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Poverty Comparisons with Noncompatible Data

Theory and Illustrations

Jean Olson Lanjouw
Peter Lanjouw

Poverty rates calculated on the basis of different definitions of consumption may reveal substantial biases, but under certain conditions robust comparisons are possible. Nonfood spending is often thought to be especially poorly measured, but the more comprehensive is the measure of consumption spending, the better it is as a measure of welfare.

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Summary findings

Comparisons of poverty rates are only rarely based on identical underlying definitions of welfare. Lanjouw and Lanjouw examine the sensitivity of poverty rates calculated from alternative definitions of consumption. They consider what theory can say about the direction of bias in comparisons and show that under certain conditions robust comparisons are possible.

Data from Ecuador, El Salvador, and Pakistan show that the magnitude of biases can be substantial.

Their robustness result is used as a baseline to explore the tradeoffs involved in aggregating noisy expenditure components. Although nonfood expenditures are often thought to be especially poorly measured, the authors' data indicate that the more comprehensive is the measure of consumption spending, the better it is as a measure of welfare.

This paper — a product of the Poverty and Human Resources Division, Policy Research Department — is part of a larger effort in the department to improve the reliability and comparability of poverty measures. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Andrea Ramirez, room N8-036, telephone 202-458-5734, fax 202-522-1153, Internet address mramirez@worldbank.org. January 1997. (26 pages)

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Poverty Comparisons with Non-Compatible Data:

Theory and Illustrations

Jean Olson Lanjouw*
Yale University

Peter Lanjouw
The World Bank

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* Corresponding author; Dept. of Economics, Yale University, 37 Hillhouse Avenue, New Haven Connecticut 06511, U.S.A. Tel: (203) 432-3568; Fax: (203) 432-6323; E-mail: Lanjouw@econ.yale.edu.
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Contents

I. Introduction

A common objective in the measurement of poverty is to arrive at credible comparisons across countries, population sub-groups, locations or time-periods. These comparisons inform the design of policies focussing on the poor. In addition, noting the spatial and temporal dimensions of poverty, and identifying household characteristics associated with poverty, provides the first clues necessary for more in-depth studies of poverty, its causes, and its evolution.

Much effort has been directed at strengthening the basis of comparative poverty analysis. For example, purchasing power parity adjustments have been introduced to correct for varying costs of living across countries (Summers and Heston, 1988 and 1991) and within countries (see, for example, Bidani and Ravallion, 1994). Similarly, in order to compare poverty over time, temporal price indices have been developed.[1] What is perhaps surprising is that the underlying *definitions* of welfare being compared are in general simply assumed to be the same across data sets.

Suppose we take consumption as our indicator of welfare and construct, for the same country, two measures which differ only in terms of the number of components which they include. It is then clear that poverty measured with reference to the same poverty line could differ across measures. In fact, poverty measured using the more encompassing definition cannot be greater than that which obtains for the less comprehensive measure, and is likely to be lower.[2] An obvious manner in which to address this problem is to avoid using a constant poverty line in the first place and to set poverty lines which are explicit functions of the definition of consumption used before making comparisons. We demonstrate in this paper, however, that this may not solve the problem.

We consider two different approaches to setting the poverty line (and a range of poverty indicators) to ask what theory can tell us about the direction of biases when comparisons are based on non-identical consumption aggregates. We then demonstrate that one approach to setting the poverty line, when used in conjunction with the headcount indicator of poverty, is "aggregation consistent" in the sense that it is robust to differences in the consumption definition. This result is contingent on three important assumptions: that the consumption measures are monotonically increasing in total expenditures; that relative prices which determine consumption patterns are not markedly different across datasets and that there is no measurement error in the expenditure data. Under these assumptions the incidence of poverty measured in a given country and time, will not vary if measured on the basis of different, even quite different, consumption definitions.

This result is useful because different data sets do not always allow the application of identical definitions. For example, in economies undergoing rapid change (such as the transition economies of Eastern Europe and the former Soviet Union), price liberalization and the increased allocation of goods and services through market transactions over time have resulted in more items available for inclusion in a consumption aggregate. Yet it is of considerable interest to enquire whether, over time, poverty has risen or fallen in these countries, and by how much.

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[1] Some of which take account of the fact that the inflation adjustments necessary to compare poverty may be quite different from those to compare average welfare levels. See, for example, Rocha, 1993; and the Government of India, 1993. Ravallion and Subramaniam, 1996, examine the importance for poverty measurement of allowing for substitution effects in response to shifts in relative prices.

[2] Grosh, Jeancard, and Zhao (1994) demonstrate in the context of Jamaica that actual differences in poverty rates are dramatic when different consumption aggregates are applied to a given poverty line.

Although these considerations have not gone entirely unrecognized (see for example Atkinson, 1991; Atkinson and Micklewright, 1992; Deininger and Squire, 1996)[3], conventional poverty analysis tends to rely only on welfare measures which are as *comprehensive* as possible, without going to the same lengths to establish perfect *comparability*. As a result, little is known about the biases in poverty comparisons caused by departures from comparability. Taking consumption as our measure, we use data from Ecuador and Pakistan to illustrate that changes in calculated poverty rates across consumption definitions can be very substantial.[4] We also present an example of the use of the robust procedure to deal with a problematic survey design used in El Salvador. In this example, a different consumption definition was used for different households within the same survey.

While we show that robust comparisons of poverty are possible across datasets with different definitions of consumption, this is at the cost of restricting oneself to the headcount measure—with its well-known drawbacks.[5] However, it can be argued that moving beyond simple counts of the poor to the development of *poverty profiles* will ultimately be of greater use to those concerned with the relative poverty of population subgroups. By virtue of their relation to poverty rates, profiles based on the aggregation consistent poverty indicator are similarly robust to different consumption definitions.

The latter fact gives us a baseline to explore the possible tradeoffs involved in aggregation when there is measurement error in the data. When measurement errors are not perfectly correlated, aggregation can be beneficial. However, non-food expenditures are often thought to be particularly poorly measured, and this might make more comprehensive consumption measures less reliable than, say, food alone. Typically, the net impact of aggregation is impossible to assess because we do not observe true expenditures. Using our robustness result we show that, in these data, aggregation is beneficial. The more comprehensive the consumption definition, the sharper the poverty profile, with more clearly defined differences between poor and non-poor population sub-groups.

The following section explores how poverty measured in a variety of ways will change as the definition of consumption expenditure becomes more comprehensive. Section III gives empirical evidence from Pakistan and Ecuador. Section IV discusses possible solutions to the problem of comparing data with different degrees of comprehensiveness, and demonstrates a use of the robust approach. Section V turns to a poverty profile for Ecuador. It details the tradeoff involved in aggregating noisy measures and uses the robustness result to determine that, in these data, aggregation improves the welfare measure. The final section offers some concluding comments.

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[3] In another context, Ravallion and Chaudhuri (1996) illustrate that conclusions from the recent literature on household consumption smoothing in rural India are also sensitive to the precise definitions of consumption which are employed.

[4] Note, the problems associated with non-comparability of consumption measures are not confined only to poverty rate calculations. Recent advances in "robust" poverty measurement, which apply stochastic dominance results, are subject to the same difficulties because within this framework distributions are compared at the same poverty line (although the comparisons may be carried out, in turn, over a number of poverty lines). See for example, Atkinson (1987).

[5] The headcount "has little but its simplicity to recommend it" (Watts, 1968, quoted in Atkinson, 1987).

II. Measured Poverty Under Alternative Consumption Definitions

We consider here a range of poverty indicators and two alternative approaches to setting a poverty line, both of which build on Engel's Law. We set out the simplest case of moving from food expenditure, F, alone as the welfare indicator to a more comprehensive measure, Y, which includes food plus non-food expenditures: $Y=F+NF$. Both food and non-food are continuous and monotonic functions of total expenditure: $F=f(Y)$, $NF=g(Y)$. It will be convenient below to define the inverse function $Y = f^{-1}(F) = k(F)$. We shall make use of the following assumptions:

A1) $f' \geq 0 \Rightarrow k' \geq 0.$

A2) $g' \geq 0$

A3) $k'' > 0$ *(Engels Law).*

By A1, food expenditure is increasing in total expenditures. A2 implies that the same for non-food expenditures while A3 implies that total expenditures increase at an increasing rate with food. The latter implies that the budget share devoted to food declines as total expenditures increase.

