investment continues to be a significant explanatory variable, and the second is that the variance of inflation retains its strong negative influence on output growth.

Growth of exports. In section 2 of Part III we discussed the determinants of export growth in terms of a demand and supply system of equations. Interaction between the two determines the volume of exports and the relative price of exportables or, in terms of growth rate, the growth of exports and the change in the terms of trade. Rather than estimating reduced form equations for these two variables attempts were made in our empirical work to identify separate export demand and supply functions. The variables entering these functions were those given in equations (III.4) and (III.5). For reasons that will be discussed below we were only successful in identifying a sensible relationship on the demand side. The results are contained in TABLE V.2.
## Table V.2

**Growth of Export Demand (DX)**

<table>
<thead>
<tr>
<th>Eqn.</th>
<th>Sample</th>
<th>Period</th>
<th>INDIVIDUAL VARIABLES</th>
<th>SEE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Const.</td>
<td>DryW</td>
</tr>
<tr>
<td>1.</td>
<td>All</td>
<td>1970-77</td>
<td>.026</td>
<td>.29</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(1.26)</td>
<td>(1.89)</td>
</tr>
<tr>
<td>2.</td>
<td>Dev.</td>
<td>&quot;</td>
<td>.014</td>
<td>.33</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(.54)</td>
<td>(1.78)</td>
</tr>
<tr>
<td>3.</td>
<td>All</td>
<td>1977-83</td>
<td>.040</td>
<td>.24</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(6.20)</td>
<td>(3.91)</td>
</tr>
<tr>
<td>4.</td>
<td>Dev.</td>
<td>&quot;</td>
<td>.044</td>
<td>.21</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3.80)</td>
<td>(2.39)</td>
</tr>
<tr>
<td>5.</td>
<td>All</td>
<td>Pooled</td>
<td>.044</td>
<td>.16</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(6.25)</td>
<td>(2.04)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3.98)</td>
<td>(1.44)</td>
</tr>
<tr>
<td>7.</td>
<td>All</td>
<td>DIFF.</td>
<td>.015</td>
<td>.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(1.36)</td>
<td>(3.68)</td>
</tr>
<tr>
<td>8.</td>
<td>Dev.</td>
<td>&quot;</td>
<td>.021</td>
<td>.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(1.31)</td>
<td>(2.48)</td>
</tr>
</tbody>
</table>
Regardless of which country grouping is chosen, the growth of foreign demand and the relative price term are highly significant in the first period. In the second period the relative price effect loses some of its importance but in the pooled sample this is regained. We may thus state with confidence that both foreign demand fluctuations and international competitiveness factors are important for export performance.

As already noted, we were unable to identify an export supply relationship that corresponds to what theory would predict. The growth rate of output as a measure of productive capacity did enter the equation with the expected positive sign, but its level of statistical significance was very low. The coefficient on the change in the terms of trade, on the other hand, was almost always negative and sometimes statistically significant. This obviously does not make any economic sense. Finally, neither the relative price of non-traded goods nor our measure of trade taxes entered the equation with significant coefficients.

The unsatisfactory overall results for the export supply equation should perhaps not be surprising given the inability of other researchers to identify such a relationship in the context of developing countries. Three factors in particular might explain the disappointing results. In the first place, while our terms of trade variable is probably a reasonable measure of the relative price of exports faced by consumers, it is quite likely that it is inadequate as a measure of the relative price faced by producers. One reason would be domestic policies such as price controls on agricultural products that drive a wedge between what domestic producers receive and what foreign consumers have to pay. Another would be the existence in certain countries of export marketing boards that buy on the domestic market at one price and export at another. Yet another could be the existence

31 The measure of growth of foreign demand is constructed according to the formula $DRY^W = E_j(x_j/x)g^W_j$, where $g^W_j$ is the growth rate of world trade in product J, $x_j$ is the exports of product j by the country in question, and $x$ is the country's total exports.
of production subsidies that effectively make relative prices an irrelevant measure of production incentives. Secondly, aggregate exports may contain too many heterogeneous components to be explainable by a single function. The price responses of agricultural, manufacturing and mineral exports, for instance, might very well be different enough for an aggregate export equation not to be appropriate. Finally, it should be noted that cross-country empirical analysis of export supply functions may be inappropriate in view of the fact that countries specialize (at least partially) in export production. Such specialization is likely to lead to cross-country differences that will render empirical estimation impossible.

In brief, it appears that only more detailed country-by-country research could come to grips with the data and aggregation problems that plague a cross-country approach such as ours.

