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Assisting the escape from persistent ultra-poverty in rural Africa

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Abstract

Sub-Saharan Africa (SSA) is home to two-thirds of the world's ultra-poor today. This paper offers current thinking on the structural causes of the spatially concentrated, persistent ultra-poverty that has plagued Africa for a generation and some key entry points for facilitating Africans' escape from persistent ultra-poverty.

The increased recognition of persistent ultra-poverty has rekindled long-dormant interest in poverty traps. The essence of a poverty trap is that there exists one or more low equilibrium level(s) of well-being in which people appear caught unnecessarily. Small adjustments fail to move people out of those equilibria sustainably. Rather, systems must change, major positive shocks must occur, or both. And in the absence of systemic change, recurring adverse shocks only drive more people into the trap.

The ultra-poverty trap that characterizes much of rural SSA today is intimately caught up with (i) the bidirectional interrelationship among hunger, ill-health, low productivity, weak institutions and natural resources degradation, all of which become manifest in low incomes, (ii) poor initial conditions associated with health and nutrition, especially early in childhood, but also with the state of infrastructure and the natural resource base on which rural livelihood disproportionately depend, and (iii) uninsured risk exposure, which is especially severe in rural areas and in agriculture. The closely coupled nature of these problems adds substantially to the challenge of addressing any one of them on its own and thereby makes integrated strategies essential.

The available theory and evidence suggests that the policy focus must fall squarely on stimulating a smallholder food productivity revolution. Toward that end, the paper concludes by identifying and explaining key entry points for assisting the escape from persistent ultra-poverty in sub-Saharan Africa.

1. Build and protect the productive asset endowments of the ultra-poor
2. Improve the productivity of the ultra-poor's current asset holdings
3. Improve risk management options for the ultra-poor
4. Facilitate favorable transitions out of agriculture

Although the topic of persistent ultra-poverty would seem to lend itself to a pessimistic ending, the future for Africa is actually rather hopeful. The East Asian experience demonstrates that mass, rapid escape from persistent ultra-poverty is feasible. Real agricultural output growth rates are accelerating in SSA, nearly doubling from the 1980s rate so that per capita food output is growing again, helping reduce rural poverty rates in countries enjoying increased agricultural productivity. Finally, the policymaking and donor communities are now appropriately focusing on how best to stimulate investment incentives, productivity growth, risk management and productive transitions out of agriculture. These broad foci are appropriate and reasonably well-grounded in both theory and empirical evidence.

Assisting the escape from persistent ultra-poverty in rural Africa

Introduction

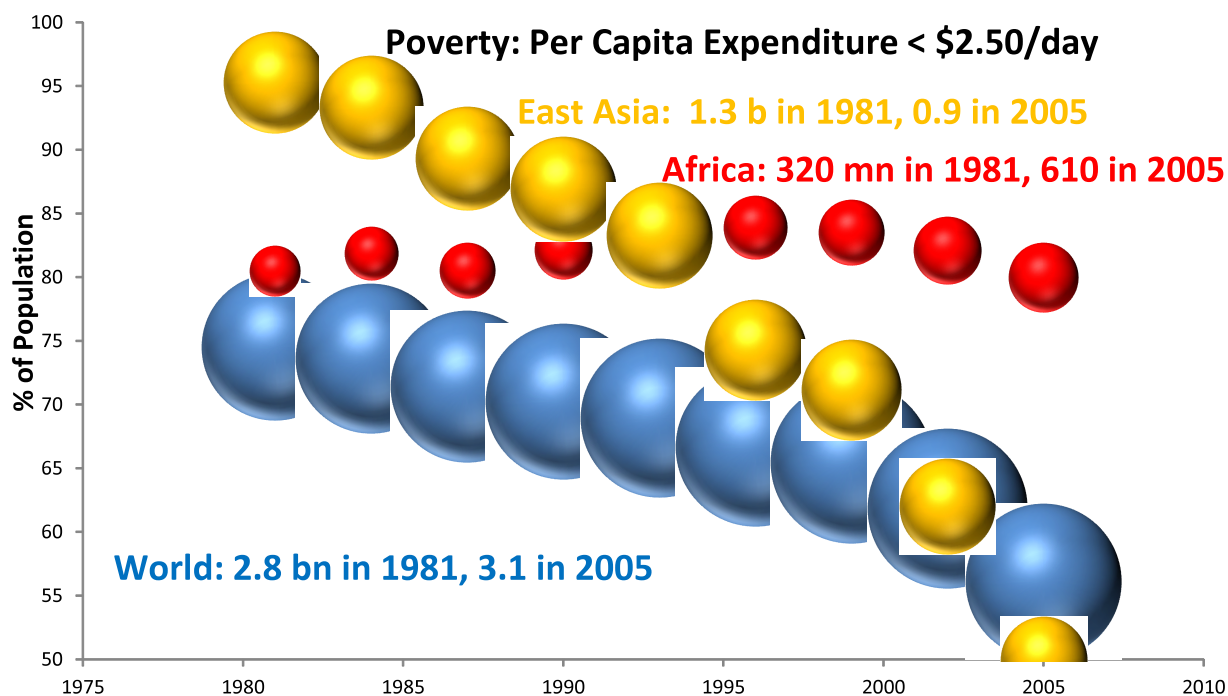
The Millennium Declaration of September 2000, adopted by the 189 member states of the United Nations, renewed the vigor of the global community's commitment to improve living conditions throughout the world. The very first Millennium Development Goal (MDG) is to halve, by 2015, the proportion of people living in extreme poverty. The bold but attainable goal enshrined in MDG#1 can be met.

Rapid poverty reduction is possible, as demonstrated by a generation of rapidly falling headcount rates of poverty, defined as per capita daily expenditures under US\$2.50 in purchasing power parity terms. As shown in Figure 1, the share of the world's population living on \$2.50/day per person or less fell from 75 percent in 1981 to 56 percent by 2005.¹ Progress has been even more dramatic in East Asia, where rapid economic growth, especially in China, has lifted historically unprecedented hundreds of millions of people from abject poverty. In 1981, more than 95 percent of the residents of East Asia lived on \$2.50/day or less; by 2005, less than half did. This is a truly remarkable accomplishment in both its scale and speed. The East Asian experience should inspire us to acknowledge that rapid, large scale escape from poverty is possible, and thus to pursue that aim with renewed vigor.

These tremendous accomplishments notwithstanding, an unacceptably large number of people continue to live in poverty. Moreover, in key parts of the world, notably sub-Saharan Africa (SSA), progress has been virtually non-existent. The headcount rate of poverty in SSA has oscillated between 80 and 84 percent since 1981 while the number of people living on \$2.50 or less per day has effectively doubled, from an estimated 320 million persons in 1981 to 610 million by 2005. While there remains reason for hope based on the East Asian experience, clearly there is something structurally different about SSA that is causing stubborn persistence in human deprivation at continental scale. This paper offers current thinking on those structural causes and some key entry points for facilitating African escape from poverty.

¹ All poverty figures reported here were computed from the World Bank's PovCalNet web application (<http://econ.worldbank.org/povcalnet>).

Figure 1: The evolution of poverty in Africa, East Asia and the World, 1981-2005



Note: Bubbles are scaled by population. Poverty figures computed from the World Bank’s PovCalNet web application (<http://econ.worldbank.org/povcalnet>).

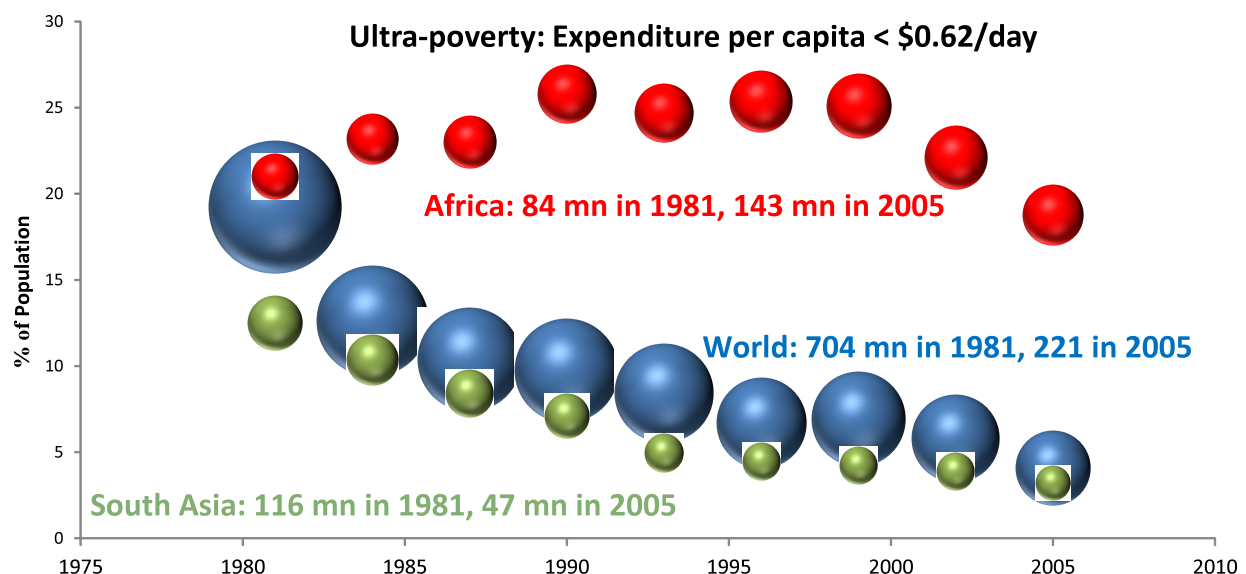
Persistent ultra-poverty

Perhaps the principal reason why there has been less progress in SSA moving people beyond the \$2.50/day per capita global poverty line is that the depth of poverty was – and, distressingly, remains – far deeper in Africa than in other continents. The ultra-poor – those living on one quarter or less of the global poverty line, i.e., \$0.62/day per capita – are disproportionately concentrated in SSA.² Worldwide, the headcount rate of ultra-poverty has absolutely collapsed, from 19 percent (704 million people) in 1981 to just 4 percent (221 million) in 2005 (Figure 2). The escape from ultra-poverty is nearly complete in East Asia, where less than one percent of the population now survives on \$0.62/day or less, down from 36 percent in 1981 (not shown). Even in South Asia, the world region that is now home to most of the world’s poor, ultra-poverty has fallen from 13 percent to 3 percent in a generation. But in SSA, the number of ultra-poor

² Ahmed et al. (2007) demonstrate the same point using different data and a different ultra-poverty line.

doubled from 1981 to 1999, from 84 to 165 million, and the ultra-poverty headcount rate has remain stuck around 20 percent. There has been notable progress over the past decade, coincident with significant progress in many African countries (Radelet 2010). But this progress has been slow and come late. SSA is now home to 65 percent of the world's ultra-poor, up from just 12 percent in 1981. While poverty remains primarily an Asian phenomenon – for the simple reason that it is the world's most populous continent – ultra-poverty is primarily and increasingly an African condition. This is the big challenge: spatially concentrated, persistent ultra-poverty that has plagued Africa for a generation.

