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Do Poverty Traps Exist? Assessing the Evidence[†]

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In 1960, per capita incomes in Burundi, Haiti, and Nicaragua were $347, $1,512, and $2,491, respectively. Despite the sevenfold difference in incomes between Nicaragua and Burundi, all three countries were poor by developed-country standards. Nicaragua's per capita income was just 16 percent of the level enjoyed by citizens of the United States at the time, while Burundi's income was a paltry 2 percent of US levels. Fifty years later in 2010, per capita incomes in these three countries were basically unchanged, at $396, $1,411, and $2,289 respectively (all measured in 2005 purchasing power parity-adjusted US dollars as reported in the Penn World Tables), reflecting negligible real growth in per capita income over this half-century.

Why did per capita incomes not increase in these countries? One possible explanation is a "poverty trap," which can be understood as a set of self-reinforcing mechanisms whereby countries start poor and remain poor: poverty begets poverty, so that current poverty is itself a direct cause of poverty in the future (Azariadis and Stachurski 2005).[1] The idea of a poverty trap has a striking implication for policy. It implies that much poverty is needless, in the sense that a different equilibrium is possible and also that one-time policy efforts that break the poverty trap may have lasting effects. For example, poverty trap analysis is often used as the basis for advocating a massive increase in foreign aid to low-income counties that would act as

[1] Others also refer to a single, poor, dynamic equilibrium as a structural poverty trap (for example, Barrett and Carter 2013, Naschold 2013), but we do not use this definition in our paper.

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"a 'big push' to instigate a virtuous circle of higher rates of savings, investment and economic growth" (UNCTAD 2006, p. 3), as well as for industrial policies designed to overcome coordination failures.

The concept of a poverty trap at the level of national economies is related to, and sometimes based on, microeconomic foundations that argue for the existence of poverty traps at the household level. Again, the general idea is that current poverty might be what is causing future poverty. This kind of analysis has led to recommendations like that of the Millennium Villages project, which plans to spend $6,000 per household to implement a complex package of interventions designed to lift selected African households out of extreme poverty (Clemens 2012). It also helps provide justification for support for microfinance loans designed to allow households to lift themselves out of poverty by buying some fixed-cost asset necessary to operate a business.

Economic theory has long offered a number of different models that can give rise to such traps at both the macro and micro levels. An early example is given by Nelson (1956), who develops a growth model with low saving and investment rates at low income levels. Even almost 60 years ago, the idea of poverty traps was so well-established in the thinking of the profession that Nelson felt obliged to acknowledge in his introduction: "Although the notion of low-level stagnation is scarcely new or different, it is hoped that this paper does more than express the common knowledge of economists in a complicated manner."

But what does the modern evidence suggest on the extent to which poverty traps exist in practice and what underlying mechanisms they might involve? To address this question, we begin by outlining a simple model of a poverty trap at the country level that was a staple of many macro views of development in the 1950s and 1960s, and use it to clarify what is meant by a poverty trap. We next examine evidence on the persistence of poverty at the country and household level to show that the stagnant incomes of countries like Burundi, Haiti, and Nicaragua over long periods is rare in practice, with the typical poor country growing at least as fast as the global average over the last 60 years.

We then turn to examining the main macro and micro mechanisms that are hypothesized to give rise to poverty traps. We deliberately restrict the scope of our paper to focus on the potential for poverty traps to account for the post–World War II growth experience of developing countries and for the persistence of poverty within households over years rather than generations.[2] Our focus is on multiple-equilibria traps that have often been used to motivate foreign aid efforts, with the idea being that a technical fix exists to enable countries or households to move to a different equilibrium. A related strand of literature considers political economy reasons for why poor countries remain poor, stressing the possibility of self-reinforcing

[2] As a result, we do not take a view on the importance of poverty traps for understanding very long-run development over hundreds or even thousands of years as for example in the work of Galor and Weil (2000) emphasizing demographic transitions, or that of Acemoglu and Zilibotti (1997) who emphasize how fixed costs of production limited the ability of countries to adopt diversified portfolios of risky but high-return technologies in the pre–Industrial Revolution period.

low-quality institutions (for example, Acemoglu and Robinson 2012). We acknowledge the potential importance of these explanations, but note that they have rarely been used as a justification for aid policy, given the difficulties in aid influencing the dynamics of political institutions.

The main mechanisms we examine include S-shaped savings functions at the country level; "big-push" theories of development based on coordination failures; hunger-based traps which rely on physical work capacity rising nonlinearly with food intake at low levels; and occupational poverty traps whereby the combination of borrowing constraints and lumpy production technologies means that poor individuals who start businesses that are too small will be trapped earning subsistence returns. We conclude that these types of poverty traps are rare and largely limited to remote or otherwise disadvantaged areas. We discuss behavioral poverty traps as a recent area of research for which the evidence is just starting to accumulate, and geographic poverty traps as the most likely form of a trap. The policy prescriptions that result are then quite different from the calls for a big push in aid or expansion of microfinance to allow people to overcome credit constraints. Rather, they call for action in less-traditional policy areas such as promoting more migration.