The current account. For reasons explained in Part III, the dependent variable in the current account equation was the change in the ratio of the current account balance less debt service payments to GDP. For each of the two individual sample periods this variable was measured by the average value of the ratio during the entire period minus its average value in the three first years of the period. For the equations denoted "DIFF" in the tables, the difference in the average current account ratios between the two sub-periods was used. Following the "intertemporal" approach the independent variables were:
- DY-DYP, the actual growth rate of GDP less the permanent growth rate. The latter was measured by the trend growth rate of GDP for the entire 1970-1983 period.
- DG-DGP, the actual minus the permanent growth rate of government spending where the latter was measured in an analogous way to DYP.
- DDEF, the change in the ratio of the government budget deficit to GDP, measured in the same way as the change in the current account.
The results presented in TABLE V.3 again indicate significant differences between the two sub-samples. In the 1970-77 sample both GDP growth and the change in the budget deficit enter the equation significantly and with the expected signs, whereas in the 1977-83 period both coefficients are insignificant and only the deficit maintains its correct sign. For the growth variable we can think of two possible reasons for the differences between the periods. The first is that the measure we have used for the permanent growth of income may be inappropriate. It is possible that the true value of DYP changed sufficiently in the second period to affect the results. Secondly, in view of the results in TABLE V.1, which showed that our model's explanation of income growth deteriorated in the 1977-83 period, it is perhaps not surprising that the income variable should not perform well in other relationships for the same period. This is because the estimation technique requires it to be replaced by the predicted value from a first-stage regression. If this first-stage regression is inadequate, the predicted value may be a poor reflection of the actual behavior of the variable in question and the second-stage results will suffer accordingly.

The differences in the coefficient of the government deficit are entirely explainable by economic factors. As pointed out in Part III, the budget deficit may fail to be a significant explanatory variable in a reduced-form relationship of the type estimated here if a sufficient amount of crowding out is taking place. The mechanism would be the following: A government deficit financed by internal or external borrowing will increase borrowing costs to the private sector in a number of ways; as a result private investment is curtailed, and the current account will be less in deficit than it otherwise would have been. In addition domestic private consumption may also be decreased as a result of higher real interest rates, again limiting the deterioration of the current account. For the crowding out hypothesis to be consistent with the data we should observe two differences between the 1970-77 and the 1977-83 subperiods.
<table>
<thead>
<tr>
<th>Eqn.</th>
<th>Sample</th>
<th>Period</th>
<th>INDEPENDENT VARIABLES</th>
<th>SEE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>CONST.</td>
<td>DY-DYP</td>
</tr>
<tr>
<td>1.</td>
<td>All</td>
<td>1970-77</td>
<td>-.017</td>
<td>.56</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3.08)</td>
<td>(1.53)</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td>-.017</td>
<td>.60</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3.10)</td>
<td>(1.78)</td>
</tr>
<tr>
<td>3.</td>
<td>Dev.</td>
<td></td>
<td>-.020</td>
<td>.82</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(2.53)</td>
<td>(1.72)</td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td></td>
<td>-.020</td>
<td>.84</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(2.60)</td>
<td>(1.92)</td>
</tr>
<tr>
<td>5.</td>
<td>All</td>
<td>1977-83</td>
<td>-.014</td>
<td>.07</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(2.01)</td>
<td>(.17)</td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td></td>
<td>-.012</td>
<td>.16</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(1.68)</td>
<td>(.42)</td>
</tr>
<tr>
<td>7.</td>
<td>Dev.</td>
<td></td>
<td>-.028</td>
<td>-.42</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(2.80)</td>
<td>(.92)</td>
</tr>
<tr>
<td>8.</td>
<td></td>
<td></td>
<td>-.026</td>
<td>-.34</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(2.52)</td>
<td>(.76)</td>
</tr>
<tr>
<td>9.</td>
<td>All</td>
<td>Diff.</td>
<td>.065</td>
<td>-.002</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3.41)</td>
<td>(1.48)</td>
</tr>
<tr>
<td>10.</td>
<td></td>
<td></td>
<td>.178</td>
<td>-.002</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(4.59)</td>
<td>(1.25)</td>
</tr>
<tr>
<td>11.</td>
<td>Dev.</td>
<td></td>
<td>.111</td>
<td>-.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3.51)</td>
<td>(.38)</td>
</tr>
<tr>
<td>12.</td>
<td></td>
<td></td>
<td>.214</td>
<td>-.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(4.39)</td>
<td>(.37)</td>
</tr>
</tbody>
</table>
Private investment should be negatively influenced by the government deficit in the second period, and the deficit should be financed by borrowing from the private sector to a larger extent in the second period than in the first. As we shall see in detail below, this is exactly what we observe. Private investment is strongly curtailed by deficits in the 1977-83 sample and there seems to have been a shift from borrowing from the central bank to borrowing from the public when we compare the early eighties with the early seventies.