Let z denote the "food poverty line", which is the cost of purchasing a minimum food consumption basket. Typically, this line provides for a nutritional intake considered to be just adequate given the consumption patterns of low income households. The "final poverty line" allows for a certain amount of "essential" non-food spending over and above what is necessary to meet a person's nutritional requirements. Because it is difficult to set objective criteria as to what constitutes essential non-food consumption, the non-food component of the final poverty line is usually obtained by scaling up, by some factor, the food poverty line. We apply two commonly implemented approaches for deriving the final poverty line. The first, which we denote the "traditional" poverty line, $T(z)$, scales up the food poverty line, z, by the non-food budget share of those households whose food expenditures exactly meet the food poverty line. Thus:

$$T(z)=k(z). \tag{1}$$

The "austere" poverty line, $A(z)$, has been proposed by Ravallion (1994a) as an alternative. It adds to the food poverty line the amount normally spent on non-food items by those households whose *total* expenditure, Y, is just equal to the food poverty line. Because this group of households is sacrificing essential food consumption in order to acquire a certain number of non-food items, Ravallion argues that these must be essential[6]. Thus:

$$A(z)=z+g(z). \tag{2}$$

If $h(F)$ is the probability density function of food spending in a sample then measured poverty, with food expenditure as the welfare measure, can be written as:
where $p_F(F, z)$ is a household poverty indicator. Now let Z denote one of the final poverty lines, $T(z)$ or $A(z)$. Then measured poverty, with total expenditure as the welfare measure, can be written as:

[6] These two approaches are described in detail in Ravallion (1994a). Variants have been implemented in practice. For example, the "traditional" approach resembles that adopted in setting the official poverty lines in the United States and India (Deaton, 1995), although usually average non-food shares of a reference population have been taken rather than the estimated non-food share of a household whose food expenditures exactly meet the food poverty line. Bidani and Ravallion (1994) apply the "austere" poverty line in a study of Indonesia. See also several recent World Bank poverty assessments, for example, the *Ecuador Poverty Report* (World Bank, 1995). It should be noted that holding the poverty line constant (in real terms) across data sets remains by far the most common practice. All of the biases discussed below pertaining to the "austere" poverty line would hold even more strongly with a constant poverty line.

$$P_F(z) = \int_0^{\infty} p_F(F,z)h(F)dF \tag{3}$$

$$P_Y(Z) = \int_0^{\infty} p_Y(Y,Z)h(F)dF \tag{4}$$

where $Y=k(F)$, and again, $p_Y(Y,Z)$ is a household poverty indicator. The change in measured poverty in moving from one consumption definition to another is then:

$$P_Y - P_F = \int_0^{\infty} (p_Y - p_F)h(F)dF. \tag{5}$$

Using first the "traditional" and then the "austere" poverty line we examine how estimated poverty changes with the consumption definition, using the Foster-Greer-Thorbecke (1984) class of poverty indicators. We consider separately the common headcount (the FGT indicator with a parameter of 0) and the remaining poverty indicators (taking parameter values greater than or equal to one).

"Traditional" Poverty Line $(Z=k(z))$

A) Headcount

$p_F(F,z)=1$	if $F < z$;	0	else.
$p_Y(Y,Z)=1$	if $Y < k(z)$;	0	else.

Given A1, $F < z$ if and only if $Y=k(F) < k(z)$. Therefore, $p_Y - p_F = 0$ for all F.

Hence, the headcount ratio does not change as the consumption definition changes - the same individuals are considered poor.

B) FGT Measures $(\alpha \geq 1)$

$$p_F(F,z) = [1-\frac{F}{z}]^{\alpha} \quad \text{if } F<z; \quad 0 \text{ else.}$$

$$p_Y(Y,Z) = [1-\frac{Y}{k(z)}]^{\alpha} \quad \text{if } Y<k(z); \quad 0 \text{ else.}$$

i) If $F \geq z$ then again, $Y=k(F) \geq k(z)$ and $p_Y - p_F = 0$.
ii) If $F < z$ then $Y < k(z)$ and

$$p_Y - p_F = [1-\frac{Y}{k(z)}]^{\alpha} - [1-\frac{F}{z}]^{\alpha} \tag{6}$$

The declining food share (A3) implies that:

$$\frac{F}{Y} > \frac{z}{k(z)} \tag{7}$$

so

$$\frac{F}{z} > \frac{Y}{k(z)} \tag{8}$$

and $p_Y - p_F > 0$.

The FGT measures rise as the consumption definition expands. As in the case of the headcount, the same individuals are considered poor under either definition of consumption. However, the relative distance between those poor and the poverty line increases as the consumption aggregate becomes more comprehensive.

"Austere" Poverty Line $(Z=z+g(z))$

C) Headcount Measure

$p_F(F,z)=1$	if $F < z$;	0	else,
$p_Y(Y,Z)=1$	if $Y < z+g(z)$;	0	else.

i) Given A2, if $F \geq z$, then $Y=F+g(Y) > z+g(z)$ and $p_Y - p_F = 0$.

Now define F^* as the food expenditure of someone with a Y just equal to the "austere" poverty line (see Figure 1).[7] That is,

$$Y = z+g(z) = F^*+g(k(F^*)). \tag{9}$$

ii) If $F^* \leq F < z$, then $Y \geq z+g(z)$ and $p_Y - p_F = -1$.

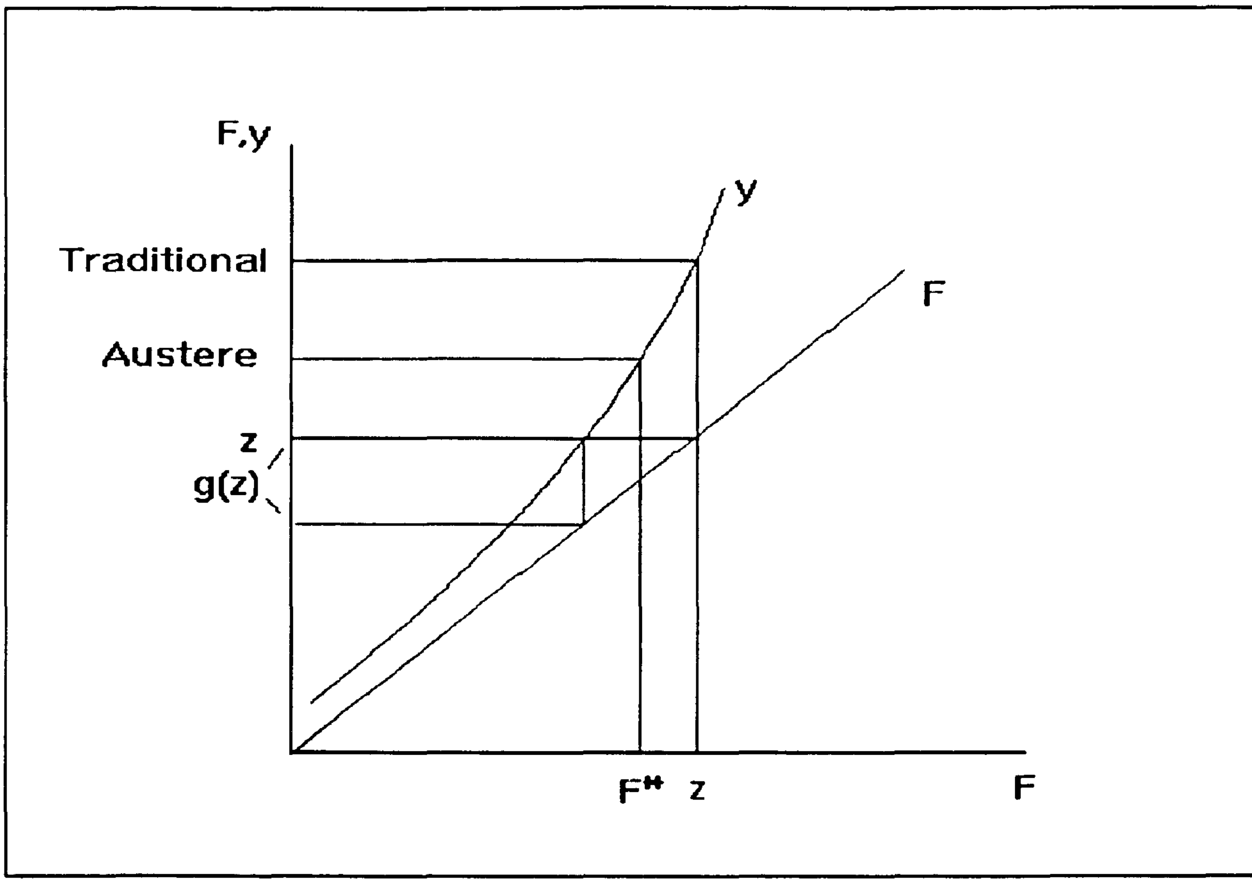
iii) If $F < F^*$, then $Y < z+g(z)$ and $p_Y - p_F = 0$.
Therefore,