A Simple Model of a Poverty Trap at a Country Level

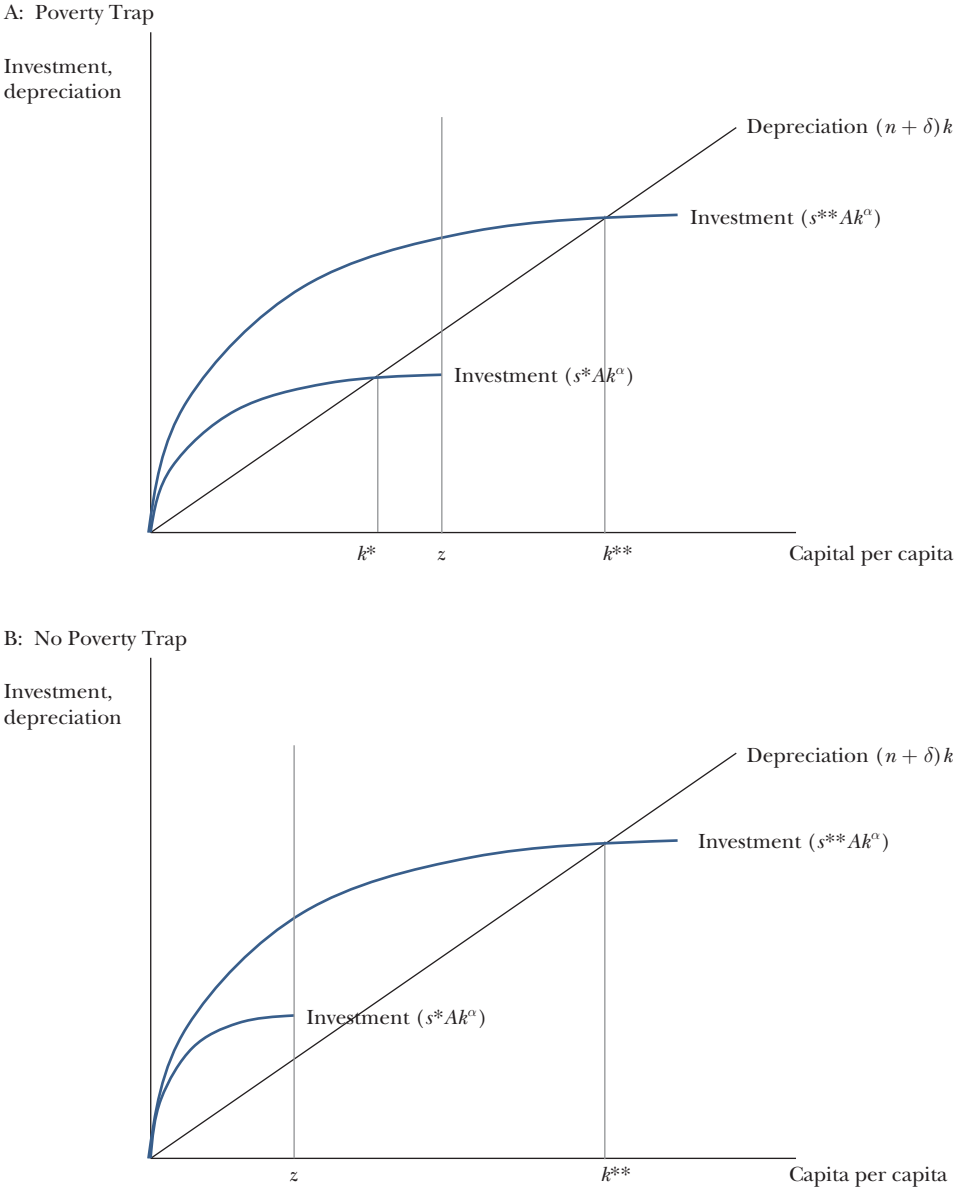
Economists have long turned to theories of poverty traps to account for the persistence of poverty over extended periods of time. One commonly invoked mechanism is that a country that is poor will remain poor because it will not be able to accumulate sufficient capital per capita for incomes to rise. This basic mechanism is captured in the standard diagram that adorns many textbook discussions of poverty traps, shown in the first panel of Figure 1.

Countries have access to an aggregate per capita production function $y = Ak^{\alpha}$ in which output (y) depends on capital per capita (k) and the level of technology (A). The economy is closed, and investment is financed by saving a fraction of income. At low levels of development, the saving rate s^* is low; the intuition often given for this assumption is it is difficult for those with low incomes to save much. At higher levels of development, the saving rate is also higher, at $s^{**} > s^*$.

The two curved lines show the amount of investment available when the saving rate is low and when the saving rate is high. At any given level of the capital stock and output, investment matches the savings: that is, investment is high when the saving rate is high, and investment is low when the saving rate is low. Because saving is a fixed fraction of output, the amount of investment increases with output and the capital stock but at a decreasing rate due to diminishing returns in the aggregate production function.

The rate of population growth is given by n and the rate of depreciation of capital stock by δ. If the amount of new saving and investment exactly offsets the decline in the per capita capital stock due to depreciation and population growth, then the economy will enter a steady-state equilibrium in which the level of capital and output remains constant over time. At low levels of development, saving and

Figure 1
Growth Models With and Without Poverty Traps



investment are low and there is a stable low-level equilibrium at k^* beyond which the country cannot grow. However, if a country manages to accumulate capital greater than some threshold z, the country then can move to a high saving rate $s^{**} > s^*$. This results in a high steady-state capital stock at $k^{**} > k^*$ and a higher level of per capita income. This framework encapsulates the basic idea that self-perpetuating

mechanisms, such as low saving at low levels of development, can keep countries trapped in poverty.

Moreover, this framework can also easily be used to illustrate a variety of other mechanisms for poverty traps. Any set of assumptions that generates a positive relationship between the level of development and growth fundamentals, such as higher productivity levels (A), higher saving rates (s), or lower population growth rates and/or depreciation ($n + \delta$), can in principle generate a diagram similar to Figure 1, with multiple steady states and a low-level poverty trap. For example, the two curves of Figure 1 could correspond to A^* and A^{**} rather than to s^* and s^{**}, then the figure represents a poverty trap story in which countries remain poor because they do not have access to high-productivity technologies. The menu of options grows further if we interpret A broadly, for example to include institutions. Similarly, one could interpret k broadly to include human capital, opening the door to models of poverty traps based on underinvestment in human as opposed to physical capital.

The appeal of such simple models of poverty traps is difficult to overstate. At a conceptual level, it seems eminently plausible that many low-income countries may lack good growth fundamentals supporting high saving rates and productivity gains. From a policy perspective, poverty trap models are a call to action, laying out a clear case for interventions to spring countries from such poverty traps. For example, if investment rates and capital accumulation are low because countries are poor and cannot afford to save, foreign aid can help to finance investment until countries develop to a point to the right of the threshold z where their saving rates climb high enough to place them on a trajectory to the high steady state at k^{**}.

