ISET WORKING PAPER SERIES

WP 012-08 SEPTEMBER 2008

Inter-Country Comparisons of Poverty Based on a Capability Approach

Muhammad Asali, Sanjay Reddy, Sujata Visaria

The International School of Economics at Tbilisi State University (ISET) is supported by BP, the Government of Georgia, the Norwegian Ministry of Foreign Affairs, Higher Education Support Program of the Open Society Institute, the Swedish International Development Agency and the World Bank.

International School of Economics at Tbilisi State University
16 Zandukeli Street, Tbilisi 0108, Georgia
www.iset.ge e-mail: publications@iset.ge

Inter-Country Comparisons of Poverty Based on a Capability Approach*

Muhammad Asali, Sanjay Reddy, Sujata Visaria†

July 23, 2008

Abstract

We argue that inter-country comparisons of income poverty based on poverty lines uniformly reflecting the costs of the basic requirements of human beings are superior to the existing money-metric approaches. In this exercise, we implement a uniform approach to income poverty assessment based on basic human capabilities for three countries in three continents: Nicaragua, Tanzania, and Vietnam. We compute standard errors of the resulting poverty estimates and compare the incidence of income poverty across these three countries. The choice of approach affects both cardinal estimates and ordinal rankings of income poverty across countries and over time. We argue that meaningful and coherent inter-country poverty comparisons are best advanced through international co-ordination in survey design, and through the construction of income poverty lines that possess a meaningful and uniform interpretation (as the cost of achieving elementary income-dependent capabilities).

*Asali *et al.* (forthcoming).

†We are grateful to Carlos Sobrado of the World Bank, Emilian Karugendo of the National Bureau of Statistics of Tanzania, Patrick Ward of Oxford Policy Management, and the General Statistics Office of Vietnam for their help with household surveys for Nicaragua, Tanzania, and Vietnam respectively. We also thank Shaohua Chen, and Howard Nye for valuable help at different stages of the project. The Bureau of Development Policy and the International Poverty Center of the United Nations Development Programme provided essential support. We thank Terry McKinley for facilitating this support. We are grateful to Ravi Kanbur, Camelia Minoiu, Nanak Kakwani, Terry McKinley, participants of the international conference on the "many dimensions of poverty" held by the UNDP International Poverty Center, and participants in a workshop on capabilities and well-being evaluation held at the University of California at Riverside for helpful comments. Our greatest thanks are to Amartya Sen for the abiding inspiration that he has provided.

1 Introduction

How should poverty be estimated? Amartya Sen has argued persuasively that poverty must be seen as the deprivation of basic capabilities, where capabilities are the "substantive freedoms [a person] enjoys to lead the kind of life he or she has reason to value," rather than merely as lowness of income. Income is one instrument for attaining such substantive freedoms, but only one. Moreover, "the instrumental relation between low income and low capability is variable between different communities and even between different families and different individuals (the impact of income on capabilities is contingent and conditional)" (Sen (1999)). Sen has also pointed out that, more generally, all poverty assessment involves two component exercises: the identification of the poor (i.e. the determination of who is poor and to what extent) and the aggregation of this information to form a judgment concerning the extent of poverty in a society.

An identification criterion that is uniform at some level of abstraction must be applied to all individuals if this exercise is to provide a meaningful basis for comparisons. Poverty assessments at the national and global level are subject to this demand. For example, we may define as income poor all those whose money income falls below a certain level (which is the predominant method in use at present: the 'money-metric' approach),[1] or instead we might define as income poor all those whose money income is below the level required to

[1] In the money-metric approach, the identification criterion used depends on an international poverty line (IPL) expressed in PPP dollars of a specific year and converted into poverty lines expressed in local currency units (and deemed equivalent to the IPL).

achieve some end (such as the attainment of basic capabilities, as Sen recommends).

Although it may appear that the money-metric approach establishes a uniform identification criterion, it may do so only in a hollow sense. As argued by Reddy and Pogge (forthcoming), the PPP conversion factors used for this purpose do not reflect an invariant level of purchasing power over essential commodities. Therefore, existing $1 and $2 per day International Poverty Lines (IPLs) have a widely discrepant substantive interpretation across countries. Moreover, the IPLs often fail to reflect the cost of achieving basic human requirements in each individual country [See e.g. Reddy and Pogge (forthcoming)]. The money-metric approach does not provide the required uniform identification criterion in that it is not evaluatively meaningful and has no common substantive interpretation.

A poverty line corresponding to the minimum cost of achieving a certain set of basic human requirements would embody a uniform identification criterion possessing the advantage of having the same meaningful interpretation in all countries. Such a meaningful approach to inter-country income poverty comparison and aggregation would avoid using PPPs altogether, and eliminate both problems of the current money-metric approach in a single stroke. Of course, a capability-based approach to income poverty assessment is not the same as an approach to poverty assessment that assesses capability deprivations as such. There is room and necessity for both approaches to poverty assessment.

In this study we report the results of a capability-based approach to income poverty assessment. We show that it is possible to use existing household survey data from three dif-

ferent countries (Nicaragua, Tanzania, and Vietnam) in three continents to define a uniform capability-based criterion for identifying the poor. We focus centrally on the capability to be adequately nourished, as it is both universally agreed that it is a relevant basic capability and is easy to employ. We use this criterion to establish poverty lines that possess a common capability-based interpretation (in terms of nutritional non-deprivation) in all three countries and then estimate income poverty in these countries. By definition, the resulting estimates are comparable in the sense that they refer to the same (capability-based) concept of poverty in all three countries. We thus demonstrate that, even with existing data sources (which have not been specifically designed with the purpose of supporting such comparisons), it is possible to implement a capability-based approach to global income poverty estimation. The sense in which the approach to poverty assessment adopted here is capability-based is admittedly a very limited one. It focuses on explicitly specifying a single capability (the ability to be adequately nourished) while making indirect allowance for other relevant capabilities. It also takes a rather restricted approach (based on food energy requirements) to the empirical identification of that capability. Finally, no allowance is made for variations in the commodities required for achieving basic capabilities, as is ultimately required in a capability-based perspective. The approach pursued falls far short of the 'first best.' Nevertheless, it presents a superior alternative to the money-metric approach, in that it is grounded in a conception of basic human requirements, and employs this conception uniformly across countries. For this reason, while being cognizant of its limitations, we will refer to the approach as

"capability-based." It is obvious that various enhancements can and could be undertaken to generate more fully adequate income poverty assessments for each country (for example, through using household adult-equivalence scales). However, the desirability of undertaking such enhancements is common to all existing approaches to regional and global income poverty estimation.[2]

We contrast the poverty estimates that we obtain based on capability-based poverty lines with those based on the money-metric international poverty lines that are commonly used and show that our approach yields notably different results. We also examine how the use of capability-based poverty lines, instead of money-metric IPLs, affects cardinal and ordinal comparisons of poverty across countries and over time. Based on this exercise, we argue that there is no "quick-fix" with which to align the existing money-metric poverty lines with a capability-based concept of poverty. A simple increase or decrease in the money-metric IPL without a change in the PPPs used to convert the IPL into local currency units cannot bring about such alignment because the adjustment that is required varies from country to country. A more comprehensive program of capability-based poverty line construction (and complementary survey design) offers the best way forward for inter-country poverty comparison and aggregation.

