

# Modern Economic Theory and Development

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THE PAST 50 YEARS have seen marked changes in our understanding of development. We know that development is possible, but not inevitable. We have had a wealth of experiments. There are clearly no sure-fire formulas for success; if there were, there would be more successes. Some strategies seem to work for a while and then stall; some strategies seem to work in some countries and not in others.<sup>1</sup> Economic theory has evolved to account for the successes and failures. This chapter attempts to describe these changes in economic theory—both in the kinds of models used and in the factors that are identified as playing key roles. It focuses on two pivotal questions: What forces can explain the divergence in incomes across countries? What implications can we draw for the nature of the interventions most likely to promote development?

A basic theme of this chapter is that industrial countries differ from developing countries by much more than their level of capital—or even their human capital. More capital may be helpful, but, remarkably, even a transfer of funds may not have a large effect on economic growth (see World Bank 1999a). Eliminating government-imposed distortions is also obviously desirable but seems neither necessary nor sufficient for sustained growth.<sup>2</sup> A view shared by all the perspectives on development that we explore in this chapter is that industrial and developing countries are on different production functions and are organized in different ways. Development is no longer seen primarily as a process of capital accumulation but rather as a process of organizational change.

We discuss work done in three broad, interrelated research programs—the economics of information, the theory of coordination problems, and institutional economics. These research programs depart from the strong assumptions of neoclassical theory. In that theory, every equi-

librium is a Pareto optimum, and, in general, the equilibrium is unique.<sup>3</sup> In contrast, in the research programs considered here, individuals need not make the right tradeoffs. And whereas in the past we thought the implication was that the economy would be slightly distorted, we now understand that the interaction of these slightly distorted behaviors may produce very large distortions. The consequence is that there may be multiple equilibria and that each may be inefficient. Given some initial equilibrium, even though each individual may know that there is another equilibrium at which all would be better off, individuals are unable to coordinate the complementary changes in their actions necessary to attain that outcome. This chapter provides examples in which rent-seeking, inefficient institutions, and underinvestment in research and development and training can each be explained as a *coordination failure*.<sup>4</sup>

The research programs discussed here entail a major shift in focus and in conclusions from neoclassical models. Such models hypothesize that one can explain output, growth, and the differences between industrial and developing countries by focusing on “fundamentals”—resources, technology, and preferences. If preferences are the same across countries, then differences across countries in capital resources are explained only by the fact that some countries started to accumulate before others. That is, underdevelopment is a result of a late start, and, in the long run, all countries will converge in per capita incomes. Appendix A analyzes the neoclassical growth model (Solow 1956) and argues that low capital cannot explain underdevelopment.

Neoclassical theory contends that the particular set of institutions in an economy does not matter. This position rests on three points: (a) outcomes are determined by fundamental forces (reflecting resources, preferences, and technology), (b) these forces lead to Pareto-efficient outcomes, and (c) institutions do not even influence the choice of the equilibrium. For example, whether a society has an institution in which the bride’s family pays a dowry, or the groom’s family pays a bride price, or neither one, neoclassical theory would contend that—with given fundamentals—the distribution of incomes will be the same as it would have been without those institutions (Becker 1973). The standard modeling technique in neoclassical economics is to solve for the outcomes that would emerge from an impersonal setting with a market for all goods, all periods, and all risks, where people make trades “with the market.” History does not matter. Not even the distribution of wealth matters if one is interested solely in efficiency. These are strong hypotheses. And in leaving out institutions, history, and distributional considerations, neoclassical economics leaves out the heart of development economics. Modern economic theory argues that the fundamentals are not the only deep determinants of economic outcomes.

Neoclassical theorists could not, of course, turn a blind eye to the fact that the kind of convergence predicted by theory was not occurring, and thus they had to look to some “outside” intervention. *Government failures provided an easy out.* When neoclassical economists go beyond the fundamentals of resources, technology, and preferences, they focus almost exclusively on government—it is government impediments to markets that prevent the economy from working smoothly. But many versions of such theories are inherently unsatisfactory. In some versions the government failures are assumed to be exogenous, leaving unexplained why they should be larger in some societies than in others. In other versions political-economy models are used to explain the government failures—in which case they typically do not explain how or when certain recommended interventions would overcome the political forces that initially led to the distortions. Surely, a pious speech from an outside adviser would seem unlikely to displace fundamental political forces! More broadly, as we note below, the “government-induced distortion” theory of underdevelopment does not do well in explaining key aspects of the development process.

Today we recognize that government failures can be critically important. But we also recognize that they need to be, and often can be, explained; with appropriate institutional design, they can even be limited. We recognize, as well, that even without government failures, market failures are pervasive, especially in developing countries.<sup>5</sup> The purpose of this chapter, however, is to go beyond the standard discussion of market failures and development in order to identify a broad set of basic influences on outcomes. We focus on four: institutions, the distribution of wealth, history, and “ecology”—by which we mean the behaviors of other agents in the economy that have spillover effects.

*Institutions.* Neoclassical theory pierced the veil of institutions, seeing through (so it argued) to the deeper determinants of economic outcomes—the economic fundamentals. Today we recognize that information and enforcement problems impose limits on economic possibilities that are just as real as the limits of technology. Nonmarket institutions arise in response to those limits and influence outcomes. But improvements in those institutions—“good mutations”—may not survive on their own if they require complementary changes in other social institutions. “If the institutional matrix rewards piracy, then piratical organizations will come into existence . . .” (North 1994: 361). There is no teleology—no evolutionary force that ensures that outcomes will be efficient. If a Nash equilibrium in institutions exists, it may not be efficient. We will provide many illustrations.

*Going inside the black boxes of institutions.* A major thrust of modern development economics is to shift the boundary between what we black-box (for example, treat as an institutional rigidity) and what we

explain with our models. Early theoretical work that focused on institutional issues and the scope for policy in development attempted to identify specific institutional characteristics of developing countries and incorporated them as exogenous features of models. This was the “structuralist” approach to development; an overview is Chenery (1975). Later work tried to evaluate policies within the context of articulated economic models that explained the problems which the policies were designed to solve.

The shift in this boundary has had strong implications for our views about policy. The chapter provides five examples.

- *Complementarities in industrialization.* Earlier models of the “big push” (Rosenstein-Rodan 1943) simply assumed complementarities in demand so that expectations of low investment could be self-fulfilling. The implication was that the government should intervene in the industrialization process. Later models developed frameworks in which complementarities were derived as an equilibrium outcome. In some cases, the complementarities were shown not to produce inefficiencies (Murphy, Shleifer, and Vishny 1989: sect. 3) or to vanish once an economy was opened to international trade. But in other cases, complementarities did produce inefficiencies, and there were no easy policy measures to resolve them. For example, there may be no simple way around search costs.

- *Rural credit.* Earlier models simply assumed that rural credit markets did not work well. Later models derived credit market imperfections from information and enforcement costs. An implication of these models was that standard interventions through credit subsidies might be ineffective but that institutional interventions could improve credit markets.

- *Labor markets.* Earlier models of urban unemployment treated the urban wage as fixed and therefore argued that it did not reflect the opportunity cost of labor. Later models explained why in equilibrium the urban wage might exceed the rural wage but nonetheless reflect the opportunity costs of expanding urban employment.

- *Saving rates.* Earlier models assumed that a higher fraction of profits than of wages or rural incomes was saved and that therefore rural incomes should be disproportionately taxed. Later experience demonstrated that rural saving rates could be very high, and theory shed light on institutional influences on saving.

- *Political constraints.* Political processes are endogenous. Earlier models tended to ignore political processes and to assume that outside intervention could effectively change policies. We distinguish “deep” interventions, which affect underlying economic and political forces and therefore change policies, from “shallow” ones, which do not and which may actually make things worse.

*Inseparability among distribution, institutions, and efficiency.* Neoclassical economics argued that neither institutions nor wealth distribution mattered for efficiency; productive resources always gravitated through market exchange into the hands of the person who valued them the most. An even stronger statement of that idea is the Coase theorem. When an economy departed from the complete-markets assumption of the neoclassical model, Coase (1960) argued, private bargaining would provide an antidote so that the economy would still be efficient. To be sure, Coase recognized that his theorem would not hold in the presence of transaction costs (McCloskey 1998). If a situation *does* have transaction costs or information problems, then it *does* matter how wealth and property rights are distributed. Transaction costs are important, particularly in developing countries. Modern economic theory emphasizes that transaction costs depend on institutions, that institutions are endogenous, and that the distribution of wealth affects economic efficiency both directly and through its effect on institutions.<sup>6</sup>

It is easy to see how the distribution of wealth affects efficiency in principal-agent relationships. In these relationships the principal (say, a lender) controls a resource that he entrusts to another individual, his agent (say, the borrower), and there is imperfect information concerning either what action the agent has undertaken or what he should undertake. In many situations the actions of an individual are not easily observable. For instance, a bank entrusts resources to a borrower but cannot perfectly monitor his investments and initiative; an agricultural landlord entrusts land to a tenant but cannot easily monitor his effort and care. The task of the principal is to design an incentive scheme to try to align the agent's incentives with his own. The principal-agent literature focuses on the design of contracts to motivate the agent to act in the principal's interest. Contract provisions that can achieve this are collateral, bonds, and provisions that shift the risk of poor output onto the agent. The greater the agent's ability to post collateral, put up a bond, pay rent in advance, or absorb risk, the greater the agent's incentives to take the appropriate actions.<sup>7</sup> In these ways, an agent's wealth will affect his incentives and productivity. Wealth in the form of collateral plays a *catalytic role* rather than a role as *input* that gets used up in the process of producing output (Hoff 1996).

The first key point is that the extent to which wealth does play this role depends on its distribution. Clearly, if the distribution of wealth is so unequal that some individuals have more than enough wealth to put their skills to best use while others have so little wealth that they cannot even obtain credit to undertake a productive project, the catalytic role of wealth will be limited. A second key point is that because the wealth distribution affects the market decisions of individuals, it affects *macrovariables* such as prices and wages, and so the welfare of any single agent depends, in general, on the entire distribution of wealth.<sup>8</sup>

Perhaps the clearest illustration of the effect of wealth distribution on contracts is sharecropping, which is ubiquitous in developing countries. Sharecropping arises as a result of inequality in the distribution of wealth (landholdings) and the absence of better ways to share risks, or the limited ability of the tenant to absorb losses. It creates a principal-agent problem between landlord and tenant that imposes potentially huge costs on the economy—the distortions associated with a 50 percent share are similar to those associated with a 50 percent marginal tax rate. (A case study is Banerjee, Gertler, and Ghatak 1998.) Overall agency costs in labor and capital markets can be reduced by interlinking those contracts, but such interlinkage may reduce the effective degree of competition in the economy (Braverman and Stiglitz 1982, 1989; Ray and Sengupta 1989).

A third key point is that because wealth distribution affects contracts, incentives, and outcomes in one period, it affects the distribution of wealth in the next. An individual with no or few assets may be relatively unproductive (that is, relative to his output in entrepreneurial occupations or under high-powered incentive contracts that he could enter if he had more wealth). And if there are many individuals with no or few assets, wage rates will be low. With low wages, individuals with initially low wealth will make low bequests to the next generation. Thus, an initial highly unequal distribution of wealth may *reproduce* itself from one period to the next. Banerjee and Newman (1993) show that the effects of an initial highly unequal wealth distribution can last forever and can permanently limit growth. Mookherjee and Ray (2000) present an even stronger result, for they allow agents to save over their infinite lifetimes to maximize their lifetime utility. Why, they ask, do not poor agents save aggressively in order to increase their productivity in the future? In answer, they demonstrate that these agents *will* do so if the market is competitive, but “if agents have no bargaining power [and lenders can only write one-period contracts], then the returns to saving of poor agents are appropriated entirely by lenders, resulting in poverty traps” (Mookherjee and Ray 2000: 1).

*History.* There are other ways besides the distribution of wealth that history affects economic outcomes. History influences a society’s technology, skill base, and institutions. It is not necessarily true that the impact of past events erodes over time. Those events may set the preconditions that drive the economy to a particular steady state.<sup>9</sup>

The case in which a transitory event has persistent effects is known as *hysteresis*. For example, the loss of life from the Black Death and the resulting shortage of labor induced labor-saving innovations in Europe, with profound implications for the historical evolution of the continent.<sup>10</sup>

History also affects outcomes by affecting beliefs. An obvious case is that in which expectations are (at least partly) adaptive: individuals

expect people to behave in the future as they have in the past. But even with fully rational expectations, history can cast a long shadow. For example, an outbreak of corruption, or the revelation that some firms in an industry passed off shoddy goods as high-quality goods, can tarnish the reputation of the whole industry. That, our intuition tells us, can reduce the incentive of every member of the group to behave honestly in the future. Tirole (1996) explores this idea formally. He assumes that the reputation of a member of the group (for example, an employee in an organization or a firm in an industry) depends on his own past behavior and also, because his track record is observed with noise, on the group's past behavior. The revelation that any member of the group was dishonest in the past will *increase* the time it takes for any given agent to establish a reputation for honesty. This will *lower* the individual's incentives to be honest and may create a *vicious circle of corruption*, where "the new members of an organization may suffer from the original sin of their elders long after the latter are gone. (p. 1)" This is an example of *path dependency*, where the level of a variable in the future depends on its level in the past.

History also matters because it affects exposure to cultural models, which shapes preferences. Changes in the ways that members of one generation earn their living may influence the next generation through changes in childrearing, schooling, informal learning rules such as conformism, role models, and social norms. The market itself is a social institution that shapes preferences; it may foster characteristics of openness, competitiveness, and self-interestedness. (Interesting discussions are in Acemoglu 1995: sect. 4, and Bowles 1998.) Preferences, technology, and institutions are all endogenous, and transitory events can have persistent effects on them.

*Multiple equilibria.* One of the major insights of general equilibrium theory is that what happens in one market has ramifications for others. In the standard neoclassical models the interactions are mediated by prices, and normally there is a unique equilibrium. If, on the contrary, a continuum of equilibria were associated with any set of fundamentals, then general equilibrium theory would not be very helpful: one could not explain much of the variation across economies by focusing on fundamentals. In fact, Solow's neoclassical growth model went further than asserting that there was a unique equilibrium at a moment in time. In his model, equilibrium in the long run did not depend on history, institutions, or the distribution of wealth.<sup>11</sup> The celebrated prediction of his model was the *convergence* of per capita incomes across economies. But once one broadens the analysis in the way we have suggested, it is easy to construct models that have multiple equilibria, as we will show below.

"*Ecological economics.*" More generally, modern development economics rejects the very notion of "equilibrium" that underlies tradi-

tional neoclassical analysis. In that analysis, the dynamics of the economy are mechanical: knowledge of the fundamentals and the initial conditions enables one to predict with precision the course of the “evolution” of the economy.<sup>12</sup> Even if there are stochastic events, if one knows the stochastic processes affecting the relevant variables, one can predict the probability distribution of outcomes at each date. By contrast, modern development economics tends to be influenced more by biological than physical models. Whereas the latter emphasize the forces pulling toward equilibrium—and with similar forces working in all economies, all should be pulled toward the same equilibrium—the former focus more on evolutionary processes, complex systems, and chance events that may cause systems to diverge.