In concluding the discussion of the current account equation, we should note that variables associated with the "trade-balance approach" to current account determination failed to receive consistent empirical support. Of the three variables included in our equation\(^3\), the terms of trade, the real exchange rate, and the growth of foreign income, only the first had consistently the right sign. Foreign income was significant in the regression but had the wrong sign, and the real exchange rate failed to be significant. It thus seems that the macro-economic approach to current account determination provides empirically a more adequate framework of analysis.

Inflation and inflation variability. TABLE V.4 contains the results for the equation explaining the rate of inflation. They confirm the strong and one-for-one influence of monetary expansion on the general price level. Beyond this the estimates require little comment, except for the fact that the role of the growth of income in the second period is again problematic, a feature of our results that is consistent across equations.

Inflation variability was measured as

\[
VD_{PT} = \frac{1}{n-1} \sum_{T} (DP_{t} - g_{t})^2
\]

where \(DP_{t}\) is the actual rate of inflation in year \(t\) of sample period \(T\), \(g\) is the trend growth rate of \(P\) during the same period,

\(^{32}\) In view of the mediocre results, we do not present the coefficient estimates in the table.
and \( n \) is the number of years in the sample. Consistent with evidence drawn from individual countries, there is a strong positive relationship between the variance of inflation and the rate of inflation itself (TABLE V.5).

### TABLE V.4

<table>
<thead>
<tr>
<th>Eqn.</th>
<th>Countries Period</th>
<th>INDEPENDENT VARIABLES</th>
<th>SEE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>CONST.</td>
<td>DM</td>
</tr>
<tr>
<td>1.</td>
<td>All   1970-77</td>
<td>.027</td>
<td>1.13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.24)</td>
<td>(15.49)</td>
</tr>
<tr>
<td>2.</td>
<td>Dev.   &quot;</td>
<td>-.002</td>
<td>1.15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(.04)</td>
<td>(17.79)</td>
</tr>
<tr>
<td>3.</td>
<td>All   1977-83</td>
<td>.01</td>
<td>1.03</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(.49)</td>
<td>(14.14)</td>
</tr>
<tr>
<td>4.</td>
<td>Dev.   &quot;</td>
<td>-.11</td>
<td>1.27</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.86)</td>
<td>(10.08)</td>
</tr>
<tr>
<td>5.</td>
<td>All   DIFF.</td>
<td>.01</td>
<td>1.15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.24)</td>
<td>(12.68)</td>
</tr>
<tr>
<td>6.</td>
<td>Dev.   &quot;</td>
<td>.02</td>
<td>1.12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(.97)</td>
<td>(10.86)</td>
</tr>
</tbody>
</table>
### TABLE V.5
VARIANCE OF INFLATION RATE (VDP)

<table>
<thead>
<tr>
<th>Eqn.</th>
<th>Countries</th>
<th>Period</th>
<th>INDEPENDENT VARIABLES</th>
<th>SEE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>CONST.</td>
<td>DP</td>
</tr>
<tr>
<td>1.</td>
<td>All</td>
<td>1970-77</td>
<td>- .054</td>
<td>.43</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3.15)</td>
<td>(5.19)</td>
</tr>
<tr>
<td>2.</td>
<td>Dev.</td>
<td>1970-77</td>
<td>- .025</td>
<td>.27</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(1.94)</td>
<td>(6.54)</td>
</tr>
<tr>
<td>3.</td>
<td>All</td>
<td>1977-83</td>
<td>- .01</td>
<td>.096</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(4.70)</td>
<td>(10.07)</td>
</tr>
<tr>
<td>4.</td>
<td>Dev.</td>
<td>1977-83</td>
<td>- .01</td>
<td>.092</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3.27)</td>
<td>(9.68)</td>
</tr>
<tr>
<td>5.</td>
<td>All</td>
<td>DIFF.</td>
<td>- .01</td>
<td>.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(1.38)</td>
<td>(5.02)</td>
</tr>
<tr>
<td>6.</td>
<td>Dev.</td>
<td>DIFF.</td>
<td>- .02</td>
<td>.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(1.62)</td>
<td>(4.30)</td>
</tr>
</tbody>
</table>
Growth of domestic credit. The equation for domestic credit growth was designed to test for possible links between credit creation and government deficit financing, on the one hand, and current account developments, on the other. The specific form of the equation requires some explanation. If a proportion $k$ of a government budget deficit is always financed by domestic credit expansion one would have the relationship