The poverty estimates produced here are not authoritative estimates of poverty in each country since the data sources and the methods of poverty line construction applied here

[2]Notably, existing global poverty estimates based on money-metric IPLs produced by the World Bank and others have not employed household equivalence scales.

are insufficiently refined to support the claim that the estimates are definitive. Our method of arriving at the poverty line is but one of several possible non-money-metric methods for constructing a set of poverty lines that possesses a uniform and meaningful interpretation across countries.

We find that the choice of approach matters a great deal. In comparing income poverty estimates across countries and over time, the capability-based approach that we employ does, in some instances, give significantly different results than the money-metric approach. Both cardinal comparisons and (perhaps more surprisingly) ordinal rankings of income poverty across countries are influenced by the approach used.

The rest of the chapter is organized as follows. In the next section, we describe the conceptual content of the method that we apply. In Sections 3.3, we describe the methodology used in each country and in Section 3.4 we describe the resulting poverty estimates. Section 3.5 discusses the implications of our analysis for inter-country poverty comparison and aggregation and presents our conclusions.

2 Inter-Country Income Poverty Comparison and Aggregation Using Existing Data: A Rough Method

The first step in the exercise is to identify a relevant set of elementary capabilities. The cost of achieving these elementary capabilities can be described in a familiar manner. It is

assumed that for each individual there exists some set of commodity bundles (adequacy set) which suffices to achieve the elementary capabilities. Given the prices faced by an individual we can identify the minimum cost of achieving the elementary capabilities.

In a particularly simple approach, the adequacy set is assumed to be common for all persons. We follow the Vietnam 1993 Living Standards Measurement Survey (LSMS) in adopting this approach. This approach is a mere starting point, and insufficiently attentive to the diverse features of persons (e.g. age, gender, or occupation) which influence the way in which they can transform commodities into capabilities. These diversities should be taken into account in a fully adequate approach to poverty assessment.[3]

In our empirical exercise, we take the ability to be adequately nourished as the centrally relevant elementary capability which anchors the identification exercise, at the risk of considerable over-simplification. If it is assumed that a certain fixed level of calories is sufficient for all persons to achieve adequate nourishment, then the minimum cost of achieving this capability may be identified for all persons. In this study, we operationalize this idea in a particular way. We follow the Vietnam LSMS in our empirical approach. We choose as a reference group that quintile of the population which comes closest to achieving the nutritional standard (in our case, a food-energy standard—2,100 kilo calories). For simplicity, the consumption pattern of this reference group is taken to indicate the composition of the minimum cost bundle. The food poverty line is the cost of the bundle containing exactly

[3]In many national poverty estimation exercises, this problem is addressed with the use of adult-equivalents.

2,100 kilo calories and reflecting this consumption pattern. This method takes into account the preferred patterns of food consumption of the group in the population whose consumption is closest to the nutritional standard and is a rough and ready way of making allowance for prevailing consumption norms. Although there is the danger of using a consumption pattern that is "richer" in one country than in another as if it was equivalent for purposes of poverty line construction, there seems no straightforward way to avoid this problem without bringing in auxiliary judgments, which could (and indeed should) be integrated into more comprehensive exercises of this type.

Next, we make an allowance for non-food requirements. Once again, we follow the methodology used in the 1993 Vietnam LSMS. We determine the ratio of non-food to food expenditure for the reference population and then maintain this ratio at the poverty line. This is a highly inadequate approach to a complex problem, which we follow here because of a lack of independent information on non-food requirements and costs.

Suppose that the average commodity bundle of the reference population has a calorie content that falls below 2,100 KCal by x percent. Our approach assumes that the reference population's shortfall in the expenditure necessary to achieve both the food and the non-food expenditure requirements (for capability adequacy) is also x percent. The implied food and non-food poverty lines are added to constitute a general poverty line which is assumed to reflect the minimum cost of achieving non-poverty.

We may informally illustrate our general approach as follows. If a minimally adequate

level of each of the relevant income-dependent capabilities is deemed essential to avoid income poverty, this gives rise to an 'adequacy set' with an L-shaped lower contour in the capability space (see Figure 1).

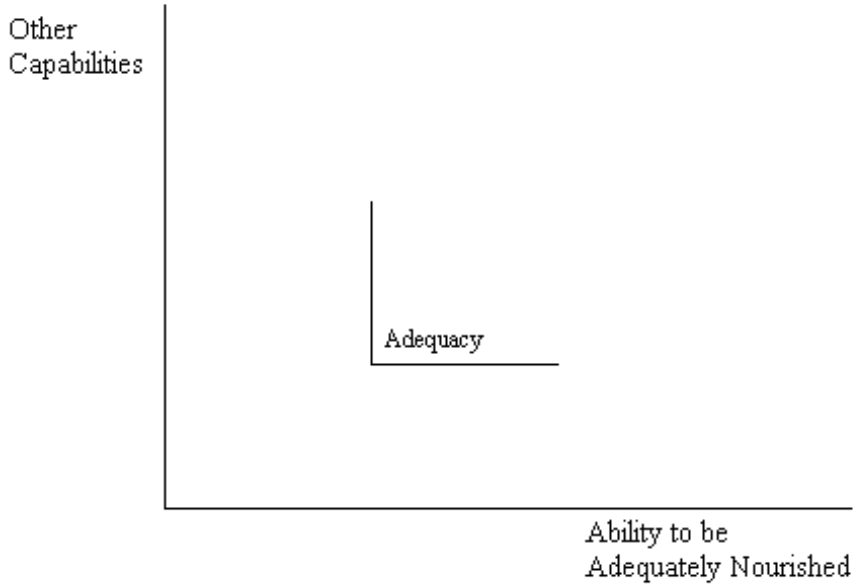

Figure 1: Capability Space

We next translate this concept of poverty into terms which are more amenable to measurement. An adequately nourished individual needs to receive adequate amounts of various food characteristics:[4] food energy, protein, fats, fiber, macronutrients and so on. It may be thought appropriate to make allowance for adequate amounts of other commodity characteristics as well (e.g. taste). Since different commodities contain these characteristics in different proportions, substitution between them may be possible, giving rise to a differently

[4] On the concept of characteristics of commodities, see Lancaster (1971).

shaped (even smooth) lower contour of the adequacy set as represented in characteristics space (see Figure 2). For example, it is conceivable that a lower level of food energy intake may suffice for nutritional adequacy if fat, protein, fiber, or other nutrients are contained in the diet to a greater extent, or for that matter if a person is healthier, or is better protected from the elements (such as cold weather). Trade-offs of this type may exist in relation to the characteristics of goods that promote each of the relevant elementary capabilities. However, our approach will not take note of this possibility. For simplicity, researchers have focused historically on the food energy intake of individuals and have anchored the poverty line in a calorie adequacy threshold. We will not depart from this classical approach, despite its very severe limitations, as employing it will suffice for us to make our broader methodological point. In our study, the calorie adequacy threshold is defined as 2,100 kilo calories per day.

As noted earlier, we make the operational assumption that if the food energy intake of the reference quintile falls below 2,100 kilo calories by x percent, the shortfall in other required characteristics (and in the commodities that possess these characteristics) is x percent as well. Let us call this the equiproportionality assumption. Building on this assumption, the average expenditure of the reference quintile is scaled up or down, as required, linearly so as to permit the reference quintile's consumption pattern to be maintained while providing resources just sufficient to consume the required number of calories. This scaled expenditure level is defined as the poverty line.