Near the end of *The Origin of Species*, Charles Darwin wrote, reflecting on the Galapagos Islands:

[The plants and animals of the Galapagos differ radically among islands that have] the same geological nature, the same height, climate, etc. . . . This long appeared to me a great difficulty, but it arises in chief part from the deeply seated error of considering the physical conditions of a country as the most important for its inhabitants; whereas it cannot, I think, be disputed that the nature of the other inhabitants, with which each has to compete, is at least as important, and generally a far more important element of success. (Darwin [1859] 1993: 540)

The economy is like an ecosystem, and Darwin was implicitly recognizing that ecosystems have multiple equilibria. Far more important in determining the evolution of the system than the fundamentals (the weather and geography) are the endogenous variables, the ecological environment. Luck—accidents of history—may play a role in determining that environment, and thus in the selection of the equilibrium.

If this is the case, development may be both easier and harder than was previously thought. Under the older theory, “all” one had to do to ensure development was to transfer enough capital and remove government-imposed distortions. Under the new theories, “all” one has to do is to induce a movement out of the old equilibrium, sufficiently far and in the right direction that the economy will be “attracted” to a new, superior equilibrium. Although this may require fewer resources, it may take more skill. Some perturbations could lead the economy to an even worse equilibrium—as, some would argue, may have been the case in certain economies in transition. In this broader perspective, the “deep” fundamentals of neoclassical theory—preferences and technology—are themselves endogenous, affected by the social and economic environment.

Although neoclassical economics has failed to provide us with a theoretical framework for thinking about the problems of develop-



ment, it has played a critical role in the evolution of development theory. By arguing that institutions do not matter, it has forced us to think about why they do. By arguing that wealth distribution does not matter, it has forced us to think about why it does. And by arguing that the main interactions in an economy are mediated by prices, it has forced us to think about the myriad of other important interactions in our ecosystem.

### I. Obstacles to Development: Beyond Capital Endowments and Government-Induced Price Distortions

How can we explain why the gap in incomes between industrial and developing countries has not narrowed over the past 50 years? A view shared by all the nonneoclassical perspectives on development is that the two groups of countries are on different production functions and are organized in different ways. The deeper question concerns the sources of these differences. This part explores in greater detail three complementary hypotheses: institutions, “ecology,” and knowledge.

#### *Institutions, Organization, and Social Capital*

A central insight of recent theoretical work is that although the institutions that arise in response to incomplete markets and contracts may have as their intention an improvement in economic outcomes, there is no assurance that improvement will actually result. Institutions may be part of an equilibrium and yet be dysfunctional. For example, Arnott and Stiglitz (1991) examine the effects of a social institution that arises because of incomplete insurance provided by markets faced with moral hazard problems. They show that informal social insurance may crowd out market insurance and decrease social welfare. With endogenous institutions, developing countries may be caught in a vicious circle in which low levels of market development result in high levels of information imperfections and these information imperfections themselves give rise to institutions—for example, informal, personalized networks of relationships—that impede the development of markets. (Other examples are Kranton 1996; Banerjee and Newman 1998.)

A precondition for effective markets, especially those associated with intertemporal trades, is the existence of institutions that make rights to private property secure, enforce contracts, and provide for disclosure of information. This requires government. To be sure, Mafia-style enforcement mechanisms are used in many places, but such enforcement mechanisms have their own drawbacks (Gambetta 1993). To name just one, the same extralegal mechanisms used to enforce

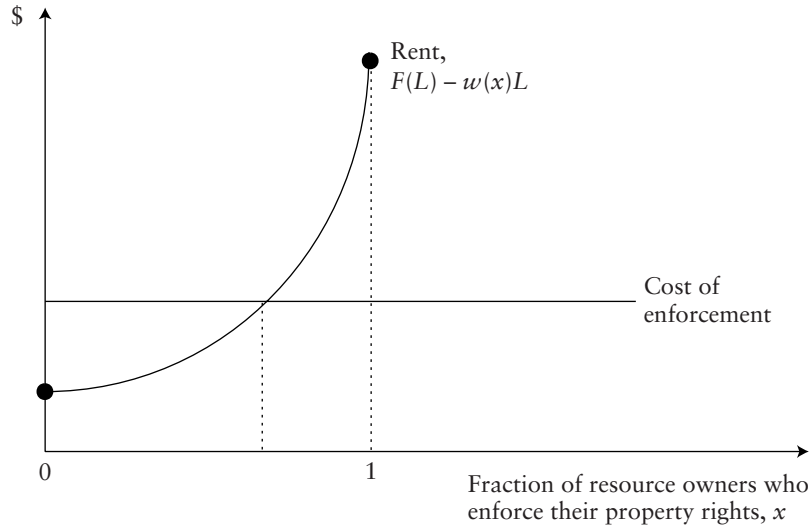
contracts are typically used to deter entry. It is not just a too overbearing state that impedes markets; frequently, a too weak state is the problem (World Bank 1997).

In some cases, private parties can enforce property rights through their individual efforts, but there is no presumption that such enforcement will have any optimality properties. De Meza and Gould (1992) demonstrate this result in a setting where the state defines property rights over a natural resource such as land or minerals but enforcement depends on the individual owner's decision to expend a fixed cost for enforcement—for example, to fence in or patrol his land. If the owner does not incur the enforcement cost, then, by assumption, other individuals will have free use of his property. The benefit to an owner from enforcing his property right is that he can hire labor to work with his natural resource and can collect the resource rents. In deciding whether to enforce his property right, an owner compares his potential rents with the fixed cost of enforcement. These rents will be larger, the lower the reservation wage of workers. In equilibrium, the reservation wage of workers itself depends on how many other owners are enforcing their property rights: as the fraction of property owners who enforce their rights *increases*, the outside opportunities of workers fall and so does the reservation wage. With lower wages, potential resource rents *rise*. Two stable equilibria may therefore exist—one in which all owners enforce their property rights and obtain high rents, and one in which none do and the rent that a single owner could obtain from enforcement is low.<sup>13</sup> (See Figure 1.)

As Coase (1937) emphasized, when enforcement of private property rights is costly, a market may or may not be the best allocation system. But as Coase did not recognize, whatever the best allocation system is, a decentralized economy with private enforcement costs may not reach it. Recent historical accounts go beyond this observation and show that systems of contract enforcement exhibit path dependence.<sup>14</sup>

Social capital (including norms, information networks, reputation mechanisms, and social sanctions) can sometimes serve as a substitute for formal enforcement mechanisms. Implicit contracts, enforced by repeated engagements, may be as important in ensuring “good behavior” as explicit contracts. There is a concern that early in the process of development, norms and information networks become weakened and thus social sanctions become less effective. As traditional communities break down with widespread migration out of villages and with high rates of change (for example, labor mobility), enforcement of implicit contracts becomes difficult. The problem is exacerbated if interest rates are high. Breakdowns in informal enforcement mechanisms normally occur prior to the reestablishment of new bonds and the development of effective formal mechanisms: social capital is destroyed before it is recreated.

Figure 1. Multiple Equilibria (with Corner Solutions) in the Level of Enforcement of Property Rights



We view society as an *organization*, in which exchange and production are mediated not just by markets but by an array of formal and informal arrangements. Early stages of development are often characterized by retrogression and decay rather than by an increase in social and informational capital; these losses are compensated for (partially or wholly) by increases in physical and human capital. The consequence of the losses is that increases in productivity are smaller than might otherwise have been expected. For instance, the widening of markets reduces the role of community enforcement and may increase the need for uniform standards and for screening institutions, but these may emerge only slowly over time. (An informal account is Klitgaard 1991.) Until they emerge, technical change can actually exacerbate information problems to such an extent that some, all, or even more than all of the gains from the technical change are dissipated (Hoff 1998).<sup>15</sup>

The pacing and sequencing of government-imposed reforms may attenuate or exacerbate these disorganizational forces. Ancillary effects of reform can largely offset or more than offset efficiency gains from otherwise desirable reforms. For instance, a potentially huge, unintended effect of rapid reforms in banking standards or exchange rate adjustments is to destroy the franchise values of banks and reduce other asset values. This weakens banks (which are then more likely to engage in looting or excessive risk-taking) and thus increases the likelihood of

bank failure. If banks fail, the resulting credit contractions cause firm bankruptcies, leading to further destruction of organizational and informational capital.

Many developing countries face the dual challenge of a loss of social capital as development proceeds and a lack of formal and informal institutions to constrain government to act within a rule of law. Democracy is a check on government. The ability of government to act as an agent of development may depend on the strength of democratic forces and on the extent to which voters are divided along class or ethnic lines. Many developing countries are polarized by class or ethnicity, which impedes the ability of the state to act as a “developmental state” in decisions about public goods (Easterly 1999) or redistribution (Tornell and Lane 1999). Others face problems with increasing levels of violence. In Africa civil disturbances have proved to be an important impediment to development (Easterly and Levine 1997).

Viewing development from an ecological/evolutionary perspective introduces new elements into the dynamic process. It is a matter of tracing out not just the dynamics of capital accumulation (on which traditional neoclassical economics focused) or even the transmission of knowledge (on which Schumpeterian theory focused) but also the evolution of social, economic, and political institutions. We need to know how, for instance, particular interventions affect the costs of forming certain institutions, which in turn affect the kinds of reform that can be enacted subsequently. We shall return to these themes in Part II.

### *Some Examples of Coordination Problems*

Only limited progress has been made in modeling the dynamic process of institutional change described in the preceding paragraph, but there has been considerable progress in the formulation of models in which coordination failures can occur.<sup>16</sup> Here, we present an overview of that work. The work captures the idea that a myriad of activities that are central to the development process, such as innovation, honesty in trade, investment, labor training, and saving, can create externalities. The externalities may be mediated by (a) changes in beliefs and information, (b) effects on the technology of the individual agent, (c) changes in the set of markets that exists, (d) changes in the size of the market, and (e) changes in search costs. These externalities affect the rewards to activities and can lead to the existence of multiple equilibria, each with a different reward structure. Thus, this work describes settings in which a given set of fundamentals—analogue to the geology, climate, and natural resources of the Galapagos Islands described by Darwin—can support as an equilibrium any one of a wide set of behaviors.

We postpone until Appendix B a formal treatment of the mathematical structure of these models, and until Part II a brief discussion of dynam-

ics. To anticipate the latter discussion, we note here that it is possible to embed the static equilibria we will describe in an intertemporal model, as Adserà and Ray (1998) do, and to show that even when agents have perfect foresight, there may not exist an equilibrium path along which an economy is able to break out of a “bad” equilibrium. The trap holds.

We present below models of *market* economies with a large number of participants, so that each ignores the effect of his actions on others, and, in fact, that effect is infinitesimal. (We thus focus on the Nash equilibria.) The models are structurally similar to *games* with strategic complementarities, but there are some important conceptual distinctions. In the game-theoretic models, the very notion of strategic interactions suggests that each player is aware that his actions may affect the actions of others, whereas in the market equilibrium models on which we focus, such strategic interactions are ruled out by assumption. We would argue that for analyzing problems of markets, the market models are far more relevant than the game-theoretic models (although the latter may be important in understanding the interaction between an isolated tenant and his landlord).

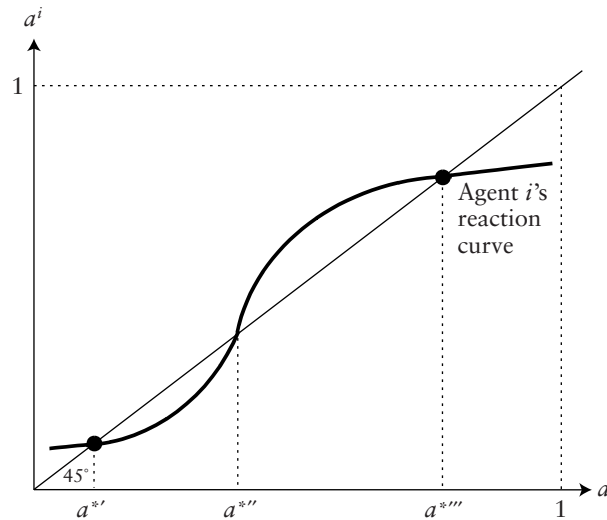
*1. R&D Spillovers.* One way to conceptualize the kind of R&D that most producers undertake is that it is a transformation of a set of known facts and accepted principles into a potentially profitable new application. In this view, the expected return to an investment in R&D rises as the stock of ideas that are in the public domain increases. If some part of the outcome of private research seeps into the “public pool,” the more private research that is conducted, the larger is the pool of ideas on which each producer draws. With a richer stock of ideas, the incentive of each producer to undertake R&D rises (Romer 1986).

To analyze this situation, consider a simple model in which the profit (utility) of any producer (all producers are assumed identical) depends on prices, his own level of R&D (his action  $a^i$ , which can be any value between 0 and 1), and the level of R&D of all others (their action  $a$ ). Since we will be concerned here only with symmetric equilibria, we consider only the case in which all other producers choose the same action. Thus, we write the profit function as  $U^i[a^i; a, p(a)]$ , where  $p$  is the price vector (which itself depends on the vector of actions of the agents). Assume for each agent decreasing marginal returns to an increase in the level of its action. Each agent chooses its action to maximize its profit, given the actions of others. (Each agent is small enough that there are no strategic interactions, and it ignores its effect on  $p$ .) The reaction function

$$(1) \quad u^i[a^i; a, p(a)] = 0$$

characterizes the action that the representative agent  $i$  will take for all possible values of  $a$  selected by the remaining actors. The function  $u^i$  is

Figure 2. Dual Stable Equilibria in a Model with Symmetric Actors



the partial derivative of  $u^i$  with respect to the first argument  $a^i$ . Equation (1) states that, given  $a$ , the agent cannot obtain a higher payoff through a marginal change in the level of his action. Figure 2 depicts the case in which a higher action  $a$  by all other agents will lead the remaining agent  $i$  to follow suit: formally, a higher action by other agents increases the marginal return to higher action by each. We say that the actions of different agents are *complements*.

The interior, symmetric equilibria are values of  $a^*$  that solve the equation:

$$(2) \quad u_1^i [a^*; a^*, p(a^*)] = 0.$$

Multiple equilibria may occur if the complementarities across agents are sufficiently large. Figure 2 illustrates a stable low-level equilibrium at  $a^{*'}$  and a stable high-level equilibrium at  $a^{*''}$ . When others do little R&D, it does not pay any firm to do much R&D. A shock that changes the level of R&D by each firm to a level even slightly above  $a^{*''}$  may generate a response that shifts the equilibrium to  $a^{*''}$  (see Romer 1986 and Krugman 1991 for a discussion of dynamics).

The model captures the simple idea of positive spillovers across agents. In contrast, in neoclassical theory the only endogenous variables that affect an agent are prices. Prices always point the way to efficient allocations because markets are *complete*. (That is, there would need to be

a mechanism by which one firm would be compensated by other firms for the spillover effects of its R&D.)