Figure 2: The evolution of ultra-poverty in Africa, South Asia and the world, 1981-2005

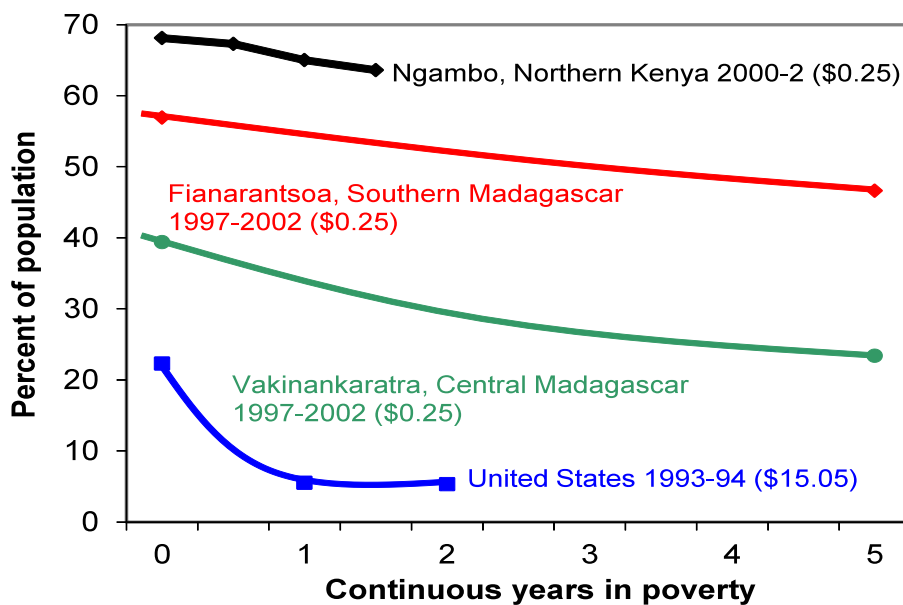


Note: Bubbles are scaled by population. Poverty figures computed from the World Bank's PovCalNet web application (<http://econ.worldbank.org/povcalnet>).

The preceding national poverty estimates are all based on nationally representative, cross-sectional household surveys. A different, arguably better way to get a sense of the persistence of poverty as experienced by individuals comes from looking at longitudinal household data. For how long do poor households typically remain mired in poverty? This is a surprisingly difficult question to answer in most settings because we lack adequate longitudinal data of households. That said, Figure 3 (adapted from Barrett and Swallow 2006) contrasts poverty dynamics in the United States (Naifeh 1998) with that in three rural African sites my collaborators and I have observed for some time: northern Kenya and central and south-central Madagascar (Barrett et al. 2006). These are very crude comparisons meant purely for illustrative purposes. But they clearly

make the key qualitative point that the percentage of the population that was poor at one point in time – for the year noted, as compared against the location-specific poverty line noted in parentheses, measured in real 2002 US dollars/day per person – who remain poor in subsequent periods falls very quickly in the United States, where most poverty is transitory, due to temporary unemployment spells. In the US, less than 25 percent of the households remained poor for one year and only 5.3 percent were still poor after two years; median time in poverty was only 4.5 months (Naifeh 1998).

Figure 3: Comparative poverty dynamics in Kenya, Madagascar and the US



Sources: USA: Naifeh (1998), others: Barrett et al. (2006). Poverty levels are all in inflation-adjusted 2002 US dollars.

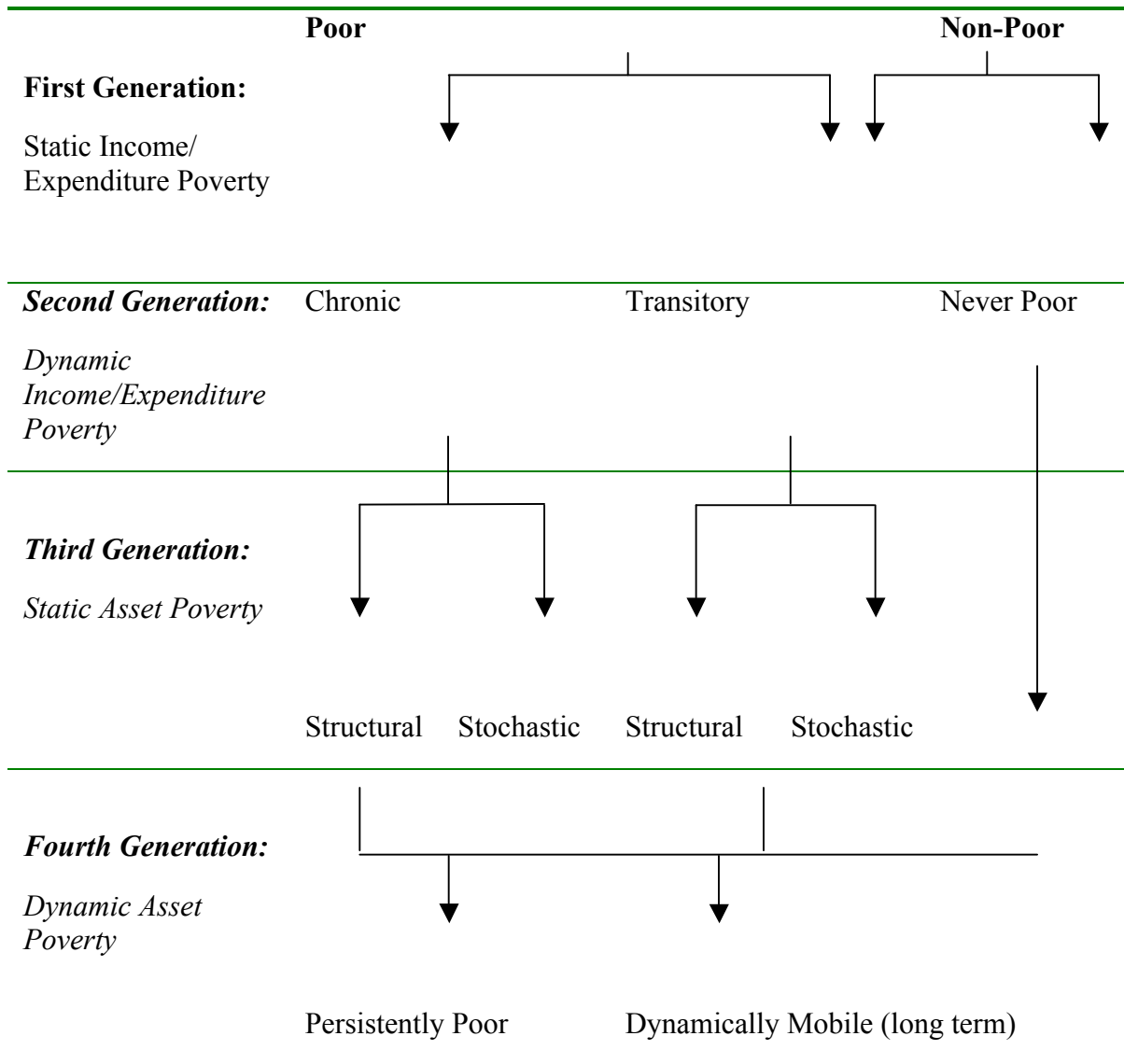
By contrast, most poverty in these African cases appears distressingly persistent. Anywhere from 60-90 percent of the ultra-poor – the poverty lines used here were half the national rural poverty lines in place at the time – remained ultra-poor 18-60 months later. In rural Africa, we do not even know the median spell length in poverty! That is because we have no longitudinal data sets in which at least half of the initially poor have exited poverty in some subsequent round, so we cannot compute the median poverty spell length.

These crude comparisons underscore an important qualitative point: it is not just the headcount poverty rate but, perhaps even more importantly, the depth and duration of poverty that

differentiates rural Africa from much of the rest of the world, even Asia. Anti-poverty policy in wealthy countries largely revolves around the provision of safety nets to cushion people against short-term shocks and to help them “get back on their feet again” quickly. In the fast-growing emerging markets of Asia it has largely revolved around ensuring inclusive growth. In rural Africa, the task is far more challenging. The persistent poverty of rural Africa is of grave concern not only because of the severe, sustained material deprivation it represents, but equally because of the feelings of hopelessness that such dim prospects can induce. This persistent ultra-poverty has complex, multi-factorial causality that has thus far rendered it impervious to simple solutions that are often motivated by relatively simplistic conceptualizations and measures of poverty, like the simple per capita expenditure measures reflected in the preceding figures.

Figure 4 (reproduced from Carter and Barrett 2006), schematically represents alternative approaches to measuring poverty. The most common (first generation) approach to poverty measurement relies on household expenditure (or income) data from a single point in time. Once a money metric poverty line is defined, the population can then be divided into poor and non-poor categories, and the standard suite of headcount and other measures can be calculated to gauge the extent and depth of poverty within an economy. Application of these first generation poverty analysis methods to repeated cross-sectional surveys allows insight into the evolution of poverty within a society. Figures 1 and 2 are examples of the sorts of descriptive analyses possible with such measures.

Figure 4: Evolving concepts and measures of poverty (reproduced from Carter and Barrett 2006)



Cross-sectional poverty measures cannot tell us, however, whether certain households are stuck in poverty for extended periods or whether there is considerable turnover within the ranks of the poor such that many people experience poverty, but only for short spells, on average. In the first case, poverty is largely chronic, as reflected in long duration poverty spells. In the latter case, poverty is primarily transitory, manifest in short poverty spells. First generation poverty measures based on cross-sectional expenditure or income measures are incapable of distinguishing between these starkly different poverty processes.