This approach is necessary because we do not have sufficient information to establish

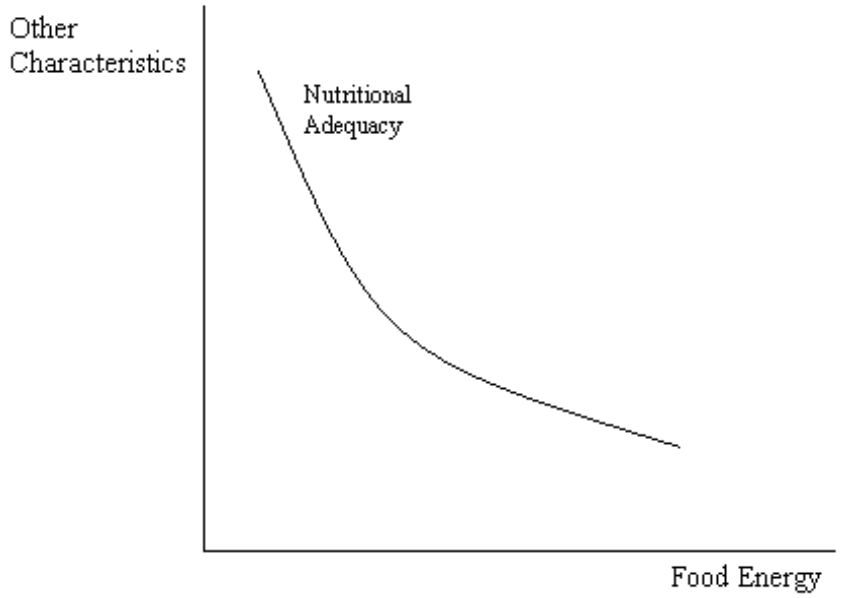

Figure 2: Characteristics Space

directly the cost of achieving the non-food capabilities considered essential for an individual to be non-poor. The approach used here relies on the observed pattern of consumption in the reference group, the calorie anchor, and the equiproportionality assumption to determine the choice of poverty line.

In principle, it should be possible to relax the equiproportionality assumption. However, in the absence of any consensus as to what non-food capabilities are of concern, on the characteristics of the commodities which promote them, on the transformation function that relates these characteristics to capabilities, and on the levels of each capability that ought to be deemed minimally adequate, any adjustment will lack adequate justification. There is a need for more explicit specification of the non-calorie requirements and the collection of

information needed to determine the cost of meeting these requirements. Such an exercise will not be readily feasible without the design of surveys specifically with this end in mind, and complementary exercises in evaluative judgment.

3 Data and Empirical Work

The methodology described in the previous section is applied to three countries: Nicaragua, Tanzania, and Vietnam. The important feature of our exercise is that we use a common capability-based approach in all three countries. We use these poverty lines to compute poverty estimates, and then compare them to those from money-metric $1 per day and $2 per day international poverty lines. We then explore the robustness of inter-country poverty comparison and aggregation to the choice of identification concept.

We follow, to the extent possible, an identical methodology of poverty line construction and survey analysis in all three countries. Although we apply a common nutritional (and specifically calorific) standard in all three countries, we attempt to account for differences in dietary norms and local prices. Since the surveys used were not designed with this end in mind, we were forced to make certain decisions to estimate comparable concepts in the diverse surveys used. Despite the necessarily second-best nature of the exercise, we believe that it represents a more coherent and meaningful approach for inter-country comparisons of poverty than does the prevalent money-metric approach.[5]

[5]The poverty estimates produced by the Economic Commission for Latin America and the Caribbean

The countries selected for this exercise are attractive choices for a few distinct reasons. First, each country lies in a different continent, thus allowing us to demonstrate that capability-based inter-country comparison and aggregation of poverty estimates can be undertaken despite different food habits and non-food expenditure patterns. Second, two of the countries (Nicaragua and Tanzania) had very similar headcount ratios in the 1990s according to the World Bank's estimates based on its \$1 and \$2 per day IPLs, but the third country (Vietnam) had a very different headcount ratio from the other two. This is summarized in Table 1.

We also compute standard errors of all poverty measures by using bootstrapping. Thus we can make both ordinal and cardinal comparisons across countries and over years and check if the differences are statistically significant.

Table 1: The World Bank's Poverty Headcount Ratio Estimates

Year	1991		1993		1998	
Poverty Line	\$1/day	\$2/day	\$1/day	\$2/day	\$1/day	\$2/day
Nicaragua	...	...	47.94	77.78	44.71	79.03
Tanzania	48.54	72.53	...	...	...	...
Vietnam	...	...	14.63	58.16	3.8	39.68

NOTE.— Source: World Bank's World Development Indicators (accessed on-line on March 13th, 2005).

Third, in each of these countries, there are well-designed household surveys to which we could gain access. For Vietnam and Nicaragua, the data are from the Living Standard Measurement Surveys conducted in these countries by the World Bank in collaboration with national statistical agencies. The data on Tanzania come from the Household Budget Survey

(ECLAC) are an important exception to the dominant use of the money-metric approach (Altimir (1982)).

conducted by the Tanzanian National Bureau of Statistics.

The LSMS for Vietnam adopted a specific methodology of poverty line construction and survey analysis using a capability-based standard of a limited kind (a 2,100 calorie nutritional anchor). We adopt the same methodology and use the household data sets for Nicaragua and Tanzania to compute comparable poverty lines for these two countries.[6] Although we have already alluded to the methodology employed for Vietnam, we describe it in detail below.

In order to facilitate comparison of statistics across countries and across poverty line concepts, we also calculated bootstrapped standard errors (using 1,000 iterations) for every poverty estimate. The large number of iterations guaranteed a very high confidence level in most, if not all, cases in the calculation of the standard errors: a 5 percent significance level and a deviation in magnitude of approximately 4.5 percent from the limiting standard deviation.[7]

[6] Adopting the methodology employed in Vietnam is, to a degree, an arbitrary starting point. It represents one among many plausible ways of construction a nutritionally anchored poverty line (see e.g., Ravallion (1994)).

[7] We used the method proposed in Andrews and Buchinsky (2000) to choose the optimal number of bootstrap iterations, and to evaluate the performance and precision of the resulting bootstrapped standard errors. In fact, following the procedures proposed by Deaton (1997) and Howes and Lanjouw (1998), we calculate standard errors both using bootstrapping and using the sepov command in STATA. The latter implements a standard error calculation based on theoretical premises. In both instances, a simple two-stage sampling design is assumed, whereas in fact all of the surveys we have examined involve a more complicated survey design. As a result, the standard errors we calculate cannot be viewed as more than indicative. This is, of course, not a problem unique to this case but is common to all of the existing literature on the calculation of standard errors for poverty measures. We report and refer only to the bootstrapped standard errors since the standard errors calculated through the two approaches were generally very close.

3.1 Methodology Used for Vietnam

The methodology applied in Vietnam amounts to undertaking five steps:

1. Exogenously identify a threshold of nutritional capability adequacy and characterize it in terms of characteristics of commodities consumed (the 2,100 KCal calorie norm).