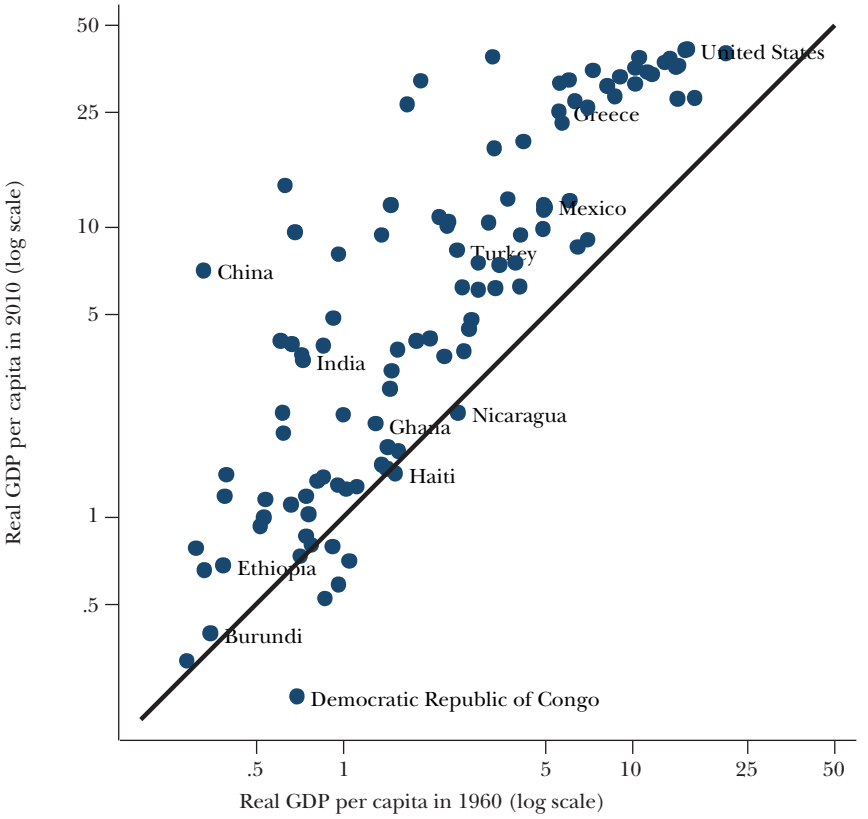
The key ingredient here is that some fundamental—such as the saving rate—is itself affected by how poor the country is. However, this is a necessary, but not sufficient, condition for a poverty trap to occur. For example, the second panel of Figure 1 is identical to the first except that the threshold z at which saving rates increase from s^* to s^{**} is shifted slightly to the left. Although saving rates rise with the level of development, no poverty trap occurs. A country that starts out poor gradually accumulates capital until it reaches the threshold value of z. At this point, its saving rates increase, and over time it reaches the new high steady state at k^{**}.

Finally, note that poverty can be persistent without there being a poverty trap in the sense the term is used here. For example, in the second panel of Figure 1, the unique steady state at k^{**} may still be at a very low level of income, due to low productivity A. In such a case, there is no scope for a short-term policy action to jump-start the economy out of poverty unless that policy is able to change the fundamentals of the economy, such as by changing the level of technology A. Simply investing in more capital will not raise the long-run steady-state level of income.

Evidence on the Persistence of Poverty

Models of poverty traps at the country level imply that countries stuck in traps will suffer from stagnant income levels over long periods of time. Similarly, poverty traps imply income dynamics at the individual or household level that are very

Figure 2
Absolute Income Stagnation is Rare



Source: Penn World Tables, Version 7.1.
Note: Real GDP per capita is in thousands of 2005 US dollars adjusted for differences in purchasing power.

different for those who are initially rich and those who are initially poor. In this section, we discuss the reduced-form evidence for the persistence of poverty, at both the "macro" and "micro" levels. This distinction is relevant, because it is in principle possible to see persistently low incomes at the country level but considerable income mobility at the individual level. Conversely, rising incomes at the country level can coincide with pockets of stagnation at the individual level within the country.

At the aggregate level, the cross-country evidence over the last half-century or so on the persistence of poverty across countries—the core pattern which many models of poverty traps aim to explain—is not particularly compelling. The truly stagnant income levels predicted by standard models of poverty traps are in fact quite rare in the cross-country aggregate data. Figure 2 puts the experience of Haiti, Nicaragua, and Burundi noted in the introduction into a broader cross-country context. It plots the log level of real GDP per capita in 2010 (on the vertical axis) against the log level of real GDP per capita in 1960 (on the horizontal axis) for a set

Table 1
Real GDP per Capita Growth 1960–2010, by Quintiles of Initial Income Distribution

	Mean real GDP per capita growth 1960–2010 (percent per year)	*Standard deviation*	*Number of countries*
Poorest quintile	2.2	2.0	22
Second quintile	0.9	1.5	22
Third quintile	2.0	1.6	22
Fourth quintile	2.4	1.2	22
Richest quintile	2.1	0.6	22

Source: Penn World Tables Version 7.0.
Note: Table 1 reports summary statistics on average growth performance from 1960–2010 for 110 countries, grouped by quintiles of the initial income distribution in 1960, updating calculations by Easterly (2006).

of 110 countries for which data is available. While it is true that a few initially poor countries cluster along the 45-degree line, and even a few such as the Democratic Republic of Congo have experienced negative growth over this period, the vast majority of countries at all initial income levels have experienced positive growth over the past 50 years, as reflected in their position well above the 45-degree line.

The observation that low-income countries as a group do not seem to show a greater propensity to no growth or even substantially slower growth can be seen more clearly in Table 1, which reports summary statistics on average growth performance from 1960–2010 for 110 countries, grouped by quintiles of the initial income distribution in 1960, updating calculations by Easterly (2006). Across all countries, average annual growth in real per capita GDP was 1.9 percent per year. The key point for the present discussion is that significantly positive growth performance can be found across all quintiles of the initial income distribution, including the poorest. Indeed, among the poorest 20 percent of countries, average per capita income growth was 2.2 percent per year, slightly higher than the global average, and also slightly higher than the average of the initially richest 20 percent of countries. Even if we further disaggregate the poorest quintile of countries, average growth among those in the poorest decile was 1.8 percent per year, while those in the second decile grew at 2.6 percent per year.

The fact that even the initially poorest 10 percent of countries has grown at a rate similar to the historical growth rate of the United States over the past 50 years—and indeed, the US growth rate over the past 200 years—is difficult to square with models of poverty traps, for two main reasons. First, poverty trap models imply stagnant incomes at low levels of development, while the post-World War II growth experience suggests that stagnant incomes are both rare and not systematically associated with initial levels of development.

Second, poverty trap models typically feature some sort of threshold that, once crossed, leads to an exit from the poverty trap and an acceleration of growth.

The fact that even the poorest countries have on average shown positive growth means that at least some of them should have crossed the relevant threshold for the poverty trap that might otherwise have constrained their development. As an illustration, per capita GDP of the median country in the poorest quintile in 1960 was about $550; suppose we take as the relevant threshold log per capita income of the richest country in the second quintile, which was about $1,500. At a growth rate of 2.2 percent per year, it would take just 46 years for the median country in the poorest quintile to reach this hypothetical threshold. More generally, unless the thresholds below which countries are trapped are very high indeed, most countries should simply grow their way out of any poverty trap.[3]

A further piece of evidence comes from looking directly at accelerations in growth rates, which poverty trap models predict should occur as countries cross the relevant threshold of per capita income. Hausmann, Pritchett, and Rodrik (2005) study episodes of substantial accelerations in real GDP growth rates. While their emphasis is not on poverty traps in particular, they document that there is no stable relationship over time between countries' income levels and the likelihood of a growth acceleration. On the other hand, models of poverty traps suggest that poor countries emerging from traps should see growth accelerations.