Growing interest in poverty dynamics motivated a second generation of poverty analysis based on longitudinal or panel data that offer repeated observations over time on a single cohort of individuals or households, such as we saw in Figure 3. As illustrated in Figure 4, panel data permit a further decomposition of households into three categories: the always or chronically poor, the sometimes or transitorily poor, and the never poor. Second generation, panel data studies of poverty in developing countries have typically found that transitory poverty comprises a rather large share of overall poverty (Baulch and Hoddinott 2000).

The large estimated share of transitory poverty based on income or expenditure underscores the inherent stochasticity of flow-based measures of welfare. People are better off one period than another without any significant or lasting change in their underlying circumstances, particularly the stock of productive assets under their control, due solely to random price and yield fluctuations and irregular, stochastic earnings from remittances, gifts, lotteries, and so forth. Moreover, the magnitude of measured transitory expenditure or income poverty may also reflect the measurement error to which flow-based welfare measures are especially prone. Barrett et al. (2006) and Naschold and Barrett (2011) show that measurement error and stochastic components to income data generating processes can completely mask structural patterns of income change over time.

The Achilles heel of second generation poverty measures is that they cannot distinguish between very distinctive sorts of poverty transitions. Individuals may appear to be transitorily poor in a standard panel study, moving from the poor to the non-poor state over time due to either of two markedly different experiences. Some may have been initially poor because of bad luck. Their transition to the non-poor state simply reflects a return to an expected non-poor standard of living (a stochastic poverty transition). For others, the transition may have been structural, due to the accumulation of new assets, or enhanced returns to the assets that they already possessed.

Similarly, those transitorily poor individuals who move from being non-poor to poor, can represent a mix of experiences. For some, the transition could represent a return to an expected standard of living, after a brief non-poor hiatus afforded by a spell of good luck. For others, the same transition could be a temporary phenomenon caused by bad luck in a later survey period. Finally, for yet others, the observed transition could reflect a structural move caused by the loss of assets (due to illness, natural disaster or theft), or by a deterioration in returns to their assets brought on by changes in the broader economy (for example, unemployment or declining terms of trade). Slightly more formally, the second generation approaches to poverty measurement cannot differentiate between stationary and non-stationary shocks to individuals' welfare.

To overcome these limitations of second generation poverty measurement, a third generation of poverty measurement arose, largely starting with the work of Carter and May (1999, 2001) to identify an asset poverty line as a natural, stock-based extension of the more familiar flow-based concept of an expenditure or income poverty line. This asset poverty line can then be used to distinguish stochastic from structural transitions, making it possible to decompose poverty transitions, as shown in Figure 4. The asset poverty line can also be used as the basis for a suite of structural poverty indicators that provide a snapshot of structural poverty, having filtered out the influence of stochastic transitions. As Barrett et al. (2006) and Naschold and Barrett (2011) show, structural economic mobility is—for simple statistical reasons—markedly less than total

economic mobility that includes transitory components. But if the underlying productive asset stock of households is slow to change, that has important implications for the persistence of poverty.

While defining and measuring poverty based on the asset poverty line provides important information on the structural foundations of poverty, it does not speak to the long-term persistence of structural poverty. Analysis based on the asset poverty line cannot by itself identify whether the currently structurally poor are likely to remain poor over the longer term, caught in a poverty trap, or indeed whether a subset of the structurally non-poor can sustain their positions over the longer term. To further decompose these groups according to their long-term, persistent poverty status requires a fourth generation approach to poverty based on an understanding of underlying patterns of asset dynamics. The growing empirical literature on asset dynamics and poverty traps (Lybbert et al. 2004, Adato et al. 2006, Barrett et al. 2006, Hoddinott 2006, Santos and Barrett 2006, Naschold 2009) points to the identification of a dynamic asset poverty threshold—the point at which current asset stocks are expected to lead to eventual escape from poverty, given the underlying asset law of motion prevailing in the economy—as the key to decomposing current structural poverty into its persistent and more transitory components over time (Carter and Barrett 2006).

Such observations have rekindled long-dormant interest in poverty traps. The idea is an old one, reflected in prominent development theories of the 1940s and 1950s that tried to explain the geographic clustering of poverty in the world (Rosenstein-Rodan 1943, Nurkse 1953, Myrdal 1957, Hirschman 1958). The essence of a poverty trap is that there exists a low-level equilibrium level of well-being in which individuals, households, communities, nations or even multinational regions appear caught unnecessarily. Small adjustments are insufficient to move people, communities or nations out of those equilibria sustainably. Systems must change, major positive shocks must occur, or both. And in the absence of systemic change, recurring adverse shocks will only drive more people into the trap. It is perhaps worth illustrating these systemic, structural features through two examples.

Two African examples

Pastoralists in the arid and semi-arid lands (ASAL) of northern Kenya and southern Ethiopia are among the world's poorest populations by many metrics. They inhabit a harsh agro-ecosystem where rainfall varies dramatically within and between years, averaging only 200-750 mm annually in most of the areas my collaborators and I have worked. As a result of historically low rainfall, poor soils, high evapotranspiration rates and very sparse transportation, communications and power infrastructure—as well as other public goods and services, such as health care—these populations' livelihood depends heavily upon the livestock herds they can sustain on the grasses and water available on the rangelands. Recent research has established reasonably convincingly the existence of multiple equilibria in both human welfare terms – a poverty trap associated with distinct wealth levels measured in herd sizes – and localized range degradation alongside (seasonally) abundant forage in large parts of the east African ASAL (McPeak and Barrett 2001; McPeak 2003; Lybbert et al. 2004; Barrett et al. 2006; Santos and Barrett 2006).

The reasons for the apparent poverty trap are several. Market imperfections – not least of which, uninsured asset risk – create two distinct modes of pastoralism: (i) a low-level equilibrium characterized by sedentarized livestock keeping of one or two cows in small, poor settlements subject to serious, but only localized range degradation, and (ii) a higher-level equilibrium based on traditional, transhumant grazing of large herds sustained by long distance treks to areas that retain abundant forage and water (Lybbert et al. 2004; Santos and Barrett 2006). There is negligible incentive to invest in education, as employment opportunities are negligible and supply-side constraints severely limit the quality of education available in most locations. Thus, investment in livestock offers the best option in this setting.

Impoverishment and range degradation seem to go hand-in-hand and are magnified by human population growth in an area facing receding available grazing lands due to the growth of towns, the gazetting of parks, and the expansion of areas of violent conflict spilling over from Somalia and southern Sudan. But those conditions by no means apply to the whole of the region. Indeed only to a very small proportion of the land area as recent, careful empirical studies find no support for classical tragedy-of-the-commons effects. That is one pastoralist's herd size having an adverse effect on the productivity or survival of another pastoralist's livestock (Lybbert et al. 2004; McPeak 2005). The range ecology of the region appears rather resilient in most locations, capable of supporting mobile pastoralism and climate variability of the sort traditionally faced in the region. Those who can maintain a reasonable size herd typically remain mobile on a resilient landscape and can weather natural shocks, while those who lose their herds, for whatever reason, commonly collapse into town-based destitution on a degrading local landscape.

The challenge of poverty traps in the east African ASAL transcends herd sizes and market imperfections, however. Historically, a clan or ethnic group's grazing areas typically have flexible and contested boundaries. As a result, environmental resource management becomes closely bound up with issues of conflict management. Setting and enforcing rules to coordinate expectations and actions becomes essential to prevent collapse, not just of the fragile range ecology but also of pastoralist communities into violence and destitution (Haro et al. 2005; Munyao and Barrett 2007). It seems unlikely that one could surmount the poverty trap problem in the pastoral areas of the east African ASAL without tackling both market imperfections and coordination/ institutional issues jointly.

Somewhat similar patterns emerge in a strikingly different agroecosystem in highland western Kenya. Shepherd and Soule (1998) found, based on a simulation model calibrated using data collected across a range of western Kenyan farms, that soil nutrient mining by poorer farmers unable or unwilling to invest in soil fertility replenishment, farmers clearly falling into a resource degradation poverty trap, can co-exist alongside stable soil quality among better-endowed farmers in a homeostatic subsystem. This important finding is one of the clearest empirical examples in the literature of a resource degradation poverty trap.

Plot- and farm-level survey data collected over the period 1989-2004 in western Kenya corroborate the patterns that Shepherd and Soule (1998) first described (Barrett et al. 2006; Marenya and Barrett 2009, Stephens et al. 2011). Those who remain non-poor over time started off with statistically significantly higher endowments of land, improved livestock and educated family members, as well as greater and more remunerative off-farm employment to generate the

cash necessary to invest in chemical fertilizer and other critical integrated soil fertility management interventions. As soil nitrogen and phosphorus stocks decline after a few decades' continuous cultivation in annual food crops, and as farms get subdivided in the face of human population growth, the better off farmers can afford to purchase and plant tea stems and to forego any earnings from the land converted to perennials during the roughly two years it takes tea bushes to mature and generate marketable leaves. The tea bushes' roots provide outstanding erosion control, however, and the local tea factories' natural monopsony – due to the need to process tea leaves quickly after picking – enables them to provide inorganic fertilizer on credit secured by future delivery of tea leaves. Those who can afford to invest in conversion from maize to tea as soil quality declines thereby escape the seasonal liquidity constraints that impede soil fertility replenishment by poorer neighbors. A homeostatic system of reasonably fertile soil conditions and adequate incomes results for these households.

Meanwhile, those who collapse into poverty all traced their decline to shocks that caused them to lose critical land, livestock or human assets, initiating a spiral from which their family has not recovered. The single most common cause of collapses into persistent ultra-poverty was health shocks that depleted family productive assets (Barrett et al. 2006), reflecting a pattern that appears relatively general worldwide (Krishna 2010). Those who suffer persistent poverty articulate less concern for conserving soil fertility and make fewer efforts to do so, presumably reflecting lower conditional (constrained) returns to investment in degraded soils for the poor (Marenya and Barrett 2009). The poor also point to certain higher-return activities as beyond their reach for want of financial capital, education (commonly due to inability to pay school fees), the social connections necessary to secure remunerative full-time employment, or some combination of these. These obstacles dampen the productivity of their limited labor, land and livestock holdings relative to better-off neighbors. The result is a system that appears to exhibit multiple soil fertility equilibria and associated levels of per capita income, driven in large part – but not entirely – by imperfections in markets for credit and insurance (Barrett et al. 2006, Stephens et al. 2011).