2. *Spillovers from Bureaucrats, Rent-Seekers, and Collectivist Enforcers.* The literature on coordination problems concerns not only the *level* of activities (such as R&D or investment) but also the *kinds* of behaviors and institutions that characterize an economy. Do individuals behave bureaucratically, or do they seek out innovations? Do they rent-seek, or produce? In order to enforce contracts, do they rely on sanctions applied by informal groups, by the individual, or by the state? An individual's behavior creates externalities. The externalities can determine the *ranking* of alternative courses of behavior. This can lead, as in the preceding example, to the existence of multiple equilibria, each with a different reward structure. We consider these three cases below.<sup>17</sup>

“*Bureaucratic*” versus “*innovative*” behavior. Sah and Stiglitz (1989a) formulate a model of societal equilibrium in which individuals can choose to behave “bureaucratically” or “innovatively.” Bureaucrats make life more difficult for innovators, and conversely.

Let  $x$  be the fraction of the population that chooses to be innovative. Let  $U(I; x, p)$  be the utility associated with the innovative strategy, and let  $U(B; x, p)$  be the utility associated with the bureaucratic strategy. Each individual chooses the activity that yields him the greater utility, taking  $x$  and the price vector  $p$  as given. If most people choose to behave bureaucratically, the rewards to innovation will be low, and it may pay only a few people to behave innovatively. But if most people behave innovatively, the rewards to innovation may be high, rendering that also an equilibrium. An interior equilibrium (where  $x$  is between 0 and 1) is a fraction  $x^*$  that solves the equation

$$U[I; x^*, p(x^*)] = U[B; x^*, p(x^*)]$$

and there may be multiple such equilibria. “Corner” equilibria where all agents make the same choice may also exist—one entailing bureaucratic behavior if

$$U[I; 0, p(0)] < U[B; 0, p(0)]$$

and another entailing innovative behavior if

$$U[I; 1, p(1)] > U[B; 1, p(1)].$$

A slight variant of this model can be used to explore evolutionary dynamics. Assume that, rather than the individual's *choosing* to be either innovative or bureaucratic, differential reproductive rates are a function of utility levels, so that

$$d \ln x/dt = k[U(I; x, p) - U(B; x, p)]$$

for some positive constant  $k$ . Then the set of equilibria will be the same as before, and the equilibrium on which the economy converges depends on its history. Historical events—for example, the opening of a country to international competition that differentially hurts “bureaucratic” firms—may move the economy from one equilibrium to another, thereby affecting the long-run rate of technological progress.

*Rent-seekers versus producers.* Another variant of the preceding model focuses on rent-seeking (Murphy, Shleifer, and Vishny 1993; Acemoglu 1995). This variant sheds light on why some countries fail to grow at all when public and private rent-seeking makes property rights insecure. One reason is that “rent-seeking, particularly rent-seeking by government officials, is likely to hurt innovative activities more than everyday production” (Murphy, Shleifer, and Vishny 1993: 409). “Public rent-seeking attacks innovation, since innovators need government-supplied goods, such as permits, licenses, import quotas, and so on . . .” (412).

Murphy, Shleifer, and Vishny consider a farm economy in which individuals choose to undertake one of three activities. An individual can be an “innovator,” which in some economies might mean merely producing a cash crop for the market; the key point is that his output is vulnerable to rent-seeking. Or he can produce a subsistence crop, in which case his output is not vulnerable to rent-seeking. Or he can be a rent-seeker and expropriate part of the output of the innovators. An equilibrium is an allocation of the population among the three activities. The authors make the plausible assumption that over some range, as more resources move into rent-seeking, returns to innovation fall faster than returns to rent-seeking do. As a consequence, the returns to rent-seeking relative to innovation increase, and this can give rise to multiple equilibria. In one equilibrium, the fraction of innovators is low and returns to innovation are low because the fraction of rent-seekers is high. But there is another equilibrium at which the reverse is true.

*“Collectivist” versus “individualist” enforcement.* Most development economists are now agreed that among the most important sets of institutions in an economy are those that provide for the enforcement of contracts. Greif (1994) examines the cultural factors that might explain why two premodern societies (the Maghribi in North Africa and the Genoese) evolved along different trajectories of societal organization. To illustrate the main ideas, he presents a model in which there are two kinds of actors: merchants and agents. Agents carry out overseas trade on behalf of the merchants. A merchant makes one decision: he chooses either collectivist or individualist enforcement of his contracts with agents. Collectivist enforcement entails punishing (by refusing to hire) an agent who is known to have cheated any merchant in the collective group. Individualist enforcement entails a merchant’s punishing



only agents who have cheated him. Greif shows that if the merchant believes that collectivist enforcement is likely to occur, in general it will not be in his interest to hire an agent who is known to have cheated other merchants. That makes such expectations self-fulfilling. The intuition for this result is straightforward: an agent who already has damaged his reputation has little to lose by cheating again, and so he will be more easily tempted to cheat his current employer than would an agent with an unblemished reputation. That makes the agent who has already damaged his reputation by cheating less desirable to hire. If, however, the merchant believes that individualist enforcement will occur, the motive for collectivist enforcement is absent. Thus, two equilibria, one entailing collectivist enforcement and one entailing individualist enforcement, can exist. The equilibrium that is “selected” will depend on beliefs (culture).

In the short run, reliance on individualist enforcement will be more costly, since it forgoes the stronger, group-level punishment mechanism. But in the long run, individualist enforcement will strengthen the forces that contribute to the emergence of formal, state-level mechanisms to enforce contracts and adjudicate conflicts. By facilitating the widening of markets, such institutions tend to promote long-run growth. Greif (1994) interprets the history of the West in just such terms.

3. *Spillovers and Inequality.* An important feature of economies is the way that differences in individual attributes give rise to differences in outcomes. Does the market reproduce, attenuate, or magnify them? Is the “mapping” unique? We present two examples where it is not; there can be multiple, Pareto-ranked equilibria.

*Informational externalities.* The actions that people take often reveal information not only about themselves but also about others who did *not* take those actions. This will be true whenever some hidden quality of an individual is correlated with the net benefit of taking that action. Intuition might suggest that rational individuals would always make the efficient choices over screening. But because their choice creates “informational externalities,” this need not be the case, as illustrated in one of the earliest models of coordination problems (Stiglitz 1975).

The model is based on the idea that a key role of education is not only to produce human capital but also to screen individuals by innate ability. Education credentials sort people into distinct groups in the labor market. Stiglitz (1975) presents a model in which education has *no* effect on innate abilities but can serve as a screen. The model addresses two simple questions: Is the equilibrium unique? Is it Pareto optimal?

Individuals are assumed to have private information about their ability. The higher their ability, the lower their nonpecuniary cost (e.g., the cost of effort) of obtaining an education credential. Employers cannot directly ascertain an individual’s ability, but they can observe whether

or not he has a credential. They can also observe the *average* ability of those who are, and who are not, credentialed.

In choosing whether to obtain a credential, an individual compares the gain—the difference between the wage of a credentialed and an uncredentialed worker—with the cost of obtaining the credential. The cost is given by  $C = C(z)$ , which depends on ability  $z$ . Consider the simplest case, where an individual is either high ability,  $H$ , or low ability,  $L$ . It is easy to see that two equilibria exist, one entailing screening for the high-ability type and one entailing no screening, if

$$C(L) > w(H) - w(L) > C(H)$$

and

$$w(H) - \mu < C(H)$$

where  $\mu$  represents the average productivity level in the population. The above inequalities imply that in the no-screening equilibrium, the high-ability as well as the low-ability individuals obtain *higher* incomes. Yet if all other high-ability agents obtain a credential, each high-ability agent is better off doing likewise, and so the case of screening is also an equilibrium.

This model illustrates the idea of *complementarities in the process of market creation*. To see this, let action  $a$ , where  $a$  is binary, be “to screen” or “not to screen.” Individuals’ choices determine whether there is one labor market or two (one for each ability level). If the above inequalities are satisfied, then two equilibria exist, and the one with just one labor market is better for everybody.<sup>18</sup>

*The structure of ownership: A parable of capitalism.* The next example considers the choice of contracts made by individuals of differing wealth. Hoff and Sen (2000) consider an economy in which capital markets are imperfect and, as a result, the cost of obtaining an equity stake in one’s business or home is higher for low-wealth individuals. But an equity stake is valuable because it creates high-powered incentives for effort. The standard treatment of this problem assumes no spillovers across agents. But the evidence suggests that spillovers are important. Ideas spill over across firms in Silicon Valley; a breakthrough into an export market by one entrepreneur increases opportunities to export by others in the economy; an improvement by one homeowner unavoidably increases the value of the parcels owned by others in the neighborhood.<sup>19</sup> Thus, one impact of a larger number of entrepreneurs (or homeowners) is that the return to entrepreneurship in an industrial belt (or to homeownership in a neighborhood) may increase. As in the preceding example, there may be multiple, Pareto-ranked equilibria in the choices made by an individual of a given type. And once we allow for an additional level of complexity—free migration across industrial

belts (or residential neighborhoods)—the consequences of coordination failures can be magnified.

To be more specific, consider an environment in which the cumulative distribution function of endowment wealth is  $F(W)$ . (For the moment, we treat the set of agents in the interaction environment as fixed.) Suppose that each firm is managed by either a salaried wage earner or an individual with a substantial equity stake in the firm (an “entrepreneur”). The capital market is imperfect: the interest rate for individual borrowers is higher than that for lenders. This means that an individual with low wealth will choose to become an entrepreneur only if his expected return is high enough to offset the transaction costs of borrowing. Each individual chooses the activity that yields him the greater utility, taking as given the fraction  $x$  of firms in the economy managed by entrepreneurs. Let  $V(e, x, W)$  be the utility associated with high effort  $e$  and any given wealth level  $W$ , and let  $V(n, x, W)$  be the utility associated with the same parameters and with low effort,  $n$ . Then if an interior equilibrium exists, it is characterized by a critical level of endowment wealth,  $W^*$ , at which the individual is just indifferent between entrepreneurship and wage-earning; that is,

$$V[e, x, W^*] = V[n, x, W^*].$$

An increase in  $x$  raises the left-hand side more than the right-hand side if there are complementarities among entrepreneurs. A fall in wealth lowers the left-hand side more than the right-hand side, since, in addition to the loss of consumption, there is an increase in the transaction costs of borrowing. Therefore associated with a higher  $x$  is a lower  $W^*$ : we can write the cutoff wealth level as

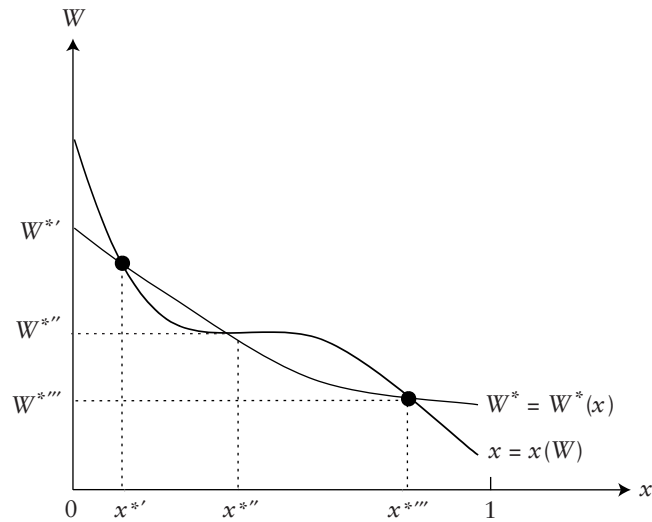
$$W^* = W^*(x).$$

Given the distribution of wealth in the economy,  $F(\cdot)$ , associated with any value of wealth  $W$  is a proportion of the population,  $x$ , whose income exceeds  $W$ . We can write this proportion as

$$x = 1 - F(W) \equiv x(W).$$

The simultaneous solution of these two equations characterizes the equilibria of the model. These two downwardly sloping curves can have multiple crossings. As illustrated in Figure 3, there may exist a low-level equilibrium in which a minority fraction  $x^{*'}$  of individuals buys enough equity to become entrepreneurs (who put in high effort); the resulting local positive externalities are low; and this outcome supports the majority decision to stay with a wage contract and produce low output. Only individuals with wealth at or above the critical level  $W^{*'}$  become entrepreneurs. By contrast, when a larger fraction ( $x^{*''}$  or  $x^{*'''}$ ) of individuals become entrepreneurs by buying equity in the firms they manage, they generate the higher level of local spillovers that makes

Figure 3. Dual Stable Equilibria in a Model with Heterogeneous Actors



that better state of affairs an equilibrium. The critical wealth level falls, respectively, to  $W^{*''}$  or  $W^{*'''}$ .

A further level of complexity and realism can be introduced into this model by recognizing that many of the spillovers that are critical for growth are *local*, not *global* (for example, they are restricted to a Silicon Valley or a single residential community, and agents are spread across various industrial belts or residential communities). Intuition might suggest that free migration across areas would resolve the problem of coordination failures. This would indeed tend to happen if individuals could costlessly form new groups and move into new business or residential areas. Suppose, however, that suitable land is in fixed supply. Then land prices will equilibrate to make even those areas with coordination failures desirable to some set of individuals. In this case migration can exacerbate the consequences of a coordination failure. Hoff and Sen (2000) show that when complementarities among entrepreneurs (or homeowners) are sufficiently strong, rich and poor agents will stratify by “contract type” and income—the rich in areas with a high level of “stakeholders” and positive externalities, and the poor in areas with low levels of both. In this way one can explain “pockets of underdevelopment” within an industrial country without assuming any innate differences in abilities or preferences among agents.<sup>20</sup>

4. *“Big Push” Theory: Linkages.* Rosenstein-Rodan’s (1943) “big push” theory is a celebrated early statement of coordination problems in development. Rosenstein-Rodan suggested a variety of mechanisms through which a coordination failure can occur. Consider his example of “missing linkages.” He argued that it did not pay a firm to make, for instance, steel if there were no firms that used steel, but no firm would be created that used steel if steel was not available. Such problems do not arise in the neoclassical model because there is a complete set of markets for commodities that are or could be produced, and the “virtual” prices of steel would induce entry of both steel-producing and steel-using firms. But even in the absence of a complete set of markets, this particular example lacks cogency because a single firm would normally be able to produce both steel and products that use steel. Only if it could be argued that there were large diseconomies of scope would the coordination failure problem seem to be significant.

A crucial feature on which the relevance of the big push models rests is diffuse externalities, where the interaction effects occur through systemwide variables such as aggregate demand, industrial demand for inputs, or search costs. Murphy, Shleifer, and Vishny (1989) formalized the big push theory by focusing on a variety of such diffuse spillover effects. The best-known of their models focuses on demand spillovers: expansion of the high-productivity manufacturing sector leads to higher incomes, which leads to higher demand for the products of that sector.

But although diffuse externalities are necessary for a convincing big push theory, they are not sufficient. For example, in a global economy a steel-using firm could purchase steel from abroad, and a steel-producing firm could sell steel abroad. International trade resolves the coordination problem, as Tinbergen (1967) recognized early on. A small developing country should, at least in the long run, be able to find an essentially boundless demand for its products. The experience of the export-oriented strategies of the East Asian economies suggests that limitations in demand have not played a critical role in limiting those economies’ growth.

