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Poverty and Vulnerability

By JONATHAN MORDUCH*

While the economics of poverty and the economics of uncertainty are well developed, the nexus of issues at their intersection has been left relatively unexplored. This is likely the product of two factors, one practical and one conceptual. At a practical level, issues of risk have not been addressed for lack of much longitudinal data on the income and consumption of poor households. The absence is particularly notable in low-income countries, although several new data sets seem promising. The lack of attention may also be due to the tendency to take most of the analytical apparatus for considering poverty from studies of poverty in high-income countries.

For example, attention has been paid to the reasonably universal phenomenon by which the lack of collateral limits borrowing by the poor in bad times, reducing the effectiveness of an important insurance mechanism (e.g., Angus Deaton, 1992 ch. 6). Much less attention has been paid to the other direction of causation: how the lack of insurance can increase the incidence of poverty, which is a problem most apparent in low-income countries.

In the United States, poverty tends to be due less often to the vagaries of the weather or price shocks, for example, and due more often to structural characteristics of poor households: low education, the incidence of single-headed households, and so forth. In their important study of poverty spells in the U.S., Mary Jo Bane and David Ellwood (1986 p. 21) find that nearly half of all spells were generated by family structure and life-cycle events (births, divorce, death of a family member). While these events lead to transitory (and sometimes chronic) poverty, they are not caused by riskiness per se. This

distinction is critical, and a definition of *stochastic* poverty is set out below in an attempt to formalize the difference.

The structural sources of poverty are also important in low-income countries. However, three additional factors contribute to poverty in poor countries:

- (i) given the overwhelming place of agriculture, weather and price variability are responsible for a large part of income fluctuations and, thus, of poverty;
- (ii) financial institutions are poorly developed;
- (iii) social insurance institutions are often weak.

The problem of transitory poverty in rural India, much of which is due to stochastic poverty, will then be addressed largely by increasing the extent and effectiveness of insurance mechanisms.

I. A Definition of Stochastic Poverty

Poverty is most often classified as being either *chronic* or *transitory*. The definitions are sample-specific: if a household is poor in every period in the sample, it is chronically poor; otherwise, it is transitorily poor. In low-income countries, transitory poverty is often given by a failure to find protection against stochastic elements in the economic environment, and in order to make this clear, it will be convenient to use the term *stochastic poverty* to describe this occurrence. If one defines x as a household's permanent income, c as current consumption, and z as the poverty line, then the stochastically poor will be those for whom $c < z < x$; their poverty arises only because it is not possible to borrow against future income.

This type of poverty can be distinguished from that of households that suffer an event which reduces their fundamental earning

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capacity, perhaps because an earner falls ill, so that both $x < z$ and $c < z$. The problem of poverty for these households is similar to that of the chronically poor, who also suffer for lack of earning capacity. Because the event which leads to the entrance to poverty is associated with a drop in permanent income, generally it will not be possible to borrow against future earnings to stay above the poverty line.

The classification can guide empirical analyses in a straightforward way. For example, in investigating poverty spells over ten years in six Indian villages, I found that village-level events, which reflect positive weather and price shocks, were responsible for lowering the probability of entrance into poverty by between 0.26 and 0.78, reflecting elements of stochastic poverty. Changes in the numbers of earners, which reflect structural elements, had either very small or insignificant effects (Morduch, 1991). Still, as much as 40 percent of poor households were poor in all years, which suggests a critical role for structural determinants of poverty. However, below I describe mechanisms through which this persistence (such that $x < z$) may also result from a lack of insurance mechanisms, rather than from intrinsic aspects of the income process.

II. Lack of Insurance and the Persistence of Income Shocks

Despite weak financial institutions in most low-income countries, households employ a variety of second-best arrangements which provide insurance. Prominent among them are borrowing from neighbors and relatives and buying and selling durable assets. In addition, where these consumption-smoothing mechanisms provide imperfect insurance, households will self-protect by exercising caution in making production decisions. Traditional crops will be favored over riskier but more profitable new varieties, and wage labor will be favored over riskier but more profitable entrepreneurial activities. Below, I describe two mechanisms through which the lack of first-best insurance arrangements exacerbates the problem of poverty: (i) via the second-best route of smoothing

income when it is not possible to smooth consumption adequately, and (ii) through the depletion of productive assets to protect current consumption levels.