2. Identify the quintile whose average calorie intake is closest to the calorie threshold.

3. Determine the cost of achieving this threshold (the food poverty line) while maintaining the pattern of consumption of a reference quintile.

4. Establish an allowance for non-food expenditures such that the ratio of this allowance to the food poverty line is the same as the ratio of non-food to food expenditures for the reference quintile.

5. Set an overall poverty line, equal to the sum of the food poverty line and the non-food expenditure allowance, and determine the number of persons living in households with per capita consumption beneath this level.

The different poverty lines of Vietnam in the years 1993 and 1998 are brought in Table 2.

Details of the procedure used are provided in the appendix to this chapter (Appendix C.1). The resulting estimates of poverty according to various poverty indicators are reported in Table 5.

Table 2: General Poverty Lines, Annual Vietnamese Dongs

Poverty Line	Vietnam 1993	Vietnam 1998
$1/day	629,341	953,794
$2/day	1,258,682	1,907,588
Capability Based	1,160,363	1,758,581

NOTE.— Value of the poverty line is expressed in Vietnamese Dongs of each year.

3.2 Applying the Methodology to Nicaraguan Data

The data for Nicaragua are from the Nicaraguan LSMS for 1997-98 (known as the EMNV 1998 Survey). We have followed the methodology used in Vietnam to calculate the capability-based poverty line for Nicaragua, employing both general and food-based CPIs to calculate equivalents in time. The details of the application of this methodology to Nicaragua are provided in the appendix to this chapter (Appendix C.2).

3.2.1 Nicaraguan Income Poverty Estimates

Once we had computed the poverty line for Nicaragua, the next step involved calculating income poverty estimates. From the household-level data set, we created an expanded individual-level data set in which each member of each household was assigned the annual per capita expenditure of that household. We then calculated the headcount ratio: the proportion of persons in the population whose per capita expenditure was below the poverty line. Similarly we computed the aggregate poverty gap, income gap ratio, Sen Index and the Foster-Greer-Thorbecke indices with values of α equal to 1.5, 2, 2.5, 3, 3.5, and 4 and calculated standard errors (the methodology is discussed further below) so as to judge the

Table 3: General Poverty Lines, Annual Nicaraguan Cordobas, 1998

Poverty Line	Value (Cordobas 1998)
\$1/day General CPI	4,017.2
\$2/day General CPI	8,034.4
\$1/day Food CPI	4,119.4
\$2/day Food CPI	8,238.9
Capability Based	3,018.4

precision with which the poverty measures were estimated.

Next, we compared our capability-based estimates of income poverty in Nicaragua with the estimates that the money-metric methodology would have produced. The comparison was done with the poverty estimates corresponding to different poverty lines: the \$1 PPP per day and \$2 PPP per day poverty lines adjusted by the consumer price index or a food price index for the country.[8] The poverty lines are presented in Table 3.

The table indicates that our capability-estimates are lower than the \$1 per day estimates. That this is so can be confirmed by referring to Table 6, which reports income poverty estimates, for Nicaragua, for varying poverty lines and measures of poverty.

3.3 Applying the Methodology to Tanzanian Data

The data for Tanzania are from the 2000/01 Tanzanian Household Budget Survey (HBS), conducted by the National Bureau of Statistics between May 2000 and June 2001. Once again, we applied our chosen methodology to establish a poverty line for Tanzania. The

[8] Shaohua Chen of the World Bank kindly provided us with the consumer price indices. These originate in the World Bank's Development Data Group and are the same ones used in the Bank's global poverty assessments. The food price indices used are produced by the ILO and available in the World Bank's World Development Indicators.

Table 4: General Poverty Lines, Annual Tanzanian Shillings, 2000/01

Poverty Line	Value (Shillings 2000/01)
$1/day General CPI	147,613.5
$2/day General CPI	295,227.0
$1/day Food CPI	158,410.8
$2/day Food CPI	316,821.7
Capability Based	80,365.1

details of the application of this methodology to Tanzania are provided in the appendix to this chapter (Appendix C.3).

3.3.1 Tanzanian Income Poverty Estimates

We produced income poverty estimates based on our capability-based poverty line for Tanzania. We provide a summary of the results based on our capability-based income poverty line and on the $1 and $2 PPP per day income poverty lines. Once again, we used both the general CPI and a food CPI to convert the IPL from local currency units in the base year to the local currency units of the survey year. Since the Household Budget Survey was administered over the period of a whole year from mid-2000 to mid-2001, we used the geometric means of the price indices pertaining to the relevant years. In Table 4, we report the different poverty lines that we employed.

Our detailed poverty estimates for different poverty lines and measures of poverty for Tanzania are presented in Table 7.

4 Inter-Country Income Poverty Comparison and Aggregation According to Alternative Approaches: Results

Tables 5–7 present the three types of poverty estimates for the different country-years. These are Vietnam in 1993 and 1998, Nicaragua in 1998, and Tanzania in 2000/01. The results are based on three different poverty lines: the $1 a day, $2 a day, and the capability-based poverty lines. Both the $1 a day and $2 a day money-metric poverty lines are defined by the World Bank for a particular base year: 1993. As noted, we use both general and food price indices to adjust these poverty lines to their assessment year equivalents.

In the tables, the magnitude of the poverty line can be read in the first row. We provide estimates for the head count ratio, income gap ratio, and poverty gap ratio, along with the aggregate poverty gap, Sen Index and the Foster-Greer-Thorbeck indices for different values of α. For each poverty estimate, the associated bootstrapped standard error is in parentheses.

We ask three kinds of questions:

1. Does the extent of estimated poverty depend on the poverty identification concept used?

2. Do the ordinal and cardinal comparisons among country-years depend on the poverty

identification concept used?

3. Does the poverty identification concept used influence the estimated extent of aggregate poverty and the share of that aggregate in different countries?

To examine the first question, consider initially the case of Tanzania in 2000-01 (Table 7). Columns (1) and (3) report estimates based on a $1 a day poverty line, using the food CPI and the general CPI respectively. Columns (2) and (4) report estimates for the $2 a day poverty line. Column (5) reports the poverty estimates for the capability-based poverty line. Each row corresponds to a different poverty measure. We can see that the capability-based poverty line consistently gives lower estimates than the $1 a day based estimates, regardless of the poverty measure used.

The reduction is substantial; whereas according to the $1 a day poverty line, 75 percent of the Tanzanian population is poor; according to the capability-based poverty line, only 40 percent is poor. A similar pattern can be seen in the results for Nicaragua as well (Table 6), although the reductions are less drastic. Whereas the use of the $1 a day poverty line generates a 44.6 percent headcount ratio, the headcount ratio associated with the capability-based poverty line is 30.6 percent. Once again, we consistently find this across poverty measures.