But there are other formalizations of Rosenstein-Rodan’s theory in which international trade does not resolve the coordination failure. Modern technologies often require a variety of *local* inputs and support services. One version of big push theory focuses on the nontradability of a range of differentiated, intermediate inputs used in the “advanced sector” of the economy that are produced under increasing returns to scale and imperfect competition (Helpman and Krugman 1985; Rodríguez-Clare 1996; Rodrik 1996). An expansion of the “advanced sector” increases the demand for these nontraded inputs, which lowers their average costs and increases the available variety. With greater variety of intermediate inputs, production is more efficient. (The intermediate sector is modeled as one of differentiated products, as in

Dixit and Stiglitz 1977.) It can thus be the case that when all other firms enter the “advanced sector,” it pays the remaining firm to do so, but when all other firms remain in the traditional, low-technology sector, it pays the remaining firm to do so, too. A low-level equilibrium can thus be sustained even when the economy is fully open to international trade.

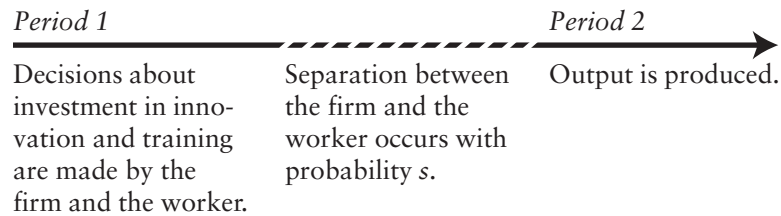
There are several ways of thinking about the nontradable inputs. One is that they represent physical input goods. Another is that they represent different categories of specialized skilled labor, such as computer technicians and software designers. As Rodrik (1996: 2) argues, “A worker’s decision to invest in a specialized skill depends both on the demand for the particular skill and the existence of complementary skills in the economy.” But this example raises the question, why cannot a single firm train the labor force it needs and thereby internalize the externalities? The next section presents a two-period model that shows why even perfect contracting *within* a firm may fail to provide a complete solution to the interdependence among the decisions made by workers and firms.

5. “*Big Push*” Theory: *Search Costs*. This version of the big push theory focuses on the problem of search in the labor market. The productivity of training depends on the ability of trained labor to find employers who have innovated; this ability, in turn, depends on the proportion of firms in the economy that have innovated. To capture this idea, we sketch a simple version of the model of Acemoglu (1997). There are two types of actors: firms, which may adopt new technology or not, and workers, who may become trained to use the new technology or not. The numbers of firms and workers are large and equal, and each firm employs just one worker. There are two time periods. In the first period each firm is matched with one worker; they jointly make decisions about training and innovation, and there is complete contracting between them—that is, there are no information problems or transaction costs. At the end of the first period there is some risk of separation. If separation occurs, a firm has to find a new worker, and a worker has to find a new firm. In the second period, output is produced.

If the worker is trained and his firm is one that has adopted new technology, the value of joint output is increased by  $\alpha$ . Skills and technology are assumed to be strongly complementary, so that if either training or innovation does not occur, there is no payoff to skills or to new technology. Let  $C$  represent the combined cost of the two investments (training and innovation), and let  $r$  represent the interest rate. To make the model interesting, assume that training and innovation are potentially valuable: that is,  $\alpha > C(1 + r)$ .

A potential coordination failure arises in this economy because there is a risk of separation between the firm and the worker at the end of

period 1. Assume that with probability  $s$ , the worker and firm will receive an adverse, match-specific shock that causes them to separate. In that event, a firm has to find a new employee, and a worker has to find a new employer. The time line is illustrated below:



Training imparts to the worker skills that he can use with any firm that has adopted the new technology. Therefore, if there were no search costs in the labor market, separation between a firm and an employee would not create a loss: if separation occurred, the worker would simply move on to another firm that had adopted the new technology, and all the surplus from training and investment would be captured by the firms and workers that made the investments. But suppose that search is costly. Then matching will be imperfect. There is no guarantee that the firm with the investment in the new technology will be matched with the worker who has the training.

Let  $\phi$  represent the probability of a good match. For simplicity, we assume that the matching process is random (but any assumption short of costless, perfect matching would serve, too). Then  $\phi$  is the proportion of firms with the new technology (which is equal to the proportion of the workers who are trained). From the perspective of the firm and its worker making their investment decisions in period 1, the combined returns from training and innovation are equal to  $-(1+r)C + (1-s)\alpha + s\phi\alpha$ . This says that with probability  $1-s$ , the pair does not separate and so they capture the return  $\alpha$  on their investment. With probability  $s$ , the pair separates, and thus the expected combined return on their investment is only  $\phi\alpha$ .

By substituting  $\phi = 1$ , we can see that an equilibrium at which all firms innovate and all workers are trained exists: the private returns to training and investment are positive. By substituting  $\phi = 0$ , we can see that an equilibrium without training and innovation may also exist. The combined expected gains to the firm and the worker from innovation and training when no one else adopts the new technology are only  $(1-s)\alpha - (1+r)C$ , which will be negative if  $s$  is sufficiently close to one. In this example, therefore, *a possible equilibrium is no innovation and no training in the economy*. Another consequence of costly search, which we do not develop here but which Acemoglu (1997) develops, is that there is imperfect competition in the labor market. This depresses the worker's return to training and further erodes his incentives to train.

The reason for the multiplicity of equilibria is that a firm's likelihood of finding the right worker depends on the *thickness* of the market (the number of trained workers). Similarly, the worker's likelihood of finding the right employer depends on the *thickness* of the market provided by firms that have adopted the new technology.<sup>21</sup> Of course, without a risk of separation ( $s = 0$ ), there would be no inefficiencies, since there would be no interactions with future employees or employers. The inefficiency arises because of an externality between the worker and his *future* employer, and between the firm and its *future* employee, that cannot be internalized because the identity of the actor with whom one may be matched is unknown.

To recapitulate, the example shows how search costs in the labor market can make the decisions of firms and workers highly interdependent in ways that are not captured by prices. Some economies may not invest in new technology and training as a result of a coordination failure arising from search costs.

### *Gaps in Knowledge*

The preceding set of hypotheses about obstacles to development focuses on coordination problems ("ecology"). Another, distinct set of hypotheses argues that it is gaps in knowledge—between industrial and developing countries, and between more advanced firms within developing countries and less advanced ones—that account for lack of development.

There are two separate issues. One is barriers to the flow of knowledge: the disease environment of an economy can be a barrier if technology transfer requires the flow of people. Accounts of Africa's interactions with the rest of the world over the past 500 years suggest that malaria has been a major barrier to Africa's normal integration into the world economy (Gallup and Sachs 1999). Nonnatives lack the resistance to the disease that Africans have acquired, and available medicines are imperfect.<sup>22</sup> Bloom and Sachs (1998) estimate that the economic effect of the single deadliest strain of malaria is to reduce growth of gross domestic product (GDP) by more than 1 percent per year.

Another issue is underinvestment in knowledge. Knowledge has public good properties, and even when it is not a pure public good, there can be important externalities (see, for example, Arrow 1962a; Gilbert, Dasgupta, and Stiglitz 1982; Stiglitz 1999). Arrow (1962b) hypothesized in his famous model of learning-by-doing that in an emerging industry, each firm's profitability depends on the accumulated experience in the industry. Such spillovers would mean that market forces will not elicit optimal investment.

Spillovers occur as well in the process of acquiring *localized* information that is relevant to production. Uncertainty about the suitability of local conditions for production means that individual producers, as



they experiment with new technology, can play a role in reducing, in future periods, the information barriers to adoption of new technology (Hoff 1997). Economists have begun to try to measure such information spillovers (Besley and Case 1994; Foster and Rosenzweig 1995; Conley and Udry 1999). For instance, Conley and Udry survey Ghanaian villages in which an established system of maize and cassava production is being transformed into intensive production of pineapple for export to Europe. Their objective is to determine exactly what farmers know about others' agricultural activities and how they know it. They find that adoption decisions, as well as the profitability of a farmer's pineapple operation, depend on local characteristics of the farmer's information network. This helps to explain why in some survey areas—but not in others with similar soils, climate, and so on—little pineapple is grown, despite its seemingly high potential profitability. The characteristics of information networks seem to explain why there is technological divergence *even across villages*.

## II. Perspectives on Policy

The changes in economic theories of development outlined in previous sections imply marked changes in policy perspectives. Some of the implied changes are obvious: if differences between industrial and developing countries depend on differences in knowledge as much as on differences in capital, policies to narrow the knowledge gap take on a first-order importance. As a consequence, improvements in secondary and tertiary education systems, not just increased access to primary education, become important (World Bank 1999b). If geography matters, policies need to focus on addressing the limitations imposed by geography—for example, on malaria eradication and on migration policies. In this part, we want to go beyond specific policy recommendations to theoretical issues regarding the nature of interventions and reform strategies.

### *Two Extreme Views: “Rational Development” and Public Choice Theory*

Implicit in much of the policy discussion in the past have been two extreme views of policy interventions. One is based on the premise of “rational development”: all that is required is to provide individuals in the economy with information about the consequences of different policies, and Coasian rationality will ensure that the parties will make use of that information to arrive at an efficient solution. To be sure, there may be market failures, but social institutions arise spontaneously to

address them. Thus, only lack of information could lead to “inefficient outcomes.” (In some variants of this view, government appears as a benevolent dictator outside the economy, with the ability to act freely on it. Thus, all that a policy analyst needs to do is to find out which policies maximize social welfare and transmit that information to the government, and it will be acted on.)

Few today hold to that view. If the adviser shows that there is an optimal set of tariffs and encourages the government to put in place a highly differentiated tariff structure, the advice might be followed. The tariff structure, however, will depend not on the subtle deadweight-loss arguments of the policy adviser but, rather, on the corrupting influence of special-interest groups trying to seize the opportunities afforded by a differentiated tariff structure to increase protection for their industries. To be sure, they may even follow the “rules of the game,” hiring economic analysts to show that an industry satisfies the conditions stipulated for higher tariff protection. But of course, both they and the government know that these are simply arguments needed to satisfy public demands for probity.

The second polar view is the extreme *public choice* view: as social scientists, we can just watch and interpret the playing out of the development drama—we cannot change policies. In this view, political forces produce an equilibrium set of policies. There are no degrees of freedom for normative intervention—a situation that has been called the *determinacy paradox* (Bhagwati, Brecher, and Srinivasan 1984).

We—and we dare say most development economists—reject both of these extreme views of the role of outsiders’ advice. Conditional on the information available, equilibria are often not Pareto efficient. Institutions that arise in response to a market failure may not only fail to cure it but may actually make matters worse, as we saw in the previous sections. Outsiders can, however, have an effect on outcomes—and in ways other than simply changing the information sets of participants. But our understanding of the processes by which interventions do affect outcomes is seriously incomplete, and many of the failures of the past can be traced to naïveté in intervention strategies.

For instance, there is mounting evidence that the practice of conditioning foreign aid to a country on its adoption of policy reforms does not work, at least in the sense of leading to sustained changes in policies that increase growth and reduce inequality and poverty. One cannot “buy” good policies (World Bank 1999a). There are good reasons for this: it is widely recognized today that successful policies need to have the country’s “ownership”—not only the support of the government, but also a broad consensus *within* the population—to be effectively implemented. Policies imposed from the outside will be circumvented, may induce resentment, and will not withstand the vicissitudes of the political process (see Bruno 1996; Stiglitz 1998c).

*Theories of the Ineffectiveness of Government Intervention*

The issue raised by the public choice school is whether an adviser can influence policy. A second, distinct issue is whether, in a market economy, government intervention can promote good outcomes. There is a long tradition in economics that the only proper role for the government is to define and enforce property rights and to provide public goods. Beyond that, government interventions are likely to be—in the extreme versions, inevitably will be—ineffective, unnecessary, or counter-productive.<sup>23</sup>

The fact that most of the “success” cases of economic growth have involved heavy doses of government intervention provides a strong counterweight to these general allegations. For instance, in the United States the government has, since 1863, played a role in financial market regulation. Evidence that since World War II downturns have been shallower and shorter and expansions longer is consistent with the hypothesis that better macroeconomic management does work. Even in industrial policies, the United States has a credible history—from the founding of the telecommunications industry, with the first telegraph line between Baltimore and Washington in 1842, to its most recent contribution to that industry, the creation of the Internet; from the support of research and dissemination in the dominant sector of the 19th century, agriculture, to support of research in the dominant high-technology industries of today. Still, it is worth disposing quickly of the major theoretical arguments underlying the ineffectiveness of intervention.

*Government is unnecessary: anything the government can do, the private sector can do better.* The fact is that government is endowed with powers which the private sector does not have, and these powers are essential in addressing the public good and externality problems that are rife throughout the economy. Coasians are simply wrong in arguing that private parties by themselves, with given, well-defined property rights, always resolve these issues.<sup>24</sup>

*Anything government does will be undone by the private sector.* Although there are specific models for which this assertion is true (see, for instance, Lucas 1973; Lucas and Prescott 1974), it is generally not true—for example, when government changes relative prices through taxation. Still, there is an important moral to these models: the actual consequences of government policies can be markedly different from the intended ones.

*Government is always captured by special-interest groups* (Stigler 1971). To be sure, there are incentives for producer special-interest groups to try to capture, for instance, the regulatory process. But there are countervailing incentives for other groups. Stigler does not explain why in some states it is consumer groups that capture, say, electricity

regulation, while in others it appears to be producer groups. In this, too, there is an important moral: political processes are critical, but the outcome of political processes is more complicated than simple theories of capture would suggest.

A variety of interventions can affect outcomes. Below we consider several broad kinds of interventions: (a) interventions to solve coordination problems, (b) information as an intervention, (c) interventions to change the dynamics of the political process, and (d) interventions to change the distribution of wealth.

### *Interventions to Solve a Coordination Problem*

Some of the multiple-equilibria models discussed above suggest interventions that can move an economy to a more favorable equilibrium. But just as the equilibrium set of behaviors in a decentralized economy may not be Pareto efficient, one cannot jump to the conclusion that Pareto improvements are likely to emerge from the political process. (At the end of this part we provide examples of cases in which they do not.)

Moreover, to make the analysis of intervention precise requires a dynamic framework. For example, only in a dynamic framework can one ask whether an initial coordination failure will in fact transmit itself over time. Why would not forward-looking agents, with sufficiently low discount rates, adopt a *path* (which might include the option of changing their behavior several times) that would permit as an equilibrium a self-fulfilling move away from a bad equilibrium to a good one? Is there really any scope for policy? Adserà and Ray (1998) address these questions in a setting in which each agent makes a discrete choice between two activities (which could be interpreted as entry into a high-tech versus a low-tech sector). They obtain a striking result: *if the positive externalities from moving to the more favorable set of activities appear with a time lag (that can be made arbitrarily short), then the final outcome depends entirely on initial conditions unless there is some gain to being the first to switch.* To put it another way, unless there is some gain to being among the first to switch, each agent will rationally wait for others to switch first, and so no one will switch at all! Initial conditions will thus determine the entire equilibrium outcome.

