a correct policy toward the foreign exchange rate is necessary to secure control over the money supply.

The need for more "outward looking" foreign trade policies for most developing countries is now generally accepted within the economics profession. More controversial is the nature of an efficient liberalization strategy. The postwar history of LDCs is replete with attempts to liberalize foreign trade—frequently with substantial aid from the International Monetary Fund or other consortia of international lenders from wealthy countries. Nevertheless, few such liberalizations have been sustained, and regression back to more repressive tariffs and exchange controls is commonplace.

Two views are prevalent about liberalization of the constricted foreign trade sector. One is that liberalization, interpreted mainly as the removal of import controls and tariffs, should be gradual, covering first "essential" producer and consumer goods and last "inessential" consumer items; and that protection should be removed first from domestic industries that are mature enough to withstand international competition and last from infant industries. The second view is that foreign aid or other external credits should come with the liberalization of foreign trade. Their purpose is to provide external financing for the increased imports that removal of controls seems to portend. Assistance from abroad has been considered useful and even necessary in helping to liberalize the economy over the critical and possibly painful adjustment period.

These views are plausible. Unfortunately, they may well be wrong, as is shown in Chapter 11. Complete rather than partial liberalization is more likely to be ultimately successful. Somewhat more surprisingly perhaps, the absorption of substantial amounts of foreign capital during the liberalization process may also be a serious mistake. That is, it may be easier to remove protective tariffs and quotas on foreign trade by avoiding extraordinary capital inflows from abroad. Such unconventional wisdom is, of course, in accordance with my optimistic view that most poor countries can secure their own successful development.

**Capital in a Fragmented Economy**

While economists can usefully divide their labor as monetary theorists, tax experts, foreign trade specialists, project evaluators, and so on, a unified view of the development process is a great analytical convenience. Why is public intervention so pervasive and generally so unsuccessful? Intervention is usually prompted by the perception—sometimes correct—that a particular market is functioning badly, so that authorities feel pressed to "do something." An infant textile firm is helped by a tariff; or the price of an agricultural product may be raised to permit farmers to use a new fertilizer-intensive technology; or a tax exemption may be granted to a foreign firm for automobile assembly. This pressure for public intervention is the result of severe fragmentation in the underdeveloped economy.

*The Fragmented Economy*

The economy is "fragmented" in the sense that firms and households are so isolated that they face different effective prices for land, labor, capital, and produced commodities and do not have access to the same technologies. Authorities then cannot presume that socially profitable investment opportunities will be taken up
by the private sector, because prevailing prices need not reflect true economic scarcity—at least not for large segments of the population. There is historical justification for this view in the nineteenth and early twentieth centuries. In Asia, Latin America, and Africa, primary commodity export enclaves were controlled by foreigners, and much of the general population remained outside of the market economy. Indigenous entrepreneurs had limited access to capital, no means of acquiring advanced technologies, and little skilled labor.

Thus in the determination of where in the vast new areas of the overseas world the raw material export industries were to be established, the pre-existing domestic supply of labor, capital, and entrepreneurship played a minimal role. Where they did exist in areas of potential export production, these factors were highly immobile and could not be counted upon to engage in export industry operation.\(^1\)

Newly independent governments quite properly felt compelled to act as agents of change to offset economic and political colonialism. In the past twenty or thirty years, poor countries have succeeded in introducing some new industrial activities—particularly the manufacture of goods previously imported—and in mobilizing some domestic factors of production. Their governments chose to do so, however, by manipulating commodity prices in a variety of ways and by intervening directly to help some individuals or sectors of the economy at the expense of others.

Consider the extraordinary lengths to which import tariffs have been used in Latin America (see Table 10-1), with rates of several hundred percent on some goods and absolute prohibitions on the import of others, while still others enter freely. The situation on the Indian subcontinent is no different. Price and quantity controls on foreign trade and domestic commerce make licensing and rationing commonplace. Byzantine patterns of industrial taxes and subsidies complicate government budgetmaking. Consequently, the market mechanism has become no better, and perhaps even worse, as an indicator of social advantage.