$$dDC = k \text{ Deficit}$$

Our measure of domestic credit growth is the proportional growth rate in DC (i.e. $DDC = dDC/DC$), and our measure of the deficit is scaled by GDP (i.e. $DEF = \text{Deficit}/\text{GDP}$). The above equation can thus be rewritten as

$$DDC = k_{1} \text{ DEF}$$

where $k_{1} = k(\text{GDP}/\text{DC})$. This last relationship could be estimated in the usual fashion provided $k_{1}$ were constant, that is, provided $(\text{GDP}/\text{DC})$ were constant across countries. The theory of the demand for money suggests, however, that it is not. In particular, it is likely that high-inflation countries will have a higher ratio of GDP to DC than low inflation countries. If we hypothesize a simple linear function

$$\text{GDP}/\text{DC} = b_{0} + b_{1} \text{ DP}$$

then we get by substitution

$$DDC = k b_{0} \text{ DEF} + k b_{1} \text{ DP DEF}$$

It is this equation with similar terms added for the current account (CA and DP CA) that was estimated with our data. Results are presented in TABLE V.6.

For the first period these show a strong effect of government budget deficits on domestic credit creation for countries with inflation rates above 10% per year.\textsuperscript{33} This effect seems to disappear in the second period, indicating that deficits were then financed either by domestic or foreign borrowing. These findings are consistent with the explanation we provided.

\textsuperscript{33} The implication of the coefficient estimates, that for lower inflation rates there is a negative relationship between deficits and credit expansion, is probably due to an inappropriate functional form of the equation and should not be taken seriously without further evidence.
above for the weak link between government deficits and the current account in the second period.

<table>
<thead>
<tr>
<th>Eqn.</th>
<th>Sample</th>
<th>Period</th>
<th>INDEPENDENT VARIABLES</th>
<th>SEE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Const.</td>
<td>DEF</td>
</tr>
<tr>
<td>1.</td>
<td>All</td>
<td>1970-77</td>
<td>.22</td>
<td>-3.45</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(8.37)</td>
<td>(5.42)</td>
</tr>
<tr>
<td>2.</td>
<td>All</td>
<td>&quot;</td>
<td>.21</td>
<td>-3.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(4.19)</td>
<td>(2.63)</td>
</tr>
<tr>
<td>3.</td>
<td>Dev.</td>
<td>&quot;</td>
<td>.27</td>
<td>-3.67</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(6.55)</td>
<td>(4.77)</td>
</tr>
<tr>
<td>4.</td>
<td>Dev.</td>
<td>&quot;</td>
<td>.16</td>
<td>-4.61</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(1.06)</td>
<td>(2.11)</td>
</tr>
<tr>
<td>5.</td>
<td>All</td>
<td>1977-83</td>
<td>.29</td>
<td>-2.27</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(6.08)</td>
<td>(1.41)</td>
</tr>
<tr>
<td>6.</td>
<td>All</td>
<td>&quot;</td>
<td>.26</td>
<td>-2.72</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(4.47)</td>
<td>(1.36)</td>
</tr>
<tr>
<td>7.</td>
<td>Dev.</td>
<td>&quot;</td>
<td>.37</td>
<td>-1.77</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(5.81)</td>
<td>(.87)</td>
</tr>
<tr>
<td>8.</td>
<td>Dev.</td>
<td>&quot;</td>
<td>.33</td>
<td>- .54</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3.13)</td>
<td>(.26)</td>
</tr>
<tr>
<td>9.</td>
<td>All</td>
<td>Diff.</td>
<td>.01</td>
<td>-6.42</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(.36)</td>
<td>(1.92)</td>
</tr>
<tr>
<td>10.</td>
<td>All</td>
<td>&quot;</td>
<td>.06</td>
<td>-7.18</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(1.00)</td>
<td>(2.06)</td>
</tr>
<tr>
<td>11.</td>
<td>Dev.</td>
<td>&quot;</td>
<td>.004</td>
<td>-11.43</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(.067)</td>
<td>(1.82)</td>
</tr>
<tr>
<td>12.</td>
<td>Dev.</td>
<td>&quot;</td>
<td>.09</td>
<td>-11.41</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(.70)</td>
<td>(1.64)</td>
</tr>
</tbody>
</table>
Current account developments do not seem to have influenced credit creation in a systematic way in our sample of countries. Only in the second period and for the developing countries is this variable significant. In this case it appears that adverse current account developments were prevented from influencing money growth by sterilization operations.