A number of studies have also searched for evidence of poverty traps by examining whether there is an S-shaped relationship in income or asset dynamics at the individual or household level. The typical approach involves estimating a nonlinear model relating income or assets today to those in the previous period, and examining the estimated dynamic relationship. For example, Jalan and Ravallion (2004) find no evidence for this kind of poverty trap at the household level using six years of income in China, and Lokshin and Ravallion (2004) find no evidence of poverty traps over four-to-six year intervals in Hungary and Russia. Naschold (2013) likewise finds no evidence of multiple-equilibria poverty traps over three-to-five year periods using panel data from rural Pakistan and Ethiopia. In contrast, Barrett et al. (2006) do find evidence of multiple equilibria in asset dynamics in some of their more remote sites in small samples from rural Kenya and Madagascar, as do Adato, Carter, and May (2006) with asset dynamics over a five-year period in South Africa.

However, the persuasiveness of this household-level evidence is mixed, whatever conclusion is reached. Most developing countries lack long-term longitudinal panels, so tracking income and assets over time is difficult and prone to measurement error. One potential solution has been to track cohorts rather than individuals over time, with Antman and McKenzie (2007) finding no evidence for a poverty trap using 58 quarters of repeated cross-sections from Mexico. Administrative data might allow a researcher to track the incomes of individuals and their children over long periods of time with less measurement error, as has been possible in several developed

[3] While most of the models of poverty traps we are aware of feature fixed absolute thresholds, it is possible to construct arguments for poverty traps based on relative thresholds. For example, consider poverty traps based on subsistence consumption (which we discuss in the following section). If the level of consumption required for subsistence rises with average incomes, then it may take much longer to grow out of a trap. One suggestive piece of evidence for this possibility is the fact that, across countries, national poverty lines tend to increase with the level of development (Chen and Ravallion 2011).

country studies (for example, Lucas and Pekkala Kerr 2013), but most of the poor in developing countries work outside the formal system, which means that they appear only sporadically in official administrative records, if at all. At least until improved data becomes available, a more promising approach is to investigate the evidence for specific mechanisms through which poverty traps are theorized to occur.

Inspecting the Mechanisms

The overall evidence suggests that poverty traps are not widespread at either the country or individual level, with most countries experiencing some growth and poor individuals not appearing to have dramatically different income dynamics from those who earn more. However, certain types of nonlinearities in these dynamics may appear in situations of crisis or famine, when markets and institutions break down (Ravallion 1997). Barrett and Carter (2013) offer a number of other reasons why direct testing of income or asset dynamics may struggle to find poverty traps even in cases where they exist. For example, poverty traps might apply for certain country circumstances or particular individuals but not others, and failing to account for this heterogeneity by averaging across these groups could mislead. Therefore, we examine the evidence behind some of the main theoretical mechanisms thought to give rise to the types of poverty traps that motivate many arguments for foreign aid. We begin with perhaps the two most well-known macro mechanisms, savings and coordination failure, then discuss two of the most well-known micro mechanisms, nutrition and lumpy investments, before turning to behavioral and geographic poverty traps.

Saving-Based Poverty Traps

Saving-based poverty traps were among the first to be developed into formally articulated models. The basic idea is straightforward: if countries (or individuals) are too poor to save, they cannot accumulate capital, and thus their incomes can only grow at the rate of total factor productivity growth. If this productivity growth is low or zero, then incomes will be stagnant. While the theoretical argument has been understood for a long time, empirical evidence concerning this mechanism is much more recent.

Kraay and Raddatz (2007) calibrate two standard growth models to match key features of sub-Saharan African countries in order to study saving-based poverty traps. The first is a Solow-style economy with an exogenously given saving rate that rises with income. A necessary condition for the existence of a poverty trap is that saving rates are an S-shaped function of the level of development, starting out flat when countries are poor, increasing sharply over some intermediate range, and then leveling off again. Kraay and Raddatz estimate a nonlinear empirical relationship between saving rates and incomes observed in the cross-country data and use this to calibrate the exogenous saving function in the Solow economy. While saving rates do increase with the level of development, it turns out that they increase sharply at quite low levels of development such that a stable low-level equilibrium corresponding to a poverty trap

does not emerge. In short, in the data, the world looks more like panel B of Figure 1 than panel A.

Second, Kraay and Raddatz (2007) consider a growth model with endogenous optimal saving decisions, coupled with a subsistence consumption constraint. They find that at low levels of development, growth reflects the balance of two forces. On the one hand, at low levels of development, the marginal utility of consumption is very high and this lowers optimal saving rates and slows growth. On the other hand, the marginal product of capital starts comparatively high because there are low levels of capital investment and diminishing returns have not yet had a forceful effect, which encourages saving, investment, and growth. For plausible calibrations of the key parameters, the attractiveness of saving and investment dominates, and countries quickly grow out of the subsistence constraint. Only when countries are very close to subsistence levels does the parameterized model suggest that saving and investment would be so low that growth could be expected to stagnate for extended periods of time. But this insight poses a challenge to the view that poverty traps are a widespread phenomenon given that income levels vary considerably among poor countries. Returning to the countries noted in the introduction, in order to argue that stagnant incomes in Burundi and Nicaragua are due to a subsistence consumption-type poverty trap, it is necessary to provide a rationale for why the relevant subsistence level of consumption is seven times higher in Nicaragua than it is in Burundi. Otherwise, theory predicts that Nicaragua would long since have outgrown subsistence constraints.

Big-Push Models of Poverty Traps

Another possible mechanism behind the poverty trap comes from the view that there are increasing returns to scale in the "modern" sector of the economy (for simplicity, usually thought of as manufacturing), and constant returns in the traditional sector (usually thought of as agriculture). If the economy devotes most of its resources to production in the traditional sector, wages will be equalized at a low level across sectors. If on the other hand the economy makes a "big push" to allocate most of its resources to the modern sector, it can realize the benefits of increasing returns and enjoy high wages in both sectors and a high overall income level. Direct empirical evidence on the importance of such mechanisms is scarce, most notably because it is difficult to disentangle the effects of policy efforts to promote "modern" sectors and activities from other factors driving aggregate growth. In the absence of such direct evidence, the literature has produced suggestive calibration exercises that point to somewhat conflicting conclusions.