Modern fragmentation, therefore, has been largely the result of government policy and goes beyond the old distinction between the export enclave and the traditional subsistence sector. One manifestation is the often-noted existence of small household enterprises and large corporate firms—all producing similar products with different factor proportions and very different levels of technological efficiency. Continuing mechanization on farms and in factories in the presence of heavy rural and urban unemployment is another. Excess plant and equipment with underutilized capacity are commonly found in economies that are reputed to be short of capital and that do suffer from specific bottlenecks. In rural areas, tiny landholdings may be split up into small noncontiguous parcels, with inadequate incentives for agricultural land improvements.\(^2\)

While tangible land and capital are badly used, fragmentation in the growth and use of human capital can be more serious and no less visible. Learning-by-doing and on-the-job training in the "organized" economy are confined to narrow enclaves—export-oriented in the past but now increasingly inward-oriented toward "modern" manufacturing—whose employment growth may be less than the growth in general population.\(^3\) Unemployment among the highly educated coexists with severe shortages in some labor skills.

Indigenous entrepreneurship is narrowly based and is supported by heavy government subsidy. Tariff protection, import licenses, tax concessions, and low-cost bank finance commonly go to small urban elites and create great income inequality between the wealthy few and the poverty-stricken many. This income inequality has failed to induce high rates of saving in the classical manner, but governments remain reluctant to reduce the disposable income

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2. See, for example, the Indian case analyzed by B. S. Minhas in "Rural Poverty, Land Redistribution and Development Strategy: Facts and Policy" (International Bank for Reconstruction and Development, Economic Development Institute, September 1970; processed).

of well-to-do investors whose unique access to investment opportunities is guaranteed by the web of official controls and by the endemic fragmentation.

**Liberalization and the Capital Market**

How does one begin to loosen the Gordian knot? The incredibly complex distortions in commodity prices now prevailing are the unplanned macroeconomic outcome of specific microeconomic interventions. But substantial fragmentation in the markets for land, labor, and capital provided the initial motivation for public authorities to “do something” and continues to pressure governments to intervene. Thus an explicit policy for improving the operation of factor markets is necessary to persuade authorities to cease intervening in commodity markets. Carefully considered liberalization in all sectors can then move forward—not merely as a reaction to the more obvious mistakes of the immediate past, but in ways that allay legitimate fears of pure laissez-faire.

However, the knot needs to be loosened further. To say that there are “imperfections in factor markets” is distressingly vague and often signals the end of formal economic analysis. But further systematic inquiry can proceed if the neoclassical approach of treating labor, land, and capital symmetrically as primary factors is dropped. It is hypothesized here that fragmentation in the capital market—endemic in the underdeveloped environment without carefully considered public policy—causes the misuse of labor and land, suppresses entrepreneurial development, and condemns important sectors of the economy to inferior technologies. Thus appropriate policy in the domestic capital market is the key to general liberalization, and particularly to the withdrawal of unwise public intervention from commodity markets.

Efficient capital markets, however, pose subtle questions of economic and social organization that go far beyond the provision of physical infrastructure. The accumulation of capital per se means little in the underdeveloped economy, where rates of return on some physical and financial assets are negative while extremely remunerative investment opportunities are forgone. One farmer may save by hoarding rice inventories, part of which is eaten by mice so that the return on his saving is negative. Another may foresee an annual return of over 60 percent in drilling a new tube well for irrigation, but the local moneylender wants 100 percent interest on any loan he provides. The operator of a small domestic machine shop may find it impossible to get bank credit to finance his inventories of finished goods and accounts receivable, whereas an exclusively licensed importer of competitive machine parts has easy access to foreign trade credit at a subsidized rate of 6 percent.