$$P_Y - P_F = -\int_{F^*}^{z} h(F)dF. \tag{10}$$

and the headcount falls. With the "austere" poverty line, fewer individuals are considered poor as the consumption aggregate becomes more comprehensive.

[7] Note that when $F=z$, $Y=z+g(k(z))>z+g(z)$ and when $F=0$, $Y=0<z+g(z)$. In conjunction with the continuity and monotonicity of $k()$ it follows that such an F^* exists within the interval (0,z) and is unique.

Figure 1



D) FGT Measures ($\alpha \geq 1$)

$$p_F(F,z) = (1 - \frac{F}{z})^{\alpha} \quad \text{if } F<z; \quad 0 \text{ else.}$$

$$p_Y(Y,Z) = (1 - \frac{F+g(Y)}{z+g(z)})^{\alpha} \quad \text{if } Y<z+g(z); \quad 0 \text{ else.}$$

i) If $F \geq z$, then, as above, $p_Y - p_F = 0$.

ii) If $F^* \leq F < z$, then $p_Y - p_F = -p_F < 0$.
This captures the effect of the change in the number of poor persons.

iii) If $F < F^*$, then

$$p_Y - p_F = \left(1 - \frac{F+g(Y)}{z+g(z)}\right)^\alpha - \left(1 - \frac{F}{z}\right)^\alpha \tag{11}$$

As in B(ii) above, the declining food share implies that $p_Y - p_F > 0$.

The direction of change in the FGT indicator is ambiguous. Fewer individuals are considered poor but the measured depth of poverty increases.

We summarize the results from this section in Table 1.

Table 1. Direction of Change in Measured Poverty As Consumption Becomes More Comprehensive

	"Traditional" Poverty Line	*"Austere" Poverty Line*
Headcount	no change	decrease
FGT ($\alpha \geq 1$)	increase	ambiguous

Two conclusions can be drawn from this section. First, the method used to set the poverty line has a bearing on how measured poverty will change simply as a result of variation in the consumption definition. Second, different indicators of poverty do not all move in the same direction. Under the "traditional" poverty line, the headcount is unchanged as the consumption aggregate expands, but indicators of poverty in the FGT class which are sensitive to depth show an unambiguous increase as the consumption definition widens. Under the "austere" poverty line, the number in poverty falls so the headcount unambiguously declines. However, this is offset to some extent by a greater relative distance to the poverty line for some still in poverty. As a result, the movement of the FGT indicators is ambiguous as the consumption definition expands.

The exposition in this section has been in terms of just two definitions of consumption expenditures: food and a composite of both food and non-food expenditures. If we are interested in comparing two different definitions of consumption, both of which include non-food items, the foregoing analysis of the direction of biases is relevant as long as there is a behavioral regularity analogous to Engel's Law regarding the share of the more broadly defined expenditure going to items which are part of the less comprehensive definition.

III. Examples

The previous section has shown that under certain assumptions we can anticipate how measured poverty will change if different definitions of consumption are used. To check these predictions and also to ascertain by *how much* measured poverty changes, we consider two empirical examples, drawing on household survey data from Ecuador and Pakistan.

The Ecuador household survey (*Encuesta Sobre Las Condiciones de Vida*) is a nationally representative household survey modelled on the World Bank's Living Standard Measurement Surveys. It was fielded in Ecuador during the period June-September, 1994. Over 4,500 households were surveyed in total and after cleaning and data consistency checks, information for 4,391 households is available for analysis. Hentschel and Lanjouw (1996) describe in detail the construction of the Ecuador consumption aggregates. The Pakistan survey (*Pakistan Integrated Household Survey*) is also nationally representative and based on the LSMS model. It was fielded over the course of the whole year in 1991. In total, information on 4,673 households is available for analysis. The construction of the consumption aggregates has been described in Howes, Gazdar and Zaidi (1994).

Tables 2 and 3 provide calculations of poverty in Ecuador based on the "traditional" and "austere" poverty lines in turn. In each table three common summary indicators of poverty are applied: the headcount index and two indicators from the FGT class, with parameter values of 1 and 2. From Table 2 it appears that, if the poverty line is set using the "traditional" approach, the headcount ratio is robust to alternative definitions of consumption (the differences are not statistically significant). This accords with the theoretical prediction. On the other hand, there is also no significant change in the FGT indicators. On the basis of the arguments above we might have expected them to increase. Turning to Table 3, where the "austere" poverty line is set, the incidence of poverty falls as predicted: from 50% when only food expenditures are used to as low as 35% when the full consumption aggregate for Ecuador is applied. Even between measures of consumption which both include food and non-food spending the decline in the incidence of poverty is as large as ten percentage points. It is important to note that the consumption aggregate defined in the second row of both tables is one which would probably find acceptance as a comprehensive measure of consumption by most observers. Poverty measured by the two FGT indicators also declines sharply.

Tables 4 and 5, based on data from Pakistan, provide a similar picture of how measured poverty changes with the definition of consumption. Once again poverty measured with respect to the "traditional" poverty line does not vary markedly as the definition of consumption changes, and this is true over all poverty indicators. And once again, poverty measured with reference to the "austere" poverty line declines sharply. The estimated incidence of poverty with the full definition of consumption is 24 percentage points lower than the incidence when only food expenditures are utilized, and still 15 percentage points lower than when a simple consumption aggregate including both food and non-food items is applied.

The patterns observed for both Ecuador and Pakistan accord broadly with those predicted. The single exception, in both cases, is failure of the FGT indicators to increase with aggregation under the "traditional" poverty line. An explanation is suggested in Section V when we consider measurement error.

Table 2. The Impact on Poverty Measures of Alternative Consumption Aggregations in Ecuador

Poverty Incidence, Depth and Severity Based on the "Traditional" Poverty Line

Consumption Aggregate	*Average Fortnightly Per Capita Consumption*	*Poverty Line*	*Incidence*	*Poverty Depth*	*Severity*
Food Spending	36,917	30,728	0.50 (0.02)	0.19 (0.01)	0.10 (0.01)
Food Spending plus Basic Non-Food Spending	61,600	44,057	0.53 (0.02)	0.20 (0.01)	0.10 (0.008)
Food plus Basic Non-Food Spending Including Energy and Education Spending	69,390	47,843	0.52 (0.02)	0.19 (0.01)	0.10 (0.007)
Above With Imputed Water Expenditures	71,696	50,012	0.52 (0.02)	0.19 (0.01)	0.09 (0.007)
Above With Imputed Value of Housing Services	80,992	55,884	0.53 (0.03)	0.19 (0.01)	0.09 (0.007)
Above With Imputed Value of Owned Consumer Durables	84,315	56,775	0.52 (0.03)	0.19 (0.01)	0.09 (0.007)

Notes:

1. Standard errors in brackets. Standard errors take into account stratification and clustering in the surveys, see Howes and Lanjouw (1995).

