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Issues in Measuring and Modeling Poverty

Martin Ravallion

An extended comment on current practices in poverty analysis. "Mainstream" or even "ideal" current practices and pressing issues are discussed on three fronts:

- measurements of poverty
- models of poverty
- and data needs.

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Summary findings

In their research and policy advice related to poverty and inequality, says Ravallion, economists have relied heavily on household incomes or expenditures normalized for differences in household-specific prices and demographics. There are some theoretically sophisticated implementations of such measures, aimed at deriving “money-metric utility,” although that term is almost absurdly boastful given how it is implemented. But recognizing the conceptual and empirical problems that confound such measures does not mean that they should be ignored. Instead, it points to the need for supplementary measures to capture the things that are missing, including (typically) intrahousehold inequalities and access to nonmarket goods.

Implementing a genuinely multidimensional approach will often make the welfare rankings of social states (including policies) more difficult, but that fact points to the nonrobustness of low-dimensional rankings. It may also have important policy implications in its own right, since there can be some correspondence between policy instruments and welfare objectives.

It also has implications for the types of models that are used to understand the processes that determine poverty and inequality. Not only will there be more dependent variables to consider, but there will also be some potentially complex relationships among variables. Low income, for example, is likely to be both a cause and an effect of poor health and schooling. The prospects of escaping poverty may depend greatly on characteristics of the individual, the household, and the community.

These relationships will often be difficult to disentangle empirically, although richer integrated and longitudinal data sets offer hopes of doing so. Such data open a rich and relevant agenda for research into the dynamics of poverty along multiple dimensions.

A simultaneous attack on these issues from all three fronts — measurement, modeling, and data — offers hope of establishing a credible empirical foundation for public action in fighting poverty.

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Issues in Measuring and Modeling Poverty

Martin Ravallion

ISSUES IN MEASURING AND MODELING POVERTY

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For over 100 years now, sample surveys of household living conditions have been used to address public concerns about poverty, and to inform public action. Seebohm Rowntree's three surveys in York, England, spanning a 50 year period from 1899, influenced both poverty analysis and the formation of British welfare policy (Atkinson, 1989, Chapter 4). Once rare, nationally representative living-standards surveys are now common in both rich and poor countries. All high-income countries, and roughly two thirds of the developing and transitional countries, now have a more or less nationally-representative sample survey instrument which collects household-level data on consumption expenditures and/or income sources at varying frequencies, from once a year to once every five years or so. Poverty measures produced from these data are keenly watched and debated. They are also increasingly relied on in policy discussions ranging from the design of targeted interventions for fighting poverty to debates on the social impact of economy-wide policies.

This paper is not a comprehensive survey of the issues that arise in using such data; some important applications are ignored, such as making international comparisons of living standards, and using survey data in the evaluation of specific policy interventions. Rather the paper is an extended comment on some current practices in poverty analysis using survey data. Section I starts with measurement issues, section II looks at models of poverty, while data needs are discussed in section III. Each section begins with a summary of what would appear to be the "mainstream" or even "ideal" in current practices, and then discusses what I see as the most pressing issues.

¹ For their comments I am grateful to Pranab Bardhan, Tim Besley, Stephen Howes, Stephen Jenkins, Peter Lanjouw, Michael Lipton, Amartya Sen, and Dominique van de Walle.

I MEASURES

Current practice

Common practice starts by identifying a single monetary indicator of household welfare; let the indicator value for the i 'th household be denoted y_i . This tends to be either total expenditure on consumption or total income over some period. Next a set of poverty lines, denoted z_i , are defined. These estimate the cost to the household of the level of welfare needed to escape poverty i.e., it is agreed, at least implicitly, that lower values of y_i/z_i mean that a typical member of the household is absolutely poorer. Practice varies in terms of the information used in setting the z 's. "Best practice" is to adjust for differences in the prices faced (over time or space, in as much detail as data permit) and household demographics. (Alternatively one can introduce the deflators at the first stage of defining y and have only one z ; poverty measures found in practice are homogeneous of degree zero so that the order of these steps makes no difference.) Another method is to set the z_i 's as a constant proportion of the mean for some sub-group to which i belongs, or each date.