In the face of great discrepancies in rates of return, it is a serious mistake to consider development as simply the accumulation of homogeneous capital of uniform productivity. This simplistic view has been held explicitly by economic growth theorists and econometricians who incorporate homogeneous capital of uniform productivity into production functions. It is held implicitly by policymakers in less developed countries (LDCs), who all too often have followed a strategy of maximizing short-run gross investment in virtually any form. It has been abetted by official international agencies that calculate the “need” for foreign aid on the assumption that output-capital ratios in recipient countries are fixed.

It seems important to develop a distinct alternative view of the role of capital. To focus the analysis still more narrowly, let us define “economic development” as the reduction of the great dispersion in social rates of return to existing and new investments under domestic entrepreneurial control. The capital market in a “developed” economy successfully monitors the efficiency with which the existing capital stock is deployed by pushing returns on physical and financial assets toward equality, thereby significantly increasing the average return. Economic development so defined is necessary and sufficient to generate high rates of saving and investment (accurately reflecting social and private time preference), the adoption of best-practice technologies, and learning-by-doing.

The converse is not likely to be true, however. Arbitrary measures to introduce modern technology via tariffs, or to increase the rate of capital accumulation by relying on foreign aid or domestic forced saving, will not necessarily lead to economic development. Thus it is hypothesized that unification of the capital market, which sharply increases rates of return to domestic savers by widening exploitable investment opportunities, is essential for eliminating other forms of fragmentation.
Production Opportunities, Wealth, and External Finance: A Fisherian Approach

How can one succinctly characterize the fragmented state of the capital market in the underdeveloped economy? First, income categories are not well defined, nor are the processes of saving and investment specialized, as they would be in advanced economies. With a large, self-financed household or “unorganized” sector and an imperfectly financed corporate or “organized” sector, there is little use in emphasizing a class structure that is based on the functional distribution of income among wages, profits, interest, and land rents. Nor is much gained from sharply distinguishing a saving class from an investing class, and both from a laboring class. Rather, there are many entrepreneurs who provide labor, make technical decisions, consume, save, and invest. The term “entrepreneur” will be used henceforth to denote individuals or families performing all five functions; and a model of entrepreneurial behavior that is characteristic of much indigenous rural and urban economic life is established.

Capital theory involves decision making over time in a fundamental way. The model presented here is built around Irving Fisher’s approach to impatience and intertemporal choice, as extended and elaborated by Jack Hirshleifer. 4 Neither of these valuable treatises has been applied specifically to the development problem as it is defined here, but they provide a convenient framework for viewing the way in which the capital constraint impinges on the decision making of entrepreneurs.

The scope for intertemporal decision making, within which the entrepreneur maximizes his utility, can usefully be reduced to three components: (1) his endowment or owned deployable capital; (2) his own peculiar productive or investment opportunity; and (3) his market opportunities for external lending or borrowing over time outside his own enterprise. At a very general level, a fragmented capital market, which is characteristic of underdevelopment, is one where the three components are badly correlated. That is, entrepreneurs with potential production opportunities lack resources of their own, as well as access to external financing. Those with substantial endowments may lack “internal” production opportunities (unless such opportunities are artificially generated by public intervention) and have no “external” investment outlets at rates of return that accurately reflect the prevailing scarcity of capital. The resulting dispersion in real rates of return reflects the misallocation of existing capital and represses new accumulation.

The Fisherian approach is distinctive because it does emphasize the individuality of each entrepreneur, who has his own more or less unique production opportunity. This opportunity depends on his specialized knowledge (technical expertise being very scarce and differentially distributed) and the factors of production available to him—family labor, landholdings, structures, and so on. Whether a man is a good farmer, a sophisticated carpenter and builder, or an efficient retailer determines his production possibilities and his need for investment in human and physical capital to exploit them. There is tremendous diversity in skills and talent throughout the rural and urban populations, but they are attached to small farm–households and not easily identified. Correspondingly there is no single authority or narrow class of individuals who can extract saving and allocate investment according to a neoclassical menu of best-practice production techniques. Unlike the situation in highly developed economies, there are few if any great indigenous agglomerations of capital under the control of organizations with proven technical expertise. Endowments do not necessarily correspond to opportunity. Thus there is but a fine line between the efficient division of labor and uneconomic fragmentation.