Adserà and Ray's model shows that in a variety of circumstances there is a *potential* role for policy to enable an economy to break free of history. A temporary subsidy can "force" an equilibrium, and yet once the equilibrium is attained, the subsidy is no longer necessary to support it. We consider several such interventions below.

*1. Affirmative Action and Anticorruption Programs.* A change in a legal statute may be able to force an equilibrium if the path to the new equilibrium entails a revision of beliefs and the revised beliefs sustain

the new equilibrium. Stiglitz (1974b) shows how affirmative action programs can eliminate equilibria in which productivity is unequal between groups (e.g., races or ethnic groups) whose innate abilities are identical but whose histories are different. Productivity between groups may be unequal if, for example, individuals' preferences for education depend on their parents' education and if the resulting differences in education lead to differential expectations by employers regarding the payoffs to training workers. Decisions by employers may then lock different groups into different positions in the income distribution. An affirmative action program changes the behavior of employers, the new behavior creates a new "history" and reveals information about the discriminated-against group, and the revised information can lead to an equilibrium in which prospective employers no longer want to discriminate. Similarly, Tirole's (1996) model of group reputation, discussed above, demonstrates the role that an anticorruption program of sufficient duration and severity can play in switching an economy from an equilibrium with high corruption—sustained by expectations of high corruption—to one with low corruption, sustained by expectations of low corruption.

2. *Enactment of Social Norms into Law.* Following Cooter (2000), suppose that a person who punishes someone for violating a social norm risks confrontation or revenge but that this risk falls as the proportion of people willing to punish increases. Suppose also that enactment into statutory law of the social norm (say, to use generally accepted accounting standards, or to send children to school) lowers the individual's private cost of enforcement because it creates the possibility that violators of the norm will face civil punishment. In doing so, it may cause the individual to believe that other individuals will enforce the norm, and the expectation can be self-fulfilling. Enactment of the law can thus "pull in" private activity rather than "crowding it out" (as occurs in traditional analysis of government provision of public goods). By extension, a state governed by laws that mirror social norms (a "rule of law state") tends to be one that is hard to corrupt, whereas a state in which law is imposed and enforced from above (the "rule of state law") tends to be costly, ineffective, and easily corrupted (Cooter 1997). A related view of statutory law is developed by Basu (2000), who argues that the *only* way government-enacted law can influence an economy is to switch it from one equilibrium to another: if an outcome (including a set of norms consistent with that outcome) is not a candidate equilibrium absent the law, it is still not an equilibrium under any conceivable legal regime.

3. *Temporary Wage Floors.* There are situations in which an economy is characterized by multiple equilibria, some preferred by a policymaker

over others, but in which the equilibria cannot be Pareto ranked. In those cases there may be interventions that switch an economy to the better equilibrium by forcing a change in the distribution of income. The classic example of multiple equilibria in the neoclassical model arises when the labor supply curve is backward-bending. Then there may exist one market equilibrium with low wages, high labor supply, and high profits and another with high wages, low labor supply, and low profits. The low-wage equilibrium is more favorable to capitalists, the other to workers. In such a setting, minimum wage legislation could serve to “rule out” the low-wage equilibrium. Once the high-wage equilibrium was attained, the minimum wage law would not be a binding constraint. That is, no effort would need to be expended to enforce the wage because, starting from the high-wage equilibrium, there is no supply of workers at the lower wage.<sup>25</sup>

### *Information as an Intervention*

Although by itself information often is not sufficient to ensure that more efficient equilibria predominate, it can be an effective intervention in many cases, for it does change the behavior of participants (see, for example, Dixit 1996). Rules concerning the disclosure of information and standards of accounting change behavior, if only by drawing attention to certain relevant “facts.” Disclosure of information can also make possible informal enforcement of community standards. In the area of pollution control, for instance, there is evidence that informal enforcement has had significant effects (see Pargal and Wheeler’s 1996 study of pollution levels across Indonesian districts).

It is precisely because information does affect the behavior of voters that governments often work so hard to keep it secret (Stiglitz 1998b). Although there is no general theorem ensuring that private parties will engage in the socially desirable level of disclosure, there are strong reasons to believe that incumbents in the political process will work hard to suppress relevant information.<sup>26</sup>

Indeed, information about the importance of information has even affected the amount of information that is disclosed and the form in which it is disclosed. While it is true that different disclosure rules may induce behavior to try to circumvent the requirements, typically these are imperfect, particularly if the disclosure requirements are well designed.

### *Interventions That Affect the Dynamics of the Political Process*

Public choice theory has provided considerable insights into the nature of political processes, including the problems associated with the formation of interest groups (Olson 1965; Becker 1983). For instance,

free-rider problems play an important role in determining which interest groups form, just as they play an important role in the provision of public goods more generally. Public actions affect the costs and benefits associated with interest-group formation. Since the costs of interest-group formation are, to some extent at least, fixed costs, interventions that affect the dynamics of the political process—thereby affecting subsequent outcomes—can be thought of as *deep* interventions. They entail irreversibilities.

An example of the dynamics of the political process may help illustrate what we have in mind. Assume that the government is contemplating privatizing a monopoly. There are several potential buyers. Each has an interest in ensuring that the regulations that prevail after privatization allow him to continue to enjoy the monopoly profits and perhaps even leverage the monopoly power further. But each, thinking that he has a small probability of winning, is unwilling to spend much to ensure this “collective” good (or bad, depending on one’s perspective). Moreover, each may face large costs of identifying who the other potential buyers are. Even if a potential buyer succeeds in identifying the others, if they are numerous there will still be a free-rider problem, each claiming publicly that he himself will obtain high profits through increased efficiency rather than by exploiting monopoly power.<sup>27</sup> But *once the privatization has occurred*, there is a single party who is the “winner.” There no longer is a collective-action problem, and the winner has the incentive and resources to fight legislation imposing regulation or competition. Thus, before the privatization, it may be possible to pass rules to promote competition (since there is no organized resistance in the private sector) and there may be (admittedly weak) public interest groups pushing for it.<sup>28</sup> The sequencing of reforms—that is, whether regulatory policies precede or follow privatization—matters. In one sequence, the result may be a competitive or regulated industry, where the benefits of privatization in terms of lower consumer prices are realized. In the other sequence, one may end up with an unregulated monopoly, which, to be sure, may be more efficient than it was as a public sector producer but which may be more efficient not only in producing goods but also in exploiting consumers.

*Deep* interventions need to be distinguished from the *shallow* interventions that typically make up a part of “reform” packages in negotiations between borrower countries and international financial organizations. Consider measures to lower tariffs. Interventions that impose such tariff reforms as part of conditionality or as part of a World Trade Organization (WTO) agreement do not necessarily change the underlying political forces. If they do not, a process that Finger (1998) calls *political fungibility* occurs: the political forces that generated the initial trade barriers simply look for other, WTO-legal, interventions. These may have the same protective effect but may be more distortionary.

The increased use of nontariff barriers, including antidumping measures, in developing countries is consistent with this theory.

It is precisely because history matters that interventions can be effective in the long run. A perturbation to the system at one date can have permanent effects. (By contrast, in neoclassical and related theories, it is fundamentals—including those associated with the political process—that determine long-run outcomes.) A particular set of circumstances in which history can matter is when there are multiple equilibria and an historical shock “selects” the equilibrium. A large enough disturbance can move an economy in a direction that converges to a different steady-state equilibrium.

### *Interventions to Change the Distribution of Wealth*

Among the most important sets of interventions are those that change the distribution of wealth. Such interventions can lead to a new steady-state distribution of wealth,  $W^*$ , defined by

$$W^* = A(W^*)W^*$$

where  $A$  is the transition matrix and  $W$  is the vector of wealth levels. We write  $A = A(W)$  to emphasize that the transition matrix depends on the distribution of wealth, the vector  $W$ . As was discussed in Part I, the wealth distribution affects economic performance through many channels. It affects the severity of agency problems (for example, access to financial markets), vulnerability to risk, and the institutions that arise to cope with agency problems and risk (such as sharecropping). These factors affect outcomes directly and also indirectly through the effect on prices, wages, interest rates, and the distribution of wealth in *succeeding* generations.

The wealth distribution also affects *political* support for institutions that, by facilitating or impeding individuals' participation in commercial activity, influence growth. Ongoing research explores the empirical relationship between the distribution of wealth and institutional development in New World economies beginning in the 1700s (see Engerman and Sokoloff 1997; Engerman, Haber, and Sokoloff 1999). These authors find that societies which began with greater inequality tended to place greater restrictions on access to primary schooling, access to land, the franchise, the right to vote in secret, the right to create a company, and the right to patent an invention and to protect that right in the courts. In Latin America these restrictions tended to perpetuate inequality and limit growth.

### *A Word of Caution: Deep versus Shallow Interventions*

When interventions to promote economic reform are not “deep” in the sense defined above, not only may their effects be undone through a



process of political fungibility, but they may actually be harmful, at least in some dimensions. Consider again the issue of privatization. One of the principal arguments against governments' running enterprises is that public officials skim off the rents. It is also argued that privatization eliminates the scope for this kind of political abuse.<sup>29</sup> In many cases, unfortunately, this has not proved to be the case. One should have been suspicious when allegedly corrupt political leaders embraced the doctrine of privatization. Perhaps it was not so much that they were converted by the sermons of the visiting priests of the new orthodoxy to give up their corrupt ways; rather, they may have seen in their preaching an opportunity to exploit the public even more. They realized that by corrupting the privatization process, they could appropriate not only some of today's rents but also a fraction of the present discounted value of rents of the future. Why leave those rents around for future politicians to grab? Should it thus come as a surprise that so many cases of privatization have been plagued by corruption? In many cases we have learned that clothing the "grabbing hand of government" in the "velvet glove of privatization" does little to impede its ability to grab.

In many cases, too, we have learned that the privatization process may even have limited efficacy in stemming the flow of *ongoing* rent-seeking by government. For instance, if local authorities have regulatory oversight (environmental, building permits, and so on), local government approval is needed for continued operation of a business. It matters not what pretext the government uses to "hold up" the company; eliminating one pretext still leaves a plethora of others. Privatization thus does not effectively tie the hands of government. Only a deep intervention that changes the nature of government behavior will succeed in addressing these concerns.<sup>30</sup>

### *Looking into Black Boxes*

The issues raised above reflect one of the central themes of this chapter: modern development economics has been looking into, trying to explain, the black boxes of the past. How do we explain institutions? What are the sources of failures of markets and of governments (an issue that we develop further in the next section)?

In the past, development theory and policy often took certain variables as *exogenous* institutional rigidities or political constraints. Modern theory has shifted the boundary between what we black-box (treat as an institutional rigidity) and what we explain within our models. This shifting boundary has strong implications for our views about policy. Here we present two further examples—on credit markets and on unemployment—each of which has been the subject of an enormous literature.

*Rural Credit Markets.* Early views in development economics were that village moneylenders charged usurious interest rates and that nothing

could be done about it. Policy interventions had to deal with such constraints. Because the source of the market failure was not well analyzed, it was hard to tell the true nature of the institutional constraint, and this left policy in a precarious position. Assume that one really believed that high rural interest rates merely reflected the monopoly power of the moneylender. Then one might view as the solution the creation of a system of government-subsidized rural lending institutions, on the assumption that this would “provide a positive institutional alternative to the moneylender himself, something which will compete with him, remove him from the forefront, and put him in his place” (Reserve Bank of India 1954, cited in Bell 1990: 297). But once one recognizes that there are information and enforcement problems in lending to the poor which formal lenders are not well positioned to solve, it is not surprising that subsidized lending in the rural sector reached primarily large farmers who could pledge land as collateral, while small farmers continued to rely on the informal financial sector.

Pushing the analysis one step further—to the structure of competition in the informal credit sector and the determinants of the moneylender’s transaction costs—Hoff and Stiglitz (1998) showed that a subsidy to rural banks need not even “trickle down” to the poor. The subsidy will normally increase the number of moneylenders (and moneylenders in many settings also act as traders, taking a part of the farmers’ crop as payment for their debt). When borrowers in the informal sector have a larger number of potential outlets for their crops and more potential sources of credit, it may be harder for each moneylender to enforce repayment. With higher enforcement costs, the interest rates that moneylenders charge may even rise in response to a subsidy to rural banks! Recognition of the information and enforcement problems in rural financial markets has redirected policy in recent years toward the creation of microfinance programs and the improvement of savings institutions that are accessible to the poor (Morduch 1999).

*Urban Unemployment and the Urban-Rural Wage Gap.* To take a second example, assume that one believed that urban unemployment existed because the urban wage was fixed in nominal terms. Then one might impose a tax on food to raise revenues, which could be used to finance a wage subsidy, expanding employment. But surely, one might think, whatever the economic or political forces determining the wage level, workers are not so irrational as to fail to see through such a lowering of the real wage; it is real wages that all participants in the market care about. Thus, pushing the analysis beyond the simple assumption of a nominal fixed wage, one quickly comes to the presumption that it is some measure of real wages that should be assumed rigid. The early models, however, simply assumed that the nominal level of urban wages was fixed and that the size of the urban labor force (the

sum of the urban employed plus unemployed) was also fixed. Thus, hiring one more laborer meant moving a worker from zero productivity (unemployment) to productive work and so was clearly desirable.

Later, Harris and Todaro (1970) showed that hiring one more laborer at a wage in excess of the rural wage would induce migration; the opportunity cost of hiring a seemingly unemployed worker is not zero but is equal to the reduced rural output resulting from the induced migration. Stiglitz (1974c) formulated a simple model in which urban wages were set endogenously (the efficiency-wage model) and migration equalized the expected income of migrants and the rural wage. In the central case examined, the opportunity cost of hiring an additional worker in the urban sector was actually equal to the urban wage. The shadow wage *was* the market wage, even though the unemployment rate could be quite high! Thus, explaining seeming rigidities in terms of more fundamental factors of information and incentives reversed the policy implications of earlier models, which had treated many aspects of the labor market as fixed constraints.

### *Rational Expectations and Political Barriers to Economic Development*

In democratic societies interventions are enacted through political processes. Economists have naively tended to assume that such processes would surely enable any Pareto improvement to occur; there should be unanimity in favor of such reforms. Distortions might arise as one group tried to force a movement that improved its welfare at the expense of others, but presumably such distortions would then be undone as the political process once again moved toward the “utility possibilities curve.” This does not seem to be the case: even changes that seem to be Pareto improvements are often resisted (Stiglitz 1998b). The theory of deep interventions helps explain this. With rational expectations, participants in the political process anticipate the consequences of any action—and those consequences are not necessarily limited to the immediate effects: participants see through the political dynamics. They will resist a Pareto improvement in the short run that will subsequently lead to a movement along the utility possibilities curve in a way that will disadvantage them in the long run. For example, an incumbent will be deterred from undertaking a Pareto-improving investment (one that provides to every individual direct net benefits) if it changes the identity of future policymakers in a way that is disadvantageous to his supporters (Besley and Coate 1998). Participants in the political process compare where they are with where the political process is likely to lead. The limited ability of governments (or political actors) to make commitments, and, in particular, to commit not to make subsequent

adverse changes, makes change—even seeming Pareto improvements—more difficult.<sup>31</sup>

The fact that individuals are risk averse and cannot possibly know the full ramifications of any change today makes reform even more difficult. A reform may yield *riskless aggregate* benefits greater than costs but entail *individual-specific uncertainty* about who the winners are. If compensation is not provided to the losers, the gains have to be large enough to compensate for the downside risk of losses. Majority voting may lead citizens to oppose such a reform in order to maintain the benefits generated by the status quo (Fernandez and Rodrik 1991; Krusell and Rios-Rull 1996).