Finally an aggregate poverty measure is identified, which summarizes the information contained in the measured y 's and z 's. The most common measure is the headcount index, given by the proportion of the population for whom $y_i/z_i < 1$. A seminal paper by Sen (1976) drew attention to the undesirable properties of this measure, such as the fact that when a poor person becomes poorer the headcount index of poverty will not increase (indeed, if the person dies, the index will fall!). A large literature has since proposed and studied enumerable alternative measures, though as yet no single measure has toppled the headcount index from public attention.¹

¹ The closest contender is the poverty gap index, though this is still neutral to inequality amongst the poor. Numerous measures have been proposed which penalize inequality amongst the poor, including the Watts (1968) index, Sen's own index and the many variations on it since, the Clark et al., (1981) indices, and the recently popular squared poverty gap index of Foster et al., (1984).

Issues in measurement practices

Every step in the above sequence has been contentious. There has been dispute over the welfare indicator (such as whether it should be consumption or income, and what should be included and how it should be valued), the poverty line (how it should vary by sub-groups or dates, and at what level it should be set on average), and the poverty measure (whether it should be additive, whether it needs to penalize inequality amongst the poor, how the resulting measure relates to "social welfare functions"). There is a large literature on most of these issues.² The following discussion will focus on some issues which seem to be still poorly resolved but would appear to have considerable bearing on the policy-oriented uses of these measures.

Why has the headcount index remained so popular, despite the trenchant critiques of Sen (1976) and others, in a long list of papers in *Econometrica* and elsewhere? Its simplicity is clearly the main reason; for something of such public interest as a poverty measure, the seemingly esoteric rationales and formulae of other measures can be difficult to digest. Nonetheless, policy analysis has started to be more aware of the need to consider impacts below the line, and to allow a potentially wide range above and below. This is evident in the more widespread use of headcount indices for multiple poverty lines, echoing both the emphasis of Lipton (1983) and others on the "ultra-poor" as well as concerns about "vulnerable" households just above the line. Once the concept of a headcount index for one line is understood, it is often easier to appeal to multiple lines rather than "higher-order" measures when assessing impacts elsewhere in the distribution.

² On the choice between consumption and income as the welfare metric see the discussions in Slesnick (1993) and Chaudhuri and Ravallion (1993). On methods of setting poverty lines see Hagenaars and van Praag (1985) and Ravallion and Bidani (1994). On the issues concerning functional form of the poverty measure are referred to the discussions in Sen (1976, 1981a), Foster (1984), Foster et al., (1984), Atkinson (1987) and Foster and Shorrocks (1991). On the relationship between poverty measures and other social welfare functions see Ravallion (1994c). Elsewhere I have tried to provide an overview of the issues involved in all these steps in current practice, and to refer readers to relevant literature (Ravallion, 1994a).

The existence of a "jump" at the poverty line has been an issue. The fact that some measures (including the headcount index) register a discontinuous change as one crosses the poverty line has been cited by some as an advantage (those who believe a jump in welfare occurs at this point) and by others as a disadvantage (who do not think such jumps exist, or do not want to identify them with a particular poverty line, or do not like the extra sensitivity of the measure to the location of the poverty line and welfare measurement errors near it). From the point of view of anti-poverty policy, a jump attaches a premium to gains for the least poor amongst the poor (in the extreme case of the single headcount index, that person should be the first to gain). If one starts instead from the value judgement that (subject to information and incentive constraints) the poorest in terms of the agreed welfare measure (y_i/z_i) should always get highest priority, then jumps are ruled out. Unlike Sen's own index, "distribution sensitive" measures such as the squared poverty gap index of Foster et al., (1984) are continuous at the poverty line,³ as is Shorrocks's (1995) modification to the Sen index (obtained by a simple re-normalization).⁴

For policy purposes, the method of setting poverty lines can matter greatly to the interpersonal welfare comparisons being made and (hence) the structure of the resulting poverty profile. Alas, looking closely at the "rule of thumb" methods used in practice can often leave one skeptical as to whether the outcome will guide policies in the right direction. For example, a worrying problem in much current practice is that the poverty lines used as deflators do not account well for the actual cost-of-living differences facing the poor due to (inter alia) spatial differences in the prices faced (Ravallion, 1994a). This can bias both the structure of the poverty profile and the

³ Though a jump can be incorporated if one wishes (Bourguignon and Fields, 1994).