On the one hand, Graham and Temple (2006) develop an innovative calibration strategy that allows them to deduce whether a second equilibrium level of output could exist for a country in addition to the one actually observed in the data. Their methodology also allows them to determine whether the second equilibrium, if it exists, implies a higher or lower income level than the one actually observed for the country. Applying this methodology to 127 countries, they find that for many of them, the existence of a second equilibrium is compatible with the data. Moreover, about a quarter of countries, predominantly poor ones, are in the lower of the two equilibria. For the typical country in the low-level

equilibrium, the corresponding high-level equilibrium involves an income level two to three times higher than the actual one. Such income differences resulting from countries finding themselves in a "bad" equilibrium certainly are nontrivial, although they are only a small fraction of the observed income differences between low-income and even middle-income countries.

On the other hand, Caucutt and Kumar (2008) study a "big push"–type model with a coordination failure arising from the fact that agents find it optimal to invest in labor-saving technologies only if other agents also do so. This coordination failure leads to a poverty trap when all agents fail to invest in the better technology. However, they argue that the existence of the low-level equilibrium is not particularly robust to small changes in parameter values, and particularly for more empirically plausible parameters of the model. Moreover, they find that even when a trap does exist, the one-time subsidy required to induce agents to invest and switch to the high equilibrium is only about 5 percent of income. If the "cure" to poverty is such a small intervention, this begs the question of why the much larger volumes of aid to poor countries have not succeeded in springing countries free from this particular trap.

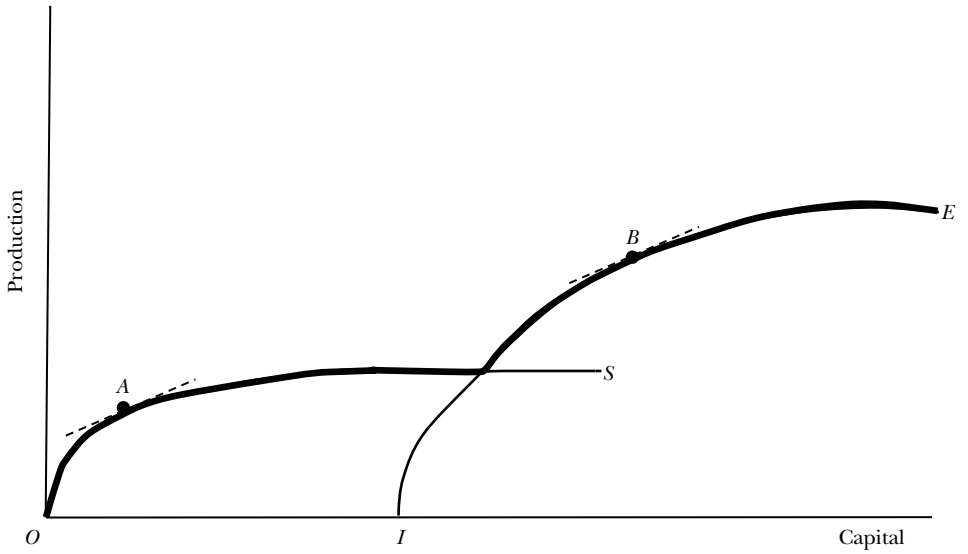
Nutritional Poverty Traps

One of the earliest examples of an S-shaped poverty trap at the individual level is based on nutrition levels (for example, Mazumdar 1959, formalized in Dasgupta and Ray 1986). In this model, poverty can be self-reinforcing because poor individuals are too malnourished to physically be able to do productive work, thereby not earning enough or producing enough food to alleviate this malnourishment. The idea is that the link between food intake and physical work capacity is nonlinear with increasing returns when one starts from a low consumption level.

However, such traps appear unlikely for most people. First, calories are too cheap in most of the world for many of the poor to be in a nutritional poverty trap. For example, Subramanian and Deaton (1996) calculated that the cost of the calories needed for a day's activity in rural Maharashtra were less than 5 percent of the daily wage, while more recently Banerjee and Duflo (2011) calculate that 2,400 daily calories can be obtained in the Philippines for as little as 21 cents (in purchasing power parity terms). There may be specific situations where these dynamics can arise: for example, during famines where markets break down and prices rise (Ravallion 1997) or in cases of continual fecal-oral contamination in which the body is unable to absorb many nutrients, effectively raising the price per absorbed calorie (Ravallion forthcoming).

Second, while both calories and micronutrients do affect productivity, a variety of studies summarized by Strauss and Thomas (1998) suggest that the shape of this relationship tends not to follow the S-shaped pattern needed for poverty trap dynamics. Of course, these points do not mean there is no scope for policy efforts to ease malnutrition; indeed, a large literature shows lasting impacts of nutritional deficiencies in early childhood and thus implies long-term benefits of early interventions to overcome these deficiencies (for example, Behrman, Alderman, and Hoddinott 2004). But the rationale for such policies should not rest on pushing people over some critical threshold in a poverty trap.

Figure 3
Production Non-convexity Arising from Choice between Two Technologies

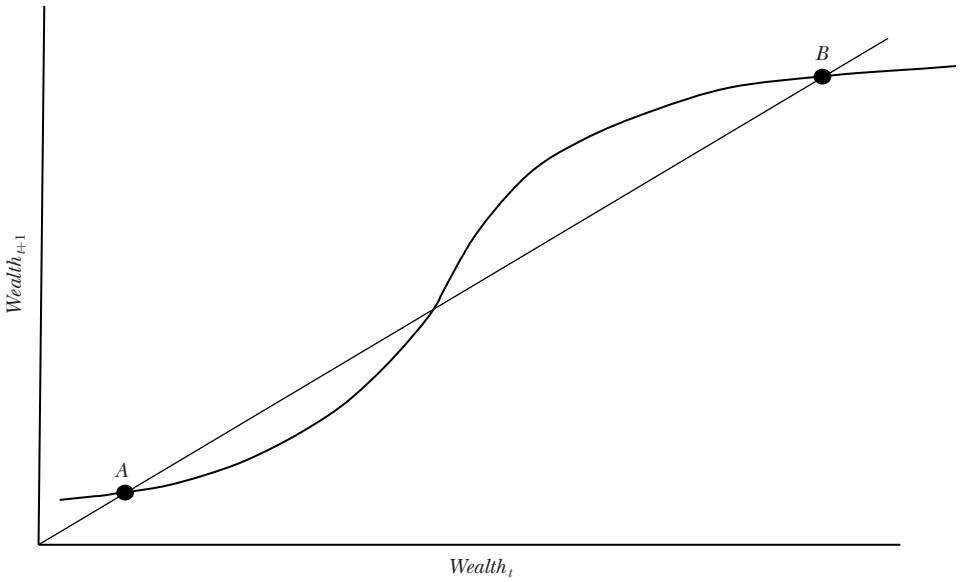


Note: Following Banerjee and Duflo (2011), Figure 3 then shows the subsistence production technology (curve *OS*) and entrepreneurial activity (curve *IE*), and the combined nonconvex production set *OE* (the darkened curve).