Jain and Mukand (1999) develop a model in which the government is assumed to have the ability to identify ex post the losers from reform and to compensate them, but there is a political constraint on credible commitment: policymakers can be punished for breaking a commitment to compensate the losers only by being voted out of office. In this environment, a reform that *hurts* a majority of 51 percent (while *benefiting* a minority of 49 percent) can be implemented, whereas one in which the fractions of winners and losers are reversed cannot be. In the former case the government can credibly commit to compensate the losers, but in the latter case it cannot, for violation of the contract will not spark a successful revenge movement at the ballot box against the government.

The problem of credible commitment, and the resulting missed opportunities for economic development, arise in a different form in dictatorships. Consider three situations. In the first situation there is a dictator, many poor farmers, and one guerrilla fighter who would like to topple the dictator. By building a road, the dictator has the potential to increase both the farmers' wealth and his own. With just one guerrilla, it is plausible that the dictator could obtain a commitment from the farmers to bar the guerrilla from using the road to attack the dictator. Then he would build the road. Now change the situation by supposing that every farmer can become a guerrilla fighter. The difficulty of contracting to constrain the actions of all the farmers may then be insuperable, and the dictator may not build the road. Finally, consider the actual case of President Mobutu Sese Seko, the longtime dictator of Zaire. When President Juvenal Habyarimana of Rwanda asked for armed support to help fight an insurgency, Mobutu responded:

I told you not to build any roads . . . building roads never did any good . . . I've been in power in Zaire for thirty years and I never built one road. Now they are driving down them to get you. (*Jeune Afrique* 1991; cited in Robinson 1999: 2)

Mobutu's perspective contrasts with Olson's (1993) view that a dictator who has an "encompassing interest" in his nation will choose, in

his self-interest, to provide property rights and other public goods. That view would be correct if there were no difficulties of commitment to ensure that the empowered population would not try to unseat the dictator. There is convincing evidence, however, that many dictators see an underdeveloped society as key to maintaining control of the country (Robinson 1999: sect. 4, and citations therein). "For predatory states, 'low-level equilibrium traps' are not something to be *escaped*; they are something to be *cherished*" (Evans 1995; cited in Robinson 1999: 3; emphasis added). More generally, a fundamental obstacle to economic development in all states, not only dictatorships, can be posed by groups whose political power is threatened by progress (Besley and Coate 1998; Acemoglu and Robinson 1999).

### *Some Observations on Recent Reform Experiences*

Recent experiences of liberalization in East Asia and of transition to market economies in Eastern Europe have imposed huge costs on many groups in those societies. The manner in which reforms have been carried out in the past has perhaps reinforced a rational skepticism, a risk aversion to change. For instance, reformers hailed financial market liberalization in East Asia as holding out the promise of faster growth. Workers saw little evidence of substantial increases in growth but soon saw disastrous consequences in the form of unemployment and wage cuts.

There is a plethora of economic models, with differing predictions concerning the outcome of various policies. If economists cannot resolve some of these differences (and in many cases we do not have the evidence needed to decisively test between competing models, while in other cases it would seem that ideological presuppositions have prevailed over a close look at empirical evidence or coherent theorizing), how is an untrained worker to judge other than by "reduced-form observations" concerning consequences?

The record of reforms is indeed one that should leave risk-averse workers and farmers wary. They have seen not just the capital market liberalizations, which have had such devastating effects in the past two years, but also financial market liberalizations in Africa that have led to higher, not lower, interest rates (Aleem and Kasekende 1999) and movements to market economies in the former Soviet Union that have led to plummeting standards of living, not higher incomes. What is being judged is not only the reforms but also the reformers; their reputations and the accuracy of their predictions have been on the line, and in many cases they have been found wanting. Just as there is a need for greater differentiation in markets so that investors can distinguish between good and bad firms, well managed and poorly managed countries, so too does there need to be greater differentiation in evaluating reforms, reform processes, and reformers. The good news is that around the world, there seems to be evidence of such increased differentiation.

Increased institutional capacity in developing countries has enabled these countries to differentiate better the recipes of the ideologues from prescriptions based on more solid evidence and theory.

Given risk aversion and the ambiguous track record of reform, the extent to which reforms are being embraced around the world is thus perhaps more of a surprise than that there have not been more reforms. Vested interests have lost out. How can we explain these changes? The answer lies in part in the complexity of democratic processes and the strength of the democratic movement. The process of democratization has a historical force that vested interests cannot fully control. To be sure, they will attempt to contain it; moneyed interests will—and do—affect the outcome of elections, and vested interests will try to keep from public scrutiny a variety of activities that favor their groups.<sup>32</sup> Even in democratic societies, not everyone has a seat at the table—or at least not all seats are the same size.

But economic and political processes are sufficiently complex that no one can fully predict or control their evolution or the evolution of reforms emanating through them. Consider, for instance, the recent debates over transparency. The focus on transparency in financial reporting as a key factor behind the East Asian crisis served strong political interests. It shifted blame from lenders in industrial countries to the borrowers in developing countries. It shifted blame from the industrial countries that had pushed rapid capital account and financial liberalization—without a corresponding stress on the importance of strong institutions and regulatory oversight—to the governments of developing countries, which had failed to enforce information disclosure. And it provided assurance to those in industrial countries—where presumably there was greater transparency—that they were not likely to be afflicted with similar problems.

The evidence concerning the role that lack of transparency played in the crisis was scant.<sup>33</sup> But once the specter of transparency was raised, it took on a life of its own. Following the publicly engineered (but privately financed) bailout of the U.S. firm Long-Term Capital Management, there were calls that increased transparency should extend to the highly leveraged institutions (hedge funds). It may not have been in the interests of some groups to see disclosure and other forms of regulation imposed on these institutions, but virtually every industrial country other than the United Kingdom joined in these demands, and eventually a study by the U.S. Treasury endorsed recommendations for increased disclosure. Had the financial community seen where calls for increased transparency would eventually lead, they might have taken a different tack earlier. But in the complex evolution of society, participants can see only a short distance ahead. If strategic interactions are like a game of chess, then the players can see, at most, only a few moves ahead in the chess game.

## Concluding Remarks

In many ways, development theory has come full circle. Thirty or 40 years ago, linkages among the parts of the society as well as the parts of the economy were stressed. The need for balance, not only among the sectors of the economy but also among the elements of society, was emphasized. Development was viewed as more than the elimination of distortions and the accumulation of capital. Indeed, it was recognized that there were other elements of a society that limited its absorptive capacity—its ability to use transfers of capital well.<sup>34</sup> It was recognized that a plantation economy or a dual economy was not a developed economy, although it might see increases in GDP.

But in the ensuing decades, much has changed. Our understanding of market economies has increased enormously, and with that understanding has come an appreciation of the difficulties entailed in making market economies work. The assumptions of perfect competition, perfect information, perfect contract enforcement, and complete markets and contracts are far from trivial, although the latter three sets of assumptions were not even mentioned in the classic statement of the competitive model (Arrow and Debreu 1954). We were always told that the neoclassical model was “just a benchmark”—a tool for thinking through complicated problems—but now there is increasing recognition that its implications are likely to be misleading in realistic settings where there are diffuse externalities. We have shown that formal theory now extends to many areas of imperfect information and incomplete contracting. This work has established that in many different settings, nonmarket interactions can give rise to complementarities, which may be associated with multiple equilibria. It is not just preferences and technologies that determine outcomes and behavior. The most important determinant of actions is one’s environment, including the particular institutions in that environment. More important, these institutions cannot be derived from the “fundamentals” of the neoclassical model. And it is not just institutions, prices, and choices that are endogenous; even preferences and technologies are. Given history, beliefs, and chance, certain behaviors and traits are rewarded and others are not. Rewarded behaviors and traits will tend to increase relative to others, and that may further increase the rewards to those behaviors and traits. Initial differences in circumstances or beliefs may thereby not only persist but be magnified over time.

So too have views about the goals of development evolved. While lip service is always paid to environmental amenities, today the environment has a far more central place in our perceptions of sustainable development. Fifty years ago we often saw rapid development and democratic participation as entailing a tradeoff (Huntington 1968). Today we are more likely to see them as complements, to stress the need for

voice and participation as a means of ensuring that reforms are politically sustainable, and to recognize as a fundamental right individuals' having a say over the decisions that affect their lives and livelihoods (Sen 1999). Fifty years ago increases in inequality were seen not only as a natural accompaniment of development (Kuznets 1955) but as actually facilitating development (Lewis 1954). Today we recognize that not only are such increases in inequality not necessary but that they may actually be detrimental to growth—by increasing agency costs in credit and land rental markets, by tending to lead to political regimes that restrict access to education and to markets, and by exacerbating social conflicts.

Although evolving societal preferences and values may have changed the relative weights associated with various developmental objectives, modern theory has cast new light on strategies for achieving those objectives. While our understanding of market economies has been enormously enhanced—markets no longer sit on the pedestal to which they were at one time assigned—our appreciation of the importance of non-economic forces (in particular, political forces) in the reform process has also increased. But our understanding of these processes is far from complete. We are at least at the stage at which we know that we do not know. That is, perhaps, a good way to begin the new century.

### Appendix A. Why Low Capital Does Not Explain Underdevelopment

If the fundamental cause of lack of development is simply a shortage of capital, then (given diminishing returns to capital) why do not incomes in all economies tend to converge over time? This appendix takes up the neoclassical perspective on development, in which the cause of underdevelopment is simply a shortage of capital or skilled labor. We will argue that this view is inconsistent with the evidence on private capital flows. Instead, a shortage of capital must be a symptom, not a cause, of underdevelopment.<sup>35</sup>

#### *Implications of the Neoclassical Production Function*

If all countries had the same production function,

$$(A-1) \quad Y = F(K, L)$$

with output being a function of capital and labor and with diminishing returns to each factor (when the other is held fixed), countries with a capital scarcity would have higher rates of return. Capital would flow from capital-rich to capital-poor countries, and in short order, as the



returns to capital were equalized, so too would be GDP per capita.<sup>36</sup> Gross national product (GNP) would not be so quickly equalized, as some of the capital in the poor countries would be owned by those in the rich countries. But eventually, even incomes per capita would be equalized, so long as saving rates were the same. If saving rates differed, differences in incomes could be totally explained by those differences in saving rates (Stiglitz 1969).

Not only does trade not seem to equalize factor prices, but capital flows from industrial to developing countries are, to say the least, far weaker than the theory would suggest. Only since 1990 have private capital flows to developing countries been significant (see Figure A-1), and the flows have been highly concentrated, with much larger flows going to middle-income countries than to low-income countries. This is true whether the flows are measured in absolute amounts, as shown in the upper panel of the figure, or as a fraction of GDP, shown in the lower panel.

*If capital accumulation were at the center of development, and if international capital flows were limited (because of “institutional” or “informational” impediments), then features of the economy that increased domestic savings rates would ensure growth. The dual-economy models provided one response to W. Arthur Lewis’s famous statement of the development problem:*

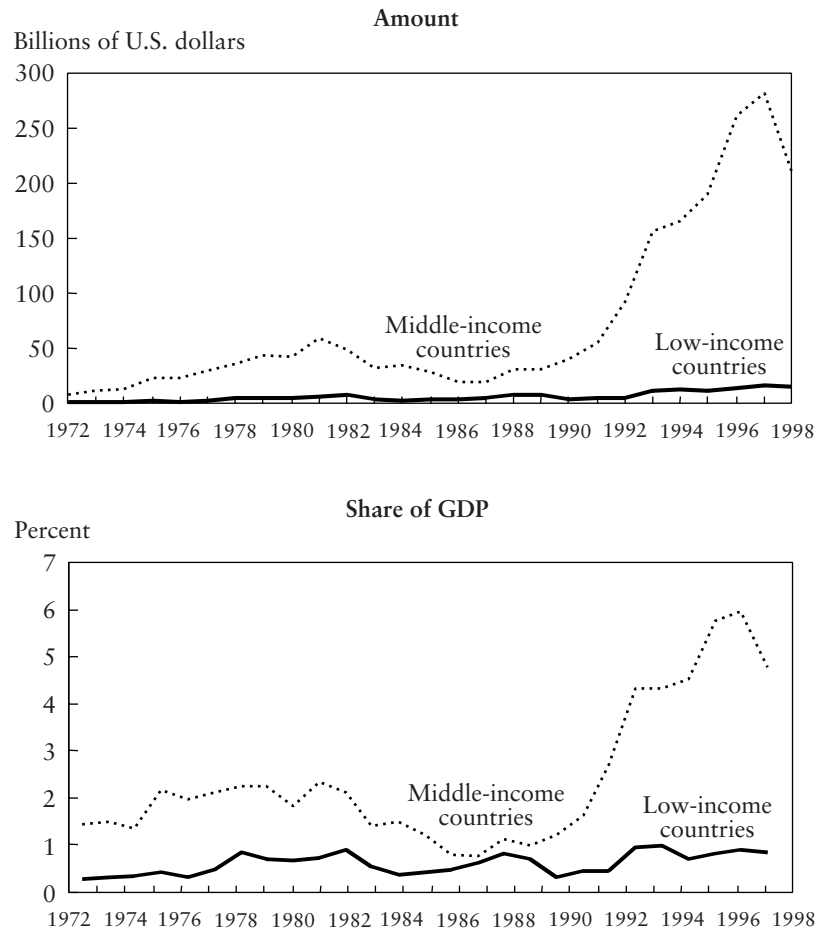
The central problem in the theory of economic development is to understand the process by which a community which was previously saving and investing 4 or 5 per cent of its national income or less, converts itself into an economy where voluntary saving is running at about 12 to 15 per cent of national income or more. This is the central problem because the central fact of economic development is rapid capital accumulation (including knowledge and skills with capital). (Lewis, 1954: 155)

Two hypotheses were key to the dual-economy models (Lewis 1954; Fei and Ranis 1969):

- Capitalists saved a higher fraction of their income than workers or peasants, so that policies which increased inequality—giving higher profits to the high-saving capitalists—would promote growth.
- There was surplus labor in the rural sector.

If the first hypothesis were true, tax policies to ensure the continued ready supply of labor from the rural sector would promote development. Such policies would keep urban wages low and thus contribute to the pool of profits out of which savings were accumulated. The second hypothesis—that there was a close to infinite elasticity of labor under the “right” policies—reinforced the emphasis on capital: it was a shortage of capital, not of labor, that prevented industrial growth.

