

Poverty Trap

Poverty trap is a self-perpetuating condition where an economy, caught in a vicious cycle, suffers from persistent underdevelopment. Although it is often modeled as a low-level equilibrium in a static model of coordination failures, we discuss the concept in a dynamic setting. This is because, in a static setting, we will not be able to distinguish poverty traps from (possibly temporary) bad market outcomes, such as recessions and financial crises, that are also often modeled as a low-level equilibrium in a static model of coordination failures.

On the Mechanics of Poverty Traps:

Imagine that the state of the economy in period t is represented by a single variable, x_t , where a higher x means that the economy is more developed, and that the equilibrium path follows a deterministic one-dimensional difference equation, $x_{t+1} = F(x_t)$. Once the initial condition, x_0 , is given, this law of motion can be applied iteratively to obtain the entire trajectory of the economy.

In Figure 1a, $F(x)$ stays above the 45° line everywhere, hence the economy grows forever (as in the endogenous growth models). In Figure 1b, for any x_0 , the economy converges to x^* (as in the Solow growth model). In either case, there is no poverty trap, since the long run performance of the economy is independent of the initial condition, no matter how underdeveloped the economy is initially. (Confusions sometime occur, because a few authors use the term, “trap,” to describe the situation depicted in Figure 1b, in the sense that growth is not sustainable. However, this should be more appropriately called, “the limit to growth.” This limit is not caused by the initial poverty of the economy.)

In Figures 2a and 2b, on the other hand, the long run performance depends on the initial condition. When the economy starts above x_c , it will stay above x_c and may either grow forever or reach a higher stationary state. However, if it starts below x_c , it will be trapped forever below x_c . In this sense, both figures exhibit a poverty trap in its strong form. In Figure 2a, the economy caught in the trap will converge to the low-level stationary state. In Figure 2b, it will fluctuate below x_c . In both cases, the economy will remain poor only because it is poor. Thus, the poverty becomes its own cause. It is this self-perpetuating nature that sets “the poverty trap” apart from “the limit to growth.”

Both Figures 2a-2b project the very stark view that the economy can never escape from the poverty trap. This should not be taken too literally. The essential message of poverty traps is that poverty tends to persist, and that it is difficult, not necessarily impossible, for the economy to escape. Poverty traps in its weak form are depicted in Figures 3a and 3b. In Figure 3a, the economy has to experience stagnation for long time, as it travels through the “narrow corridor” between $F(\bullet)$ and the 45° line, before eventually succeeding in taking off. In Figure 3b, the economy may or may not manage to escape the trap after experiencing (possibly many) periods of volatility. For all practical purposes, the situations depicted in Figures 2a-2b, and in Figure 3a-3b, are difficult to separate, but the message is the same; the self-perpetuating nature of poverty.

The above analysis can be extended in many directions. First, one could add stochastic shocks to the system, as $x_{t+1} = F(x_t; \xi_{t+1})$. Such shocks perturb the map, which may switch the graph back and forth between Figures 2a (or 2b) and Figures 3a (or 3b). This can be viewed as a jump in the state variable in the case of the additive shocks, $x_{t+1} = F(x_t) + \xi_{t+1}$. (For example, natural disasters, plagues, and wars could cause the capital/labor ratio to jump up and down.) In the presence of such stochastic shocks, the economy may occasionally and recurrently escape or fall into the trap. Hence, the analysis has to be described in terms of the stochastic kernel; see Azariadis and Stachurski (2004) for a detailed discussion of stochastic poverty trap models. Second, the above analysis assumes that x_{t+1} is uniquely determined as a function of x_t . If the underlying economic models permit multiple equilibria, as often is the case with models of external economies and strategic complementarity, then $F(\bullet)$ becomes a correspondence, and the (deterministic) equilibrium path follows the difference inclusion, $x_{t+1} \in F(x_t)$. See Matsuyama (1997) for some examples. Figure 4 depicts one possibility, suggesting that the economy is stuck in a low-level stationary state, in part due to coordination failures; In this case, the economy could escape the poverty

trap if it could succeed in coordinating on a higher equilibrium, as indicated by the dashed arrow. (If such coordination takes place through a realization of some coordination devices, “sunspots,” it can be viewed as a model of endogenous stochastic shocks.) Third, the underlying economic model may imply that the law of motion be described in a multi-dimensional system. For example, the state space may be two-dimensional, (x, q) , where x is the state (or backward-looking) variable, such as the capital stock, and q is the co-state (or forward-looking) variable, such as the asset price or consumption, and the law of motion is given by a two-dimensional difference equation, $(x_{t+1}, q_{t+1}) = F(x_t, q_t)$. In this case, for a given initial condition, x_0 , the equilibrium condition may not uniquely pin down the initial value, q_0 . That is, there may be multiple equilibrium paths, with self-fulfilling expectations, which suggests another way in which the economy may escape from the poverty trap; see Matsuyama (1991). Or, the dimensionality of the state space may be equal to the number of industries in a multi-industry model, or to the number of countries in a multi-country world economy model. In such a high-dimensional system, one could encounter a much richer set of dynamics, where the long run behavior can depend on the initial condition in a much more complex manner.