To fix the first idea, imagine a poor agricultural household which exists for two periods. At the start of the first period, the household makes a productive decision, in which riskiness is balanced against expected income. Actual income, Y_1 , is received at the end of the first period, at which time first-period consumption takes place. In the second period, income is known with certainty to be Y_2 . As in most places, agricultural insurance is not available, and the only way to protect consumption is through borrowing or saving. These stylizations help to simplify the story, and they capture the flavor of institutional arrangements in many rural areas of developing economies (see e.g., Thomas S. Walker and James G. Ryan, 1990).

The household's first-period production decision can be characterized as a basic portfolio-choice problem. The household chooses which share of resources $0 \leq \beta \leq 1$ to allocate to an absolutely safe activity with positive return s , with the balance allocated to a risky but more profitable activity. The first period then has two possible states. In state 1H the risky activity has a positive return h and in state 1L it has a negative return l . Each state occurs with probability 0.5 and $(h + l)/2 > s > 0$. Thus, first-period income is either high, $Y_1 = Y_{1H} = \beta s + (1 - \beta)h$, or low, $Y_1 = Y_{1L} = \beta s + (1 - \beta)l$.

Given a low draw in the first period, the household chooses consumption to maximize $U(C_{1L}) + U(C_{2L})$ subject to the constraint that assets in the second period are $(Y_{1L} - C_{1L})(1 + r) + Y_2$ at interest rate r . Optimal consumption is chosen according to the standard condition $(1 + r)U'(C_{2L}) = U'(C_{1L})$, with optimal net borrowing b_L^* . Then, lifetime (i.e., two-period) utility is $U_L(\cdot)$; lifetime utility is $U_H(\cdot)$ for the corresponding high-income scenario.

This result relies on the ability to borrow or save without constraint. Imagine instead that in the low-income scenario, households can only borrow a fraction α of Y_2 . This may be due to a lack of collateral, which is a

particular problem for poor households. The borrowing constraint will bind when $\alpha Y_2 < b_L^*$. In this case, $U'(C_{1L}) > U'(C_{2L})(1+r)$, and the corresponding welfare loss from the inability to protect first-period consumption is captured by the function

$$\delta(Y_{1L}; \alpha, Y_2) = U_L(\cdot) - [U(Y_{1L} + \alpha Y_2) + U(Y_2 - \alpha Y_2[1+r])] > 0.$$

By the envelope theorem, an increase in first-period income reduces the effect of the borrowing constraint such that $\delta'_{Y_1}(\cdot) \leq 0$. While similar to the Lagrange-multiplier approach, here the endogeneity of the borrowing constraint is captured explicitly.

So, how does the household choose the optimal amount of risk-taking? If the borrowing constraint binds when shocks are bad but not when shocks are good, the household chooses β to maximize expected lifetime utility:

$$\max_{\beta} 0.5 U_H(\cdot) + 0.5 [U_L(\cdot) - \delta(Y_{1L}; \alpha, Y_2)].$$

The first order condition simplifies to

$$\begin{aligned} U'_H(\cdot) / [U'_L(\cdot) - \delta'_{Y_1}(\cdot)] \\ = -(s-l) / (s-h). \end{aligned}$$

While reduced risk-taking lowers expected income, it helps to protect consumption when shocks are bad; this is seen by the role of $\delta'(\cdot)$ in the denominator of the left-hand side. The presence of the borrowing constraint makes the denominator larger than it would be otherwise. Thus, the numerator must also be larger than otherwise: expected profits are sacrificed for greater self-protection. By similar reasoning, $d\beta/d\alpha \leq 0$; less risk is taken as the borrowing constraint is tightened. Therefore, poor households with restricted access to consumption credit will pass up risky but profitable opportunities, even if they can secure adequate credit for production purposes.

In the rural Indian sample, the evidence for these relationships is weak in terms of particular production choices (traditional

varieties versus riskier new hybrids). Nonetheless, there is a substantial positive impact of borrowing constraints on crop and, especially, plot diversification (Morduch, 1993), two important means through which farm households smooth incomes.

Three points are worth noting. First, there will appear to be less observed riskiness than is present in actuality. Income will be smoothed, so that its variability, a common indicator of environmental risk, will understate inherent variability. Moreover, income-smoothing may yield the misimpression that the poverty of individuals is structural (i.e., that households have fundamentally low earning power). This need not be the case, since financial development which reduces vulnerability will enable households to increase their expected earnings.