Figure A-1. Net Private Capital Flows to Low- and Middle-Income Developing Countries, 1972–98

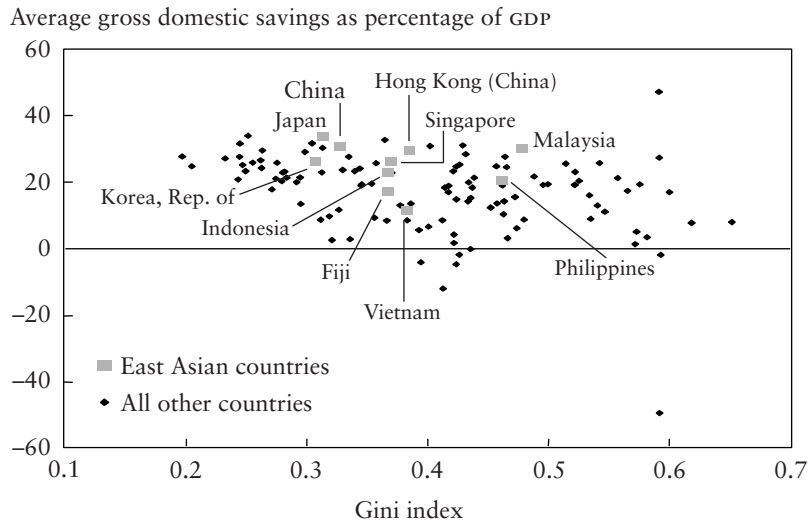


Note: The classification of economies is based on per capita income. For 1998, the per capita cutoff levels are as follows: low income, US\$760 or less; middle income, US\$761 to US\$9,360.

Source: Statistical Information and Management Analysis (SIMA), World Bank.

Experience has not been kind to these theories. One problem is that the “right” policies were not implementable. For instance, in many countries the government can tax only tradable goods—through marketing boards or at the port. But once a tax on tradables is imposed, farmers tend to shift out of such goods. A second problem is that if farmers

Figure A-2. Average Savings Rates and Inequality, East Asia and the Rest of the World, 1960–95



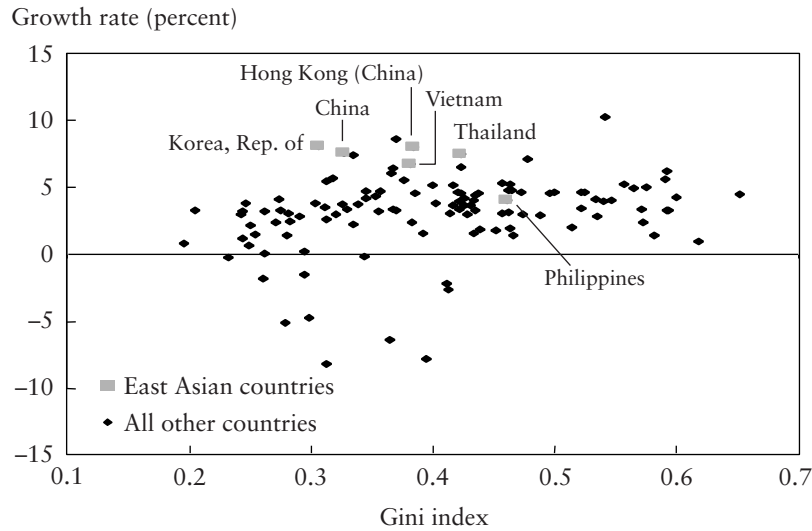
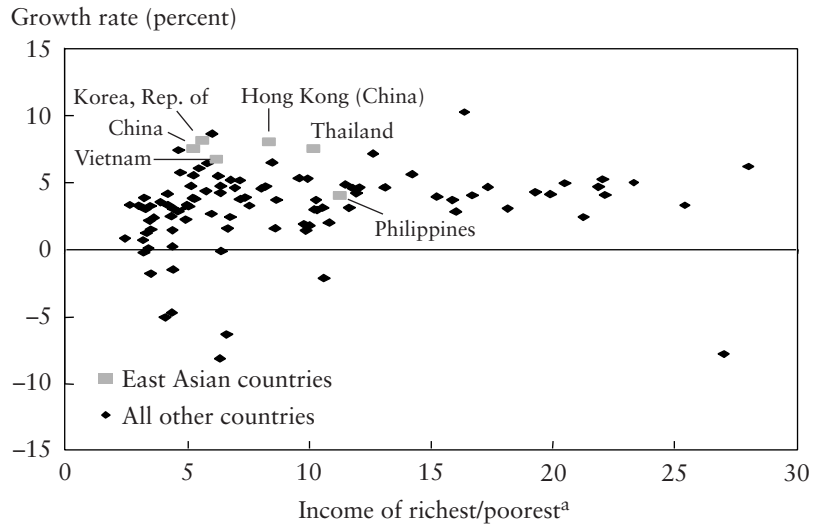
Source: Statistical Information and Management Analysis (SIMA), World Bank.

come to believe that any agricultural surplus will be taxed away, they lose all incentive to respond to new productive opportunities. For example, as reported in Krueger (1993), in the early 1980s it was not uncommon for prices received by farmers in developing countries to be less than 20 percent of the border price of agricultural commodities. The consequence of the tax wedge and of governmental inefficiency in marketing was that in Ghana the real producer price of cocoa in 1984 was about 10 percent of its price some 30 years earlier. “Small wonder that Ghanaian exports of cocoa fell as farmers had first virtually ceased replanting, and then stopped picking the crop” (Krueger 1993: 98).

The East Asian experience also helped undercut these theories. East Asia showed that countries could generate a very high rate of voluntary savings without high levels of inequality. Figure A-2 shows that over the period 1960–95 the East Asian economies had much higher than average saving rates and average or below-average inequality. For example, Japan and the Republic of Korea had saving rates of 33.6 and 26.2 percent, respectively (compared with an average for all countries of 17.6 percent), and both had Gini coefficients of approximately 0.31 (compared with an average for all countries of 0.40).

High savings and low inequality translate into high growth and low inequality. Figure A-3 plots growth and inequality, measured in two

Figure A-3. Average Growth Rates and Inequality, East Asia and the Rest of the World, 1960–95



a. Ratio of income of richest 20 percent of population to income of poorest 20 percent.

Source: SIMA.

different ways. In the upper panel the inequality measure is the income share of the top quintile as a proportion of the income share of the bottom quintile. In the lower panel the inequality measure is the Gini index. Using these measures, the higher than average growth for the

East Asian countries is associated with average or below-average inequality.

The East Asian experience raised a new question: how could one explain the high rate of saving? Empirical research showed that in East Asia saving rates increased with growth rates. One hypothesis was that saving *functions* in East Asia were similar to those elsewhere but that along this function, saving rates increased with growth rates. It is easy to construct theoretical models for which that might plausibly be the case.<sup>37</sup>

The interesting feature of such a saving function is that it can explain multiple transition paths through which an economy would approach the long-run equilibrium growth rate of the neoclassical model. In this view, East Asia was the first region where countries had jumped to the high-growth path to long-run equilibrium (and in that sense, its development differed from that of earlier industrializers, none of which had had such high saving rates). If the saving rate depends on the rate of growth of income per capita,  $g$ , and if the rate of growth of population is  $n$ , then from a Cobb-Douglas version of the aggregate production function in equation (A-1),

$$(A-2) \quad Y = AK^\alpha L^{1-\alpha}$$

we have

$$\frac{\Delta Y}{Y} = \frac{\Delta A}{A} + \alpha \frac{\Delta K}{K} + [1 - \alpha]n$$

and so (since  $g = \Delta Y/Y - n$ ),

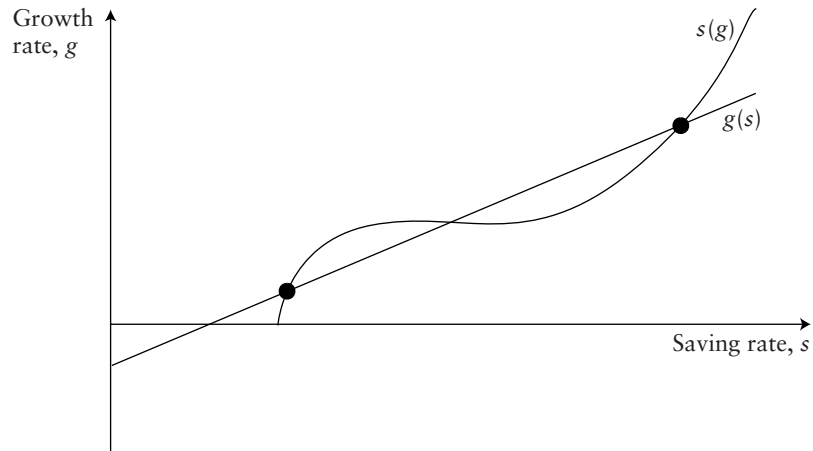
$$(A-3) \quad g = \Delta A/A + \alpha[s\beta(k) - n]$$

where  $\beta(k)$  is the output-capital ratio, a decreasing function of capital per worker,  $k$ .

In the neoclassical growth model (Solow 1956), there is a fixed fraction  $s$  of income saved and a steady-state growth rate fixed uniquely by the exogenous rate of technical change,  $\Delta A/A$ . Starting from a point *out of* steady state—e.g., a low capital-labor ratio, so that  $s\beta(k) > n$ —the model predicts a unique transition path to the steady state. But if the saving rate increases with the growth rate, there may be multiple values of the equilibrium growth rate at a moment in time, as illustrated in Figure A-4, and thus multiple transition paths that asymptotically converge to the same growth rate and the same income level, as illustrated in Figure A-5—the high-growth, high-saving-rate path that characterized East Asia, and the low-growth, low-saving-rate path that characterized most of the rest of the world.

Notice that the body of this chapter focused on multiple equilibria and argued that there may be *no* forces for convergence, even in the long run. Here we make a quite different point. Even if one conceded

Figure A-4. Multiple Short-Run Equilibria in the Levels of Savings and Growth

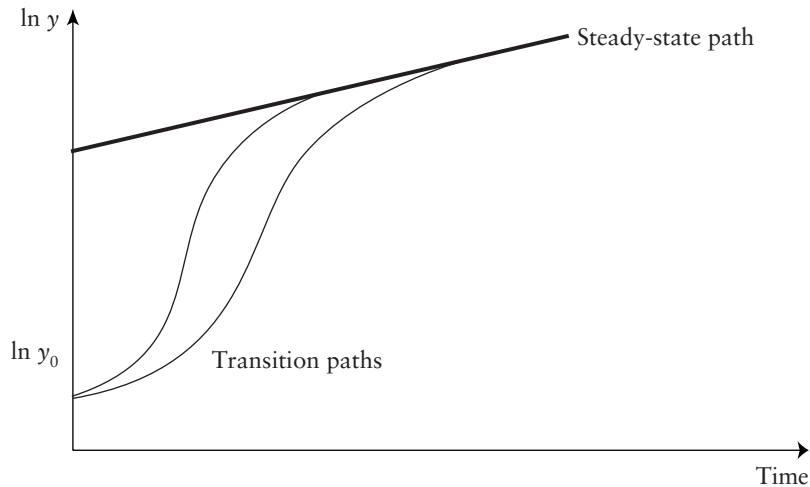


that the neoclassicals were right about the very long run, there could be multiple rates at which an economy approached the long-run equilibrium. There is an ecological environment and a set of expectations that foster high savings and high growth and another such combination that does not.<sup>38</sup>

But it seems that while the high growth rate can explain some, or even much, of East Asia's high saving rates, other factors were at play. Stiglitz and Uy (1996) argue that the high saving rates were attributable at least in part to public policies that promoted institutions designed to mobilize savings, especially in the rural sector. Modern theory, which emphasizes information and enforcement costs, has played an important role in enhancing our understanding, and changing our perceptions, of the kinds of policy likely to promote saving. Savings, especially savings available for industrialization, will be larger if the transaction costs of saving through financial institutions are smaller, if risk is reduced, and if return is increased. The East Asian experience has provided insights into the magnitudes of these effects. While large negative real returns, associated with financial repression (Shaw 1973), have had adverse effects on savings, the interest elasticity of savings has been relatively low: as long as returns were positive, individuals cared more about risk. Government postal savings accounts, for instance, with low transaction costs, low risk, and low return, succeeded in mobilizing enormous savings in Japan.

In summary, low capital seems an unsatisfactory basis for explaining low rates of development, for two reasons. First, if low capital is

Figure A-5. Multiple Transition Paths to the Steady State



itself the barrier to growth, returns to capital should be sufficiently high to attract large capital inflows. The problem would thus be self-correcting in a market environment. Second, the experience of the East Asian economies shows that under at least some set of institutions, it is possible for an economy to generate enormously high rates of savings and domestic investment. This leads us to ask whether there is a way, *by relaxing certain of the neoclassical assumptions about the production function*, to account for the fact that even as government-imposed barriers to the flow of capital have been brought down, capital has not flowed to many of the countries most starved of capital. We consider, in turn, two possible explanations: (a) the role of skilled labor in enhancing the marginal product of capital in capital-rich countries, and (b) aggregate economies of scale. We present a theoretical model consistent with (a) but argue that (b) does not provide a persuasive explanation of low capital flows to poor countries.

*Increasing Returns to Skilled Labor.* The production function model suggests that it is a shortage of complementary factors—not labor in general but, rather, skilled and educated labor—that may explain limited capital flows to capital-poor countries. But the phenomenon of brain drain raises questions about this explanation. Why, for instance, would skilled labor migrate from India to the United States if there was a shortage of skilled labor in India and if that shortage explained India's lack of development?

There are simple models that go beyond the neoclassical model with constant returns to scale and that can in fact explain the seeming anomaly. If the production function exhibits *increasing returns to scale in skilled workers*, it will pay for all the skilled workers to cluster together. Consider, for instance, two islands, each with the same endowment of capital and unskilled labor (assumed to be unable to migrate between islands) and an endowment of skilled labor, which can migrate freely from one island to the other. Assume that the production function is

$$(A-4) \quad y = K^\alpha L^\beta (S + 1)^\gamma \quad \text{with } \alpha + \beta < 1 \quad \text{and } \gamma > 1.$$

Then all the skilled labor will migrate to one island. The marginal productivity of both capital and skilled labor will be higher on that island, which we will call the “developed island.” This is true even though the developed and less developed islands have the same production functions.

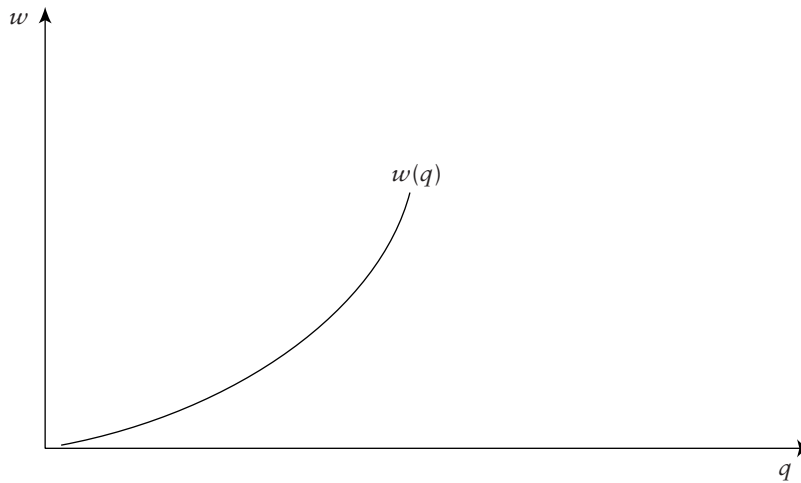
Kremer’s (1993) O-ring theory of production is a striking example of a production function with the key features of equation (A-4), namely, that there are increasing returns to skilled labor. The O-ring theory takes its name from the space shuttle *Challenger*, which exploded because one of its thousands of components, an O-ring, failed. The explosion dramatized the complementarity among inputs to a production process. No matter how good the other parts may be, if one part malfunctions, the other parts may create little, if any, value.