Growth of the money supply. The results in TABLE V.7 attest to the importance of domestic credit growth for the growth of the money supply. Together with the results for the inflation rate and credit growth equations, these estimates provide one of the links between policy variables and performance indicators that we shall discuss further below.

As in the domestic credit equations, the current account does not have a consistent significant influence on the money supplies in our sample of countries.

TABLE V.7
GROWTH OF THE MONEY SUPPLY (DM)

<table>
<thead>
<tr>
<th>Eqn.</th>
<th>Sample</th>
<th>Period</th>
<th>INDEPENDENT VARIABLES</th>
<th>SEE</th>
</tr>
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<td></td>
<td></td>
<td></td>
<td>CONST.</td>
<td>DDC</td>
</tr>
<tr>
<td>1</td>
<td>All</td>
<td>1970-77</td>
<td>.005</td>
<td>.87</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.33)</td>
<td>(22.60)</td>
</tr>
<tr>
<td>2</td>
<td>Dev.</td>
<td>&quot;</td>
<td>-.001</td>
<td>.86</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.07)</td>
<td>(20.16)</td>
</tr>
<tr>
<td>3</td>
<td>All</td>
<td>1977-83</td>
<td>-.01</td>
<td>.80</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(.94)</td>
<td>(19.50)</td>
</tr>
<tr>
<td>4</td>
<td>Dev.</td>
<td>&quot;</td>
<td>-.01</td>
<td>.83</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(.32)</td>
<td>(12.32)</td>
</tr>
<tr>
<td>5</td>
<td>All</td>
<td>Diff.</td>
<td>-.03</td>
<td>.80</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(1.81)</td>
<td>(6.48)</td>
</tr>
<tr>
<td>6</td>
<td>Dev.</td>
<td>&quot;</td>
<td>-.06</td>
<td>.87</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(1.37)</td>
<td>(4.71)</td>
</tr>
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</table>
The investment ratio. Following the discussion in Part III, the independent variables tried in the equation for the private investment to GDP ratio were:

- growth of income, DY
- growth of real domestic credit, DRDC. Observations on this variable were obtained by subtracting the inflation rate from the growth rate of nominal domestic credit. Both of the components of this variable were treated as endogenous variables in the model as a whole.
- The ratio of government investment to GDP, IG.
- The government budget deficit as a proportion of GDP, DEF. This variable was included to test for crowding out effects.
- Various tax variables such as trade taxes as a proportion of total trade and total taxes as a proportion of GDP as well as changes in these two variables.
- Variability measures such as the variance of inflation and the variance of foreign demand.
- The current account balance. This variable was included as a proxy for the availability of foreign exchange.

The results reported in TABLE V.8 permit four conclusions that can be qualified as robust with respect to both changes in the sample of countries and changes in the time period. The first is that a higher growth rate of output will bring about increased investment in accord with the accelerator model. The second is that the growth rate of real domestic credit plays virtually no role in our medium term context as opposed to the somewhat shorter-term perspective in, for instance, Blejer and Khan. Third, government investment has a positive and generally significant influence on private investment. This points to a complementarity between private and government investment which could be the result of the nature of government investment (e.g. infrastructure) or of the generally favorable investment climate in a country where the government itself spends a significant amount on improving productive capacity. The fourth and final robust result is the negative effect of the government
<table>
<thead>
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<th>Eqn.</th>
<th>Sample Period</th>
<th>INDEPENDENT VARIABLES</th>
<th>SEE</th>
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<tr>
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<td>DY</td>
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<td>1.04</td>
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<td>(11.46)</td>
<td>(2.21)</td>
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<tr>
<td>2.</td>
<td>&quot;</td>
<td>.21</td>
<td>.94</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(11.19)</td>
<td>(1.93)</td>
</tr>
<tr>
<td>3.</td>
<td>Dev. &quot;</td>
<td>.18</td>
<td>1.35</td>
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<tr>
<td></td>
<td></td>
<td>(6.07)</td>
<td>(2.72)</td>
</tr>
<tr>
<td>4.</td>
<td>&quot;</td>
<td>.17</td>
<td>1.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(5.43)</td>
<td>(2.40)</td>
</tr>
<tr>
<td>5.</td>
<td>All 1977-83</td>
<td>.19</td>
<td>1.22</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(12.97)</td>
<td>(2.24)</td>
</tr>
<tr>
<td>6.</td>
<td>&quot;</td>
<td>.19</td>
<td>.98</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(13.69)</td>
<td>(1.83)</td>
</tr>
<tr>
<td>7.</td>
<td>Dev. &quot;</td>
<td>.15</td>
<td>1.08</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3.97)</td>
<td>(1.86)</td>
</tr>
<tr>
<td>8.</td>
<td>&quot;</td>
<td>.12</td>
<td>.97</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3.10)</td>
<td>(1.68)</td>
</tr>
<tr>
<td>9.</td>
<td>All Diff.</td>
<td>.02</td>
<td>1.49</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.45)</td>
<td>(3.17)</td>
</tr>
<tr>
<td>10.</td>
<td>Dev. &quot;</td>
<td>.03</td>
<td>1.24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.52)</td>
<td>(2.30)</td>
</tr>
</tbody>
</table>