What can pull the fragments together so that the efficient division of labor prevails? Since one cannot rely on initial endowments to supply capital, supplemental financing from outside the individual enterprise is of critical importance in determining whether or not high-productivity investments are undertaken. It is more critical in poor economies that are trying to break out of past patterns of using capital than in wealthy ones with established investment and reinvestment patterns. The aggregate consumable surplus or “capital” available to all LDC entrepreneurs at any one point in time must be reshuffled among them somehow so that

those with the best internal opportunities are net recipients of funds, even though some of these recipients may be net suppliers of funds in later periods, all on a quid pro quo basis. Then small but highly productive individual investments in seed-fertilizer packages, on-the-job labor training, equipment purchases, or inventory holding can all be encompassed by a single allocative mechanism. The need for "public" decision making in each sphere of economic activity is correspondingly reduced.

Unfortunately, financing from outside the individual enterprise is either unavailable or extremely limited in the underdeveloped environment. Raymond W. Goldsmith has shown statistically that newly issued primary securities are a much smaller proportion of gross national product (GNP) and of aggregate saving in underdeveloped countries than in wealthy ones. The extent of intermediation through the banking system is also relatively limited, as will be shown below.

In Chapter 5, specific public policies affecting both industry and agriculture are interpreted as responses to this constraint on external finance. First, however, the problem in the absence of compensating public intervention is examined.

**Indivisible Investments and Technological Innovation**

Superimposed on our Fisherian model of fragmented investment opportunities is the problem of "indivisibilities." Typically, investments associated with the adoption of markedly improved technologies bulk large in the eyes of small-scale entrepreneurs. Investing in an improved breed of dairy cattle, buying a simple lathe or sewing machine, or assembling a new combination of seeds, fertilizers, and pesticides necessarily require quantum changes in cash outlays from a net income that may be barely sustaining the entrepreneur and his family. Poverty and the inability to borrow to finance discrete increases in expenditures can be formidable barriers to the adoption of even the simplest and most productive innovations.

Indeed, without indivisibilities, self-financed capital accumulation—where saving and investment take place within the same firm—might well be sufficient for a slow diffusion of new technologies and a gradual reduction in the dispersion in rates of return within and between various enterprises. Marginal innovative investments by poor but thrifty entrepreneurs would thrive, because divisible investments could be financed directly by marginal reductions in current consumption. With indivisibilities so important in practice, however, financially isolated entrepreneurs can easily be caught in a low-level equilibrium trap, where innovation is completely blocked except for a small handful of the very wealthy, who get wealthier. Discrepancies in earned rates of return may actually increase.

Although limited to self-finance, the "typical" entrepreneur can still make certain important investment and consumption decisions that serve to allocate his capital over time. Within the confines of traditional technology applied to his own enterprise, he can choose to consume marginally less now and more later—that is, to invest a consumable surplus. For example, a farmer can decide to leave some of his land fallow, at the cost of a smaller crop this year, in order to get a larger one next year. With an unsophisticated agricultural technology, the internal return from deferring current consumption is likely to be quite low.

Now suppose that a "green revolution" has taken place and the farmer has succeeded in building up his working capital—seeds, pesticides, fertilizer—and his fixed capital—irrigation facilities—which put him on a whole new technology. The same kind of marginal balancing can take place in the context of this new technology. The farmer could provide his own savings to increase slightly the commercial fertilizer that he is now using, and the return on this marginal new investment could be calculated.

The important point, however, is the virtual impossibility of a poor farmer’s financing from his current savings the whole of the balanced investment needed to adopt the new technology. Access to external financial resources is likely to be necessary over the one or two years when the change takes place. Without this access, the constraint of self-finance sharply biases investment strategy toward marginal variations within the traditional technology. This bias is demonstrated formally in the technical note at the end of this chapter, where the standard Fisherian diagram portraying inter-temporal investment and consumption is modified to take account

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of the indivisibility that is associated with the introduction of a distinctly new technique.