⁴ The "non-additivity" of poverty measures such as the Sen and Shorrocks indices—whereby poverty may increase within some sub-group and yet aggregate poverty does not increase—has also been an issue; see Foster and Shorrocks (1991) for further discussion.

aggregate measure obtained. It is often the case that a reasonably credible solution to such problems can be implemented with the data available.⁵

Setting poverty lines as a constant proportion of the mean for each sub-group or date seems very unlikely to deliver poverty comparisons of much relevance to anti-poverty policies, since the implicit welfare indicator loses meaning in terms of absolute levels of living. Policies based on this method could easily miss the poorest of the poor, by anyone's reckoning. A better way of introducing "relative poverty" considerations is to start with an individual welfare measure which is a combination of both individual consumption and consumption relative to the mean, and increasing in both. (Some methods of setting the non-food component of the poverty line do this implicitly.) The poverty line should then be fixed in terms of this composite welfare indicator.

Another critique of standard practice associated with Sen's (1985, 1987) writings, strikes deep at its foundation. This critique is built on the observation that the poverty measures described above are essentially "income" indicators of one sort or another. It is argued that this is too limited a concept of "welfare", and that it would be better to use various "non-income" indicators, notably "social indicators", such as life expectancy, infant mortality and literacy.⁶

Should current practice in poverty measurement be abandoned in favor of "non-income" indicators? "Income" or "consumption" can be defined in many ways, some far preferable to others. At one extreme there is "net cash inflow" (as a measure of income) or "cash expenditures" (consumption), but it is widely agreed that their coverage is too limited. More or less comprehensive measures (including imputed values when necessary) are now generally feasible, and becoming

⁵ See Ravallion and Bidani (1994) for an example of how deceptive some methods of setting poverty lines can be, and how the main problem can be remedied using the same data.

⁶ This critique has roots in the "basic needs" approach to development policy which emerged in the late 1970s (Streeton et al., 1981; Stewart, 1985). Sen (1985, 1987) has been influential in exposing the limitations of relying solely on income metrics. The UNDP's *Human Development Reports* (annual since UNDP, 1990) have been prominent representatives and interpreters of this critique.

common.⁷ In theory, one can define a very broad income concept which provides an exact money metric of almost any concept of "welfare" one is likely to come up with, including both "utility"- and "capability"-based concepts.⁸ This should include the value at appropriate prices of all commodities consumed (both bought and from own- production or stock) and it should be normalized for differences in the cost-of-living and differences in household "needs" such as due to differences in demographic composition. The poverty line is then interpretable as a point on the consumer's cost function corresponding to the reference utility level which defines the poverty line in welfare space. The "welfare ratio", y_i/z_i , will only be an exact money metric of utility for certain restrictions on preferences (notably homotheticity), though it still has some desirable properties for poverty-focused policy evaluation (Blackorby and Donaldson, 1987). The specific institutional setting (which goods are market goods; whether or not there is any rationing) and the (non-monetary) concept of "welfare" will determine the precise properties of this broad money metric, notably what prices are appropriate and the way in which differences in the cost of living and needs are incorporated. Clearly the fact of using a monetary representation is not the real issue.

However, it can be agreed that even the best "income" and "non-income" measures found in practice are incomplete on their own. Considerable research has gone into the problem of identifying "money metric utility" from demand behavior, including setting equivalence scales which give the differences in income needed to compensate families with different demographic compositions.⁹ There is a deep problem in identifying the relevant parameters of the (theoretically)

⁷ Expenditures on consumption from own production and gifts in kind now seem to be routinely imputed in developing country settings where these are important components of full consumption. Less common is a correction for subsidized, publicly-provided private goods. The value of leisure is rarely imputed; the shadow wage rate remains contentious.

⁸ On this distinction see Sen (1985).

⁹ There is a large literature. Deaton and Muellbauer (1980) is a classic treatment of the topic. For recent discussions see Browning (1992) and Nelson (1992).

correct welfare metric from conventional demand data.¹⁰ In applied work there is a tendency to note these identification problems but pass them by, and adopt a more narrow welfare metric (even though typically broader than "net cash inflow" for example). This can be a poor substitute for the correct money metric of welfare.