Table V.8

INVESTMENT TO OUTPUT RATIO (INV)
budget deficit on private investment. This negative influence is not statistically significant in the first period but strongly so in the second. It thus supports the previously proposed hypothesis according to which the switch from financing budget deficits at the central bank to financing them by borrowing is likely to lead to crowding out of domestic private investment.

Of all the tax measures that were tried, only the trade tax variable turned out to have a significant effect. This effect was however not consistent enough across specifications and samples to inspire confidence in its general validity. Variability measures such as VDP and VDY did not seem to be important for investment decisions, and although the current account (used as a proxy for foreign exchange availability) did get a positive sign, it was far from being statistically significant.

Growth of the real exchange rate. The real exchange rate regressions contained three types of variables; a relative price measure (growth of the terms of trade), excess spending variables (the government deficit and the current account), and a measure of the composition of total spending calculated as the change in the ratio of government spending to output, DGY. The estimation results were not of sufficient quality to warrant including them in a table of their own. The only variable that had the correct sign and was significant was DGY. The other two either had the wrong sign or were statistically insignificant.

We turn in conclusion from the specific results of each equation to an overview of the model as a whole. In our view the empirical work provides support for the general approach taken here in modeling the relationship between policy and performance. Not all details of the results conform to theoretical expectations but there is sufficient agreement to warrant using this type of cross-country empirical work as a starting point for more detailed work on individual countries or country groups.
Policy affects performance in a number of direct and indirect ways in the model. The role of government budget deficits is perhaps the best example. The impact of such deficits depends on the way in which they are financed. If, as seems to have been the case in the early seventies, deficits are financed by the inflation tax total output in the economy is likely to suffer from the greater uncertainty that the inflation brings about. In addition, the current account balance is likely to deteriorate as a result of the excess spending by the government. On the other hand, if budget deficits result in internal or external public sector borrowing, private investment spending is likely to suffer from the reduced availability of credit. Future economic growth is thereby directly compromised. The build-up of foreign debt (in the case of external borrowing) may furthermore necessitate unpleasant adjustment measures in the future.

Government spending affects performance in other ways than through the budget deficits they lead to. Both the size and the composition of government outlays are important. Increases in total spending appear to slow down economic activity in general. If, however, government purchases are of the nature of investment goods (especially related to infrastructure), then there will be offsetting beneficial effects on private investment and output. Presumably, although our data were not detailed enough to test for this possibility, if government spending instead were of the consumption type or consisted of support for inefficient domestic industries, the negative effect of the level of government spending would be reinforced by its unproductive composition.

The form of taxation provides a further link between policy and performance. Our strongest evidence here relates to the role of the inflation tax. Its indirect effects on output and the current account balance have already been discussed above. Due to lack of adequate data we have not been able to investigate in detail the role of other forms of taxes except for those on
international trade. Here we have found some weak evidence that investment spending might be adversely affected by such taxes.
VI. CONCLUSION

By way of conclusion, we return to the uses of the type of approach adopted in this study in the design and implementation of so-called medium-term action programs. To this end, we will refrain from commenting further on some of the preceding section's results such as, for instance, the differences between the first and second period in our sample and their explanation, even though these might be topics well worth pursuing in their own right. Instead, we will take up four issues. How useful in the perspective of medium-term program design are our cross-section results as they stand? What improvements may readily suggest themselves? What other cross-section investigations may prove fruitful? And what are the respective roles of cross-section and time-series approaches in the design of policy packages specific to a particular country?