On the other hand, for Vietnam in 1993, the use of the capability-based poverty line gives rise to much higher poverty estimates than the $1 a day poverty line, although they are below the $2 a day estimates. This is true for Vietnam in 1998 as well. The presence

Table 5: Poverty Statistics, Vietnam 1993–1998

Poverty Line	1993			1998		
	$1	$2	Capability Based	$1	$2	Capability Based
HCR	13.37	63.72	58.15	5.20	41.98	35.62
	(1.270)	(1.750)	(1.785)	(.710)	(1.626)	(1.672)
IGR	21.12	34.22	31.78	17.15	27.13	25.43
	(1.729)	(.846)	(.853)	(1.546)	(.915)	(.923)
APG(m)	.42	6.54	5.11	644.80	16470	12070
	(.065)	(.297)	(.258)	(121)	(1150)	(950)
PGR	2.82	21.81	18.48	0.89	11.39	9.06
	(.433)	(.953)	(.905)	(.166)	(.734)	(.669)
Sen	4.04	28.67	24.64	1.30	15.56	12.50
	(.625)	(1.201)	(1.169)	(.237)	(.951)	(.880)
FGT(1.5)	1.59	14.25	11.79	.46	6.87	5.34
	(.305)	(.751)	(.698)	(.099)	(.521)	(.458)
FGT(2)	.98	9.72	7.88	.26	4.38	3.34
	(.228)	(.606)	(.554)	(.062)	(.378)	(.323)
FGT(2.5)	.64	6.85	5.45	.16	2.91	2.19
	(.177)	(.498)	(.450)	(.041)	(.280)	(.234)
FGT(3)	.44	4.95	3.89	.10	2.00	1.48
	(.141)	(.416)	(.373)	(.028)	(.212)	(.174)
FGT(3.5)	.32	3.66	2.84	.07	1.41	1.03
	(.115)	(.352)	(.314)	(.019)	(.163)	(.132)
FGT(4)	.24	2.76	2.12	.04	1.02	.74
	(.095)	(.302)	(.268)	(.013)	(.127)	(.102)

NOTE.— Bootstrapped standard errors are in parentheses. See text for details. The $1 a day poverty line for 1993 is 629,341.1 dongs. The Capability-based poverty line for 1993 is 1,160,363 dongs. The $1 a day poverty line for 1998 is 953,794 dongs. The Capability-based poverty line for 1998 is 1,758,581 dongs.

Table 6: Poverty Statistics, Nicaragua 1998

	$1 food-CPI	$2 food-CPI	$1 general-CPI	$2 general-CPI	Capability Based
HCR	45.78	79.90	44.62	79.03	30.61
	(1.310)	(1.229)	(1.310)	(1.265)	(1.464)
IGR	37.80	52.43	37.19	51.80	31.66
	(.934)	(.665)	(.976)	(.678)	(.836)
APG(m)	3432	16620	3209	15830	1409
	(154)	(607)	(146)	(581)	(79.800)
PGR	17.30	41.89	16.59	40.93	9.69
	(.720)	(.840)	(.712)	(.837)	(.558)
Sen	22.98	52.21	22.12	51.17	13.25
	(.875)	(.951)	(.862)	(.959)	(.741)
FGT(1.5)	11.99	32.60	11.44	31.73	6.31
	(.573)	(.757)	(.562)	(.753)	(.401)
FGT(2)	8.67	26.06	8.24	25.27	4.33
	(.461)	(.691)	(.448)	(.686)	(.301)
FGT(2.5)	6.46	21.25	6.12	20.54	3.09
	(.374)	(.634)	(.362)	(.627)	(.232)
FGT(3)	4.93	17.59	4.66	16.96	2.26
	(.307)	(.581)	(.296)	(.574)	(.183)
FGT(3.5)	3.84	14.74	3.61	14.18	1.70
	(.256)	(.533)	(.245)	(.524)	(.147)
FGT(4)	3.04	12.49	2.85	11.98	1.30
	(.214)	(.488)	(.205)	(.479)	(.119)

NOTE.— Bootstrapped standard errors in parentheses. See text for details. The $1 a day food-CPI poverty line is 4,119.44 cordobas. The $1 a day general-CPI poverty line is 4,017.20 cordobas. The Capability-based poverty line is 3,018.42 cordobas.

Table 7: Poverty Statistics, Tanzania 2000/01

	$1 food-CPI	$2 food-CPI	$1 general-CPI	$2 general-CPI	Capability Based
HCR	78.51	95.66	75.39	94.75	40.13
	(1.218)	(.390)	(1.321)	(.518)	(1.756)
IGR	47.84	66.60	45.99	64.80	31.45
	(.850)	(.678)	(.858)	(.698)	(1.092)
APG(m)	1898000	6438000	1632000	5782000	323500
	(110000)	(313000)	(97400)	(285000)	(27800)
PGR	37.56	63.70	34.67	61.40	12.62
	(1.076)	(.803)	(1.077)	(.838)	(.835)
Sen	47.21	73.64	43.91	71.55	17.25
	(1.204)	(.713)	(1.233)	(.781)	(1.069)
FGT(1.5)	28.07	53.78	25.53	51.30	8.19
	(.970)	(.872)	(.953)	(.897)	(.624)
FGT(2)	21.59	45.99	19.39	43.47	5.60
	(.866)	(.899)	(.838)	(.913)	(.474)
FGT(2.5)	16.98	39.72	15.07	37.24	3.98
	(.770)	(.900)	(.736)	(.904)	(.365)
FGT(3)	13.58	34.59	11.94	32.18	2.91
	(.684)	(.885)	(.646)	(.881)	(.285)
FGT(3.5)	11.02	30.32	9.60	28.02	2.17
	(.607)	(.860)	(.567)	(.849)	(.224)
FGT(4)	9.04	26.73	7.82	24.55	1.65
	(.539)	(.829)	(.499)	(.813)	(.179)

NOTE.— Bootstrapped standard errors in parentheses. See text for details. The $1 a day food-CPI poverty line is 158,410.83 Tanzanian Shillings (TSH). The $1 a day general-CPI poverty line is 147,613.50 TSH. The Capability-based poverty line is 80,365.10 TSH.

of data for two different years for Vietnam also allows one to see if the choice of poverty line affects the rate of poverty reduction. According to the $1 a day poverty line, poverty fell from 13.4 percent in 1993 to 5.2 percent in 1998, a reduction of 61 percent. According to the $2 a day poverty line, the reduction was 34 percent. Once again, the use of the capability-based poverty line gives rise to a rate of reduction that is between the two, at 38 percent (see Table 8).

Table 8: Vietnam Head Count Ratio (HCR) Reduction

Poverty Line	HCR 1993	HCR 1998	HCR 98/HCR 93	HCR Reduction
$1/Day	13%	5%	0.3846	61.5%
$2/Day	64%	42%	0.6563	34.4%
Capability-Based	58%	36%	0.6207	37.9%

NOTE.— *Source:* First row of Table 5.

However imperfect our capability-based approach might be, it was constructed with the

explicit aim of capturing the minimum cost of achieving the same basic capabilities in each of these three countries. In light of this, the fact that our estimates differ drastically from the money-metric estimates is informative. It raises the concern that the money-metric poverty lines fail to represent the cost of achieving basic capabilities in these countries, whether or not they reflect prevailing norms and conceptions of poverty (for which there is little evidence).