Second, since income-smoothing substitutes for consumption-smoothing, the presence of borrowing constraints will be less evident. In the extreme, income could be so smoothed that consumption is very smooth as well, giving little or no evidence of borrowing constraints even though, to the contrary, they play a central role in the economic environment.

Third, the behavior described above will lead to persistence in income patterns, even where persistence is not intrinsic to the income process. Good shocks will ease credit constraints and lead to more risk-taking and higher expected income in the future. Bad shocks can lead to a poverty trap.

This element of persistence also runs through a second mechanism. In the case above, it is assumed that poor households smooth consumption by borrowing against future income. Imagine instead that this constraint is relaxed; now, in the face of credit rationing, households can sell some of their land, A (or, alternatively, their livestock, tools, or other assets). Rather than taking Y_2 as given, let $Y_2 = f(A)$, $f'(A) > 0$. Then, in the face of credit-rationing and an adverse income shock, the household can sell land, where the gain in period-1 consumption is balanced by a fall in period-2 income. With an active land market, this can be an effective way to cope with idiosyn-

cratic shocks, but it may afford less protection against covariate shocks as all households try to sell their land simultaneously, sending prices downward.

In terms of vulnerability, persistence in income patterns is again created for a reason unrelated to the stochastic nature of the income process, as Mark Rosenzweig and Kenneth Wolpin (1993) demonstrate in analyzing investments in bullocks in India. As productive assets are depleted to protect consumption today, poor households will face lower expected income in the future.¹

The two mechanisms described above counter the common assertion that income in poor agricultural areas may be reasonably characterized as being independently and identically distributed (i.i.d.) due to i.i.d. weather shocks (Deaton, 1992 p. 203). Note that even in the first example, where returns to particular activities are i.i.d., total income exhibits persistence.

III. Vulnerability and Poverty Alleviation

The concern so far has been with the impact of vulnerability on the income patterns of poor households, but nothing has been said about the expected impact on measured poverty. This, however, has been the focus of the few studies which have considered poverty and risk to date (Martin Ravallion, 1988; Morduch, 1991). Are more households expected to escape from poverty due to good shocks or to be pushed into poverty by bad shocks? Answers require assumptions about the distribution of permanent income. Consider the case in which the distribution of x is unimodal and shocks are additive so that current income is the sum of permanent income and a transitory i.i.d. shock, $y = x + \varepsilon$. If the shock is symmetrically distributed around 0 and house-

holds cannot smooth consumption (or can only smooth a given share of consumption), an income-stabilization program will, in itself, lower the headcount of poverty as well as the cost of poverty alleviation if the modal permanent income is above the poverty line ($x > z$).

Antipoverty programs may then benefit from the simultaneous presence of price stabilization and financial development programs. Not only do they address stochastic poverty directly, but in doing so, they help to reduce some of the heterogeneity of the poor, making targeted poverty-alleviation programs more effective. Similarly, strengthening employment-guarantee schemes can help reduce poverty, both through providing wages directly and through providing an insurance function which enables households to take risks that raise expected income (Thomas S. Walker and James G. Ryan, 1990). As in the cases described above, lack of insurance exacerbates the poverty problem, and when income processes are persistent, the benefits of stabilization will be accentuated.

IV. Vulnerability and the Concept of Poverty

While the effects of risk on expected poverty and income processes have been considered, no consideration has been given to the place of risk as a *component* of poverty. Vulnerability to income shocks may be intrinsically detrimental to the poor, and, just as deprivations in health and nutrition may be considered as part of an expanded poverty concept, one could also consider a measure of lack of access to consumption-smoothing mechanisms. As a practical matter, this is difficult to make precise and operational. One avenue involves measuring poverty in terms of both the mean and variance of consumption over time; another possibility is to measure poverty in terms of certainty-equivalent consumption. While neither path will allow much progress given the current state of data, it should not dim the observation that, in considering risk aversion, poor households are even worse off. They not only have lower incomes than

¹It should not be surprising that, up to a point, households are willing to forgo consumption in order to protect productive assets. However, this is not always possible, for example, when a health problem demands medical attention. Health insurance or publicly provided medical services can then have a particularly important role in alleviating some cases of poverty.

richer households, but their consumption can vary a good deal over time. Thus, vulnerability does not just result from poverty; it can also reinforce the income processes which lead to poverty and further diminish the expected welfare of the poor.

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