Usefulness of the results. The results reported in Section V can be divided into "positive" and "negative" results. Among the former, we may mention that a neo-classical view of the relationship between policy and performance receives broad support from our cross-country investigation. In particular, fiscal variables have in general the expected effect, and control of the government deficit indeed appears crucial to good economic performance. Furthermore, a number of important channels through which an increase in that deficit affects performance adversely, especially monetary channels, are clearly identified in the model. The strong adverse effect of the variance of inflation on output growth is also noteworthy and suggests that steadiness in policy is an important factor in good performance. Finally, the results suggest that there are no negative trade-offs among performance indicators, in particular growth and payments adjustment, in the medium to long run.

Turning to "negative" results, the model suggests that neutrality propositions broadly hold in the medium to long run. In particular, increases in the rate of monetary expansion have little effect on relative prices such as the real exchange rate
and, if anything, a negative influence on output growth. These negative results provide a credible negative answer to the sometimes advocated "alternative" programs of the type "increase growth in the medium to long run through inflation".

All in all, then, we would argue that the type of investigation we have carried out does have relevance to the design of medium-term programs. It should be particularly useful in two respects. In the first place, it does provide reassurance that policy recommendations based on the neo-classical paradigm receive broad support from experience across a large number of rather diverse countries. In the second place, the type of simultaneous framework of Section V would seem to constitute a good starting point for setting up more detailed and refined time-series models applicable to individual countries to help design appropriate specific policy packages.

That being said, it is also clear that our model is only a starting point, that it could be improved in a number of ways, and that it cannot pretend to supplant other types of investigations.

Suggestions for model improvement. There are a number of directions in which the model of Section V could be improved, refined, or extended. These are beyond the scope of the present investigation, and some would require a fairly massive research and data collection effort; they may nevertheless be worth undertaking in future research endeavors.

A first improvement would be to increase the sample size. This could be done fairly easily for the current specification, as the current sample size is the result of elimination of a number of countries for which data series (which eventually were not used, because of insignificance or other problems) were not available. Such an extension of the sample would presumably improve the reliability of estimated coefficients. The second and most important area for potential improvement is the collection of better, more comparable, data across countries. This is probably the area which proved most troublesome in our investigation. In particular, improved data on prices, tax and
subsidy structure and rates, and distortions are essential if robust estimates of the effects of structural policies on performance across countries are to be obtained. We suspect that no good estimates of export supply, of agricultural supply, or more robust estimates of the medium-to-long term effect of the structure of commercial policy can be obtained within the simultaneous cross-section framework we have adopted, unless such data is made available on an internationally comparable basis. Availability of such data would allow a third improvement, namely, more refined specification of the model.

Improvements along these lines are likely to be costly; substantial improvement in data availability will take a significant amount of time, and the data may, in any event, not come in a form that is easily incorporated in the type of model we have estimated. Furthermore, there are limitations inherent in the cross-section approach, most notably its maintained hypothesis of substantial similarity in economic structure across countries, which make it unsuitable for some purposes. All this suggests that alternative, or additional, approaches may be worth pursuing.

Complementary cross-section approaches. As we have just argued, the type of model we have estimated is not ideally suited to capturing the effects of the general stance of policy on performance. This is where the more specific cross-section studies of the Balassa, and Balassa and McCarthy type are particularly useful. Moreover, variables such as performance or policy stance are typically not continuous, but may often best be thought of as binary. In addition, the broad relationship between a variable such as "outwardness" in commercial policy and good or bad growth or adjustment performance is not easily captured by a structural equation to be estimated through classical regression methods. This suggests to us that logit or probit analysis may provide a promising method for ascertaining the relationship between policy and performance in some areas. We provide one simple example, based on our data, in the appendix to Section V. Although that example does not address properly
the scaling of either dependent or independent variables, we nevertheless feel that this constitutes a promising area for future research into the cross-country relationship between broad performance and policy indicators, which could also yield some insights into the existence or non-existence of trade-offs among various performance indicators.

**Time series vs. cross-section methods.** Our emphasis on cross-section results is not meant to deny the usefulness, indeed the necessity, of time-series investigations. With imperfect knowledge, all available evidence ought to be brought to bear in the design of policy packages. The most ambitious claim to be made for the type of model we have estimated is perhaps that it does provide a useful first general framework, broadly applicable across countries, which can then be applied and enriched through time-series applications to individual countries that take into account the specifics of these countries' institutions and economic structure.
REFERENCES


APPENDIX I.

DATA SOURCES.

Data for this study were obtained mainly from the World Debt and National Accounts tapes of the World Bank and the Balance of Payments Statistics, Government Finance Statistics, and International Financial Statistics tapes of the International Monetary Fund.

WORLD DEBT.

Total debt service

NATIONAL ACCOUNTS.