Table 3. The Impact on Poverty Measures of Alternative Consumption Aggregations in Ecuador

Poverty Incidence, Depth and Severity Based on "Austere" Poverty Line

Consumption Aggregate	*Average Fortnightly Per Capita Consumption*	*Poverty Line*	*Incidence*	*Poverty Depth*	*Severity*
Food Spending	36,917	30,728	0.50	0.19	0.10
			(0.02)	(0.01)	(0.01)
Food Spending plus Basic Non-Food Spending	61,600	39,688	0.45	0.16	0.08
			(0.02)	(0.01)	(0.007)
Food plus Basic Non-Food Spending Including Energy and Education Spending	69,390	41,439	0.40	0.14	0.07
			(0.02)	(0.01)	(0.006)
Above With Imputed Water Expenditures	71,696	42,555	0.39	0.13	0.06
			(0.02)	(0.01)	(0.006)
Above With Imputed Value of Housing Services	80,992	44,534	0.36	0.11	0.05
			(0.02)	(0.01)	(0.005)
Above With Imputed Value of Owned Consumer Durables	84,315	44,625	0.35	0.11	0.05
			(0.02)	(0.01)	(0.005)

Notes:

1. Standard errors in brackets, see Table 2.

Table 4. The Impact on Poverty Measures of Alternative Consumption Aggregations in Pakistan

Poverty Incidence, Depth and Severity Based on the "Traditional" Poverty Line

Consumption Aggregate	*Average Monthly Per Capita Consumption*	*Poverty Line*	*Incidence*	*Poverty Depth*	*Severity*
Food Spending	254.3	245.7	0.61	0.21	0.09
			(0.01)	(0.006)	(0.004)
Food Spending plus Basic Non-Food Spending	377.8	336.7	0.59	0.20	0.09
			(0.01)	(0.006)	(0.004)
Food plus Basic Non-Food Spending Including Energy and Education Spending	423.6	382.7	0.60	0.21	0.09
			(0.01)	(0.006)	(0.004)
Above With Imputed Health Expenditures	489.7	425.7	0.59	0.20	0.09
			(0.01)	(0.006)	(0.003)
Above With Imputed Value of Housing Services	566.6	488.7	0.60	0.21	0.09
			(0.01)	(0.006)	(0.004)
Above With Imputed Value of Owned Consumer Durables	569.6	489.7	0.59	0.21	0.09
			(0.01)	(0.006)	(0.004)

Notes:

1. Standard errors in brackets, see Table 2.

Table 5. The Impact on Poverty Measures of Alternative Consumption Aggregations in Pakistan

Poverty Incidence, Depth and Severity Based on the "Austere" Poverty Line

Consumption Aggregate	*Average Monthly Per Capita Consumption*	*Poverty Line*	*Incidence*	*Poverty Depth*	*Severity*
Food Spending	254.3	245.7	0.61 (0.01)	0.21 (0.006)	0.09 (0.004)
Food Spending plus Basic Non-Food Spending	377.8	305.8	0.52 (0.01)	0.17 (0.005)	0.07 (0.003)
Food plus Basic Non-Food Spending Including Energy and Education Spending	422.9	326.8	0.48 (0.01)	0.15 (0.005)	0.06 (0.003)
Above With Imputed Health Expenditures	489.8	336.7	0.40 (0.01)	0.12 (0.005)	0.05 (0.002)
Above With Imputed Value of Housing Services	566.6	355.5	0.37 (0.01)	0.10 (0.005)	0.04 (0.002)
Above With Imputed Value of Owned Consumer Durables	569.6	355.6	0.36 (0.01)	0.10 (0.005)	0.04 (0.002)

Notes:

1. Standard errors in brackets, see Table 2.

Before proceeding it is interesting to note how measured inequality changes with the definition of consumption.[8] Given the analysis above, inequality should increase with a more comprehensive definition of consumption (by an argument similar to that given above with respect to FGT indicators with $\alpha \geq 1$). Table 6 presents calculations for both Ecuador and Pakistan. Estimated inequality in Ecuador ranges from a Gini coefficient of 0.359 if only food expenditures are taken into account (including an imputed value for home consumed food production) to a Gini of 0.430 when the full definition of consumption is employed. Inequality in Pakistan rises from a low of 0.316 when only food expenditures are considered to a high of 0.374 with the full definition of consumption. Clearly the definition of consumption can have an important influence on estimated inequality. It is worth emphasizing that even an ordinal ranking of Pakistan and Ecuador in terms of inequality could be overturned if the consumption definition is not held constant across the two countries.

Table 6. Inequality and the Measurement of Inequality

Gini Coefficients

Consumption Aggregate	*Ecuador*	*Pakistan*
Food Spending	0.359	0.316
Food Spending plus Basic Non-Food Spending	0.420	0.351
Food plus Basic Non-Food Spending Including Energy and Education Spending	0.421	0.345
Above With Imputed Water Expenditures	0.415	
Above With Imputed Health Expenditures		0.355
Above With Imputed Value of Housing Services	0.420	0.373
Above With Imputed Value of Owned Consumer Durables	0.430	0.374

[8] Deininger and Squire, 1996, discuss this issue in the context of international comparisons of inequality. However, they are less concerned with the precise composition of consumption and income measures as with the problems arising from comparisons of consumption against income or of pre-tax against post-tax incomes.

IV. Resolving Problems of Non-Compatible Data

In this section we outline how our results may be used to deal with the problem of comparing data of differing levels of comprehensiveness. There are two approaches. The first is to make direct use of the robustness result obtained in Section II and restrict attention to the headcount ratio using final poverty lines constructed in the "traditional" manner. This allows one to make comparisons over time or across regions without adjusting the data. The second approach is to calculate predicted values of total expenditure for the periods or countries where actual total expenditure is not available, in order to have consumption measures which are comparable.

We demonstrate the direct use of the robustness result, using data for El Salvador. The *Encuesta de Hogares de Propositos Multiples* household survey in El Salvador (covering 4220 households during the period July-September, 1994) was the subject of an experiment: two non-overlapping samples were drawn from the same sampling frame and were administered different food consumption modules (both of which include some basic non-food goods and services as well). A short module asking about the consumption of 18 food items and six non-food items was completed for 3,182 households. A long module enquiring into the consumption of 72 food items and 25 non-food items was completed for 1047 households. Only with reference to five basic food items did the two coincide: corn tortilla, bread, sweet bread, beans and rice. Essentially, the long module referred in a more detailed, itemized, way to broad food categories included in the short module. Table 7 shows that average consumption levels by decile in the two subsamples differ markedly, with households covered by the short module spending significantly less than those covered by the long module. If one were to measure poverty by applying a single poverty line across the two sub-samples, one would conclude that poverty among those covered by the short module is much greater than among those covered by the long module. Because both samples are representative of the same underlying population, this is clearly incorrect[9].

Table 7. Per Capita Monthly Expenditure: Long and Short Questionnaires

Percentiles	*Long*	*Short*
10*th*	124.97	94.83
20*th*	193.60	153.35
30*th*	242.20	204.62
40*th*	296.78	255.24
50*th*	358.54	315.25
60*th*	445.25	382.19
70*th*	575.17	483.18
80*th*	730.99	627.97
90*th*	992.79	864.83
Top	2090.5	2225.4

Source: Republic of El Salvador: Encuesta de Hogares de Propositos Multiples, 1994-III.

[9] The two sub-samples were drawn from the same frame and were explicitly intended to be identical in all respects except for the consumption modules. Scott and Jolliffe (1995) show, in terms of location, household size, income levels, education, etc., that households in the two sub-samples resemble each other closely.

To implement the robust approach, we define a food poverty line which is based on only those food items about which exactly identical questions are asked in the two consumption modules and which are also included as components in the official (food) poverty line: tortilla maize, rice, beans and bread. These four items represent 32.5% of the value of the food poverty line, corresponding to 82.1 colones per person per month.