In answer to the second question, we find that the ordinal rankings of country-years according to the extent of poverty are often robust to the choice of identification concept. In Table 9, dominance relations are represented in a Hasse diagram (following the suggestion made by Amartya Sen in diverse writings that intersection partial orderings can be a valuable device in empirical investigations). A dominance relation is identified as existing only if one measure can be deemed greater than another at the 95 percent level of confidence. The dominance relations are represented by a vertical hierarchy: country-years with greater poverty are placed in a tier vertically above country-years with less poverty. Countries which do not stand in any dominance relation to one another are placed in the same tier. For example, consider the capability-based estimates of the Head Count Ratio (HCR). The diagram shows that Vietnam in 1993 had a higher HCR than Vietnam in 1998, at a 95% significance level. It was also higher than Tanzania 2000-01, which in turn, together with Vietnam 1998, was higher than Nicaragua 1998. The HCRs of Tanzania 2000-01 and Vietnam 1998 are not significantly different from each other. It can also be seen that Tanzania (2000/01) is almost always estimated to have had greater poverty than Nicaragua is estimated

to have had in 1998. This relationship breaks down only for the most distribution sensitive FGT indices, and for specific methods of calculating standard errors. Similarly, it is almost always the case that Vietnam in 1993 is estimated to have had greater poverty than Vietnam is estimated to have had in 1998. Thus, some dominance relations are stable, irrespective of the concept underpinning the poverty line or the poverty measure used.

However, some dominance relations are altered drastically. The money-metric IPL based poverty estimates almost always suggest that poverty was greatest in Tanzania (2000/01), second greatest in Nicaragua (1998), third greatest in Vietnam (1993) and fourth greatest in Vietnam (1998). In sharp contrast, the capability-based estimates suggest that poverty was almost always highest in Vietnam in 1993. However, it is ambiguous whether it was lowest in Vietnam in 1998 or in Nicaragua in 1998.

An important observation emerges from this table. Income poverty appears to have decreased in Vietnam from 1993 to 1998, regardless of the method used. There exists a broad-based perception that there was a large decrease in poverty in Vietnam in the 1990s. It is hence reassuring that the capability-based results confirm this. This reduction is apparent in the money metric estimates as well. However, when we compare countries (for example, Tanzania 2000-01 with Vietnam 1993), the direction of ordinal comparisons depends on the choice of the poverty identification concept. It may be checked that the ordinal comparisons between country-years are almost uniformly invariant to the choice between money-metric ($1 or $2 per day) IPLs. On the other hand, ordinal comparisons between country-years

Table 9: Hasse Diagram for Vietnam, Nicaragua, and Tanzania Poverty Statistics

Poverty Line	\$1 GCPI	\$1 FPI	\$2 GCPI	\$2 FPI	Capability
HCR	T	T	T	T	V93
	N	N	N	N	T,V98
	V93	V93	V93	V93	N
	V98	V98	V98	V98	
IGR	T	T	T	T	V93,T,N
	N	N	N	N	V98
	V93 V98	V93 V98	V93	V93	
			V98	V98	
PGR	T	T	T	T	V93
	N	N	N	N	T
	V93	V93	V93	V93	V98,N
	V98	V98	V98	V98	
Sen	T	T	T	T	V93
	N	N	N	N	T
	V93	V93	V93	V93	V98,N
	V98	V98	V98	V98	
FGT(1.5)	T	T	T	T	V93
	N	N	N	N	T
	V93	V93	V93	V93	V98,N
	V98	V98	V98	V98	
FGT(2, 2.5, 3)	T	T	T	T	V93
	N	N	N	N	T
	V93	V93	V93	V93	N
	V98	V98	V98	V98	V98
FGT(3.5)	T	T	T	T	V93, T
	N	N	N	N	N
	V93	V93	V93	V93	V98
	V98	V98	V98	V98	
FGT(4)	T	T	T	T	V93, T
	N	N	N	N	N
	V93	V93	V93	V93	V98
	V98	V98	V98	V98	

NOTE.— $GCPI$ is General Consumer Price Index. FPI is Food Price Index. T stands for Tanzania 2000-01, N for Nicaragua 1998, $V93$ for Vietnam-1993, and $V98$ for Vietnam-1998. For $FGT(3)$, under the capability-based poverty line, T is not significantly different from N. Under the capability-based poverty line, $FGT(3.5)$ and $FGT(4)$ of Tanzania can be deemed to be larger than corresponding measures of Nicaragua only at the 10% significance level.

are greatly influenced by the choice between a capability-based poverty line and a money-metric poverty line. There is a straightforward way to understand this phenomenon. Income poverty estimates are determined by the level of the poverty line and the income profile (or distribution of absolute incomes) in each country. A shift from the $1 per day IPL to the $2 per day IPL entails a doubling of the poverty line in each country (since the PPP used to convert the IPL into local currency and the CPI used to convert the poverty line from the base year to the assessment year do not change as a result of this shift). Although such a shift need not preserve ordinal rankings of poverty across countries (since income profiles can vary in shape across countries, so that the impact of the doubling of the poverty line on the headcount may vary from country to country), it has done so in this case. In contrast, a shift from a money-metric ($1 or $2 per day) IPL to a capability-based poverty line entails a change in the magnitude of the poverty line which varies in proportion from country to country. For example, a shift from the $1 per day poverty line to the capability based poverty line leads to an increase in the poverty line by 84 percent in Vietnam in 1993 whereas it leads to a decrease of 45 percent in Tanzania in 2000/01. The shift from money-metric to capability based income poverty lines leads to changes that vary both in direction and magnitude from country to country. It is not surprising that the results change the ordinal rankings of income poverty estimates of countries. A single correction factor applied to the money-metric poverty line in all countries will not work to bring the money metric poverty line in line with a capability-based concept of income poverty. Thus, no "quick fix"

Table 10: Synthetic World A (Vietnam 1998, Tanzania 2000, Nicaragua 1998). World Population=115,027,080

Poverty Line	$1/Day	$2/Day	Capabilities
World Head Count (HC)	31,529,871.6	67,851,421.3	42,252,195.8
World HC Ratio	27%	59%	37%
Nicaragua's Share of World HC	7%	6%	3%
Tanzania's Share of World HC	81%	47%	32%
Vietnam's Share of World HC	13%	47%	65%

Table 11: Synthetic World B (Vietnam 1993, Tanzania 2000, Nicaragua 1998). World Population=108,855,380

Poverty Line	$1/Day	$2/Day	Capabilities
World Head Count (HC)	36,955,134.8	80,554,709.3	55,901,134.6
World HC Ratio	34%	74%	51%
Nicaragua's Share of World HC	6%	5%	3%
Tanzania's Share of World HC	69%	40%	24%
Vietnam's Share of World HC	25%	56%	73%

in the form of a change in the IPL will suffice to eliminate the biases associated with the money-metric approach to poverty assessment.

The third question we asked was whether the estimated extent of aggregate income poverty and the contribution of a specific country to aggregate income poverty are influenced by the criterion used to identify the poor. Since the poverty estimates vary so much, it is not surprising that both aggregate income poverty and the share of that aggregate represented by income poverty in each country are affected. In Tables 10 and 11, we generate "synthetic" worlds consisting of just three countries. Synthetic World A consists of Vietnam in 1998, Tanzania in 2000, and Nicaragua in 1998. In Synthetic World B, we have Vietnam in 1993, Tanzania in 2000, and Nicaragua in 1998. The synthetic worlds are based on the actual populations of these countries in these years. Both the extent of aggregate income

poverty and the contributions of each country to aggregate income poverty do indeed vary significantly according to the criterion used to identify the poor. In both worlds, a capability based analysis leads to a worldwide headcount ratio which is substantially at variance with those generated by the \$1/day and the \$2/day identification criteria, and which lies between them. The contribution of individual countries to global income poverty varies dramatically depending on the identification criterion used. For example, in the first artificial aggregate considered, Vietnam's share of world income poverty rises from 13 percent (using the \$1/day identification criterion) to 65 percent (using the capability-based identification criterion).