These financial market imperfections that impede optimal investment are compounded by coordination failures among farmers. Nutrient-depleted soils in sub-Saharan Africa have become infested with the parasitic weed *Striga hermonthica*, with yield losses now over US\$7 billion annually (SPIPM 2003). Prevention of *Striga* encroachment depends on maintaining high soil fertility and moisture, which is difficult in rainfed lands with infrequent rotation or fallowing. Once established, “witchweed”, as Kenyan farmers understandably call the plant, has proved resistant to conventional methods of weed control via herbicides and hand or mechanical weeding. A single *Striga* plant produces thousands of tiny seeds that are difficult to notice. Most of the damage to the crop occurs before the parasite emerges from the ground and can be readily identified, and the seed can remain dormant but viable in the soil for many years. *Striga* is therefore difficult to eradicate because a single surviving plant can recolonize a large area in a single season. And with so many lightweight seeds, it spreads readily from farm to farm via wind, water, animals and humans. Coordinated measures are essential for effective eradication because the returns to an individual farmer's efforts to block the entry of (or to eradicate) *Striga* on his fields are an increasing function of neighboring farmers' efforts at weed control. It has proved exceedingly difficult, however, to organize communities to combat *Striga* in spite of the parasitic weed's considerable costs. This seems to be especially true in villages with large

numbers of recent immigrants, inter-clan frictions and other social phenomena that dampen the strong ties necessary to resolve such coordination problems (Barrett 2005). Thus crop yields and soil quality continue to decline, in this case, due in large measure to the coordination failures mechanism behind poverty traps.

Poverty traps

The preceding examples illustrate the notion of a poverty trap, defined as any self-reinforcing mechanism which causes poverty to persist (Azariadis and Stachurski 2007). This can include single equilibrium systems where the unique equilibrium is at a low-level of well-being or systems characterized by multiple dynamic equilibria, at least one of which involves an unacceptably low standard of living. The poverty traps idea remains a conjecture – albeit a compelling one – because finding irrefutable empirical evidence that poverty traps really exist remains a difficult challenge for researchers. This difficulty arises due both to paucity of high quality longitudinal data on households and individuals in low-income countries and to disagreements among technical experts over how best to test the hypothesis that some people might be caught in a poverty trap.³ While it is important to attack that epistemological question via basic research in the social sciences, the core empirical fact of widespread persistent ultra-poverty – simply put, a poverty trap – has proved largely intractable to recent interventions remains regardless of the academic dispute. And there is much that we already know that can usefully inform policy even as the intellectual struggle continues to understand more rigorously and precisely the etiology of SSA's apparent poverty trap.

First, we know that there are multiple, interacting causes behind persistent ultra-poverty. That is why it is difficult – really, futile – to find a single, simple solutions. Stocks of productive assets govern the dynamics of an economic system. But in ultra-poor communities, stocks of financial, human, natural and physical capital are typically low due to limited investment capacity – people have meager savings and scant access to credit with which to invest – and a poor risk-return profile to most assets. Low stocks are the result of both insecurity due to weak property rights and exposure to natural threats (e.g., disease, predators, hydrometeorological disasters) and low average returns due to rudimentary production technologies and weak marketing systems. This combination of limited asset holdings and low productivity of those assets tends to be highly spatially concentrated, leading to geographic poverty traps wherein the poverty of individuals reinforces that of communities – even of entire nations – and vice versa (Barrett and Swallow 2006).

This all reflects reinforcing feedback. Low productivity leads to low incomes and thus poverty. But low real incomes are in turn the primary cause of food insecurity and ill health, as well as a significant factor explaining weak institutions and natural resource degradation (Barrett 2008). Of course, undernutrition impedes cognitive and physical development, thereby depressing educational attainment and adult earnings and productivity. Disease likewise impedes the uptake

³ See Azariadis and Stachurski (2007) and Carter and Barrett (2006) for discussion of the technical issues and empirical disagreements in the literature.

of scarce nutrients, aggravating hunger and micronutrient malnutrition problems and hurting labor productivity and earnings, further underscoring the multifactorial feedback intrinsic to poverty traps (Dasgupta 1997; Schultz 1997; Strauss and Thomas 1998). Furthermore, since much health care provision is a public good funded by tax revenues, areas of concentrated ultra-poverty commonly cannot afford the physical infrastructure or professional staffing necessary to ensure an adequate, high quality supply of preventive and curative health care in very poor communities. This relationship between the public finance problems associated with health care provision and the dynamics that lead to individual- and household-level poverty and ill-health traps is a classic example of spillovers between micro- and meso-scale phenomena that lead to what Barrett and Swallow (2006) term “fractal poverty traps”—patterns that are replicated at multiple scales of analysis. The reinforcing feedback among poverty, ill health, food insecurity, natural resources degradation and weak sociopolitical institutions and hunger – manifest at all levels of analysis in contemporary Africa – is a central characteristic of the poverty traps apparent in SSA today.

Two other key things about poverty traps merit brief review. First, initial conditions matter. This applies not just to nutritional and health status (e.g., low birth weight babies typically have retarded cognitive and physical development, with long-term economic and health consequences), but far more broadly. Those who possess the means to invest are commonly better able and more willing to secure credit, access to complementary resources, political favors or whatever else it might take to induce investment, whether in new production technologies, new marketing relationships, education and health care for children, productive new assets, or improvements to the natural resource base on which future earnings depend. And such investment is the engine for exiting long-term poverty and hunger.

In thinking about initial conditions for the ultra-poor in SSA, it is extremely important to keep in mind that they are especially likely to live in rural areas. Poverty remains a disproportionately rural phenomenon worldwide. This is especially pronounced among the ultra-poor; the average percent difference between rural and urban poverty incidences are roughly 400 percent for the ultra-poor, more than twice as large a gap as for those living in poverty but above the ultra-poor income threshold (Ahmed et al. 2007). Rural people depend heavily on the natural resource base for their livelihoods, as farmers, fishers, forest product gatherers, herders and workers. In much of SSA, soil fertility and water access are especially poor, and in many places, deteriorating. Furthermore, the physical and institutional infrastructure to support commerce, innovation and value-addition are commonly rudimentary or absent. For example, in 1999 (the most recent year for which comparable data are available), only 12.1 percent of the roads in SSA were paved, as compared with 36.3 percent worldwide and even 30.8 percent in South Asia (World Bank 2007a). These areas have been disfavored by both nature and states, creating an immediate disadvantage for rural Africans’ productivity and investment incentives.

The second key thing we know about poverty traps is the importance of risk. Even transitory shocks can have persistent effects by casting people onto a downward spiral into destitution from which they do not recover, or by keeping them from growing their way out of persistent poverty by regularly knocking them backwards as they struggle to climb out of the trap, a real-world Sisyphian tragedy (Dercon 1998; McPeak and Barrett 2001; Dercon 2005; Carter and Barrett 2006; Santos and Barrett 2006; Carter et al. 2007, Krishna 2010).

People's response to shocks – both *ex post* and *ex ante* – can likewise trap them in poverty. Risk can have two distinct, crucial effects in systems characterized by poverty traps. First, *ex ante* efforts to reduce risk exposure can dampen accumulation – either voluntarily or through credit rationing – thereby creating a low-level equilibrium. Second, the *ex post* consequences of a shock—both the shock's direct biophysical effects or those due to coping strategies taken in response to the shock—can knock vulnerable people back into a poverty trap.

The ultra-poor who disproportionately inhabit rural SSA are especially risk-exposed. Conflict and associated complex emergencies are perhaps the most shocking source of risk borne by rural Africans. But even where peace reigns, weather-related risks disproportionately affect rural people and the agriculture sector through drought and flooding, the effects of which are compounded by less reliable physical and institutional infrastructure for responding to shocks. These patterns are aggravated by spatial inequality in the coverage and effectiveness of public and veterinary health systems, which strongly favor richer areas. Overall, people in low-income countries are four times more likely to die due to natural disaster, and cost per disaster as a share of GDP are considerably higher in developing than in OECD countries (Gaiha and Thapa 2006). Poorer, rural areas appear far more vulnerable to disasters than are wealthier and more urban areas. Moreover, at the household level, evidence from drought in Ethiopia indicates that the medium-term effects of shocks vary by initial wealth, with poorer households feeling the adverse effects more acutely and for a longer period (Carter et al. 2007).

The most serious and commonplace catastrophic risk faced by the African rural poor, however, is ill health. As already mentioned, health shocks are the single most common explanation people offer for how previously non-poor families collapsed into persistent poverty. Those in or at risk of falling into poverty traps face a range of health challenges: maintaining an adequate diet, avoiding injuries most commonly associated with manual labor that is the mainstay of the poor, and staving off diseases commonly associated with unreliable water supplies, exposure to animal and human waste, and other standard hardships of poor communities. Furthermore, the ultra-poor are concentrated in an employment sector that is especially risky. The International Labour Organization (2000) reports that the agricultural sector is the most hazardous to human health worldwide, accounting for a majority of work-related mortality globally due to exposure to animals, chemicals, plants and weather, use of hazardous tools and machinery, long working hours under physically challenging conditions, etc.

The ultra-poverty trap that seems to characterize so much of rural SSA today is thus intimately caught up with (i) the bidirectional interrelationship among hunger, ill-health, low productivity, weak institutions and natural resources degradation, all of which become manifest in low incomes, (ii) poor initial conditions associated with health and nutrition, especially early in childhood, but also with the state of infrastructure and the natural resource base on which rural livelihood disproportionately depend, and (iii) risk exposure, which is especially severe in rural areas and in agriculture. The closely coupled nature of these problems adds substantially to the challenge of addressing any one of them on its own and thereby makes integrated strategies essential. It is therefore natural to start with agricultural and rural development as locus for developing an integrated strategy for addressing persistent ultra-poverty in rural SSA.