Some Models of Poverty Trap:

Many (dynamic) models of poverty traps have been proposed in the literature. The common feature of these models is the presence of some external economies or strategic complementarities that give rise to the circular causation. Here is a highly selective list.

Learning-By-Doing Externalities

The infant industry argument for protection (see Corden 1977 for a synopsis) is a classic example. When firms are inexperienced and unproductive, they cannot offer wages high enough to attract workers from other sectors, hence they are not able to accumulate their experiences; temporary protection has been suggested as a way to break the vicious cycle. Helping some industries accumulate experience to escape from a poverty trap, however, may end up pushing the economy into another poverty trap, as it could prevent other (new and possibly more promising) industries from growing. If the scope of productivity improvement in any industry is limited, then the only way of avoiding poverty traps and achieving sustainable growth is to keep the delicate balance so that production will shift constantly from one industry to another, as existing industries become mature and new industries are born; see Stokey (1988); Brezis, Krugman, and Tsiddon (1993); Matsuyama (2002).

Search Externalities

The difficulty of finding business partners can discourage many to enter an industry, which in turn makes it even harder for others to find business partners. See Diamond (1982).

Human Capital Externalities

Following the Lucas (1988) model of endogenous growth based on human capital accumulation, Azariadis-Drazen (1990) showed how it could lead to the existence of poverty traps, when human capital is subject to threshold externalities.

Market Size and Division of Labor

Adam Smith argued that “the division of labor is limited by the extent of the market.” Young (1928) argued that the extent of the market is also limited by the division of labor. That is, economic growth can be achieved by means of greater specialization, which was formalized by Romer (1987) and others. Built on this body of work, Ciccone and Matsuyama (1996) showed how the economy can be caught in a poverty trap. The basic mechanism is that advanced technologies require the use of highly specialized equipments and producer services. In the underdeveloped economy, the limited availability of specialized inputs forces the downstream industries to rely on less advanced technologies, which do not require the use of specialized inputs. This in turn leads to a small market size for specialized firms in the upstream industries. Hence, the economy is caught in the vicious cycle of the limited market size and limited division of labor.

Financial Developments

In countries with limited opportunities to diversify risk, the entrepreneurs are discouraged from making productive but risky investments. This in turn leads to a limited set of traded financial assets, which reduces the opportunity to diversify risk. See Saint-Paul (1992) and Acemoglu and Zilibotti (1997).

Low Wealth/Low Investment

When external finance is more costly than internal finance, a decline in borrower net worth leads to a higher investment distortion. In Bernanke and Gertler (1989), this leads to a decline in the investment, which in turn leads to a decline in the net worth of the next generation of entrepreneurs, hence generating persistence in the aggregate investment dynamics. In Matsuyama (2004), the same mechanism could make some (but not all) countries in the world caught in the vicious cycle of low net worth/low investment. Matsuyama (2005) showed how the trap can sometimes take the form of greater volatility (as shown in Figure 2b). In a setup that allows for the wealth distribution to evolve over time, Banerjee and Newman (1993) suggested that greater initial wealth inequality, to the extent that it increases the number of entrepreneurs rich enough to finance their investments, can lead to a higher aggregate higher investment, which in turn could help the poor in the long run, thereby breaking the vicious cycle.

Demographic Trap

Nelson (1957) is among the first to argue that the underdeveloped countries are caught in the vicious cycle of high population growth and low per capita income. Becker, Murphy, and Tamura (1990) showed how the economy may be caught in the vicious cycle of high fertility/low human capital. Basu (1999) and Doepke and Zilibotti (2005) discussed child labor traps. In Matsuyama (2000), intergenerational persistence of a high labor force participation rate by the elderly could lead to a poverty trap.

Contagious Social Norms

Tirole (1996) showed how corruption or other unethical behaviors can be contagious and persistent. He considered the setting where, in the presence of imperfect information, the reputation of a member of the group (say, a firm in the industry) depends not only on his own past behavior, but also on the past behavior of other group members. Then, when the group has the reputation of being dishonest, it would be difficult for the member to establish a reputation for honesty. This induces him to behave dishonestly, thereby contributing to the bad reputation of the group.

Modeling Inertia

Underdevelopment is often modeled as a Pareto-dominated equilibrium in a static game of strategic complementarities. Murphy, Shleifer, and Vishny (1989) is the most well-known example. By adding some inertia, which restricts the ability of the players to switch their strategies, one can convert virtually any static game of strategic complementarities into a dynamic model of poverty traps, where both the initial condition and the expectations can play a role in determining the long run performance of the economy. See the techniques developed by Matsuyama (1991) and Matsui and Matsuyama (1995).