Our rankings of countries must not in any way be taken as authoritative. Our results suffer from many obvious flaws, among which are the following. First, the survey designs are different in different countries, forcing us to make certain judgments in order to carry out this exercise, and these judgments may be questioned. Second, the non-food poverty line we construct (based on the equiproportionality assumption) may be inappropriate, and indeed its appropriateness may vary from country to country. Third, we do not use equivalence scales to adjust for differences in the calorie and other requirements of different groups of people (as defined by sex, age, etc.). Fourth, while it is useful to employ the consumption pattern of a reference quintile in order to define the composition of the food basket assumed necessary to command at the poverty line (in order to make appropriate allowance for prevailing food habits and preferences), this procedure may also lead to problems arising from systematic differences in real income across countries. If the reference quintile in one country possesses

a higher real income than that in another, it may also possess a richer diet (e.g. one that is more varied and contains foods that are nutritionally or otherwise superior). This reference quintile may consume more "expensive calories" than does that in another country, and hence the food poverty line imputed by our procedure in this country would be (arguably inappropriately) higher. The result would be a substantive non-equivalence of the poverty line across countries, which may be thought to undermine the claim that we have established comparable poverty lines. Concerns of this type are legitimate. However, such problems can be diminished or overcome in a more comprehensive and detailed future program of poverty line construction and survey design aimed at more adequately supporting capability-based income poverty comparisons.

5 Conclusions

A requirement for meaningful comparison and aggregation of poverty across countries is that the same criterion must be used to identify the poor regardless of where they live. We have argued that the use of an identification criterion based on the possession of elementary capabilities provides an approach to international income poverty comparison and aggregation that is both coherent and meaningful, unlike existing money-metric approaches. In our empirical exercise involving three countries from three continents (Nicaragua, Tanzania, and Vietnam), we have demonstrated that it is possible to produce internationally comparable capability-based income poverty estimates of a limited kind using existing data

sources. Standard errors were constructed and intersection partial ordering techniques were employed to establish which pair-wise inter-country poverty comparisons are robust to the choice of identification criterion and which are not. In our case study, both cardinal and ordinal comparisons were affected by the choice of approach.

This finding suggests that the choice of identification criterion may be an important determinant of our judgments concerning which countries are poorer than others and by how much. We do not make the claim that our poverty estimates are authoritative because they were produced using data sources that were not specifically designed to support the exercise we have undertaken and based on strong simplifying assumptions. However, unlike existing money-metric international poverty lines, our poverty lines possess a meaningful and plausibly uniform interpretation. The fact that they lead to substantially different estimates of absolute and relative poverty levels than money-metric poverty lines suggests that existing methods of poverty estimation ought to be critically reevaluated.

The exercise presented here points to the desirability of undertaking international co-ordination of survey design and poverty line construction methods. Such coordination will facilitate larger scale application of capability-based international poverty comparison and aggregation. An effort of this kind must identify relevant elementary capabilities and the characteristics of the commodities that promote them. There may be almost universal agreement on some elementary income-dependent capabilities (such as the ability to be adequately nourished) and on the characteristics of commodities that promote them (such as calorie

content), whereas agreement about other relevant elementary income-dependent capabilities (and the characteristics of commodities that promote them) may not be so readily achieved. The possibility of controversy over what the relevant elementary income-dependent capabilities are and how they are furthered is not in itself reason to dismiss the approach as infeasible. Rather, it is reason to seek an operationally adequate consensus over such questions.

Although our aim has been to show the feasibility and desirability of undertaking capability-based income poverty comparisons using available data, we have not meant to suggest that available data is adequate for this purpose. The development of common international survey design and poverty line construction protocols is a requirement for increasing the coherence and meaningfulness of international poverty comparison and aggregation. Finally, income poverty assessment, although an essential dimension of poverty assessment generally, remains only one aspect of such assessment. Income poverty assessment must be informed by the capability perspective but cannot begin to exhaust the relevance and reach of that transformative approach.

(Chapter head:)

A Construction of the Vietnam Poverty Line

The head count ratio for Vietnam was calculated by the Vietnam Living Standards Survey (VLSS) as follows.

The calorie anchor used was 2100 calories per day. Using the data on household per capita expenditure from the VLSS 1993, survey households were divided into quintiles according to their total expenditures per capita. No distinction was made between rural and urban sectors. The average calorie intake per person per day was calculated for each quintile based on the quantities of food consumed by these households, with some calorie numbers imputed when exact quantities consumed were not clear.[9]

The quintile the calorie intake of which was closest to 2100 was identified as the 'reference quintile'. This was quintile 3, with a per-capita calorie intake of 2052 calories per day. Its average food basket was used to construct a 'synthetic' food basket containing 2100 kilocalories and possessing the same consumption pattern as the reference quintile. The average quantities of the food items consumed by the reference quintile were scaled up linearly (by $2100 \div 1969$) to create a "synthetic" food basket containing the required total calorie content.[10] This food basket consists of the quantities of 40 food items that if consumed by a person in a year, can generate a food energy intake of 2100 calories per day. To convert from daily calorie intake to yearly, 2100 was multiplied by 365. Median national prices calculated from the VLSS 93 commune-level price data were used to price the food basket. The prices recorded in the VLSS were observed in January 1993. Evaluation of the cost of the synthetic food basket at the median national prices gives an estimate of the national

[9] In some cases where caloric values could not be computed directly, either because of lacking calorie conversion information or when the goods were consumed too inrregularly to be reported, they were imputed. See World Bank (1999) for more details.

[10] The number 1969 is used instead of 2052 because 2052 is the post-imputation number.

'food poverty line' of 749,723 Dong per person per year. For the third quintile, non-food expenditures were 401,291 Dong per person per year. This number was scaled up by 1.023 ($= 2100 \div 2052$) to arrive at a non-food expenditure allowance at the poverty line of 410,640 Dong. The national overall poverty line was set accordingly at 1,160,363 Dong (= 410,640 + 749,723): the sum of the food poverty line and the non-food expenditure allowance. To arrive at more specific regional poverty lines, regional price deflators were constructed from the price questionnaire of VLSS 93, in which the weights were the expenditure shares of all (food and non-food) items.[11]

We were able to reproduce the poverty estimates produced by the LSMS and include them in Table 5 below along with associated standard errors (the methodology of constructing those is discussed further below). We provide resulting estimates for Vietnamese poverty in two different LSMS survey years, 1993 and 1998. We also constructed $1 a day and $2 a day poverty estimates for Vietnam in each year. We used the official general CPI for Vietnam to translate these poverty lines (Actually $1.08 PPP and $2.16 PPP a day) from their base year (1993) to the 1998 assessment year. Since no food-CPI is available for Vietnam for the year 1993, we did not also use a food-CPI for this purpose, as we did for the other countries in the study.

[11] Since the survey was carried out in different months in different communes even within 1992-93, all household nominal expenditures were deflated so as to express them in the currency units of January 1993. For this, monthly price deflators for 3 categories: rice, other food, and non-food items, provided by the Vietnamese General Statistical Office (GSO) were used.