There are "non-income" indicators that may help in identifying omitted aspects of welfare in standard poverty measures. Consider, for example, the treatment of inequalities within households. Standard practice has been to assume that all family members are equal within a unitary-decision-maker model. The inadequacy of this has long been recognized. But our data are typically for the household's total consumptions, though often with some individual-level data such as on labor supply and some "non-income" welfare indicators. Under certain conditions it is still possible to infer aspects of distribution within households by examining how demographic differences between households influence demand behavior at the household level (Deaton, 1994; Strauss and Thomas, 1995). Here there have also been some advances in modelling households as a collection of individuals who behave cooperatively to arrive at efficient bargaining solutions (Chiappori, 1988). These new theoretical models may allow us to learn more about distribution within households from standard data sources. But the problems in doing so should not be underrated. For example, Apps and Rees (1994) show that key identifying results from bargaining models collapse when one introduces production within the household. It appears likely that there will remain an important role for supplementary data, such as indicators of child nutritional status. For example, some data sets now monitor anthropometric indicators for children. There have also been a few cases where direct observation on food consumptions at the individual level has thrown light on these issues (including Haddad and Kanbur, 1990).

¹⁰ These issues are discussed further in Pollak (1991), Blundell and Lewbel (1991) and Browning (1992).

Similarly, access to public health and education services will often be poorly reflected in these measures, even in the most sophisticated versions.¹¹ Indicators such as infant mortality and primary school enrollments can help complete the picture.

Ingredients for a credible approach to poverty measurement

What indicators should be used? By taking a multiple-indicator approach we do not need, or even want, each indicator to measure everything. But it should at least be clear what exactly each is measuring, and why we need it. Four sets of indicators can be defended:

i) A sensible poverty measure based on the distribution of real expenditure per single adult, covering all market goods and services (including those obtained from non-market sources).

ii) Indicators of access to non-market goods for which meaningful prices cannot be assigned, such as access to non-market education and health services.

iii) Indicators of distribution within households; measures of gender disparities and child nutritional status.

iv) Indicators of certain personal characteristics which entail unusual constraints on the ability of escape poverty, such as physical handicaps or impairments due to past chronic undernutrition.

Not all of these need be relevant in every context. It may be reasonable to concentrate on the consumption-poverty measure when assessing the effects of (say) external trade liberalization, while this would not do when looking at the effects of (say) a cut in social-sector spending. But generally each of these is needed to capture something that is clearly missing from the others. Notice, however, that there would be no point adding (say) "housing" to the list in settings in which

¹¹ On the issues in measuring the welfare gains from publicly provided goods see Cornes (1995). For an attempt to include valuations for public services see Smeeding et al., (1993).

it is a market good already included in the consumption measure. The goal of achieving useful poverty orderings with multiple indicators is clearly not served by double counting.

How can social states be ranked with such multiple indicators? Formulae such as the Borda rule has been popular. (Each observation gets a point according to its rank in each of the multiple dimensions, and these points are added up to form its "Borda score", which is then used to rank all observations.) This ignores the cardinal information in each dimension, and attaches the same value everywhere to differences in rank with no obvious justification. There are other aggregation methods that at least have a clearer axiomatic basis.¹²

But recognizing the limitations of conventional money metrics of welfare does not mean that one should aggregate the multiple indicators into a single metric when there is no obvious basis for setting the trade-offs. Being "multi-dimensional" just does not mean that one should somehow "add up" multiple indicators. It is not clear what meaning can be attached to the result, and the aggregation also wastes information; it can be important to know that region A is doing well in the income space, but not in basic health and schooling, while in region B it is the reverse. Rather, what seems to be called for is a genuinely multi-dimensional approach in which expenditure on market goods sits side-by-side with "non-income" indicators of access to non-market goods and indicators of intra-household distribution.

Some help can be obtained from a small and somewhat neglected literature on the problem of multi-dimensional inequality analysis when the aggregation function is unknown. Atkinson and Bourguignon (1982, 1987) study how to rank multi-variate distributions when one knows little more than the signs of the first and (possibly) second derivatives (both own- and cross-partials) of the aggregation function. Complete orderings may be illusive, but that can be important to know.

¹² Maasoumi (1994) reviews this literature; a recent contribution is Tsui (1995).