Population
Nominal and real gross domestic investment
Nominal and real exports
Nominal and real imports
Nominal and real gross domestic product
Nominal and real agricultural production
Nominal and real manufacturing production
Nominal and real mining production

BALANCE OF PAYMENTS STATISTICS

Current account balance

GOVERNMENT FINANCE STATISTICS

Government revenue
Total tax receipts
Taxes on international trade and transactions
Government expenditures
Government capital expenditures

INTERNATIONAL FINANCIAL STATISTICS

Money, line 34
Domestic credit, line 34 - line 31n

All price indices were obtained from the implicit price deflators in the national accounts. The price of non-traded goods was obtained as a weighted average of the implicit deflators of
agriculture, manufacturing, and mining where the weights were calculated from the share of each sector in GDP. The measure of foreign income used in the export demand equations was provided directly by the World Bank.

LIST OF COUNTRIES.

Argentina*
Australia
Austria
Belgium*
Bolivia*
Brazil*
Cameroon*
Canada
Chile*
Colombia*
Denmark
Egypt*
Finland
France
Germany (Fed. Rep.)
India*
Indonesia*
South Korea*
Malaysia*
Mexico*
Morocco*
Netherlands
Norway
Pakistan*
Spain
Sri Lanka*
Sweden
Tanzania*
Thailand*
Tunisia*
Turkey*
United Kingdom
United States
Uruguay*
Venezuela*

* = Developing country
APPENDIX II.

A Note on the Use of Probit Analysis in Evaluating Economic Performance.

The aim of this appendix (to part V) is to sketch how probit analysis could be used to characterize the relationship between policy measures and economic performance as a complement to the classical regression methods used in part V of this study. It should be emphasized at the outset that the example at the end of this appendix is given for heuristic reasons only as it uses a binary classification of variables that are not binary by nature.

Probit analysis may be useful when economic performance is to be measured not by the exact value of the particular indicator chosen but by a variable which indicates that a country has either performed well or not well on some criterion. Similarly one might want to classify policy initiatives as either being conducive to economic performance or not. Using this binary scale for measuring both performance and policy would make it possible to incorporate essentially qualitative notions such as the degree of export orientation of the economy or the degree of distortions contained in the tax system into the econometric analysis.

The example that follows does not include such additional qualitative variables since to do so would have necessitated additional data gathering. Instead, and purely for illustrative purposes, we have transformed a few of the variables used in the econometric model estimated in the text into binary variables by scaling each performance indicator and each policy measure used thus: if its value for a country was larger than the sample mean for all countries, the variable took the value one and, if it was lower than the sample mean, it took the value zero. The variables were thus converted to a zero-one classification that, in a more detailed and adequate analysis, could be thought of as capturing the notion of "good" versus "bad" performance or "good" versus "bad" policy.

The results for one performance indicator, the growth rate of output, are reported below. The notation in the equation is the same as in the main text but it should be remembered that the variables are measured on the zero-one scale according to whether an observation is below or above the sample mean as explained above. In view of the preliminary nature of the analysis we only present results for the first of our sample periods, 1970-77. Numbers in parentheses are t-ratios which have the usual interpretation. "Cases correct" refers to the number of
observations for which the model would correctly predict the value of the dependent variable.

Growth of output.

All countries:

\[ \text{DY} = -0.92 \text{ G} - 0.12 \text{ TRTAX} + 1.62 \text{ IG} - 0.20 \text{ VDP} \]

\[ (2.11) \quad (0.20) \quad (2.25) \quad (0.31) \]

No. of observations = 34    Cases correct = 28

Developing countries:

\[ \text{DY} = -0.38 \text{ G} - 0.94 \text{ TRTAX} + 1.21 \text{ IG} - 0.33 \text{ VDP} \]

\[ (0.63) \quad (1.30) \quad (1.62) \quad (0.42) \]

No. of observations = 20    Cases correct = 14

As in the results reported in the main text, a large share of government expenditures in GDP, substantial taxes on trade, and high variance of inflation are all associated with low growth performance. Government investment, holding government spending constant improves growth. The model correctly classifies between 70 and 80% of the countries.

To conclude, we would like to re-iterate that this example is given for illustrative purposes only. A truly interesting application would make use of variables that are inherently qualitative, for instance inward- versus outward- orientation of trade policy as an independent policy variable or indicator. It would also regress several performance indicators on a similar set of policy variables, thus allowing one to gather some indication of possible positive or negative trade-offs among policy instruments and performance indicators. Such an analysis is not a substitute for the simultaneous cross-section analysis we have carried out in the text but it appears promising enough to be worth undertaking, though in the context of an entirely separate study.