Start with agricultural and rural development

“Most of the people in the world are poor, so if we knew the economics of being poor we would know much of the economics that really matters. Most of the world’s poor people earn their living from agriculture, so if we knew the economics of agriculture we would know much of the economics of being poor.”

T.W. Schultz (1980, p. 639)

Several recent studies have reinforced Schultz’s seminal point. Agriculture is the lead sector for reduction of poverty and hunger, especially in sub-Saharan Africa (Christiaensen and Demery 2007; Diao et al. 2007; World Bank 2007b). Real GDP growth from agriculture is 2.7 times more effective in reducing the extreme poverty headcount in the poorest quarter of countries, including most of SSA, than is growth in non-agricultural sectors (Christiaensen and Demery 2007). And the focus must fall squarely on stimulating a smallholder food productivity revolution.

The reasons are straightforward. First, agriculture is the primary employment sector for the poor. A super-majority of Africa’s ultra-poor are small farmers who grow food, at least part time. Since earnings are determined by the productivity of one’s asset holdings and labor – and to a lesser degree, land and livestock – and are the primary asset of the poor, earnings in food agriculture are fundamental to their well-being. Rural Africans are disproportionately ultra-poor because their labor productivity is so low. Boosting the productivity of the labor, land, livestock and other assets controlled by the poor must be at the center of any strategy for breaking out of the ultra-poverty/hunger trap.

Second, although most of the ultra-poor are employed in agriculture, their productivity is so low that they typically do not produce enough to feed their families, forcing them to depend on non-farm earnings to supplement farming to pay for their net purchases of food. As Barrett (2008) documents, across a wide array of staple grain commodities, countries and years, multiple data sets consistently indicate that a small minority of SSA food crop producers are net (or even gross) sellers of these commodities; and within that minority, sales are heavily concentrated among just a few of the larger farmers. Because most smallholders are actually net buyers of the basic foods they produce, productivity gains not only have favorable real output effects on their well-being, but any induced declines in real food prices caused by aggregate supply expansion also benefit them.

Meanwhile, food is overwhelmingly the largest share of the budgets of the ultra-poor – whether or not they farm – routinely 65-80 percent of total household expenditures in this subpopulation (Ahmed et al. 2007). Since the budget share reflects the instantaneous elasticity of welfare with respect to prices (Deaton 1997), this fact signals that supply expansion that reduces real food prices is to be welcomed as it has a dramatic effect on the ultra-poor. This point is, of course, consistent with the longstanding observation that the bulk of the poverty reduction benefits of the Green Revolution in Asia (and to a lesser extent, in Latin America) came about through increased consumer surplus accruing to poor food buyers, not from income gains to farmers. Conversely, the high budget share of food among the rural poor also helps explain why recent global food price crises have been of particular concern for humanitarian agencies, although

many observers continue to overlook the fact that most small farmers are among those adversely affected by sharp food price increases. The fact that current price rises are due to demand growth far outpacing supply expansion underscores the central point that accelerating productivity growth in food agriculture is critical to the well-being of the poor.

The ultra-poor's sectoral affiliation as agricultural producers and workers, and the heavy concentration of their expenditures on foods both point toward agricultural development as the nexus where interventions are most likely to bear substantial fruit. These sectoral and expenditure effects are reinforced by the strong (backward and forward) linkages from agriculture to secondary and tertiary sectors in the economy.

Minten and Barrett (2008) provide strong empirical evidence that better agricultural performance – as proxied by higher rice yields in their analysis of Madagascar – is strongly correlated with higher real wages, improved rice profitability and lower real consumer prices for the staple food. A doubling of rice yields in this setting leads to an average reduction of 38 percent in the share of food insecure households in the community, shortens the average hunger period by 1.7 months (or one-third), and increases real unskilled wages in the lean (planting and growing) season by 89 percent due both to lower real rice prices and to increased demand for unskilled labor by wealthier farmers. Thus greater food crop productivity reduces extreme poverty for all the major subpopulations of the poor – net rice buyers, net rice sellers and unskilled workers – with the gains accruing disproportionately to the poorest: workers and poor net food buyers.

Such findings are not surprising since agricultural and rural development have been the foundation of poverty reduction and modern economic growth throughout history. All past cases of rapid, widespread progress from poverty have been causally associated with the transformation of agriculture, from 18th and 19th century Europe and North America to late 20th century East Asia. Striking increases in agricultural productivity, improvements in food safety, and markedly reduced costs of food distribution improved the quantity, quality and variety of food available at lower prices. These advances permitted historically unprecedented growth in incomes, life expectancy and population, decreased the risk of chronic or acute malnutrition and enabled increased investment in education and non-agricultural activities in today's advanced economies (Fogel 1994; Johnson 1997; Maddison 2001; Timmer 2002; Fogel 2004). In Asia, rapid increases in crop yields have been major drivers of historically unprecedented declines in poverty. By contrast, in SSA, staple grain yields have remained stagnant at roughly one ton/hectare for the past twenty-something years; and headcount poverty measures have remained similarly stuck at 40-50 percent of the population.

The “food problem” was Schultz's (1953) label for the observation that until communities and countries made scientific and institutional advances to reliably meet their subsistence food needs through improved production, processing and trade, few could begin the process of modern economic growth. This view has been largely echoed in a vast subsequent social science literature (Boserup 1965; Geertz 1966; Diamond 1997; Timmer 2002; Gollin et al. 2007). Growth in agricultural productivity directly accounts for a disproportionately large share of economic growth and poverty reduction in a range of rapidly growing developing countries over the past several decades (Ravallion and Datt 1996; Gollin et al. 2002). Much of this effect arises

from agricultural linkages to non-agricultural sectors, including to human nutrition and to improved natural resources management.

Is agricultural and rural development the only thing that matters? Absolutely not. But it is hugely important and has been seriously underemphasized over the past decade or two as international assistance for agriculture has lagged, and rural institutions and public goods and services have been dismantled in the course of structural adjustment episodes. It is very difficult to envision, based on the historical or current empirical evidence, rural Africans mounting any sustained, broad-scale escape from persistent ultra-poverty without significant advances in the continent's agricultural and rural productivity.

Key entry points for assisting the escape from persistent ultra-poverty

So where are the entry points for helping the ultra-poor of rural Africa enjoy sustained improvement in their and their children's standards of living? Agricultural productivity gains are, as one would expect, strongly and positively associated with the adoption of improved agricultural production technologies, the stock of productive assets (soil quality, livestock, etc.) under farmers' control, access to supporting services (such as agricultural extension), and the availability of irrigation and market access (Minten and Barrett 2008). The latter four variables have both direct and indirect effects – through induced technology adoption – on crop yields in rural SSA. These are perhaps the most potent policy levers available if one wants to improve agricultural productivity so as to reduce persistent ultra-poverty.

But a key is to guard against excessive generalization. No one size fits all approach exists. The binding constraints to progress vary from country to country and often from place to place within individual countries. There is no substitute for careful contextualization and empirical validation of specific policy ideas. There are, however, several key principles that can be clearly identified from a growing mass of evidence. Listed in order of importance:

1. Build and protect the productive asset endowments of the ultra-poor

Given production technologies and the market and non-market institutions that value what a household produces, earnings depend directly on the stock of productive assets to which a household has access. This includes both privately owned assets such as human capital, land, livestock or financial savings, as well as common property or public goods such as road or irrigation infrastructure. The most basic pathway out of poverty is to accumulate productive assets. In a poverty trap, however, investment is low because the incentives to invest are poor and thus meager asset holdings emerge as a low-level equilibrium. Changing this condition is a first-order imperative.

In some cases, assets must be provided to poor people who are simply unable to reserve any of their negligible income for investment. Examples include feeding programs for destitute sub-populations facing emergencies, free education for children, etc. This is especially important for human capital and natural capital that deliver high average returns but over time horizons typically measured in decades, so that financing constraints have particular bite.

But in most settings, the key to inducing private investment is to change incentives. In some cases, this requires firming up the institutions that ensure secure access to private property – rules of resource tenure, police protection against property crime, etc. Often, it requires investment in complementary inputs – so-called “crowding in” investment, whether in key infrastructure (e.g., roads, electrification, water) or in human capital through education and health programming, perhaps especially for pregnant women and children three years of age and younger. In other cases, this requires resolving financial markets failures – in credit and/or insurance – so as to enable people to borrow against future expected earnings and to shield their investment from transitory shocks that might otherwise imperil them. Indeed, an oft-overlooked element of changing incentives for asset accumulation concerns the provision of safety nets. Informal social arrangements commonly provide some measure of insurance against shocks for those who are reasonably well-integrated into local social networks; but many people appear to fall through the holes in social safety nets in rural Africa (Vanderpuye-Orgle and Barrett 2009; Santos and Barrett 2011). Moreover, village-level social networks necessarily cannot handle major, covariate shocks that simultaneously challenge most or all members of a social network. Hence the role for public (or external, private) provision of safety nets in the form of employment guarantee schemes, post-drought herd restocking, emergency (food and cash) assistance programs, etc. Indeed, recent theoretical work suggests that productive safety nets may be among the highest return policy instruments available in economies characterized by poverty traps (Barrett, Carter and Ikegami 2007).

One asset of special concern in rural SSA today is soil fertility. The land is the main non-human asset to which the poor have access. And it is degrading rapidly in much of SSA, contributing mightily to the apparent poverty trap in which many rural Africans presently find themselves. Recent estimates show that sub-Saharan Africa faces what a recent study refers to as “an escalating soil fertility crisis” (Morris et al. 2007, p. 18). The region lost 4.4 million tons of nitrogen, 0.5 million tons of phosphorous, and 3 million tons of potassium between 1980 and 2004, costing the continent more than \$4 billion worth of soil nutrients per year (IFDC 2006). Declining soil fertility is also aggravating the problem of parasitic weeds in the *Striga spp.*, which cause more than \$7 billion in yield losses and affect more than 100 million farmers annually in sub-Saharan Africa (CIMMYT 2007). Shrinking landholdings due to subdivision, continuous cropping, insecure land tenure and unaffordable fertilizer have resulted in severe soil degradation, diminished crop productivity and incomes, malnutrition and vulnerability to ill health. Without effective interventions to increase soil productivity and cropping system diversity, many farmers and their families are unable to produce enough food to feed their families or to earn adequate incomes. They then resort to the destructive, but perfectly rational, exploitation of the surrounding natural resource base, such as cutting down trees to make charcoal or clearing the river and stream banks’ protective vegetation to grow vegetables. While the importance of soil nutrient depletion to poverty reduction and overall economic development in sub-Saharan Africa was emphasized by the June 2006 international fertilizer summit in Abuja, Nigeria, and attended by many African heads of state and governments (IFDC 2006), systems level understanding of this growing crisis and of appropriate interventions remains distressingly scarce. In this setting, poverty reduction depends on improving our understanding of the economic, social and biological aspects of agricultural systems as a precursor for identifying sustainable and adoptable solutions that will enable and encourage SSA farmers to build and protect their stock of natural capital in the soil.