Do measurement assumptions matter? Given the pervasive uncertainties in measurement, there is a compelling case for greater future effort in testing the robustness of key conclusions to changes in measurement assumptions. There has been substantial progress in applying stochastic dominance tests in poverty analysis (Atkinson, 1987; Foster and Shorrocks, 1988; Howes, 1994; Jenkins and Lambert, 1995). These methods are coming into wider use, including in policy analysis.¹³ There has also been progress in evaluating methodologies, though here the issues are more ad hoc. There are many "quick and dirty" methods for dealing with welfare measurement problems. An important task for research is to better understand these practices: What normative judgements are they making? Are they consistent in those judgements? Are there better methods that can be implemented with the same basic data? Are qualitative conclusions robust to alternative identifying assumptions for calibrating welfare measures from the data available?

Recent research has illustrated ways in which changes in measurement assumptions can radically alter policy-relevant conclusions. For example, there is virtually zero correlation between the rankings in terms of poverty of Indonesia's provinces obtained by two different methods of setting poverty lines—yet both methods used the same nutritional requirements and the same primary survey data (Ravallion and Bidani, 1994). Statements about the demographics of poverty—such as the widely endorsed claim that larger households are poorer in developing countries—appear to be similarly fragile to measurement assumptions, notably the allowance made for size economies in household consumption (Lanjouw and Ravallion, 1995).¹⁴ Data users should look critically at the measurement assumptions, which can easily pre-determine the policy inference.

¹³ Examples of policy applications include Ravallion (1994, Part 3) and Bishop et al., (1995).

¹⁴ Experiments on various aspects of methodology can be found in Hagenaars and de Vos (1988), Ravallion (1996), and Lanjouw and Lanjouw (1996).

II MODELS

Current practice

Having measured "poverty" one wants to better understand its causes. Standard practice is to estimate a "poverty profile" giving the decomposition of an aggregate poverty measure by population sub-groups, such as region of residence or education level or combinations thereof. Such poverty profiles have been widely used to inform efforts to make public spending policies more pro-poor. For example, a well-designed poverty profile can guide the targeting of transfers aimed at minimizing aggregate poverty (Kanbur, 1987; Besley and Kanbur, 1993). Poverty profiles have also informed discussions of economy-wide policies; for example, critics of the (frequent) "urban bias" in public spending policies in developing countries have pointed out that the incidence of absolute poverty tends to be higher in rural than urban areas (Lipton, 1977; Lipton and Ravallion, 1995).

An increasingly common practice is to construct the poverty profile in the form of a regression of the individual poverty measure against a variety of household characteristics. One postulates that y_i/z_i (or its log) is a function of a vector of observed household characteristics \mathbf{x}_i , namely $y_i/z_i = \beta\mathbf{x}_i + \varepsilon_i$ where β is a vector of parameters and ε_i is an error term; this can be termed the "levels regression". One then defines the binary variable, $h_i = 1$ if $y_i/z_i < 1$ and $h_i = 0$ otherwise. The method then pretends not to observe the y_i 's, acting as if only h_i and the vector of characteristics \mathbf{x}_i is observed. The probability that a household will be poor is $P = \text{Prob}[y/z < 1 | \mathbf{x}] = \text{Prob}[\varepsilon < 1 - \beta\mathbf{x}] = F(1 - \beta\mathbf{x})$, where F is the cumulative density function specified for the error term in the levels regression. A probit or logit is usually estimated, depending on the assumption one makes about the distribution of the error term ε_i . (One could also use a semi-parametric estimator which allows the distribution of the error to be data determined.) One can also generalize this procedure to other ("higher-order") poverty measures and use estimators for censored regressions.

What can be learnt from a poverty regression?

The usefulness of poverty profiles has not always been positively related to the degree of their sophistication. Indeed, the controls in a multivariate model may actually be irrelevant to the policy problem. In choosing whether region A or B should get priority, one does not want to hold constant the human or physical capital of residents; the "unconditional" poverty profile would be a better guide. As a general rule, the specifics of a policy and its setting should dictate the desired properties of a poverty profile relevant to guiding policy decisions. This point is well understood in tax and spending reform analysis, including the formulation of optimal targeting rules (see, for example, Besley and Kanbur, 1993).