This emphasis on external financial restraint is different from the dominant neoclassical theory of technological diffusion and “learning.” The prevailing theory begins by assuming that there is a perfect capital market equalizing all private rates of return, that indivisibilities are not important, and that entrepreneurs have similar production opportunities. Evident frictions or imperfections in technological diffusion must then be explained differently by recourse to “external” or “extra-market” effects. Kenneth Arrow has suggested that learning-by-doing in an industry depends on the level of gross investment undertaken by individual firms. Learning by one entrepreneur spills over or becomes more easily copied by others. To promote these social benefits not captured in individual decision making, Arrow concludes that a state subsidy to gross investment in high-learning industries is warranted.

A subsidy to gross investment in any particular industry, however, would be entirely inappropriate in a world where traditional technologies coexist with modern ones, and it is seldom clear to government authorities which of the two has the highest rate of return. Indeed, as will be discussed in Chapter 3, authorities in poor countries have subsidized investments in modern plant and machinery extensively, with highly perverse results. The internal rate of return that a particular enterprise can earn—which varies greatly by entrepreneur within and across industries—is a much better index of learning-by-doing than is some measure of gross investment. Fortunately, the internal rate of return itself can attract enough resources to individual firm–households if an adequate capital market exists. State subsidies to encourage technical innovation can then be confined to more general support for research and development and the dissemination of information through institutions like agricultural extension services.

The Importance of High Rates of Interest

Is then the provision of cheap external finance to small-scale industry and agriculture the correct strategy for the government to follow? Notice that our small farmer, contemplating a discrete investment in the “green revolution,” can greatly improve his position even if he has to borrow at a rate that exceeds the marginal rate of return under self-financed investments with the old technique. Artificially low-cost loans or subsidized credit programs may be both unnecessary and unwise.

Consider the pooling of savings in a number of similarly situated, although not identical, firm–households. The borrowing rate for firms undertaking discrete investments can be closely related to the return seen by those who are net savers. By paying a rate of interest on financial assets that is significantly above the marginal efficiency of investment in existing techniques, one can induce some entrepreneurs to disinvest from inferior processes to permit lending for investments in improved technology and increased scale in other enterprises. Even though all entrepreneurs will continue to do some internal investing, a higher proportion of gross savings will pass through the external capital market. The release of resources from inferior uses in the underdeveloped environment is as important as new net saving per se.

The enterprise with the most productive investment possibility can change from one point in time to the next. That is, once one firm or farm upgrades its technology, the repayment flow can then be used by another to do the same—again at a sufficiently high rate of interest to lure funds away from lower-yield investments elsewhere. Given different productive opportunities across family firms, no single firm need continually outbid others that also have possibilities for modernization. Rather, one can imagine a sequence of discrete investments by different entrepreneurs as new technologies become diffused throughout the economy.

Where loans are plentiful, high rates of interest for both lenders and borrowers introduce the dynamism that one wants in development, calling forth new net saving and diverting investment from inferior uses so as to encourage technical improvement. In contrast, the common policy of maintaining low or negative rates of interest on financial assets and limited loan availability may accomplish neither. It is easy for authorities to underestimate the possible yield from loans to small-scale enterprises that have low re-


8. This possibility is demonstrated more formally in the technical note at the end of this chapter, where the slope of $T, T, \hat{T}$ at $B$ in Figure 2-1 is exceeded by the slope of $CD$, the borrowing rate.

9. As illustrated by the movement from $B$ to $E$ in Figure 2-1, below.
turns on existing investments. By comparison, established enclaves in export, or import-substitution, industries may seem more lucrative because of their historically freer access to domestic and foreign sources of external finance. However, evidence is provided in Chapter 7 that potential returns to the efficient deployment of finance in the indigenous economy can be much higher than in the established enclaves.