2. Improve the productivity of the ultra-poor's current asset holdings

Increasing the returns to the assets held by the poor is the second core principle that must underpin strategies to facilitate rural Africans' escape from persistent ultra-poverty. This happens both through (i) technological improvements to the physical productivity of agricultural production and post-harvest processing systems, and (ii) through advances in marketing systems that squeeze out costs from distribution channels and improve the economic returns farmers enjoy per unit of output grown while simultaneously holding down retail prices for net food buyers.

It is important to recognize that this is the second principle because adoption of improved technologies and participation in more remunerative marketing channels commonly depend in large measure on households' asset endowments. The consistently strong positive relationship one finds in the literature between land holdings, livestock ownership, credit access or other measures of wealth and either adoption of improved technologies or natural resources management practices or participation in higher-value-added markets underscores how important asset endowment effects are to understanding patterns of agricultural productivity growth. Ultra-poor farmers commonly lack the assets to produce marketable surpluses and therefore they cannot afford new technologies nor reap the considerable gains attainable from market-based exchange. These restraints limit their ability to accumulate (or borrow) assets, reinforcing the initial condition and generating a low-level dynamic equilibrium (Carter and Barrett 2006). Making improved markets and technologies available is very important, but limited uptake is to be expected in the absence of adequate endowments to take good advantage of these new opportunities.

The returns to research on improved agricultural technologies have always been and remain high. The World Bank (2007b) estimates the average rate of return on agricultural research in SSA at roughly 35 percent per annum, far higher than returns on financial assets in virtually all SSA countries. Yet agricultural research remains severely underfunded on the continent. Although 75 percent of the extremely poor live in rural areas and are (at least partly) employed in agriculture, only 4 percent of global overseas development assistance (ODA) goes to agriculture (down from 10 percent in 1990), and only 4 percent of public expenditures in SSA are directed to agriculture (World Bank 2007b). Those figures heavily overstate the resources devoted to agricultural research and institutional development because they include the administrative costs of Ministries of Agriculture, which account for the overwhelming majority of such funds. Without a substantial reallocation of ODA and public resources in the direction of agricultural research, productivity growth in African food systems and thus progress in the fight against poverty, ill health and hunger will be slow at best.

Meanwhile, the productivity problems of ultra-poor smallholders are magnified by relatively poor integration into national and global markets and by rapid changes overtaking agrifood supply chains in the low-income world. Rapid concentration worldwide in both upstream input (e.g., seed, fertilizer) and downstream food wholesale and retail industries threatens the future of small farms worldwide (Reardon et al. 2003, 2009). We know remarkably little about who is able to participate in modern agrifood marketing channels, under what terms, and with what effects. Nor do we know much about what interventions – e.g., in supporting the creation or expansion of

farmer cooperatives, provision of infrastructure, improved monitoring and enforcement of grades and standards and of contracts, etc. – favorably affect poor rural residents’ capacity to take advantage of these changes, whether as suppliers, consumers or workers. These are key research areas because improving the incidence and terms of market participation by the rural poor is such an important principle for agricultural and rural development (Gomez et al. 2011).

3. Improve risk management options for the ultra-poor

Risk is a key impediment to investment in building up stocks of productive assets and to uptake of new technologies or participation in emerging marketing channels. Thus it is closely related to the preceding two principles. But this is where an added, tragic dimension enters: even if an ultra-poor household does make all the sacrifices necessary to invest in building up productive assets, to adopt all the best technologies, and to participate in the most remunerative marketing channels, it can all be wiped out in an instant. Catastrophic shocks – due to drought, flooding, disease, injury, conflict, crime, price spikes, etc. – are distressingly common, and relatively little of this risk exposure is formally or informally insurable in rural Africa. Therefore, improving risk management is central to the task of helping rural Africans escape from persistent ultra-poverty.

There are three big challenges in improving risk management. The first is the multidimensionality of the serious risks faced by the rural ultra-poor in SSA. Price volatility is significant and leaves producers vulnerable to sharp seasonal swings in markets. Add to this the fact that more than 95 percent of agricultural land in SSA is rainfed and particularly vulnerable to climate shocks. Pests and diseases also cause massive crop and livestock losses in much of SSA. And violent conflict has been a major burden on rural Africans, aggravating routine but pervasive insecurity of property rights due to weak tenurial institutions as well as to poor police protection. Furthermore, Africa is the only continent where infectious diseases cause more deaths than non-communicable illnesses, underscoring the severity of covariate human health risks that are especially difficult to manage.

Second, risk exposure tends also to be inversely related to standards of living, with the poorest bearing the greatest uninsured risks. For example, as soil quality declines, a parallel decline in crop vigor makes plants more susceptible to abiotic and biotic stresses; soil-borne pests and diseases appear to especially thrive under these conditions. Mycotoxins, such as aflatoxin, provide another example of an insidious threat that is particularly pronounced in poorer areas and among people who have less access to proper storage technologies and to food distributions systems with reliable food safety controls. Aflatoxin is immunosuppressive, growth-retardant and carcinogenic at lower concentrations and lethal at higher concentrations. Ill-nourished animals, like ill-nourished humans, have compromised immune function and are less productive and more susceptible to disease than their adequately fed counterparts. Meanwhile crime rates are commonly higher in poorer and more remote regions (Fafchamps and Moser 2003).

Third, the most relevant risks faced by different subpopulations are highly context specific. The most serious risks born by the rural poor vary markedly across space and time, even among seemingly homogeneous populations (Doss et al. 2008). Wealthy households owning large herds or enjoying high-paying salaried employment may bear considerable animal disease and unemployment risk, while poorer neighbors face relatively greater likelihood of contracting

serious disease or facing a disastrous staple food price spike. There are not many multiple hazard risk management options available, especially in rural areas.

Effective risk management therefore involves two distinct threads: risk reduction to dampen ex ante risk exposure and risk transfer to diffuse the impacts ex post of unavoidable shocks that occur. The primary means of risk reduction for the ultra-poor involve improvements to crop and livestock production systems, through improved cultivars, animal, human and plant disease control, water management systems, and increased access to diversification opportunities so as to build portfolios of activities offering weakly correlated returns. There is real progress in this arena. For example, improved maize cultivars that tolerate drought are coming online now, helping maize farmers in stress-prone areas of southern Africa. New varieties of rice that survive flooding are being tested, and the new rices for Africa (NERICAs) have demonstrated a remarkable capacity to combine higher yield with resistance to local abiotic and biotic stresses in West and Central Africa. Meso-level institutions associated with the establishment and maintenance of law and order and with control of infectious diseases are critical as well. Unfortunately, there has been less progress in these areas.

In high-income countries, financial systems and highly integrated markets provide the central means of risk transfer. The underdeveloped state of African rural financial systems and the spatially segmented nature of many rural food markets in SSA sharply limit risk transfer opportunities. Instead, there has been excessive dependence on external assistance in the form of emergency food aid relief and other instruments. But advances in food aid programming (Barrett and Maxwell 2005; Barrett et al. 2011) and in the design of index-based risk finance instruments (Barnett et al. 2008) show great promise for rapid progress in this area in the coming decade.

4. Facilitate favorable transitions out of agriculture

The final principle is necessarily ironic. Because agricultural productivity growth naturally stimulates relative contraction in the agricultural sector, relative to secondary and tertiary sectors, efforts to improve food systems must be accompanied by measures to help foster deliberate migration into non-farm livelihoods. Clearly, these must be of the demand-pull variety, not driven by catastrophic loss of agricultural assets. But in all past cases of successful agriculture-led growth, falling real food prices and stimulus to non-agricultural labor demand have consistently fostered such agricultural and rural transformation (Timmer 2002).

The key here is to help the current generation of adults improve their on-farm productivity so that they can invest in the health, nutrition and education of their children, thereby equipping the next generation with the human capital necessary to leave agriculture if and when the opportunity presents itself. In particular, and most appropriate to our focus on the ultra-poor of rural Africa, this underscores the especially high returns in adulthood to investments in disadvantaged children very early in life. Studies such as Heckman (2006) and Behrman et al. (2007) provide strong evidence in support of the hypothesis that early childhood (including prenatal and neonatal) health, nutrition and educational interventions have a strong effect on adult cognitive and physical performance and thus on earnings. Hodinott et al. (2008) provide strong evidence that improved nutrition early in childhood led to significantly higher wages and total earnings among rural Guatemalans. Although there is no similar empirical evidence base from Africa – an important research gap waiting to be filled – the logic and moral imperative of

these results carries over directly. We know that early childhood investments in readying the next generation for a transition out of agriculture is essential for breaking out of the ultra-poverty/ultra-hunger/ill-health trap in the long-run.

Conclusions

Although the topic of persistent ultra-poverty would seem to lend itself to a pessimistic ending, I end on a positive note for multiple reasons. First, the East Asian experience – and increasingly, the South Asian one as well – provide ample reason to believe that mass, rapid escape from persistent ultra-poverty is feasible. Fifty years ago few commentators saw much prospect for the historically unprecedented ultra-poverty reduction on which most of East Asia embarked starting in the 1970s.

Second, real agricultural output growth rates are accelerating in SSA at long last, nearly doubling from the 1980s rate so that per capita food output is growing again in SSA (World Bank 2007b). More importantly, this contributes directly to falling rural poverty rates in countries enjoying increased agricultural productivity (e.g., Ghana). Public sector reforms, private investment and some well-targeted ODA have combined to help more than a dozen African countries achieve rapid economic growth and poverty reduction in the past several years, leading some respected observers to speculate that we may be entering an era of African economic take-off (Radelet 2010).