B Construction of the Nicaragua Poverty Line

We constructed a capability-based poverty line for Nicaragua as follows:

1. The Nicaragua LSMS asked each survey household to report the quantities of foods purchased and foods received as gifts over the past 15 days. Households were asked questions about 62 different foods. Our first step was to assess the calories consumed per day per person in each household. This required converting each food quantity consumed into the calories it contained.[12] We then multiplied each quantity-unit by the appropriate conversion factor to arrive at the implied calorie consumption from each food quantity. The aggregate of these resulting calories consumed over all foods gave the total calorie consumption per day by the household. This total was divided by the number of household members to arrive at the calorie expenditure per capita for each household.

2. Next, we used data on the total per capita expenditure by each household and divided the sample into quintiles of per capita total expenditure.[13] For each of the five quintiles we computed the mean per capita calorie consumption. These means are presented in Table 12. As can be seen, at 2091.39 calories per day, the mean per capita calorie consumption of quintile 2 was closest in absolute difference to 2100. Therefore, the

[12] Carlos Sobrado of the World Bank provided us with the calorie conversion factors used to prepare the Nicaragua LSMS report.

[13] To account for the non-random sampling design of the survey, we compute weighted statistics in all steps. The individual weights (or inflation factors) are provided in the LSMS data.

food poverty line was anchored to the average food basket of persons in the reference quintile. A synthetic food basket was constructed by scaling up this average food basket (by multiplying by $2100 \div 2091.39 = 1.004$) so that the synthetic food basket contained a total calorie content of 2100 calories per day. The next task was to price the synthetic food basket. For each food whose quantity was reported by the household, the price at which the food was purchased was also reported in the survey. Moreover, households reported the monetary value of foods that they received as gifts. For each household, we identified the resulting unit-value information corresponding both to the purchased and received items. We then computed the median price of each food-unit combination over all survey households, the unit-value of the purchased and the gifted items being treated alike. These median prices were used to price the food basket consumed by each household. This total household expenditure was then divided by the total number of household members to arrive at the food expenditure per person per day in each household and was multiplied by 365 to arrive at the annual food expenditure per person in each household in the reference quintile. The mean of these per-person annual expenditures is taken to be the purchasing power a person living in Nicaragua needed to have during 1998 to consume 2100 calories per day. The use of the average food basket of the reference quintile helps to ensure that this food poverty line reflects local dietary norms. This is the food poverty line for Nicaragua: 2036.526 Nicaraguan cordobas per capita/per year.

Table 12: Calories Consumed Per Capita Per Day, by Quintile. Nicaragua 1998

Quintile	Mean	Std. Dev.
1	1,419.76	1,118.61
2	2,091.39	1,297.82
3	2,458.32	1,617.71
4	2,940.60	3,007.98
5	3,672.91	3,897.25

Table 13: Expenditures by Quintile 2. Nicaragua 1998.

Components of the General Poverty Line	Observations	Mean	Std. Dev.
Annual food expenditure	766	2036.53	909.01
Annual non-food expenditure	766	981.90	884.10

3. To go from the food poverty line to the overall poverty line, we needed to add to the food poverty line an allowance for non-food expenditures. The mean non-food expenditure of the 2nd quintile was 981.90 cordobas. This is added to the food poverty line to arrive at an overall poverty line per year of 3018.42 cordobas (in the survey year). See Table 13.

C Construction of Tanzania Poverty Line

We constructed a capability-based poverty line for Nicaragua as follows:

1. The Tanzanian Household Budget Survey (HBS) asked households about their item-wise food consumption from a wide spectrum of sources. This included food consumed from purchases, own production, received gifts, and other sources. Also, the quantities of individual food items were reported, each with associated total monetary value. Since no direct price data were available, we used these to establish the me-

Table 14: Calories consumed per capita per day, by quintile. Tanzania 2000/01

Quintile	Mean	Std. Dev.
1	1,539.32	751.85
2	2,161.44	885.36
3	2,617.46	1,093.92
4	2,995.38	1,274.01
5	3,733.57	1,925.68

dian unit values for each food item and treated these as the median prices The total calorie consumption per capita within each household was established by using the calorie conversion tables found in the final report of the Household Budget Survey, National Bureau of Statistics (2002). We calculated the total calories consumed by each household from its consumption of each food item and arrived at per capita calorie consumption for each household.

2. Next, we used total expenditure per capita for each household to divide the sample into quintiles. With an average daily per capita consumption of 2161.44, the second quintile was picked to be the reference group (see Table 14).

3. We calculated the average per-capita consumption of each food item in the second quintile, measured in units of consumption (e.g., grams, ml, or "pieces"), assuming zero consumption of food items for which the households did not report any value. We then scaled the resulting average bundle down (by multiplying by $2100 \div 2161.44$) to create a synthetic bundle with calorie content of 2100 calories per day. Multiplying the median prices calculated above by this vector of standardized average consumption yielded the *food poverty line* of 170.7 Tanzanian Shillings (TSH) a day, or 62,306.5

TSH's a year (in 2000/01 TSH's).

4. In the same way as we did for the food poverty line, we rescaled the average per-capita non-food expenditure of quintile 2 households (by multiplying by $2100 \div 2161.44$). This gave us the non-food expenditure allowance of 49.48 TSH a day, or 18058.5 TSH's a year (in 2000/01 TSH's).

5. The *general poverty line* is the sum of the food poverty line (from 3) and the non-food expenditure allowance (from 4): 80,365.1 Tanzanian Shillings a year.

References

Altimir, Oscar. 1982. "The Extent of Poverty in Latin America," *World Bank Staff Working Papers*, **522**(March). The World Bank, Washington D.C.

Andrews, D., and Buchinsky, M. 2000. "A Three-Step Method for Choosing the Number of Bootstrap Repetitions," *Econometrica*, **68**(1), 23–51.

Asali, Muhammad, Reddy, Sanjay G., and Visaria, Sujata. forthcoming. "Inter-Country Comparisons of Income Poverty Based on a Capability Approach,". *Chap. 1 of:* Basu, Kaushik, and Kanbur, Ravi (eds), *Arguments for a Better World: Essays in Honour of Amartya Sen* vol. II. Cornell University.

Deaton, Angus. 1997. *The Analysis of Household Surveys*. Baltimore: Johns Hopkins University Press.

Howes, S., and Lanjouw, J. O. 1998. "Does Sample Design Matter for Poverty Comparisons?," *Review of Income and Wealth*, **Series 44**(1), 99–109.

Lancaster, K. J. 1971. *Consumer Demand: A New Approach*. New York City, NY, USA: Columbia University Press.

National Bureau of Statistics, Tanzania. 2002. *Household Budget Survery 2000/2001*.

Ravallion, Martin. 1994. *Poverty Comparisons*. Chur, Switzerland: Harwood Academic Publishers. Fundamentals of Pure and Applied Economics Volume 56.

Reddy, Sanjay, and Pogge, Thomas. Forthcoming. "How *Not* to Count the Poor,". *In:* Stiglitz, J., Anand, S., and Segal, P. (eds), *Debates on the Measurement of Poverty*. Oxford: Oxford University Press. Available on www.socialanalysis.org.

Sen, Amartya. 1999. *Commodities and Capabilities*. Oxford University Press.

World Bank. 1999. "Vietnam Development Report 2000: Attacking Poverty,". World Bank Report No. 19914-VN.