Lumpy Investments Coupled with Borrowing Constraints

A number of models of poverty traps are based on an interaction between capital market imperfections, which restrict the amount individuals can borrow, and the idea that the production technology is nonconvex—that is, there is a range where investing a little has low returns and investing a lot more has much higher returns. For example, in the models of Banerjee and Newman (1993) and Aghion and Bolton (1997), individuals may choose between a subsistence activity that requires no fixed capital investment and an entrepreneurial activity that requires a minimum outlay of capital *I*. Following Banerjee and Duflo (2011), Figure 3 then shows the subsistence production technology (curve *OS*) and entrepreneurial activity (curve *IE*), and the combined nonconvex production set *OE* (the darkened curve). Individuals with low initial wealth who cannot borrow begin in the subsistence production activity, while individuals with high initial wealth become entrepreneurs. In the absence of borrowing, individuals choosing between consumption and investment in their business will choose a production level such that the marginal return on investment equals the marginal rate of substitution between consumption today and consumption in the future. This gives rise to two steady-state production points given by *A* and *B* in Figure 3, and to the S-shaped wealth dynamics in Figure 4. Individuals who begin with too little wealth will be stuck in the poverty trap at *A*—returns to capital are too low for them to bootstrap

Figure 4
Poverty Trap Corresponding to Dual Technology Choice

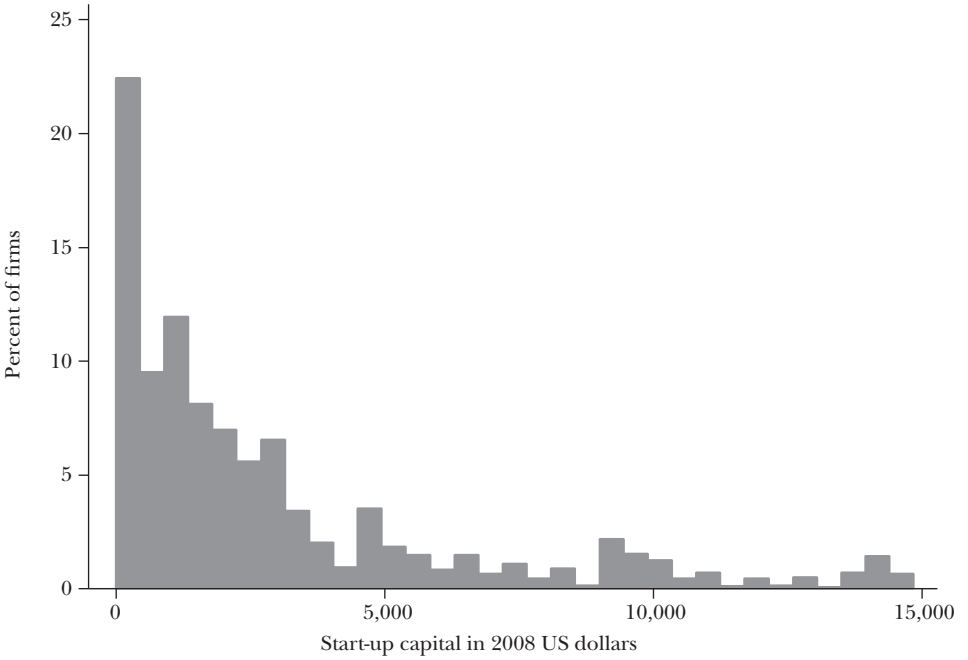


their way out of poverty, while borrowing constraints prevent them reaching the scale needed for the entrepreneurial activity.

How realistic is this model? The closest practical analog to this theoretical case can be found in studies of pastoralists in rural Ethiopia conducted by Lybbert, Barrett, Desta, and Coppock (2004) and Santos and Barrett (2011), and by Barrett et al. (2006) among rural pastoralists in Kenya. Raising cattle is the only production activity for these individuals, and looking at cattle herd size dynamics, these studies find evidence for a process like that in Figure 4, whereby individuals who start with a small herd size appear trapped around a very low level (A in the figure), whereas there is also a much higher-level equilibrium (B). They suggest that a minimum herd size is required in order to be able to undertake the migratory herding necessary to deal with variation in water availability and forage, and those with smaller herds than this size must stay near their base camps, where land degradation means only a small herd size can be supported. Moreover, Santos and Barrett (2011) show that these asset dynamics are known to the farmers, and those too close to the low-level steady state are excluded from informal credit markets. So in this remote location, with only a single nonconvex production technology and no access to credit, some pastoralists appear trapped in poverty as theory would suggest. The key question, to which we will return, then becomes why more people don't leave such areas.

In contrast, in most of the world, individuals face multiple production technologies. Individuals have a choice over many different types of sectors—for example, they might make clothing, sell food, or sell other goods—and, within a sector, a

Figure 5
The Empirical Distribution of Start-up Capital Shows There Are Many Production Choices



Source: Sri Lankan Longitudinal Survey of Enterprises, Baseline data.
Notes: There are 2,255 microenterprises in the survey, and the graph is for the 2,019 of them in the bottom 90 percent in terms of start-up capital.

choice over which items to make and sell. Empirically this gives rise to several fact patterns that, taken together, are difficult to reconcile with models of poverty-traps like the one in Figures 3 and 4.

First, in practice, it seems individuals don't need a lot of capital to start a business; many business owners start with very low levels of capital, and some start with zero capital. Second, the amount of capital needed to start a business appears relatively continuous—it does not seem that business owners only have a small number of production technologies they can choose amongst. As an example, Figure 5 plots the distribution of start-up costs for 2,019 urban Sri Lankan microenterprises in the baseline of the Sri Lanka Longitudinal Survey of Enterprises (SLLSE) (de Mel, McKenzie, and Woodruff 2009). Start-up capital includes land, buildings, machinery, and working capital. The data show a wide range of initial start-up levels of capital, with 10 percent of firms starting with US$100 or less and 23 percent with $500 or less. McKenzie and Woodruff (2006) find a similar range of different starting capital levels for Mexican microenterprises, with many starting with low amounts.