Third, there is reason for optimism thanks to bold new initiatives such as the joint Gates-Rockefeller Alliance for a Green Revolution in Africa, the Obama Administration's Feed the Future Initiative and the prospect of renewed attention being paid to agriculture in Africa. This newfound emphasis was reflected clearly in the World Bank's dedication of its flagship *World Development Report* to the topic for the first time in a quarter century (World Bank 2007b). But it has found perhaps its greatest and most important expression in the slowly accumulating successes of the Comprehensive Africa Agriculture Development Program in lifting the profile of agricultural and rural development within policy dialogues on the continent and eliciting increased government commitments to funding agricultural research, extension and infrastructure. Yield gaps – the difference between realized output and agronomic potential – remain significant in SSA, so the opportunities to achieve significant gains in short order are very real. And although aid to agriculture for SSA declined by roughly half from the late 1980s through 2002, it is now slowly turning around. Private investment in SSA is likewise picking up, with important innovations throughout rural Africa, from development of improved crop varieties and fertilizers to the introduction of modern agrifood supply chain management systems to the astounding rapid roll-out of mobile telecommunications systems. While there is no guarantee that these emerging opportunities will benefit the rural ultra-poor, such opportunities are necessary (albeit not sufficient) for progress. The prospects for agriculture-led reduction in persistent ultra-poverty in rural SSA are very real.

This is good news because the poverty traps apparent in rural SSA imply that intervention of some sort is essential in order to help people escape and avoid persistent ultra-poverty. Recognizing the need for some sort of intervention is the easy part, however. While intervention

is valuable, indeed essential, and the four key entry points identified above provide clear direction, there remains only limited empirical evidence to guide detailed design and implementation of strategies to stimulate agricultural and rural development so as to break the lock of poverty traps that disproportionately ensnare rural Africans.

The 1980s/90s structural adjustment era of economic reforms focused on reaping static efficiency gains from removing policies that distorted resource allocation. Unfortunately, policy design in that era was based on empirically flawed assumptions and the structural adjustment approach largely failed to stimulate either macro-level economic growth and balance of payments stability, or reduction of poverty and food insecurity in rural SSA. The focus of the policymaking and donor communities has thankfully shifted over the past decade from static concerns about “getting prices right” to dynamic concerns about incentives to innovate, invest and grow out of poverty over time, i.e., to finding “pathways from poverty”. Today, growing attention is focusing instead on how best to stimulate investment incentives, productivity growth, risk management and productive transitions out of agriculture. These broad foci are appropriate and reasonably well-grounded in both theory and empirical evidence.

But just as the (empirical and theoretical) evidence base was relatively thin at the outset of the structural adjustment era, so too does our current knowledge about the dynamics of reducing persistent ultra-poverty remain disturbingly limited today. So we need to proceed with caution and remain vigilant about rigorously investigating the premises that underpin policy designs and re-evaluating policies as the evidence base grows and sheds new light on what works best under which conditions.

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Core literature on ultra-poverty and its manifestations in rural Africa

Ahmed, A.U., R.V. Hill, L.C. Smith, D.M. Wiesmann and T. Frankenberger. 2007. *The world's most deprived: Characteristics and causes of extreme poverty and hunger*. Washington, DC: International Food Policy Research Institute.

This landmark study by IFPRI was the first to systematically look below the dollar-a-day poverty line to determine who the poorest people are, where they live, and how each group has fared over time. This analysis called unprecedented attention to the “ultra-poor” and pointed out that they are overwhelmingly concentrated in one region: Sub-Saharan Africa. They emphasize how and why the severity of poverty in Sub-Saharan Africa, and the limited progress in reducing it, indicate that the poorest in Sub-Saharan Africa may be trapped in poverty. They underscore the close relationship between ultra-poverty and hunger and discuss some of the structural barriers to progress.

Azariadis, C., and J. Stachurski. 2007. Poverty traps. In P. Aghion and S. Durlauf, eds. *Handbook of economic growth*, vol. 1b. Amsterdam: Elsevier.

The definitive, technical summary of the theoretical economic literature on poverty traps through the early-mid 2000s. This chapter walks readers through the basic models, explains the various mechanisms posited to lead to low-level dynamic equilibria, and clarifies the formal mathematics of poverty trap models. The coverage spans both macroeconomic and microeconomic models.

Carter, M.R., and C.B. Barrett. 2006. The economics of poverty traps and persistent poverty: An asset-based approach. *Journal of Development Studies* 42(2): 178–199.

This paper explains in relatively nontechnical fashion the evolution of poverty measurement from static, cross-sectional to dynamic, longitudinal measures and how the empirics of poverty traps relate to the theory. It explains how familiar flow-based measures of well-being, such as income poverty, are related to stock-based measures founded on assets and thereby makes the case for asset-based approaches to the study of poverty dynamics.

Dasgupta, P.. 1997. Nutritional status, the capacity for work, and poverty traps. *Journal of Econometrics* 77(1): 5–37.

Following up on Dasgupta’s prior, seminal work on nutritional poverty traps (much of it written with Debraj Ray), this compact paper expertly describes the feedback between nutrient intake, physical capacity for work, and labor earnings. The narrative weaves together key findings from the nutritional and health literature with the essential economic theory and a clear intuition of the phenomenon.

Dercon, S., ed.. 2005. *Insurance against poverty*. Oxford: Oxford University Press.

This book is a leading contribution to the literature on risk and risk management among poor populations in developing countries. The book, edited by a leading scholar in the field, includes a variety of chapters that evaluate alternatives in widening insurance and social protection provision through both private sector initiatives and public policy. The papers span a range of

empirical methods and geographical settings, offering a nice introduction to a range of techniques and ideas.

Krishna, A.. 2010. *One illness away: Why people become poor and how they escape poverty*. Oxford: Oxford University Press.

An important contribution by an empirical political scientist who developed a novel method for collecting longitudinal recall data on poverty transitions, the “stages of progress” method, and applied it in surveys of 35,000 households in different parts of India, Kenya, Uganda, Peru, and the United States. A very readable, empirically grounded work, Krishna’s findings underscore that the reasons why some people collapse into long-term poverty are different from the reasons others escape persistent poverty. He emphasizes the cross-cultural importance of uninsured health shocks as the key driver of declines into persistent poverty.

Lipton, M. and M. Ravallion. 1995. Poverty and policy. Chapter 41 in J. Behrman and T.N. Srinivasan, eds., *Handbook of development economics, volume 3, part 2*, pages 2551-2657. Amsterdam: Elsevier.

This survey chapter by two of the modern giants of poverty analysis reviews the history of poverty measurement, as well as key correlates of poverty worldwide and the relationship between economic growth and poverty reduction. They then discuss a wide range of policies aimed at reducing poverty and the associated targeting methods and issues that influence the efficacy of anti-poverty interventions.

Lybbert, T.J., C.B. Barrett, S. Desta, and D. L. Coppock. 2004. Stochastic wealth dynamics and risk management among a poor population. *Economic Journal* 114(498): 750-777.

This paper was perhaps the first to rigorously demonstrate the existence of poverty traps, in this case among Boran pastoralists in southern Ethiopia. The paper explains how asset shocks can lead to catastrophic declines in standards of living from which rapid recovery is unlikely. It also documents that most of the risk faced by the poor is idiosyncratic, shocks experienced by one household at a time rather than by everyone simultaneously, and the implications for failures of community institutions -- such as social sharing norms – for poverty dynamics.

Marenya, P.P. and C.B. Barrett. 2009. State-conditional fertilizer yield response on Western Kenyan farms. *American Journal of Agricultural Economics* 91(4): 991-1006.

This paper offers the first solid empirical evidence documenting a “resource degradation poverty trap” in African agriculture. Fertilizer interventions have attained prominence in rural poverty reduction programs in Africa. Using data from maize plots operated by small farmers in Kenya, this paper shows that low soil organic matter commonly limits crop yield response to mineral fertilizer application. Although fertilizer is, on average, profitable, on roughly one-third of the plots degraded soils limit the marginal productivity of fertilizer such that it becomes unprofitable at prevailing prices. Moreover, because poorer farmers most commonly cultivate soils deficient in soil organic matter, fertilizer interventions might be less pro-poor than is widely assumed and may instead reinforce *ex ante* income inequality.

Minten, B. and C.B. Barrett. 2008. Agricultural technology, productivity and poverty in Madagascar. *World Development* 36(5): 797-822.

This paper uses a unique, spatially-explicit dataset to study the link between agricultural performance and rural poverty in Madagascar. It shows that, controlling for geographical and physical characteristics, communes that have higher rates of adoption of improved agricultural technologies and, consequently, higher crop yields enjoy lower food prices, higher real wages for unskilled workers, and better welfare indicators. The empirical evidence strongly favors support for improved agricultural production as an important part of any strategy to reduce high poverty and food insecurity rates.

Schultz, T.W.. 1980. Nobel lecture: The economics of being poor. *Journal of Political Economy* 88(4): 639-651.

This Nobel acceptance lecture by perhaps the greatest scholars of agricultural development lays out the core arguments for why agricultural productivity growth is central to improving the income and welfare of poor people. Schultz makes a strong argument, moreover, that the key factor in stimulating productivity growth and poverty reduction is not land or other material inputs, it is human capital: the education, health and innovativeness of the poor themselves.

Timmer, C.P.. 2002. Agriculture and economic development. Chapter 29 in Gardner, B.L., and G.C. Rauser, eds., *Handbook of agricultural economics. Agriculture and its external linkages, vol. 2A*. Amsterdam: Elsevier Science.

This lucid survey chapter by a leading thinker on agriculture's role in the process of economic development offers an analytical framework for understanding and quantifying the contribution of agriculture to economic growth and development. The framework points to the key areas where positive linkages, not necessarily well-mediated by markets, might exist, and it highlights the empirical difficulties in establishing their quantitative magnitude and direction of impact. Evidence on the impact of investments in rural education and of nutrition on economic growth is reviewed. The policy discussion focuses especially on the role of agricultural growth in poverty alleviation and the nature of the market environment that will stimulate that growth.

World Bank. 2007. *World development report 2008: Agriculture for development*. Washington, DC: World Bank.