Furthermore, even when the conditional poverty profile is needed, the probit or logit model may be redundant. Unlike the usual binary response model, here the continuous "latent" variable is not latent at all, but observed. So there is no need for a binary response estimator if one wants to test effects of household characteristics or to estimate $\text{Prob}[y/z < 1 | \mathbf{x}]$ for some \mathbf{x} . The parameters can be estimated directly by regressing y_i/z_i on \mathbf{x}_i . The relevant information is the levels regression which is consistently estimable under weaker assumptions about the distribution of the error.¹⁵

Poverty regressions make more sense if one wants to test the model's stability across values of y/z , relaxing the first-order dominance assumption implicit in attaching a single parameter to each element of \mathbf{x} , whatever y/z . Then one might want to specify a set of regression functions, the parameters of which vary according to the segment of the distribution one is considering. One way of estimating such a model is by assuming that the segment-specific error terms are of the logit form, entailing a multinomial logit model (Diamond et al., 1990).

¹⁵ Predicted probabilities can also be retrieved from the levels regression using the distribution of the errors; for example, if normally distributed with zero mean and variance σ^2 , the probability of being poor is $F[(1-\beta\mathbf{x})/\sigma]$ for F standard normal. But the binary response estimator is redundant.

The interlinkage between income poverty and human development

The interlinkage between income poverty and undernutrition has been much researched, though controversies linger.¹⁶ There has been a debate about how important low incomes are as a determinant of undernutrition (reviewed in Lipton and Ravallion, 1995). There has also been research on the reverse causation. One prominent body of theory has argued that the chronically undernourished may be so unproductive that they do not get hired at any wage; thus they fall into a nutrition-based poverty trap.¹⁷ There is evidence that low nutritional status reduces productivity (Strauss, 1986; Deolalikar, 1988; Behrman and Deolalikar, 1989; Bhargava, 1996), though the effect may not be strong enough to create nutrition-based poverty traps (Swamy, 1996). Also, some features of wage determination are inconsistent with the model (Bardhan, 1984, chapter 4).

Important, but less researched, questions include understanding the processes determining access to non-market goods. It is widely believed that income poverty is a cause of inequalities in education and health, which in turn perpetuate income poverty. But other factors are at work; amongst countries at any given average income one finds diverse attainments in terms of the non-income dimensions of welfare (Sen, 1981b; Drèze and Sen, 1989; Anand and Ravallion, 1993). Public action to improve access to non-market goods and services—clean drinking water, sanitation, health care, epidemiological protection, elementary education, and so on—has often paid off, and the benefits should clearly not be assessed solely in terms of incomes. By the same token, cutting public spending on these things may matter far more to poor people, who are less able than others to protect

¹⁶ For a good overview of these and other issues discussed in this paragraph see Strauss and Thomas (1995).

¹⁷ Early formulations were by Mirrlees (1975) and Stiglitz (1976). Subsequent elaborations and extensions include Dasgupta and Ray (1986) and Dasgupta (1993).

the non-income dimensions of their welfare from such changes (for evidence on this see Bidani and Ravallion, 1996). More work is needed to test, strengthen, and elaborate these links.

The dynamics of poverty

The standard practice is essentially static; it is based on observations of living standards over a relatively short period. Current household circumstances can, however, be rather uninformative about longer-term levels of living (Chaudhuri and Ravallion, 1994; Jalan and Ravallion, 1996). Household living standards are changing over time, and in often un-predictable ways.¹⁸ A static analysis then begs many questions. It does not tell us how much of any reduction in poverty was due to better protection of those vulnerable to poverty, versus better performance at promoting the poor (terms due to Drèze and Sen, 1989). It does not help us distinguish the characteristics of the persistently poor from the transiently poor, and appropriate policies may be quite different for these two groups. The same post-intervention distribution of living standards can be produced in any number of ways; for example, two policies may yield the same number of poor, yet in one case many more fell into poverty, and many escaped, than in the other. We may be far from neutral to such differences when evaluating social progress in general, and specific social safety net policies (Ravallion, et al., 1995). This opens up a potentially rich set of researchable questions, including decomposing poverty into chronic and transient components and identifying the (possibly quite distinct) determinants of each, and dynamic analyses of public spending incidence, distinguishing impacts on chronic poverty from transient poverty.¹⁹

¹⁸ For an overview of the theory and evidence on inter-temporal consumption behavior see Deaton (1992).

¹⁹ For a selection of writings on the dynamics of poverty see Bane and Ellwood (1986), Ravallion (1988), Gaiha (1988), Rodgers and Rodgers (1993), Ravallion et al., (1995), Grootaert and Kanbur (1995), Jarvis and Jenkins (1995), and Jalan and Ravallion (1996).