When many different production technologies are available, each with a different initial starting cost, then the overall production technology appears

convex. Imagine Figure 3 with ten rather than two production technologies. The outer curve (shown in bold in Figure 3) would still have small areas of locally increasing returns, but the curve becomes much smoother than with two technologies. In these kinds of figures, nonconvexity is the tell-tale sign of a potential poverty trap, because it will be difficult for those with low incomes to jump across the nonconvexity; but as one moves to many production choices across a range of levels of start-up capital, the overall production choice set becomes more convex.[4]

If individuals face many different production technologies and can choose among them (for example, by adding another product line to their retail store, or selling off one business and using the proceeds to start another), then a multiple-equilibria-based poverty trap should not arise. Even if individuals are unable to borrow, they should be able to start small, reinvest some of their earnings, and slowly bootstrap their way towards a higher production level. Moreover, to the extent that individuals are liquidity constrained and far from their optimal production levels, additional small capital investments should have high returns. This prediction is in sharp contrast to the dual technology poverty traps model in which individuals who start small will have very low returns on capital unless they make a very big investment.

A third fact that casts doubt on technology-based poverty trap models is that many small-scale businesses do in fact have high returns to capital. Several studies, including randomized experiments that give one-time grants of $100 or $200 to microenterprise owners find high returns to capital when starting at a relatively low level of capital stock. In Sri Lanka, de Mel, McKenzie, and Woodruff (2008, 2012) find a return to capital of 5 percent per month on average. In Mexico, using nonexperimental methods, McKenzie and Woodruff (2006) find marginal returns to capital averaging 15 percent per month for male business owners with less than $200 in capital, with a follow-up experiment finding returns of 20 percent per month or more. Finally, in Ghana, Fafchamps, McKenzie, Quinn, and Woodruff (2014) also find returns averaging 20 percent per month and evidence that the impact is higher when capital is given in-kind than as an unrestricted cash grant.[5]

Finally, if all that was holding individuals back from moving from a low-level steady-state like *A* in Figure 4 to operating at a higher level that is out of poverty, like *B*, was access to finance, then one would expect microfinance loans to have large effects on poverty—at least if individuals could borrow enough to finance the lumpy production technology needed to move them out of a trap. However, a number of randomized experiments have now offered microfinance to randomly selected individuals or communities, and none of them have found strong evidence of impacts on business growth or poverty (see Duflo, Banerjee, Glennerster, and Kinnan, 2013,

[4] A distinct issue that can then arise is whether there are nonconvexities further up the scale distribution that prevent small firms from turning into medium firms, or medium firms into large firms. Hsieh and Olken discuss this issue in this symposium.

[5] One disconcerting thread in this line of research is that in some studies the higher returns for small investments appear for men but not for women. For example, de Mel, McKenzie, and Woodruff (2008, 2012) find returns that are higher for men and near zero for female owners. Similarly, Fafchamps et al. (2014) find no evidence of returns for women running very small businesses.

for an example, and their last section for an overview of several recent studies). At least in most of the low-income world, it seems unlikely that the combination of a limited number of lumpy productive investments, coupled with constraints on borrowing, are causing poverty traps.

While these facts taken together help to rule out multiple-equilibria poverty traps, some individuals may remain persistently in poverty because their underlying characteristics may be such that their single steady-state level of production is extremely low (Barrett and Carter 2013). Regardless of the amount of financing available, individuals with poor skills and facing other constraints may be unable to produce at more than a subsistence level. With this possibility in mind, a number of policy interventions have sought to combine assets with intensive skills training and savings promotion. Examples include the BRAC ultra-poor program evaluated by Bandiera et al. (2013) among rural women in Bangladesh; the Bardhan hard-core program evaluated by Banerjee, Duflo, Chattopadhyay, and Shapiro (2011) in rural West Bengal, India; and the SKS ultra-poor program evaluated by Morduch, Ravi, and Bauchet (2012) in rural Andhra Pradesh, India. These programs were aimed at extremely poor households, with eligibility requirements for households being that they have no male workers, not own productive assets, have limited land, and not be microfinance clients. The Bandiera et al. (2013) study finds this combination intervention has lasting effects over a four-year horizon, with an increase in earnings that is large in relative terms, but small in absolute value (approximately US$0.07 per day higher). Banerjee et al. (2011) find similar results over an 18-month horizon, with program households receiving an approximate US$0.06 per day increase in per capita earnings. In contrast, Morduch, Ravi, and Bauchet (2012) find no overall effect on income growth, which they attribute to the presence of opportunities for wage labor that opened up at the same time as the ultra-poor program and enabled the control group to grow at the same rate.

These programs demonstrate that the combination of asset support, training, and other assistance can take some individuals from being extremely poor to being just poor. It is difficult to discern from this evidence whether the relatively small gains, in absolute terms, involve escaping a poverty trap or just a standard dynamic of greater financial and human capital leading to higher income. In either case, the individuals remain quite poor, although it is possible that as more time passes, the income gains from the intervention will increase.

Behavioral Poverty Traps

For individuals to be able to grow out of poverty from a low initial level of capital, they need to save and reinvest continually. However, recent work in behavioral economics suggests that poverty may be self-reinforcing because of the way it affects decision making. Banerjee and Mullainathan (2010) provide a theoretical example of a poverty trap. In this model, individuals allocate spending between temptation and nontemptation goods, and the fraction of the marginal dollar spent on temptation goods declines with total amount spent. This model leads to poor individuals being present-biased and unwilling to take on small high-return investments, keeping them poor. Shah, Mullainathan, and Shafir (2012) provide another potential explanation in which scarcity causes individuals in poverty to devote more

mental effort to meeting daily needs, leaving less attentional resources for other problems—such as perhaps thinking about how to grow their firm. A consequence, in these theories, is that poor business owners may lack the self-control to reinvest cash in their business, preventing them from making investments that would slowly allow them to grow out of poverty.

Some suggestive evidence supports the potential importance of this form of the poverty trap. Ghana, Fafchamps, McKenzie, Quinn, and Woodruff (2014) find that a one-time grant given as cash had much lower effects on business profitability than the same size grant given in kind among female microenterprise owners, with some evidence to suggest this is driven by self-control. Schaner (2013) finds persistent effects on nonfarm business growth of short-term incentives to save among Kenyan households, which she attributes to them setting up "mental accounts" geared towards the business. The control group of firms in the Sri Lankan grant experiment of de Mel, McKenzie, and Woodruff (2012) still have not caught up to the treatment group over five years later, although the treatment group largely makes divisible investments of working capital. It appears that small business owners are not taking on some investments that are divisible and profitable, limiting their ability to reinvest their way towards a high steady-state. Indeed, Kremer, Lee, Robinson, and Rostopshova (2013) and Duflo, Kremer, and Robinson (2011) provide additional examples of small business owners not undertaking small investments with high marginal returns. Nevertheless, these same types of small firms do appear to grow over time in a growing economy (de Mel, McKenzie, and Woodruff 2013), suggesting that any behavioral constraints on firm growth do not prevent the owners responding over time to rising demand. This suggests that small positive shocks may be enough to shift the equilibrium business size, so any "trap" would still not be tied to an absolute size threshold.