Uncertainty and Leverage

The disadvantages of capital accumulation through self-finance have been discussed at some length. But what prevents the development of financial institutions that break the confines of self-finance? The answer is, of course, uncertainty, which fragments the interest rate structure so that it no longer uniformly reflects the community’s collective time preference. “The effect of risk . . . is to lower the rate of interest on safe loans, though at the same time . . . it will raise the rate of interest on unsafe loans. . . .” 10 In addition, “the necessity of having to offer collateral will affect not only the rate which a man has to pay, but the amount he can borrow. It will limit therefore the extent to which he can modify his income stream by this means.” 11

Many unfortunate public policies are attempts to get around the uncertainty that plagues capital markets in underdeveloped economies, as is specifically illustrated in Chapter 3. Financial institutions for reducing uncertainty at some cost in real resources are explored in Chapters 6 through 8. The remainder of this chapter is limited to two objectives: (1) to characterize briefly the inadequacies of current approaches to the pure theory of uncertainty, and (2) to distill a point of view more relevant for the development problem as defined here.

In contrast to the fragmentation hypothesis, prevailing theories of uncertainty assume that individual savers and investors are quite free to select whatever portfolios of physical and financial assets they choose. Moreover, to do so they can borrow—issue their own liabilities—without restraint at a given rate of interest. This freedom characterizes the “mean-variance” approach to uncertainty, associated with James Tobin 12 and the “state-preference” approach of Kenneth J. Arrow. 13

In this theoretical context, uncertainty can be defined “objectively” in terms of the variable returns one might experience in holding alternative physical and financial assets. This variability in expected rates of return is the same for all asset holders or “entrepreneurs,” although wealth owners may differ in their personal willingness to assume risk. The principal raison d’etre of the financial system, then, is to ensure that risk-bearing is distributed according to people’s “taste” for risk-taking. Risk averters will hold safe assets with lower yields. Those with a taste for risk will hold high-variance, high-return assets and may borrow or leverage themselves to do so. Indeed, “potential private borrowers are individuals with little or no risk aversion.” 14

In the underdeveloped world, however, neither individuals nor the government have a common menu of physical assets, with objectively defined probability distributions of rates of return. Indeed, if the division of labor is at all important, investment and production opportunities will be highly differentiated—even among government departments. The efficiency with which different assets are operated will depend on who owns or manages them. Consequently, the best investment opportunities (those with the highest expected rate of return) need not be the most risky, defined in the objective sense. Entrepreneurs (potential borrowers) in a position to exploit these high-return opportunities may or may not be risk preferers. Nevertheless they are likely to be constrained from investing by their own limited wealth and inability to borrow.

Similarly, potential lenders (savers)—even those with a significant personal taste for risk bearing—may have limited internal

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11. Ibid., pp. 210–11.
investment opportunities of their own, and no external outlet. For example, they may be farmers who are confined to low-yield saving-investment within a traditional technology. Over all, differences in production opportunities and information availability can be expected to swamp differences in personal taste for risk-bearing—with the latter the concern mainly of operators of gambling casinos. The potential increases in real output associated with an improved financial structure, therefore, are much greater than the conventional theory of uncertainty would have one believe.

Why "subjective" uncertainty exists among firm–households (potential lenders and borrowers) is easy enough to see. Economic units, on both the saving and the investing side, are small. Reliable information on any one contemplated loan or investment may be costly, relative to its size, for outsiders to obtain. Repayment records are not well established, and many units operate with little liquidity. The fear of bankruptcy or default—which hardly enters at all into conventional uncertainty theory—pervades the underdeveloped economy.

In dealing with this interpersonal uncertainty and imperfect information, leverage becomes a key consideration. Many entrepreneurs can obtain no significant leverage through borrowing and are limited to investing their initial endowments. Moreover, for those who can obtain some external financing, their initial endowments may be an important form of collateral to ensure good performance. Thus initial endowment and capacity to borrow are complementary over a significant range, and leverage is particularly limited for those with small endowments. Ideally, a highly developed capital market markedly reduces the correlation between initial wealth holding and access to external finance.