The most up-to-date summary of the empirical evidence for and theory behind agricultural development as the key engine of poverty reduction in the world. Led by two distinguished agricultural economists, Derek Byerlee and Alain de Janvry, this was the first of the World Bank's flagship World Development Reports to focus on agricultural development in a quarter century. Its coincidence with the global food price crisis of 2007-8 made it especially influential in shaping ensuing policy debates in both developing countries and donor organizations.

Discussant comments on “Assisting the Escape from Persistent Ultra-Poverty in Rural Africa” - April 27, 2011

William A. Masters,⁴ Professor of Food Policy, Friedman School of Nutrition Science and Policy, Tufts University

Chris Barrett’s paper and presentation for this symposium is very rich in detail offering many starting points for discussion. Following his work can be a challenge, since he writes faster than most of us can read! A quick check on Google Scholar reveals the many other articles that cite his research and build on his ideas in multiple directions.⁵

My job is to open up discussion here today at Stanford, and also for those joining this symposium later on. Professor Barrett’s summary of the pathways out of poverty is admirably specific and clear, so there is no need for me to restate any of it. Instead, I would like to spark discussion with a bit more context, and to frame these ideas in a way that might open up further dialogue from a variety of perspectives. I will do that first in terms of methodology and style of research, then in terms of research findings and their implications for poverty reduction.

Methodology

Some of the most striking features of today’s symposium involve research methods. Barrett’s approach offers an extremely valuable way of thinking, which helps account for the wider success of his work.

One feature of Barrett’s methods that I hope everyone appreciates is his balanced approach. He avoids monocausal hypotheses, and instead, explains observed outcomes as the result of some kind of interaction between multiple causes. The goal is to identify a structural system in which outcomes are not determined by any one force, but rather by the way in which many forces interact. For example, outcomes might depend on the interaction between each year’s income and a cumulative stock of assets, or between an average level of returns and the riskiness of those returns, or between individual and group characteristics.

Barrett’s focus on a structural system of interactions is of course an attribute of economics in general, whereby economists try to explain each observed outcome and predict changes as being an equilibrium among forces. He makes it look easy, but it is very difficult to keep an eye on several forces at once, see how each one operates and how they interact, without jumping to the conclusion that any one of them actually dictates the outcome. Thinking in terms of equilibria among many forces can help make discussions more productive by avoiding determinism about negative outcomes, and revealing opportunities to intervene in the system so that it works better. Those ‘points of entry’ as Barrett calls them are collective actions, guided by a research-based

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⁵ As of this writing, such a search can be conducted as: www.google.com/scholar?=&q=c.b.barrett.

diagnosis, that reveal how to overcome the market failures and political-economy constraints that currently limit the speed of poverty reduction, especially in Africa.

An empathetic approach

A second key feature of Barrett's approach, which others and I appreciate, is the empathy he shows towards the decision-making of the ultra-poor. That is, trying to understand their choices from their point of view. Again he makes it look easy, but in fact it is very difficult to understand the choices of other people in a helpful way, especially when many of the outcomes for them are so awful. All too often, analysts think of people in bad situations as either passive victims of circumstance, or as having made bad decisions. Here again, the empathetic approach that Barrett uses is characteristic of good economics in general. To understand poor peoples' decisions from their point of view requires the use of constrained optimization; however, calculus is not needed to understand the basic idea. Economics research starts by admitting ignorance about what other people want, assuming only that their observed choices must have optimized something. The task is then to ask what objectives and constraints could have led them to choose what they did.

Barrett uses optimization very skillfully, starting from faith that even the very poorest are already doing the best they can. He then looks for explanations in the structure of each person's objectives and constraints and the resulting outcome in interactions with other people. Following his approach also helps make discussion more productive. Once a constraint or structural trap is diagnosed, it can perhaps be sprung through collective action, informed by that diagnosis.

To advance the discussion I would like to zoom out from the specific results of Barrett's very detailed fieldwork in Kenya, Ethiopia, and Madagascar, and to frame those findings in terms of much broader, long-term forces. Over the long span of history, it seems clear that rural Africans were driven into extreme poverty much more recently than the poor in Asia, and have only just begun to escape from that poverty in the past decade. It seems promising to search for common underlying forces, whose parameters might explain the speed at which specific interventions are most needed.

Results and implications

To frame Barrett's findings in a more general context, I would like to look at two broad dimensions: the extent of poverty and the distribution of income at a given time, and then, the changes in that distribution as it moves from year to year. This approach will help place the experience of the ultra-poor in the context of the entire income distribution, and their escape from poverty in the growth dynamics of an entire society.

Economists who study inequality generally find that income is distributed asymmetrically, with a mass of poor people and fewer rich people. This skewed outcome has been found almost everywhere that income has been measured, and is typically approximated by a log-normal distribution. Many structural processes could lead to such an outcome, but the simplest explanation for the skewness is that underlying variations interact multiplicatively rather than

additively. For example, if it takes money to make money, or more generally if one advantage begets another, then income distribution will be skewed in this way. Over time, however, income distributions do not always become more skewed. Diminishing returns may set in to limit how fast money begets money, thereby slowing the pace at which the rich get richer so that the poor can catch up. One of Barrett's many useful ideas is thinking of interventions to help the poor as being a 'cargo net' rather than a 'safety net', where the goal of the intervention is to help the poor rise rather than to prevent their fall.

Barrett's work is quite technically sophisticated, so for discussion purposes I would like to frame it in what I think is the simplest possible story about income distributions and its change over time. The goal here is to explain why there might be a mass of people in poverty, from which some can rise at different speeds, if they are helped by appropriate intervention.

The (over) simplified model I find most useful explains income distribution as resulting from half of a group being relatively lucky, and the other half unlucky. Furthermore, half have relatively high skills, while the others are unskilled. This is a 2x2 example of what in reality would involve many different abilities and sources of income. The system can be symmetric in every dimension, but if it takes skill to use luck, then only those who are both skilled and lucky can escape from poverty. In the simplest 2x2 example, three-quarters of the members would be relatively poor because they were either unlucky or unskilled or both, and only one-fourth escape from poverty. In Barrett's terms the unskilled are 'structurally' poor, while the skilled will fluctuate stochastically in and out of poverty.

To see how income grows over time, another feature is needed in the model. There must be some way to save and invest in man-made capital, making for a 2x2x2 model. There are many kinds of capital, of course, and if the capital that is introduced requires both skill and luck to make income, then the rich get even richer and income distribution becomes even more skewed. On the other hand, if the capital can be used directly by the poor, it will help them advance and perhaps even acquire the same skills that the rich used to get ahead in the first place. That process would make income distribution less skewed.

In reality, as the old cliché says, the rich get richer... and the poor get children. Demography and population growth are two influences on poverty that Barrett rarely addresses in his work. He is in very good company in abstracting from population growth, because almost all development economists now realize that population density is no absolute barrier to poverty reduction. The issue is rather how demographic structure changes during the demographic transition, particularly in two dimensions: first by changing the mix of ages in the population, and second by changing the number of farmers and hence the area of land available per farmer.

The role of changing age structure in economic growth has been well explored since Bloom and Williamson's research (1998). They show how historical patterns of demographic transition – in which socioeconomic improvements lead to child mortality decline followed by a decline in fertility – creates an initial rise and then a fall in children as a share of the population. This 'demographic drag' can slow economic growth as it did earlier in Asia and even more so in Africa a few decades later. However, the later 'demographic dividend' can help accelerate growth when child dependency rates fall. The fraction of people available for productive work is

now rising in Africa, as it did earlier in Asia, offering a powerful opportunity for faster income growth in each household and for the economy as a whole.

The influence of demographic transition on land area per farmer is less well understood among economists, but it has special resonance in this particular setting. Professor Bruce Johnston worked here at Stanford for the entire second half of the 20th century. One of his most important discoveries was how demographic transition, when combined with the growth of nonfarm employment, changes the land available per farmer.

In the early 1970s, Johnston's findings from Asia led to his clear prediction for Africa. Even if nonfarm employment grew at world-record speed, the small fraction of Africans who already had nonfarm employment ensured that the absolute number of farmers would grow for several decades before it could fall (Johnston and Kilby 1975). Johnston's prediction was that Africa's rapid total population growth could not be absorbed through urbanization. As a consequence, the decline in land area per farmer would drive them ever further into poverty. He stressed this Malthusian phase of development would eventually come to an end as cities grew and absorbed more workers. The implications of this idea for modern Africa are illustrated in Masters (2005; 2011).

The arithmetic of rural population growth helps explain the dramatic worsening of African poverty through the 1990s. When available land per farmer is falling, that land gets used with increasing intensity of labor, capital and other inputs per acre, but diminishing marginal returns drive down each worker's earnings and living standards. The speed and timing of this decline depends on how fast the country's total workforce is growing, how fast nonfarm employment grows, and also on the fraction of workers already in nonfarm employment.

To see how this matters for income distribution and growth, I return to the simple 2x2x2 model, and recognize that capital accumulation mainly pulls people up out of poverty through nonfarm employment. The distribution of agricultural income generally falls further and further behind the distribution of income from services and industry, both rural and urban, until nonfarm employment outgrows the total population. At that point the absolute number of farmers can begin to fall, acreage per farm family begins to rise, and the distribution of farm income begins to catch up with the distribution of nonfarm income. Development specialist, Peter Timmer, has shown how this leads to a U-shaped curve in agricultural as opposed to nonagricultural incomes; contributing to the overall problem of poverty worsening before it improves (Timmer 2009).

This fall-and-then-rise relationship in land per farmer and hence farm living standards is driven fundamentally by the arithmetic of demography and migration. So returning to the simplified model of income distribution and growth, it is useful to think of two separate sources of income: earnings from agriculture follows a 2x2x2 model in which earnings depend on farmland per worker; in contrast, earnings from nonfarm work can grow without that constraint.

In conclusion, I hope that the development profession can sustain Barrett's very productive approach of balanced explanations (equilibrium) with empathy towards the decisions of the poor themselves (optimization). It is important that we see how the poverty traps he documents are embedded in the larger economy wide distribution of income. Finally, I am concerned about the several decade-long impact population growth has on farmer income. Growth drives down land per

farmer and hence farmer income, and until that trend reverses, farm income will be unable to catch up to nonfarm income.

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