



Discussion Paper BRIEFS

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Estimating Utility-Consistent Poverty Lines

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With the focus of international development resources increasingly turned toward poverty reduction, the demand for reliable empirical estimates of poverty levels has grown dramatically. Governments and donors are particularly interested in making valid poverty comparisons across space and through time. In many poor countries, failure to reduce poverty would likely catalyze calls for policy reform and reconsideration of donor assistance levels.

In fluid developing country environments, generating these comparisons is challenging. But reasonably precise measures of poverty levels and changes in poverty levels through time are needed.

This paper contributes to the poverty measurement literature by introducing an information theoretic approach to assuring the utility consistency of poverty lines. Even though the philosophical roots of information theory and the links between information theory and other estimation criteria fill volumes, the actual practical application of the approach is quite straightforward.

For the case of Mozambique, the approach permits estimation of poverty measures based on utility-consistent poverty lines, despite substantial changes in relative prices and consumption patterns over the period 1996–97 and 2002–03. Relative to other approaches, the entropy-adjusted “Cost of Basic Needs” (CBN) bundles provide more credible results, with the larger adjustments conforming to available information on correlates of poverty such as asset ownership. Utility consistency substantially enhances the credibility of the results obtained and should facilitate welfare comparisons in the future.

Overall, we conclude that this approach for estimating utility-consistent bundles represents a powerful addition to the poverty analyst’s tool kit and enhances the attractiveness of the CBN approach for practical poverty measurement problems.

Consistency of Poverty Comparisons

The poverty line is an essential element in most poverty analysis. It is the cost of attaining a minimum acceptable level of well-being, or utility. Since poverty lines are intended to reflect a fixed standard of living, they will vary over space and time with changes in the cost of basic necessities. Adjusting for spatial and temporal differences in the cost of reaching a basic standard of living is fundamental in poverty analysis. Although poverty lines are sometimes criticized as

artificial dividing lines separating the poor and nonpoor, this overlooks their more important function: they serve as low-income cost-of-living indices that permit consistent poverty comparisons across space and over time.

Recent evidence from countries as diverse as Russia, Papua New Guinea, and Mozambique has shown that the widely accepted CBN method for setting poverty lines often yields poverty lines that are utility inconsistent. That is, the standard of living associated with the poverty line is not held fixed in real terms, rendering poverty comparisons unreliable.

This paper draws upon information theory and revealed preference conditions of consumer theory to propose a method of adjusting CBN poverty lines to ensure utility consistency.

Methodology and Data

Previous studies in Mozambique employed the CBN approach to set poverty lines, using data from the 1996–97 national household survey to specify separate poverty lines for 13 different regions in Mozambique. Because the relative prices for basic commodities vary considerably by locale, the basic needs bundle was allowed to vary by region as well, reflecting both the consumption choices and prices faced by poor households.

A second national household survey was conducted in 2002–03. An important objective of the second survey was to update the poverty lines to capture the change in prices over the intervening six years, and to update estimates of poverty levels in Mozambique. The two surveys showed that relative prices of basic food items vary not only regionally, but also over time. Predictably, households adjust their consumption

patterns in response to changing prices. Therefore, simply applying the 2002–03 prices to the quantities specified in the 1996–97 CBN bundles is likely to produce poverty lines that correspond to a higher level of

utility than the 1996–97 poverty lines, because they ignore the substitution effects associated with changes in prices.

Four alternative methods for updating the poverty lines were examined. The first was the “naïve” approach outlined above, based on the cost of the original 13 bundles from 1996–97 when evaluated at 2002–03 prices. The second method explored the potential magnitude of

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consumer substitution effects on poverty lines by allowing the composition of the CBN bundles to vary between the two surveys, assuming a Cobb-Douglas functional form for consumer preferences. The third method derived new bundles based on consumption patterns observed in the 2002–03 data, without reference to the CBN bundles derived from the 1996–97 survey.

The fourth method introduces the innovation that provides the most consistent and reliable poverty lines. The results of the third method are subjected to a set of revealed preference tests, which indicate whether the CBN consumption bundle in one period or region is inferior to that specified for a different period or region. Numerous violations of revealed preference conditions were detected, implying that the CBN poverty lines did not represent a fixed standard of living, and that poverty comparisons based on such lines are inconsistent. To make them consistent, we employ entropy estimation methods, which are motivated by information theory. In particular, we approach the composition of the poverty line bundles as a minimum cross entropy (CE) optimization problem. In this problem, the budget shares observed in the data serve as prior information about the likely parameter values, and the revealed preference conditions enter as constraints on the possible values that the parameters can take. The solution to the problem is the set of budget shares that conforms to the system's constraints and minimizes the CE function. These are the budget shares that are as close as possible (in terms of entropy distance) to the original budget shares while obeying the revealed preference constraints.

Results

It was estimated that in 1996–97, 69 percent of Mozambicans lived below the poverty line. Poverty levels were lower in 2002–03 regardless of the method used to set poverty lines, although the choice of method affects the magnitude of estimated poverty reduction. As

expected, the first method, which does not allow for consumer substitution in response to price changes, yielded the highest poverty lines and poverty levels, with a headcount ratio estimate of 63 percent. The second method, which assumes Cobb-Douglas preferences, produced a headcount estimate of 52 percent. The third method, i.e., updating the CBN bundles to reflect changed prices and consumption patterns but not imposing revealed preference constraints, generated the lowest poverty headcount estimate, at 48 percent.

The fourth method, which ensures utility consistency of the poverty lines using the entropy estimation approach, estimates the national headcount at 54 percent. The increase in estimated poverty when utility consistency is imposed is driven in large part by adjustments to the CBN bundle in rural Nampula Province, which comprises more than 10 percent of the country's population. From several perspectives, the consumption bundles and poverty estimates using the utility-consistent poverty lines are more credible, and correspond more closely with information available about correlates of poverty, such as asset ownership.

Although the various poverty line methods differ in the magnitude of estimated poverty reduction, the qualitative story in terms of directions of movement compared with the levels estimated for 1996–97 is robust, especially for the three approaches that allow for consumer substitution effects between the two survey periods. Regardless of the poverty line methodology employed, poverty levels declined substantially nationwide, with poverty reduction occurring more rapidly in rural areas than in urban areas. The utility-consistent estimates derived from the adjusted bundles present, in our view, the preferred estimates.

Keywords: poverty lines, entropy estimation, revealed preferences, Mozambique

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