The "traditional" poverty lines derived from this (modified) food poverty line are 575 colones per person per month for those households covered by the short consumption module, and 667 colones per person per month for those covered by the long consumption module. Given the theoretical results in Section II, we would expect that, using this approach, measured poverty using the headcount would be the same for the two samples. This is indeed the case—72% of the population is poor in El Salvador irrespective of the consumption definition being used.

This example demonstrates that comparisons of poverty rates are feasible even in the presence of concern about the comparability of the underlying consumption aggregates. If one is prepared to confine one's attention to using the "traditional" methodology for setting the poverty line and to using only the headcount as a measure of poverty then measured poverty rates will not vary if the two distributions differ only in terms of the definition of consumption they employ. In other words, when poverty rates do differ this result will not have been driven by the definitions of consumption employed in the different datasets.

Before proceeding it is useful to re-state the assumptions involved in deriving our results. The robustness result required only the use of A1, that food expenditure increases with total expenditure. Similarly robust comparisons may be made using any other sub-component of expenditure which increases in total expenditure, provided an appropriate poverty line is used. For example, if only non-food data were available, one could make robust comparisons using the headcount and a poverty line equal to $K(z)-z$, that is, the amount by which the food poverty line is "grossed-up" to reach the "traditional" final poverty line.

A second assumption, which has not been explicitly stated so far, is also necessary. Throughout we are assuming that underlying consumption patterns do not differ as a result of sharply divergent relative prices across datasets. When attention is focussed on measuring poverty across different datasets, for a given country and at a given moment, this assumption is rather innocuous. However, to make credible comparisons of poverty across countries, or over time, the assumption becomes more controversial. Suppose we have a food-only consumption measure for Island F, and a comprehensive consumption measure for Island T. Suppose the two islands resemble each other closely in most respects, but that on Island F all non-food items are extremely expensive as they have to be imported over long distances, while on Island T non-food items are produced locally and cheaply. On Island F, food is inexpensive relative to non-food items and the islanders therefore tend to devote a large share of their budget to food items. On island T the converse applies. The approach outlined in Section II requires that the welfare level of two islanders consuming the same amount of food on their respective islands is equal. But on Island F an individual with a given budget allocation on food is likely to be spending rather little on non-food items (because of their expense) while on Island T an individual spending the same amount on food is likely to have purchased far more non-food items as well. At a given expenditure on food the individual on Island T is likely to be better off. Hence, to apply the approach developed in Section II, one must invoke the assumption that the different consumption definitions found across datasets do not coincide with relative price differences across their respective settings. This implies that the approach is more likely to offer a solution to comparisons over relatively short periods of time for a given country, or to comparisons across similar regions.

The second approach to dealing with consumption data which differ in their level of comprehensiveness is to predict unknown expenditure components. For example, suppose we have two time periods, *F* and *T*, with food and food plus non-food expenditure data, respectively. A food share equation can be estimated using the data in period *T*. The estimated relationship between food and total expenditure can then be used to calculate a *predicted* value of total expenditure for each household in period *F* based on that household's food expenditure in time *F*. Finally a poverty measure based on predicted total expenditure for time period *F* can be compared to one based on actual total expenditure in *T*. Using this approach, one can base comparisons on a common, price-adjusted, final poverty line, as is common practice, without recourse to food poverty lines (on price adjustments in this context see Datt, 1995, and Ravallion and Subramanian, 1996). The procedure would be more relevant when making a comparison of poverty between two time periods within a country, where the assumption of a stable set of demand functions is most tenable, rather than across countries.

Because the comprehensiveness of the data being compared across time periods or countries is, in principle, identical using this procedure, all poverty indicators may be used. However, in practice, caution is warranted. Households may deviate from the expenditure predicted for them based on the assumption that Engel's Law holds for the population as a whole. For example, a given household may purchase relatively little food given its income level. To the extent that this is true, welfare measures based on a small subset of expenditure components will be a poor proxy for true household welfare. In addition, all components of surveyed expenditure data are subject to measurement error. The quality of the welfare measure is likely to be particularly poor when the data are sparse. (These issues are discussed in detail in the following section.) Since FGT measures are more sensitive than the headcount to errors, the use of these indicators should be restricted to situations where all of the consumption data being compared are reasonably comprehensive.[10]

[10] What may appear to be a straightforward solution to the problem of inconsistent consumption data is to discard some of the available information and base comparisons only on those components of consumption which are common to all countries or time periods. While simple, there are, however, a number of drawbacks to this approach. First, discarding data is likely to worsen the measure of household welfare. Second, if one is interested in a cardinal magnitude for the poverty rate, rather than ordinal comparisons, then the appropriate basis is total expenditure. As shown in Section II, FGT ($\alpha \geq 1$) measures of poverty, for example, would have a lower values when food expenditure alone is used in their calculation. Finally, this approach may be impossible to implement, either because detail about sub-categories of expenditure are unavailable or because there are no common elements in the sub-categories used in the different datasets.

V. Changes in the Poverty Profile

In this section we use the robustness result of Section II, together with poverty profiles, to assess whether adding more, perhaps noisily measured, expenditure components improves consumption as a measure of household welfare. A comparison of poverty profiles reveals changes over time or across countries in the relative poverty of certain sub-groups of the population. Profiles are constructed by first calculating a poverty indicator for each household, say $p_Y(Y,Z)$, and then estimating a model of the relationship between this indicator and various household characteristics. Because profiles, like poverty rates, are based on the household indicators, $p_Y(Y,Z)$, they will also not change with different consumption definitions if the aggregation-consistent approach is used, and the requisite assumptions hold. This result allows us to assess whether aggregation is beneficial when there is, in fact, measurement error in the data and households deviate from predicted expenditure patterns.