Uncertainty, which reduces leverage in the amount an entrepreneur can borrow, also shortens the time horizon over which he can borrow. Finance is at very short term in the underdeveloped economy, severely limiting the intertemporal redistribution of entrepreneurial resources. The same need for collateral or security is manifested in demand for a quick visible payoff on the trickle of external finance that is provided. Thus borrowing has a time dimension and a quantity dimension, both of which are severely limited. Contrary to prevailing theories, unlimited personal freedom to select asset portfolios does not exist.

Moderating uncertainty and reducing fragmentation in capital markets require careful monetary and financial policies and a benign view of institutions that facilitate borrowing and lending over time. This, however, has generally not been the route followed by authorities in LDCs where organized and unorganized finance have languished and/or been actively repressed. Rather, various devices are used to substitute for nonoperative capital markets, as will be seen. Implicitly, governments have been strongly influenced by the financial constraint, but have responded with various "second-best" policies that have turned out to have unfortunate consequences.

**Technical Note**

The problem of allocating investment and consumption over time is telescoped into a two-period Fishelian diagram in Figure 2-1. Individuals may abstain from consumption (invest) in period one in order to augment their consumable output in period two. Income or starting wealth, $Y$, as well as consumption, $C$, in period one are measured on the horizontal axis. Investment in the first period increases the income flow in the second, which is measured on the vertical axis. Internal investment opportunities, initial endowments, and the possibilities for borrowing and lending externally can all be encompassed by the diagram.

To illustrate the problem of "indivisibilities," it has been assumed that internal investments within the firm can be made only in the context of two distinct technologies. $T,T'$ is a "traditional" agricultural technology with continually diminishing returns to investment beginning at $T$. $T,T'$ defines the farmer's trade-off between reducing consumption in period one in order to increase it in period two, without significant innovation in agricultural technique. In contrast, $T,T''$ may represent a more mechanized technique or an irrigation system. There is a discontinuity in returns—associated with the purchase of the initial equipment or the building of an irrigation ditch—since an investment of $T,T'$ is
period two’s consumable income. The fact that the investment locus extends to the left into the second quadrant indicates simply that investment opportunities exceed the current endowment.

The limited initial endowment relative to consumption needs can bias the choice of technique if the entrepreneur is restricted to self-finance. First and second period consumption can be positive in a balanced fashion at B only when the enterprise uses the traditional technology; whereas first period consumption would have to be negative—an economic impossibility—if the economies of scale of the superior technique were effectively utilized. The consumption indifference curves for the entrepreneur/household are given the conventional convex shapes in I₁ and I₂. Consumption must be positive in both periods, and one can expect this consumption constraint to bind severely in poor economies. In the case portrayed in Figure 2.1, the consumption constraint and limited endowment lock the entrepreneur into an inferior technology at point B.

Access to external borrowing, however, will permit the entrepreneur to break out of the traditional mold with higher production, using new technology at D and with much improved consumption at C. That is, if he can borrow as much as he wishes at the rate of interest given by the slope of the straight line DC, this external finance will permit him to invest Y₁D₁ in the new technology and increase consumption in period one. The gain in private and social productivity permits him to repay the loan in period two. Notice that the slope of DC, which defines the rate at which he can borrow, is greater than the marginal productivity of self-financed investment at point B, under the traditional technology.

In an idyllic “fully developed” economy, such intertemporal transactions would take place freely so that neither consumption limitations nor sparse initial endowment would inhibit high-return investments where “lumpiness” or indivisibilities were important. In short, poverty would be no barrier to the efficient deployment of the country’s limited capital.

15. Since this two-period model is well established in the literature, the reader is referred to Hirshleifer, *Investment, Interest, and Capital*, especially Chaps. 2 and 3, for further clarification of the underlying concepts.