What determines why poverty measures have fallen so much faster in some settings than others? One can also make an a priori argument, backed by some evidence, that the higher the initial inequalities in physical and human assets the less economic growth one sees, and the less likely the poor will participate in that growth.²⁰ If for no other reason, initial distribution matters because the absolute gains to the poor will depend on their initial shares of total income, as well as the extent of that growth and how distribution changes. There are other links. Since credit constraints are likely to bite more for the poor, high initial inequality implies that more people will be constrained from making productive investments; growth is lower and inequality persists. Distribution is also one factor influencing the commodities that are available and their prices in a market economy, which in turn influence how much the poor will share in rising aggregate affluence.²¹

All this suggests the existence of "virtuous cycles", whereby a push to equitable human and physical resource development can be instrumental in promoting equitable economic growth—and in fostering further resource development. It has been argued that this was an important part of the East Asian successes in promoting both equitable growth and human development (World Bank, 1993; Birdsall et al., 1995). Cross-country comparisons are plagued by data problems here as elsewhere. More comparable data across states of India over 30 years confirms that human and physical infrastructure endowments mattered greatly to the amount of growth and how pro-poor it was (Datt and Ravallion, 1995). By the same token, economies with high initial inequalities of human capital may get stuck in a "macro-poverty trap" of low and inequitable growth. We need to know more about the state-dependence of the paths out of poverty.

²⁰ For reviews of these arguments see Bruno et al. (1996) and Piketty (1995).

²¹ For example, Atkinson (1995) shows how certain initial distributions can entail that with rising average incomes the poor will find that the goods they consume cease to be supplied.

The economic geography of poverty

It is very common to find (often large) regional disparities in poverty measures; almost every country can identify its "poor areas" where poverty measures are well above the national mean. And there appears to be a degree of persistence over time in the geography of poverty. Various "poor area programs" try to deal with this problem, such as the Integrated Rural Development Programs found in many countries.

But the types of policies called for may depend critically on why we see poor areas, and the reasons are not as yet very well understood. A still widely held individualistic model of poverty—epitomized by the standard human-capital earnings functions—does not attach causal significance to spatial effects; by this view, poor areas presumably exist because individuals with poor endowments end up living together through a process of residential differentiation. Against this, it can be conjectured that both current levels of poverty and rates of poverty reduction depend causally on various area characteristics. Poor local infrastructure, for example, may entail lower current incomes, but also less chance of escaping poverty, because of adverse effects on the productivity of private investment. "Geographic capital" may thus be one of the factors creating the aforementioned state dependence in prospects of escaping poverty. For example, in southern China, there is evidence that households living in areas with poor infrastructure saw lower subsequent rates of consumption growth than one would have expected given their initial a-spatial characteristics, including exposure to exogenous shocks (Jalan and Ravallion, 1995). In the U.S., the neighborhood where a child was raised appears to influence her schooling performance and adult wages (Borjas, 1995).

Such results are suggestive, but we are still a long way from a good understanding of why poor areas exist and persist. And the answers could have great bearing on anti-poverty policy. If the process of escaping poverty involves strong spatial effects then there may be substantially higher

benefits than have been thought from policies and projects which are targeted to poor areas, even if they are not targeted to households with poor endowments *per se*. It may also mean that, without (possibly substantial) extra resources, or greater mobility, the poor may be caught in a spatial poverty trap. To have any chance of success an anti-poverty policy may have to break the local-level constraints on escaping poverty, by public investment or migration incentives. Further research is clearly needed on these issues.

III DATA

Current practice

Poverty analysis has traditionally relied heavily on single household surveys of consumption or incomes, with a somewhat minimal set of other relevant variables. Such data were once only used to inform a rather narrow range of policy issues, notably targeted interventions. We are now seeing much wider range of applications in all aspects of poverty policy, including macro policies, pricing policies, and public spending allocations. This is creating a demand for different types of data.

Better micro data sets

Different dimensions of welfare are often collected from different samples; for example, a household budget survey gets the "income" dimensions, while a demographic and health survey gets the "non-income" data. It has long been recognized that this greatly limits the usefulness of such data for both research and policy. Many socio-economic indicators are only available in a highly aggregated form, such as for provinces or countries. Yet one would like to know how they vary between different socio-economic groups. If one had access to the household-level data from a

suitable integrated survey this would be easy.²² For estimating behavioral models we clearly need a wide range of data for the same households, including community characteristics. Integrated data sets are becoming more common, such as those supported by the World Bank's Living Standards Measurement Study (Grosh and Glewwe, 1995). But even the relatively good surveys are often weak in certain respects, such as in measuring gender and other intra-household inequalities.