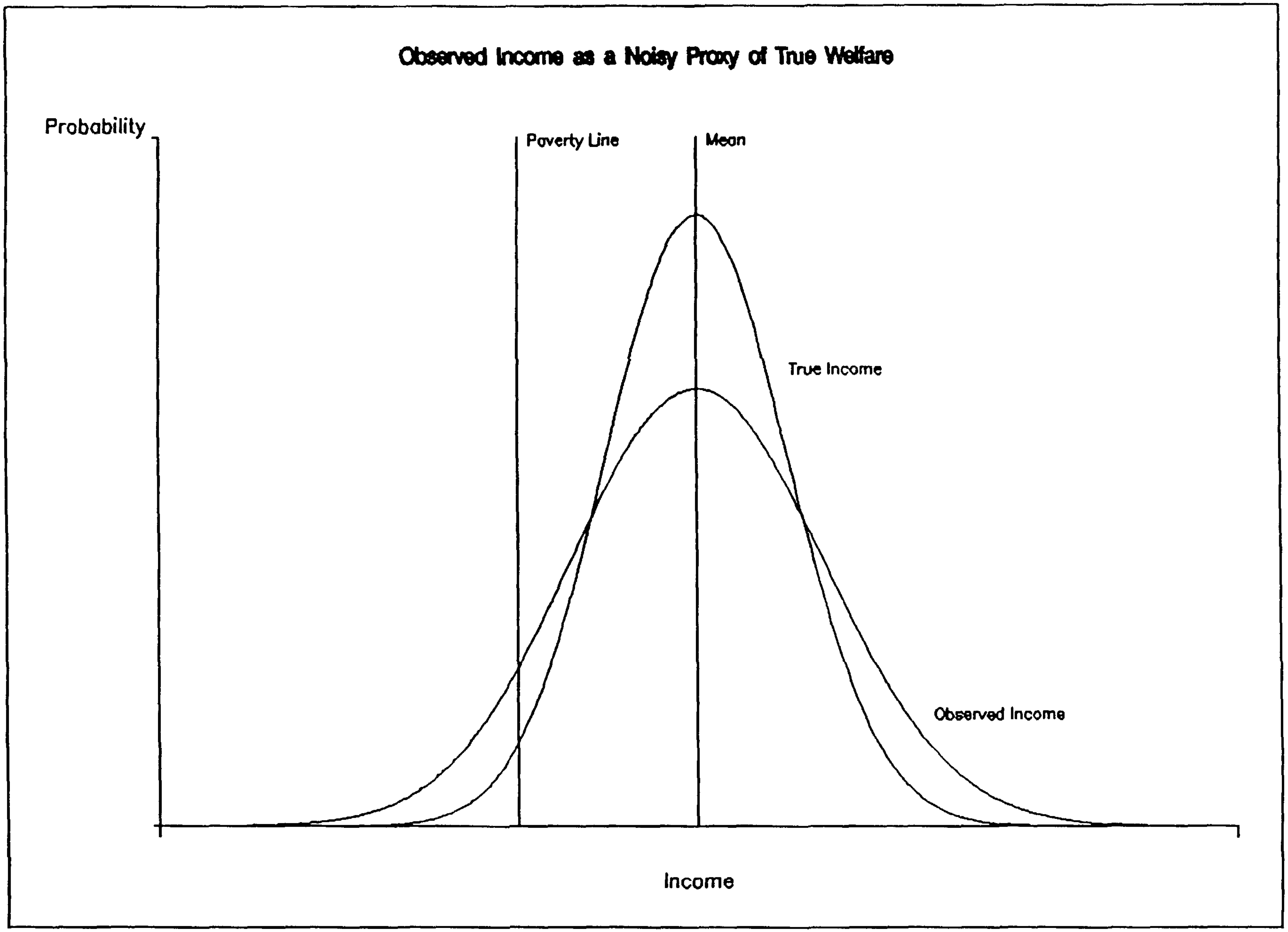
The introduction of error means that both poverty rates and poverty profiles will no longer be invariant as the consumption definition expands. Figure 2 illustrates why with a very simple example. Suppose that observed expenditure is equal to true expenditure plus a normally distributed, uncorrelated, error term. The density function of observed expenditure will have the same shape as that of true expenditure but with wider tails. As Ravallion (1988) has shown, if the poverty line is located to the left of the mode of these two distributions, the incidence of poverty measured from observed expenditure will be higher than that measured from true expenditure.[11] Now suppose we are comparing two subgroups of the population, one whose distribution is concentrated above the poverty line (as in Figure 2) and another whose distribution is concentrated below the poverty line. For the subgroup concentrated below the poverty line, measured poverty based on observed expenditure will be *lower* than that based on true expenditure. In other words, the poverty of the truly poor is understated and the poverty of the truly non-poor is overstated[12]. The ability of a poverty profile to distinguish depends on the noisiness of the measure.

If a more aggregate consumption measure is a less noisy indicator of true welfare we expect to see the poverty profile become more precise. Anand and Harris (1989) argue that because durable non-food expenditures are likely to be measured with more error than food expenditure, the latter, less comprehensive, consumption aggregate should be used in poverty analysis. In fact, however, if measurement errors are at least partially independent across components, there is a trade-off between the benefits from aggregating across components (so that errors can cancel each other out) and the potential danger from adding further imprecisely measured components.

[11] For poverty measures that belong to the FGT class, Ravallion (1988) shows that the presence of noise leads to an overestimate of measured poverty regardless of where the poverty line is relative to the mode of the distribution (see also Ravallion, 1994b).

[12] See also Drèze, Lanjouw and Stern (1992).

Figure 2


Observed Income as a Noisy Proxy of True Welfare
Probability
Poverty Line
Mean
True Income
Observed Income
Income

We can look at the tradeoff more formally as follows. Let $F = sY + \nu$ and $NF = (1\text{-}s)Y - \nu$ be true food and non-food, respectively, with the disturbance ν capturing household deviations from the Engel curve. (The food share is assumed here to be a constant, s.) Let $Y = F + NF$ be the true value of total expenditure. Suppose that observed expenditures differ from their true values due to measurement error in both food and non-food components: $f = F + \epsilon$, $nf = NF + \eta$ and $y = Y + \epsilon + \eta$. We make the following assumptions:

$$\epsilon \sim N(0,\sigma_\epsilon^2), \qquad \eta \sim N(0,\sigma_\eta^2), \qquad \nu \sim N(0,\sigma_\nu^2),$$

$$\sigma_{\epsilon,\eta} \geq 0, \qquad \sigma_{\epsilon,\nu} = \sigma_{\eta,\nu} = 0.$$

Let z be the food poverty line, with $Z = z/s$ the corresponding "traditional" poverty line. Using y rather than f alone will generate a poverty profile with better resolution if poor people are more likely to be identified as such and visa versa. It is sufficient for y to be preferred that, for all Y,

$$Prob(y < z/s \mid Y<z/s) \;>\; Prob(f < z \mid Y<z/s) \tag{12}$$

and

$$Prob(y > z/s \mid Y>z/s) \;>\; Prob(f > z \mid Y>z/s) \tag{13}$$

or, equivalently, for all Y,

$$\Phi\left(\frac{\mid z/s - Y \mid}{\sqrt{[\sigma_\epsilon^2 + \sigma_\eta^2 + 2\sigma_{\epsilon,\eta}]}} \right) \;>\; \Phi\left(\frac{\mid s\,(z/s - Y) \mid}{\sqrt{[\sigma_\epsilon^2 + \sigma_\nu^2]}} \right) \tag{14}$$

where $\Phi(.)$ represents a cumulative standard normal distribution. It follows that y will be a better measure than f if

$$\sigma_\epsilon^2 + \sigma_\nu^2 > s^2(\sigma_\epsilon^2 + \sigma_\eta^2 + 2\sigma_{\epsilon,\eta}). \tag{15}$$

To get a sense of what this requirement means, consider the simplest case where there is only measurement error and the measurement errors are independent, $\sigma_\nu^2 = \sigma_{\epsilon,\eta} = 0$. Then the condition simplifies to y being preferred to f if:

$$\left[\frac{(1-s^2)}{s^2}\right]\sigma_\epsilon^2 \;>\; \sigma_\eta^2. \tag{16}$$

To aid in the interpretation of this condition on variances, when food and non-food components of expenditure may be of very different magnitudes, we define β as a normalized measure of the noisiness of non-food expenditure relative to food expenditure:

$$\beta = [\frac{\sigma_\epsilon}{\sigma_\eta}]/[\frac{F}{NF}]. \qquad (17)$$

When β equals one, both components are equally noisy. Using this definition in (16), and noting that $s = F/(NF+F)$, total expenditure, y, will be a better measure than food expenditure, f, whenever