Some Cautionary Remarks on Interpretations:

i) Poverty trap is often interpreted as an explanation for the *cross-country* income difference. As such, it is frequently viewed as *an alternative* to the models that attribute *cross-country* income difference to the *cross-country* difference in, say, TFP and/or the investment distortions. This is a misinterpretation. First, the message of poverty trap models is the self-perpetuating nature of poverty. It suggests that the long run performance of an economy could be much better if its initial condition were better. It does *not* mean that the cross-country difference in the long run performance is due mostly to the difference in their initial conditions. Second, the notion of poverty trap does not contradict the observation that the low-income is often associated with low TFP and/or high investment distortions. Indeed, many poverty trap models attempt to explain the two-way causality between the low-income and low TFP and/or high investment distortions. By endogenizing TFP and/or the investment distortions, these poverty trap models go one step further than the models that treat these variables as exogenously given.

ii) Many calls for foreign assistance for underdeveloped countries can be understood using the notion of poverty trap. See, e.g., Sachs et. al. (2004). Indeed, poverty trap is often viewed as a powerful case for policy activism. However, one should be careful when using any particular model of poverty trap to

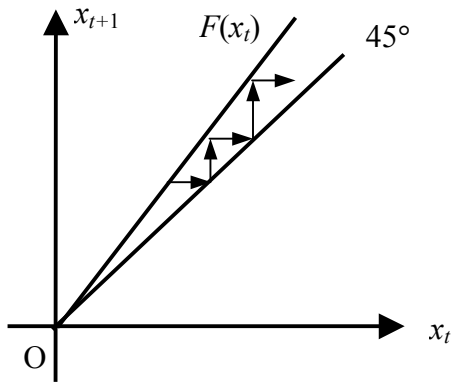
make policy proposals. It is important to keep in mind that each model of poverty trap is designed to highlight one particular feedback mechanism behind the vicious cycle. To this end, other sources of poverty trap are deliberately assumed away. In reality, of course, many sources of poverty trap are likely to co-exist. If there is one important lesson from the literature reviewed above, it should be that there are hundreds of traps that the economy can fall into, and any policy intervention in an attempt to pull the economy out of one trap may end up pushing it into another. As we know, any attempt to solve a problem can often become a source of another, even bigger, problem. For more on this issue, see Matsuyama (1996), which discusses economic development as “complex” coordination problems.

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Figure 1a



1b

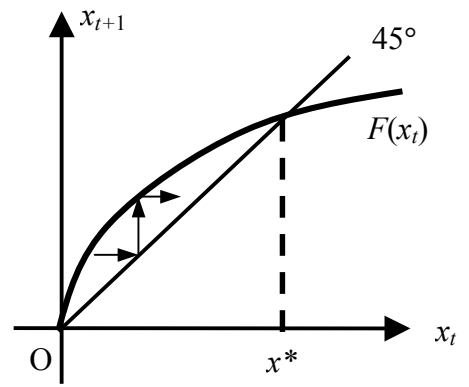
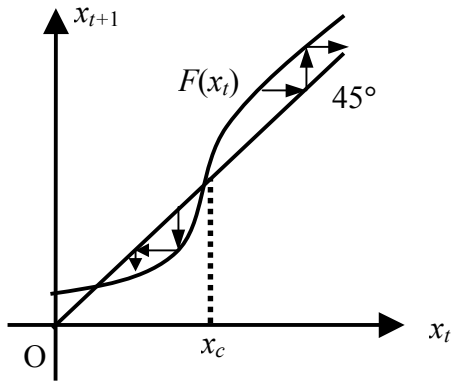


Figure 2a



2b

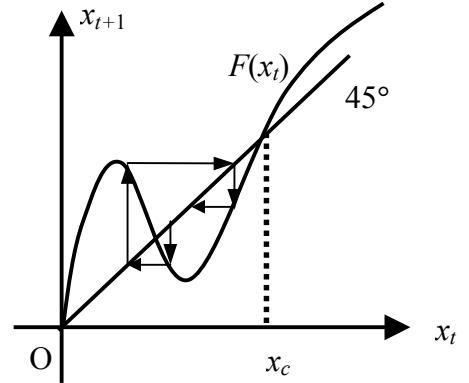
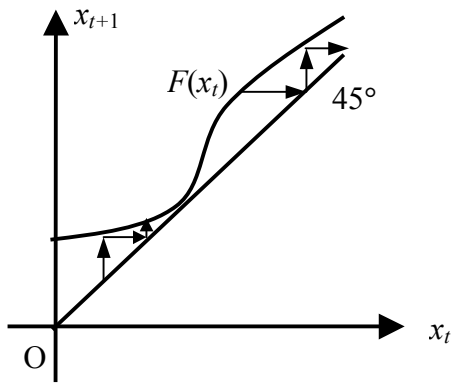


Figure 3a



3b

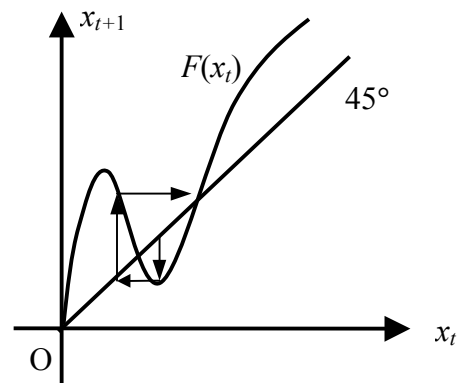


Figure 4