Conventional cross-sectional data sets are less than ideal for analyzing the aforementioned issues concerning the dynamics of poverty, including its state dependence, and for dealing with certain problems of endogeneity. There has been some progress in analyzing cohorts from repeated cross-sectional surveys (Deaton and Paxson, 1994). However, there is still a high return to longitudinal data, particularly for the analysis of poverty dynamics. Even one extra wave of data on the key welfare indicators for the same sample can add enormously to the survey's explanatory power for understanding why some people do much better than others in escaping poverty.

We also need a broader approach to the types of questions asked in surveys. Economists have often shied away from subjective/qualitative questions. Yet subjective welfare assessments can be one way of identifying the properties of money metric utility functions (Kapteyn, 1994). Some other social scientists have turned their backs on the "objective" data. There can be large gains to having both types of data for the same households. This segmentation has also made it difficult to test the claims made by various methodologies, such as "rapid-appraisal methods"; critics of conventional socio-economic data have claimed they can do better at lower cost, but the only test I know of suggests large losses in welfare-measurement precision (Ravallion, 1996).

²² One can still estimate the various conditional means, by decomposing socio-economic indicators using the distribution of the population across the relevant sub-groups for which the decomposition is desired (Bidani and Ravallion, 1994). However, there are severe limitations to these methods. The accuracy of such a sub-group decomposition could depend heavily on the extent to which other relevant variables (correlated with sub-group shares) have been controlled for (Ravallion, 1996).

Taking errors seriously

Current practice in poverty analysis typically ignores the statistical imprecision of the measures used. Yet, standard errors for the usual (additive) poverty measures are easy to calculate in simple random samples (Kakwani, 1993), and not much more difficult for the more complex sample designs found in practice provided the design is known (Howes and Lanjouw, 1994). Allowing for non-sampling errors is more problematic. Closer scrutiny of sampling and surveying methods is needed. Excessive "tinkering" with surveys often jeopardizes comparability over time; we still know little about how much questionnaire design influences the results, and more experiments are badly needed, using both survey methods on the same sample, or representing the same population. Pilot tests are highly desirable before changing survey and questionnaire design.

Measurement errors can have profound implications for empirical poverty analysis. Errors in the welfare indicator can entail that absolute poverty comparisons must be made over the entire range of the distribution (Ravallion, 1994c). Dominance tests can be constructed for assessing the robustness of poverty comparisons to certain structures of measurement errors, though orderings can be illusive when the error distributions are heterogeneous (Ravallion, 1994b). Research is needed to better understand welfare measurement errors and their implications.

IV CONCLUSIONS

In their research and policy advice related to poverty and inequality, economists have relied heavily on household incomes or expenditures normalized for differences in household-specific prices and demographics. There are some theoretically sophisticated implementations of such measures, aiming to derive what is often called "money-metric utility", though that term is almost absurdly boastful given how it is in fact implemented. But recognizing the conceptual and empirical problems that confound such measures does not mean that they should be ignored—rather it points to the need

for supplementary measures aiming to capture those things that are missing, including (typically) access to non-market goods and intra-household inequalities. Implementing a genuinely multi-dimensional approach will often make the welfare rankings of social states (including policies) more difficult, but that fact points to the non-robustness of low-dimensional rankings, and it may also have important policy implications in its own right, given that there can be some degree of correspondence between policy instruments and welfare objectives. It also has implications for the types of models that are used to understand the processes determining poverty and inequality. There will not only be more dependent variables to consider, but there will also be some potentially complex interrelationships amongst these variables. Low income, for example, is likely to be both a cause and effect of poor health and schooling. Prospects of escaping poverty may be highly dependent on individual, household and community characteristics. These interrelationships will often be difficult to disentangle empirically, though richer integrated and longitudinal data sets offer hope of doing so. Such data open up a rich and relevant agenda of research into the dynamics of poverty and inequality along multiple dimensions. A simultaneous attack on these issues from all three fronts—measurement, modelling and data—offers hope of establishing a credible empirical foundation for public action in fighting poverty.

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