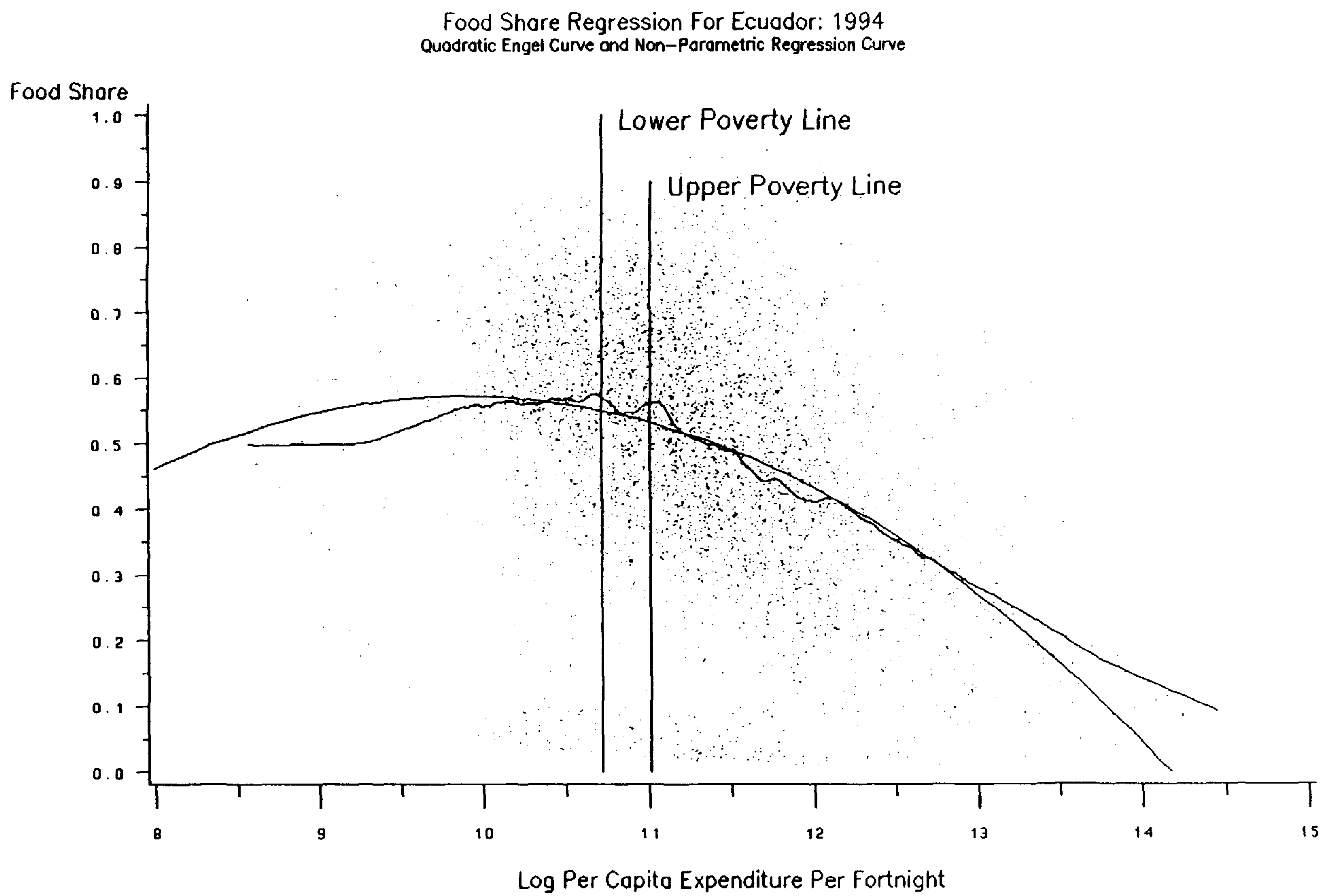
$$\beta < \frac{(1+s)}{(1-s)}. \qquad (18)$$

The right hand side of this inequality is always greater than one, which means that it will be advantageous to use non-food expenditure information even if it is somewhat noisier than food expenditure information. This is the benefit of aggregation. The data suggest that non-food information can, in fact, be substantially noisier and still be useful. The RHS of (18) is equal to approximately four for Ecuador and five for Pakistan, using food shares of 0.60 and 0.67, respectively (see Tables 2 and 4, rows 1 and 2). In other words, as long as the relative noise of non-food expenditure is no more than four times that of food in the case of Ecuador, and no more than five times that of food in the case of Pakistan, aggregating these two components into a comprehensive measure of consumption provides a better indicator of welfare than food alone.

The preceding values assume independence across measurement errors and, of course, a positive correlation between them would diminish the advantages of aggregation. However, there are grounds for expecting less than perfect correlation. First, questions on household expenditures are often answered by different family members. In LSMS surveys interviewers are generally instructed to ask questions of those who are best placed to answer them (Grootaert, 1986). This might imply, for instance, that the questions on food expenditures are answered by women, while transport or durable purchase expenditures are described by men. Second, at least some of the non-food expenditures which can be included in the consumption aggregate consist of imputed expenditures, eg. for housing, consumer durables, or certain public services (see for example, Hentschel and Lanjouw, 1996). The errors which these components introduce stem from the underlying imputation model, and it would seem reasonable to suppose that they are not correlated with the errors introduced by a specific household's response to questions on other consumption components.

The above values also assume that there are no household deviations from population food demand patterns. As is clear from the condition given in (15), the addition of such variation makes the use of non-food expenditure information more important in assessing the standard of living of households.

Figure 3



(Non-parametric regression applies locally weighted scatterplot smoothing with a bandwidth of 0.1)

In the end the net effect of aggregation is an empirical issue so we turn to the data. Figure 3 shows a scatter plot of the food share against log per capita consumption in Ecuador, with parametric and non-parametric estimates of the Engel curve.[13] The figure indicates that there is a good deal of variation around the estimated Engel curves. In fact, for Ecuador the Engel curve is not even monotonic, with the food share increasing at low levels of income. This is not too unusual as in many data sets Engel's Law does not hold empirically at low levels of expenditure (for a survey, see Thomas, 1986). More interesting, however, is the reason for this departure from Engel's Law: the scatter of households at the bottom of the figure. These households have moderate incomes but close to zero food expenditure—which suggests that there is, in fact, substantial mismeasurement in food expenditure.[14] This also explains why the FGT measures presented in the previous section do not rise with aggregation as expected under the "traditional" poverty line. Because so little food expenditure is attributed to these households, the depth of poverty measured by F alone is overstated.

A simple poverty profile for Ecuador is presented in Table 8, based on a range of possible definitions of consumption and using the aggregation consistent measure (traditional poverty line/headcount). It is clear from this table that those who are more likely than average to be poor based on a narrow definition of consumption are also more likely to be poor based on more comprehensive definitions. There is a remarkable degree of stability across definitions of consumption in this respect. However, the "resolution" of the poverty profile improves as the definition of consumption expands. For example, under the food definition persons in primary-educated households are just twice as likely to be identified as poor than persons in tertiary-educated households (.55/.28), but almost six times more likely to be identified as poor when the full definition is taken (.57/.10). This pattern holds across virtually all comparisons. Since we would expect no change in the absence of error, we conclude that moving to a more comprehensive indicator which includes non-food expenditures yields a less noisy measure of welfare.

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[13] The picture for Pakistan resembles that for Ecuador closely.

[14] One explanation is that the survey recording period may not correspond to the period in which households purchase food. Consider a simple example. Suppose that households purchase all of their food on a fortnightly basis (with households uniformly spread across weeks) and that the recording period is one week. Let F = *average* weekly food expenditure and Y = average weekly income. Suppose further that non-food expenditure = (Y-F) is correctly measured due to a longer recording period. If n households are sampled from a group with identical {F,Y}, n/2 will have food purchases of f=2F, with y = Y+F, and n/2 will have f=0, with y=Y-F. The mean food expenditure is correctly estimated as (1/2)*2F + (1/2)*0 = F. However, the distribution of consumption and income, and hence the Engel curve, are incorrectly estimated. The true food share is F/Y while the empirical food shares are zero, with probability one half, and 2F/(Y+F) with probability one half. The foodshare is increasing in y. (See Lanjouw and Lanjouw, 1996, for a proof that an inappropriate recording period can lead to a non-monotonic Engel curve in a more general setting.)