Micro Meets Macro: Geographic Poverty Traps

The evidence most consistent with poverty traps comes from poor households in remote rural regions—whether it is the work among East African pastoralists or the suggestive evidence about ultra-poor programs breaking some individuals out of poverty traps. In remote rural areas, isolation reduces the number of available production technologies, which means the choice between lower-income and higher-income outcomes may be a more difficult discrete step (as illustrated back in Figure 3). Jalan and Ravallion (2002) define a "geographic poverty trap" as occurring when the characteristics of a geographic region are such that a household's consumption cannot rise over time while an otherwise identical household living in a different, better-endowed area would enjoy a rising standard of living. They use farm household panel data from rural China to estimate a dynamic consumption model that allows fixed or slowly changing geographic characteristics to influence household consumption and find evidence to support the idea that, all else equal, living in a poor area lowers the productivity of a farmer's own investments, with areas with insufficient geographical capital, such as few rural roads, potentially in geographic poverty traps.

Why don't more people move out of poor areas? In the Chinese context, mobility restrictions such as the household registration (*hukou*) system under which households

are only entitled to social services like health and education if they are living in the area of their registration, along with thin rural land markets and uncertain land property rights, might explain low mobility (Jalan and Ravallion 2002). But many people remain in poor rural areas throughout much of the world, despite high returns to internal migration. Cost can be one reason—the same credit market failures that prevent investing in more productive assets can also prevent households financing the costs of moving. Bryan, Chowdhury, and Mobarak (2013) conduct experimental work in Bangladesh to try to understand why more households don't undertake seasonal migration, which they show to have high returns; part of the explanation, they suggest, is that households close to subsistence are unwilling to take the risk of migration; but they become more willing to do so if insured against this risk. The result is that policies to facilitate more internal migration may help lift some people out of poverty traps. However, concerns about congestion and the development of urban slums, along with other political concerns, often make policymakers reluctant to encourage more internal migration in many low-income countries.

More broadly, in our view, the strongest evidence for a poverty trap at an individual level is the one based on country of residence. The same individual can be in persistent poverty or earning substantially more depending solely on the country they happen to work in. For example, using a visa lottery, McKenzie, Gibson, and Stillman (2010) estimate that Tongan workers experience a 263 percent increase in their (purchasing-power-adjusted) income within a few months of migrating to New Zealand. Clemens, Montenegro, and Pritchett (2008) estimate that a male worker with nine years of education would earn 7.8 times as much working in the United States as in Haiti. Effectively, the different productive technologies in Figure 3 operate in different countries, and poor people are unable to afford the cost of movement that would allow them to earn substantially higher incomes.

To make this concrete, consider two individuals in Mexico of identical abilities but different initial wealth levels. The cost of migrating to the United States, where they could be substantially more productive and earn multiples of their Mexican incomes, is not affordable to a liquidity-constrained poor individual. In contrast, the wealthier individual can pay for the recruiting fees, skills training, certification costs, and transportation costs necessary for different types of legal migration through a work visa; pay the costs needed to migrate through an investor visa; or pay to hire a *coyote* (smuggler) to enable them to migrate illegally. The result is that migrants will be positively selected on wealth (McKenzie and Rapoport 2007), with poor individuals unable to pay the migration costs and therefore remaining poor, while slightly wealthier individuals who can pay these costs will be able to migrate and then move to the higher-equilibrium income.

Implications for Policy

Overall, our view of the existing literature finds no strong evidence for many of the common mechanisms theorized to give rise to poverty traps. Coupled with the fact that even poor countries have managed to grow at a rate similar to the historical

growth rate of the United States over the past 200 years, we suggest that one should be skeptical of claims that countries need a "big push" of aid or loans to take them over some threshold at which their growth prospects will shift dramatically. Likewise, one should be skeptical of claims that microfinance will be the solution to poverty traps caused by the interaction of financial constraints and lumpy investment technologies or that there are many workers for whom receiving more calories will be the difference between them being stuck working at low productivity or not.

Of course, this rather mixed evidence for poverty traps does not imply that there is no economic case for improving nutrition or for improved access to finance through microfinance at the individual level. Even if households are not in a poverty trap, they can be in a situation where they are converging only very slowly to a steady state and thus still benefit from aid. Aid projects that reduce premature mortality are an obvious example where a lack of poverty traps need not preclude large benefits from aid. Many other successful aid projects like conditional cash transfers based on school attendance or health care targets, deworming, school reforms, and others have outcomes that improve the well-being of recipients in important ways even though, in our view, such programs are unlikely to move that person from one equilibrium to another—or at least to a very different one.

The same is true at the aggregate level. While we have not seen much evidence in support of mechanisms that would imply that a large scaling-up of aid is *necessary* to deliver positive growth effects, this does not mean that aid cannot have positive effects on aggregate growth. Even if a country is not specifically in a poverty trap, people in that country may be persistently poor due to poor fundamentals, and aid-financed investments can certainly help to improve these fundamentals, thereby leading to higher growth. However, it is difficult to argue that such aid programs are likely to lead to a sharp acceleration of growth at the aggregate level as a country breaks free from a poverty trap.

While the evidence indicates that poverty traps are rare, this does not mean they can never exist. The clearest evidence for traps appears to come from people being trapped in low-productivity locations—whether this be remote rural regions within a country, or in low-productivity countries. Policy efforts to lower the barriers to internal and international mobility therefore appear to offer large potential payoffs in terms of taking people out of poverty.

We conclude with two important qualifications. First, a key feature of the empirical evidence reviewed in this paper is that individual studies have focused on documenting specific mechanisms in isolation. In reality the world is of course much more complicated, and it is plausible that many trap-like forces might be simultaneously at play, at both the individual and the country level. If there are important interactions across different mechanisms, then these trap-like mechanisms might jointly impede development, even if in isolation they do not appear to matter all that much. More theoretical and empirical work on such interactions could be a promising direction for future research. Second, although we argue that many models of poverty traps do not seem to be that prevalent empirically, we do not think that economists' efforts over the past several decades to develop these models and confront them with the data have been a waste of time. Rather, models

of poverty traps, arguably, have provided an intellectually coherent and rigorous framework for efforts to understand the process of economic development. While both the reduced-form relationships as well as efforts to document particular mechanisms have yielded rather mixed evidence about the importance of poverty traps, these models and the associated empirical efforts to test them have greatly enhanced our understanding of a wide range of important development issues, such as how markets function in developing countries; what the returns are to a range of capital, educational, and nutritional investments; and what other barriers may be holding back growth.

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