Table 8. Household Characteristics and the Risk of Poverty
Alternative Consumption Aggregates and the "Traditional" Poverty Line

The Incidence of Poverty Under Different Household Characteristics and Consumption Aggregations

Household Characteristics	*Food Spending*	*Food plus Basic Non-Food*	*Food plus Non-Food (with education and energy)*	*Expenditure including imputed water*	*Expenditure including imputed water and housing*	*Expenditure with imputed water, housing, and durables*
Average Risk of Poverty	0.50	0.53	0.52	0.52	0.53	0.52
Rural	0.55	0.60	0.60	0.61	0.63	0.63
Urban	0.46	0.41	0.38	0.38	0.37	0.36
Sierra	0.50	0.49	0.47	0.47	0.47	0.46
Costa	0.49	0.49	0.48	0.48	0.49	0.49
Oriente	0.67	0.69	0.69	0.69	0.70	0.70
Black and White TV	0.52	0.50	0.49	0.49	0.49	0.48
Color TV	0.33	0.27	0.22	0.22	0.21	0.19
Bicycle	0.49	0.45	0.42	0.42	0.41	0.40
Refrigerator	0.39	0.33	0.29	0.28	0.27	0.26
Radio/Cassette	0.46	0.45	0.43	0.43	0.43	0.42
House with Mud Walls	0.54	0.53	0.55	0.55	0.56	0.56
House with Dirt Floor	0.65	0.67	0.69	0.70	0.73	0.74
House with Wood Walls	0.60	0.68	0.65	0.67	0.72	0.72
Telephone Connection	0.30	0.21	0.14	0.14	0.09	0.09
Networked Electricity	0.48	0.47	0.45	0.45	0.45	0.44
Networked Water	0.44	0.40	0.36	0.36	0.35	0.34
Waste Disposal	0.43	0.37	0.34	0.34	0.32	0.31
Sewage Removal	0.45	0.41	0.38	0.38	0.37	0.36
Head with No Education	0.61	0.68	0.67	0.68	0.69	0.70
Primary Educated Head	0.55	0.57	0.56	0.57	0.58	0.57
Secondary Educated Head	0.40	0.35	0.30	0.30	0.30	0.29
Tertiary Educated Head	0.28	0.18	0.14	0.13	0.11	0.10
Indigenous Head	0.76	0.76	0.76	0.76	0.77	0.78

VI. Concluding Remarks

This paper has argued that comparisons of poverty rates measured with respect to different definitions of consumption are often biased. Efforts to achieve comparability between different data sources have rarely recognized this in the past. We have shown in this paper that the magnitude of error which is introduced as a result of a failure to ensure strict comparability of the consumption definition can be very substantial. It is important to note that the errors can be significant even between two definitions which would appear to resemble each other closely and would be treated as comparable in practice.

Under certain assumptions, we determine how measured poverty changes if the definition of consumption expands to include more items and services. In particular, we assume that the relationship between two definitions of consumption follows Engel's Law: as expenditures defined in terms of the more comprehensive definition increase, the ratio of expenditures in terms of the less comprehensive definition to the more comprehensive definition declines. We assume also the relative prices are not different across the datasets which yield the alternative consumption definitions. The results of the theory section then show that one can make comparisons which are robust to alternative definitions of consumption by using the headcount measure and the "traditional" poverty line.

The fact that this approach limits one to the headcount measure when calculating poverty rates is a feature which is perhaps somewhat unappealing. But headcounts are useful for the purpose of constructing poverty profiles, and focussing on the ordinal conclusions that stem from such profiles is rather more attractive. One of the implications of the theory section is that, in principle, poverty profiles will not vary whether one constructs them on the basis of a very simple definition of consumption or a comprehensive one. This might be interpreted to imply that one could simplify life by working only with the most easily calculated definition of consumption. Measurement error is always present and we have argued, and illustrated, that as the consumption aggregate becomes more complete the poverty profile is likely to become more sharply defined.

References

Anand, S. and Harris, C. (1989) 'Food and the Standard of Living,' in Drèze, J. and A. Sen (eds.) (1989) *The Political Economy of Hunger Vol 1: Entitlement and Well-Being* (Oxford: Clarendon Press).

Atkinson, A. (1987) 'On the Measurement of Poverty,' *Econometrica*. Vol. 55.

Atkinson, A. (1991) 'Comparing Poverty Rates Internationally: Lessons from Recent Studies in Developed Countries,' *The World Bank Economic Review*, Vol. 5, no. 1.

Atkinson, A. and J. Micklewright (1992) *Economic Transformation in Eastern Europe and the Distribution of Income* (Cambridge: Cambridge University Press).

Bidani, B. and Ravallion, M. (1994) 'How Robust is a Poverty Profile?' *The World Bank Economic Review*, Vol. 8.

Datt, G. (1995) 'Poverty in India 1951-1992: Trends and Decompositions', mimeo, Policy Research Department, the World Bank.

Deaton, A. (1994) *The Analysis of Household Surveys: Microeconometric Analysis for Development Policy*. Manuscript. The World Bank. forthcoming.

Deaton, A. and D. Thomas (1986) 'Working-Leser Engel Curves When Expenditures are Measured With Error,' Mimeo. Princeton University.

Deininger, K. and L. Squire (1996) 'Measuring Income Inequality: A New Data-Base,' Mimeo. Policy Research Department, the World Bank.

Drèze, J.P., P. Lanjouw and N. Stern (1992) 'Economic Mobility and Agricultural Labour in Rural India: a Case Study,' *Indian Economic Review*. Vol. XXVII.

Foster, J., J. Greer and E. Thorbecke (1984) 'A Class of Decomposable Poverty Measures,' *Econometrica*. Vol. 52.

Government of India (1993) *Report of the Expert Group on Estimation of Proportion and Number of Poor* (New Delhi: Government of India Planning Commission).

Grootaert, C. (1986) 'Measuring and Analyzing Levels of Living in Developing Countries: An Annotated Questionnaire,' Living Standards Measurement Survey Working Paper No. 24, the World Bank.

Grosh, M. and H-P. Jeancard (1994) 'The Sensitivity of Consumption Aggregates to Questionnaire Formulation: Some Preliminary Evidence from the Jamaican and Ghanaian LSMS Surveys,' Mimeo. Poverty Research Department. The World Bank.

Hentschel, J. and P. Lanjouw (1996) 'Constructing an Indicator of Consumption for the Analysis of Poverty: Principles and Illustrations with Reference to Ecuador,' Living Standards Measurement Survey Working Paper No. 124, the World Bank.

Howes, S. and J. O. Lanjouw (1995) 'Making Poverty Comparisons Taking Into Account Survey Design: How and Why,' Mimeo. The World Bank.

Howes, S., H. Gazdar and S. Zaidi (1994) 'Poverty in Pakistan: Measurement, Trends and Patterns,' Mimeo. STICERD, The London School of Economics.

Lanjouw, J.O. and P. Lanjouw (1996) 'Comparing Poverty With Non-Identical Consumption Aggregates: Theory and Illustrations from Ecuador and Pakistan,' Mimeo. PRDPH, The World Bank.

Ravallion, M. (1988) 'Expected Poverty Under Risk-Induced Welfare Variability,' *The Economic Journal*, Vol. 98.

Ravallion, M. (1994a) *Poverty Comparisons* (Chur: Harwood Academic Publishers).

Ravallion, M. (1994b) 'Poverty Rankings Using Noisy Data on Living Standards,' *Economics Letters*. Vol. 45.

Ravallion, M. (1995) 'Bounds on a Poverty Line,' Mimeo. Policy Research Department, the World Bank.

Ravallion, M. and S. Chaudhuri (1996) 'Risk and Insurance in Village India: Comment,' *Econometrica*. forthcoming.

Ravallion, M. and S. Subramanian (1996) 'Welfare Measurement With and Without Substitution,' Mimeo. World Bank.

Rocha, S. (1993) 'Poverty Lines for Brazil: New Estimates from Recent Empirical Evidence,' Mimeo. IBGE/POF, Brazil.

Scott, K. and D. Jolliffe (1995) 'A Comparison of Alternative Consumption Modules in the El Salvador Encuesta de Propositos Multiples,' Mimeo. PRDPH, the World Bank.

Summers, R. and A. Heston (1988) 'A New Set of International Comparisons of Real Product and Price Levels Estimates for 130 Countries, 1950 - 1985,' *Review of Income and Wealth*. pp. 1-25.

Summers, R. and A. Heston (1991) 'The Penn World Table (Mark 5): An Extended Set of International Comparisons, 1950 -1988' *Quarterly Journal of Economics*. Vol. 106.

Thomas, D. (1986) *The Food Share as a Welfare Measure*. Ph.D. Dissertation, Princeton University.

Watts, H.W. (1968) 'An Economic Definition of Poverty,' in D.P. Moynihan (ed.) *On Understanding Poverty*. (New York: Basic Books). pp. 316-29.

The World Bank (1995) *Ecuador Poverty Report*, Report No. 14533-EC.

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