To capture that idea, Kremer proposes an unusual production function. He supposes that there are  $n$  tasks in a production process. For simplicity, let  $n = 2$ . Each worker has a skill  $q$ , where  $q$  is between 0 and 1. Let  $q_1$  denote the skill of the person performing the first task, and let  $q_2$  denote the skill of the person performing the second task. A firm’s production function is  $y = Aq_1q_2$ . One way to interpret the model is that  $q$  is the probability that a job is done correctly. Under this interpretation, the value of a firm’s output if both jobs are done correctly is  $A$ , and the probability of that joint event is  $q_1q_2$ .

Competitive equilibrium is characterized by a wage function, denoted by  $w(q)$ , and an allocation of workers to firms. Given the wage function, each firm will choose  $q_1$  and  $q_2$  to maximize its expected income,  $Aq_1q_2 - w(q_1) - w(q_2)$ . The first implication of the model is the “skill-clustering theorem”: competitive forces will lead to the clustering of a high-skill worker with other high-skill workers, and similarly for low-skill workers.

To see this is straightforward. Consider any distinct values  $a$  and  $b$ . Since  $(a - b)^2 = a^2 + b^2 - 2ab > 0$ , it must be true that  $a^2 + b^2 > 2ab$ . If we let the values  $a$  and  $b$  represent the skill levels of the individuals who perform the first and second tasks, it follows that expected output is higher when the skill levels of the workers in the two tasks are matched



*Figure A-6.* Wage Rate as a Function of Worker Quality

than when they are not. Intuitively, it does not pay to “waste” a worker with a high probability of success by pairing him or her with a co-worker who has a low probability of success. This means that whatever the wage and skill levels are, competitive forces will lead workers of a given skill level to be grouped together in any production unit. If this model captures forces present in the economy as a whole, there will be increasing returns to skill, as illustrated in Figure A-6, and incentives for human capital to flow to the richest countries—the brain drain.

*Scale Economies.* Besides the phenomenon of skill clustering, there is a second way one might retain the hypothesis that industrial and developing countries have the same production function but that industrial economies have a higher marginal product of capital: scale economies. Ironically, in postulating scale economies, one has to abandon the standard competitive model, unless one argues that all the returns to scale are external to the firm (Marshall 1897).<sup>39</sup> With returns to scale at the national level, a larger country will be more productive than a smaller one and so will tend to attract higher capital investments. Although such scale economies underlie several of the theories of development that have received extensive attention in the past 15 years, we find these theories implausible because they miss the fundamental units across which scale economies might operate.<sup>40</sup> This is especially the case when the scale economies arise from an externality. Then it is simply assumed that the externality is conferred on others in the country but does not

extend beyond the boundaries of the country. With increased globalization (with firms, for instance, operating across national boundaries), this hypothesis seems dubious. Hong Kong and Singapore have high per capita incomes, although their aggregate income remains low simply because they are small. If economies of scale operate at the level of the whole economy, China should be relatively rich, and Hong Kong and Singapore should be poor. But with the growth of international trade, it is less persuasive that the natural unit is the country or economy. If the economies of scale operate at the level of cities (from agglomeration economies), then it is possible that poor countries will have growth poles in rich cities. To the extent that economies of scale operate at the level of an industry, poor countries could again enjoy the benefits of scale simply by concentrating in particular industries.<sup>41</sup>

### *Distortions: Harberger Triangles and Krueger Rectangles*

As we noted in the introduction, neoclassical theorists typically hypothesize that government-induced distortions—stemming from taxes, tariffs, and quotas, for example—are critical to explaining divergent economic performances across economies. Government controls over economic activity not only misallocate resources among productive activities, inducing Harberger (1964) triangles, but also invite competition for government protection that leads to the dissipation of resources in rent-seeking activities such as lobbying. In a limiting case—constant returns to scale in rent-seeking—the rent-seeking activities will dissipate the total value of the rents, producing Krueger (1974) rectangles of deadweight loss.

Government-induced distortions can be so large as to destroy an economy's potential to develop, but the evidence suggests that more than the elimination of price distortions is at stake in creating the preconditions for development. The experience in the aftermath of liberalization in Brazil—where these distortions were reduced enormously, if not eliminated—was that growth remained limited (even more limited than during earlier periods such as Brazil's import-substitution phase). Similarly, the contrast between the transformation to a market economy of the countries in Eastern Europe and the former Soviet Union, on the one hand, and China, on the other, suggests that something important was missing in the usual prescriptions of liberalization and privatization. Even as the distortions were reduced, output fell—in marked contrast to the predictions of the standard neoclassical theory (Blanchard and Kremer 1997; Stiglitz 2000).

In a sense, there was a close similarity between those who saw the problem of underdevelopment as one of *government-induced failures* and those, such as the dual-economy theorists, who saw it as one of *easily remedied market failures*. Both thought that straightforward in-

terventions to address the problem of resource misallocation—moving to the production possibilities frontier from inside the frontier—provided the key to successful economic transformation. Economic distortions are costly, particularly to poor countries that can ill afford them. Reducing them can undoubtedly transform a very poor developing country into a poor developing country. But reducing distortions—whether by planning or by eliminating government-induced market distortions—seemingly provides neither necessary nor sufficient conditions for sustained growth.<sup>42</sup>

## Appendix B. Coordination Problems: A Mathematical Treatment

In Part I we presented a series of models of coordination problems. This appendix highlights their common mathematical structure.

Each model has three elements: a set of *actors*; the set of feasible actions for each actor, i.e. *strategy sets*; and the *payoff functions*. The payoff functions depend in general on one's own actions, the actions of others, and prices (which depend on the actions of all individuals).

In some specializations of the model, the impact of other individuals' actions is entirely through prices; that is, the only externalities are pecuniary ones. Then the payoff functions can be written as a function of only one's own actions and prices. All that matters is the "atmosphere," which can be represented solely by the price system. Examples include the screening model (Stiglitz 1975), the property rights enforcement model (de Meza and Gould 1992), and the "big push" model of Murphy, Shleifer, and Vishny (1989: sect. IV).<sup>43</sup>

Table B-1 provides a taxonomy that distinguishes three ways of modeling actors: as identical (column I), with individual differences in payoff functions (column II), or with individual differences in strategy sets (column III). The table distinguishes two ways of modeling strategy sets: continuous (top row) or discrete (bottom row). The models described in Part I can be placed into the six categories defined by this matrix (I-C, I-D, and so on). Although we did not describe such cases here, there are also hybrids of these six types. For example, in one version of Acemoglu (1997) the workers' choice variable (training) is continuous, but the firms' choice variable (innovation) is discrete.

### *Class I-C. Identical Actors and Continuous Actions*

The first class of models hypothesizes identical actors with the preferences (profits) of agent  $i$  being  $u^i(a^i; a, p)$ , where  $a^i$  is the actor's own action,  $a$  is everyone else's action, and  $p$  is a vector of prices—itsself a function of the entire vector of actions. Each action is a continuous

Table B-1. A Taxonomy of Models of Coordination Problems

Actions	Actors		
	I. Actors are identical	II. Actors differ in their payoff functions	III. Actors differ in their strategy sets
C. Continuous-choice variable	R&D (Romer 1986) Savings (Appendix A in this chapter)		Training and innovation (Acemoglu 1997)
D. Discrete-choice variable	Innovative behavior (Sah and Stiglitz 1989a) Contract enforcement (Greif 1994) Rent-seeking (Murphy, Shleifer, and Vishny 1993; Acemoglu 1995)	Education as screening (Stiglitz 1975) Innovative behavior (Sah and Stiglitz 1989a) Structure of ownership (Hoff and Sen 2000)	“Big push” models (Helpman and Krugman 1985; Murphy, Shleifer, and Vishny 1989; Rodriguez-Clare 1996; Rodrik 1996) Training and innovation (Acemoglu 1997)

variable. An increase in everyone else’s action raises  $u^i$  (that is,  $u_2^i > 0$ ). We summarize everyone else’s action by the variable  $a$  because we limit our discussion to the case of *symmetric* equilibria.

Assuming decreasing marginal returns to an increase in one’s own action (that is,  $u_{11}^i < 0$ ), the representative agent’s behavior is described by the reaction function:

$$(B-1) \quad u_1^i[a^i; a, p(a)] = 0.$$

That is, if all others choose some action  $a$ , the  $i$ th agent’s incentive would be to choose  $a^i$  to satisfy (B-1). At that point he would be at an optimum, given his environment. As noted in Part I, the interior symmetric equilibria are the values of  $a^*$  that solve

$$(B-2) \quad u_1^i[a^*; a^*, p(a^*)] = 0$$

for at  $a^*$ , all actors are optimizing.

Complementarities are captured in this model by the condition that  $u_{12}^i > 0$ , and if complementarities are sufficiently large, there will be multiple equilibrium values of  $a^*$  (see Figure 2). All individuals are better off in the equilibrium at which all choose a higher action, since for any given  $a^i$ , an increase in others’ action increases utility ( $u_2^i > 0$ ).

That an individual then finds it optimal to increase  $a^i$  increases his welfare further.

### *Class I-D. Identical Actors and Discrete Activities*

The next class of models assumes identical actors who have *discrete* actions. The simplest case is where there are just two possible actions or activities (a binary choice). Then the payoff to any activity depends on the fraction  $x$  of agents that undertake, say, the first activity. The utility function of the  $i$ th agent can be written as  $U^i = U^i[a^i; x, p(x)]$ , where  $a = 1$  if the individual undertakes the first activity and  $a = 2$  if he undertakes the second activity. The value  $p$  is a function of  $x$ :  $p = p(x)$ . The individual chooses his activity,  $a^i$ , to maximize  $U^i[a^i; x, p(x)]$ , taking  $x$  as given. With a continuum of agents, an equilibrium in which  $x \in (0, 1)$  is described by the values of the fraction  $x$  that solve

$$(B-3) \quad U^i[1; x^*, p(x^*)] = U^i[2; x^*, p(x^*)].$$

This states that when a fraction  $x^*$  of the population undertakes the first activity, every agent is indifferent between the two activities. Complementarities exist in this model if the relative return to the first activity is increasing in  $x$ : that is, if the partial derivative of the payoff function with respect to  $x$ , denoted  $U_x^i$ , satisfies

$$(B-4) \quad U_x^i[1, x, p(x)] - U_x^i[2, x, p(x)] > 0.$$

When complementarities are sufficiently strong, the *ranking* of activities 1 and 2 for each agent can change with  $x$ , and thus there can be multiple values of  $x^*$  that solve (B-3).

With complementarities, corner solutions are also possible. A corner solution where all individuals choose activity 1 exists if

$$(B-5) \quad U^i[1; 1, p(1)] > U^i[2; 1, p(1)]$$

and another corner solution exists where all choose activity 2 if

$$(B-6) \quad U^i[2; 0, p(0)] > U^i[1; 0, p(0)].$$

(B-5) states that when all other individuals choose the first activity, it is individually optimal to choose the first activity. (B-6) states that when all other individuals choose the second activity, it is individually optimal to choose the second activity.

This binary choice model can be generalized to an arbitrarily large number of discrete activities. In Murphy, Shleifer, and Vishny (1993),

there are three activities: cash-crop production, a subsistence activity, and rent-seeking (predation). The returns to the subsistence activity, denoted by  $\gamma$ , are exogenous, while the returns to cash-crop production and rent-seeking are decreasing in the ratio  $n$  of rent-seekers relative to cash-crop producers. An interior equilibrium is described by a value  $n^*$  that solves

$$(B-7) \quad U^i[1; n^*, p(n^*)] = U^i[2; n^*, p(n^*)] = \gamma.$$

Suppose that over some range of  $n$ , returns are decreasing more steeply for cash-crop production than for rent-seeking. This implies that over some range of  $n$ , the *relative* returns to rent-seeking are increasing in  $n$ . In this case, multiple Pareto-rankable equilibria may exist. Some are characterized by a low fraction of rent-seekers where all individuals' payoffs exceed  $\gamma$  (thus there are no subsistence producers). Other equilibria are characterized by a high fraction of rent-seekers where all actors' payoffs are driven down to the subsistence return  $\gamma$ .

#### *Class II-D. Individual Differences in Payoff Functions and Discrete Activities*

In the preceding class of models, some individuals chose one action and others chose another. All individuals were identical, and so the theory provides no explanation of why this happened—and, in fact, it makes no difference. All that is required is that individuals be indifferent as to what they do. But, in general, there *are* important individual differences. Whenever such differences exist, they may explain why some individuals choose one action rather than another. The next category of models entails individual differences in payoff functions.

The structure of these models is such that there is some characteristic of the individual, reflected in, say, his utility function or wealth and denoted for simplicity by  $c$ , and there is a probability distribution of individuals according to  $c$ , say  $F(c)$ . Suppose as before that individuals have a binary choice of activities. Each individual chooses his activity,  $a^i$ , to maximize his payoff, say  $V^i(a^i; x, c)$ , taking  $x$  as given. [For simplicity, we suppress the dependence of payoffs on  $p(x)$ .] The utility functions have the structure that we can order individuals by  $c$  such that there exists a critical value  $c^*$  that satisfies:

$$(B-8) \quad V[1, F(c^*), c] \begin{matrix} \geq \\ \leq \end{matrix} V[2, F(c^*), c] \quad \text{as } c \begin{matrix} \geq \\ \leq \end{matrix} c^*$$

This states that individuals whose attribute is above  $c^*$  prefer activity 1, individuals whose attribute is equal to  $c^*$  are indifferent, and individuals whose attribute is below  $c^*$  prefer activity 2.

Complementarities are defined, as in equation (B-4), by the condition that the relative return to activity 1 is increasing in the fraction  $x$  of individuals undertaking activity 1:  $V_x^i(1, x, c) - V_x^i(2, x, c) > 0$ . When

complementarities are sufficiently strong, there can exist multiple solutions for  $c^*$ .

### *Class III. Individual Differences in Strategy Sets*

Coordination failures can also emerge from the interaction of different kinds of actors. Consider a situation with two groups of actors that differ in their strategy sets—for example, firms that can innovate or not, and workers who can train or not. For simplicity, we will represent each group by a single actor, but in fact each group can consist of a large number of actors. In that case, we solve for the symmetric equilibrium of each class of actors using the techniques of Class I-C.

Suppose there are two groups of actors, and suppose the action of the first is a continuous variable denoted by  $a$  and the action of the second is a continuous variable denoted by  $b$ . Then the first group maximizes a payoff function  $v^1[a; b, p(a, b)]$  with respect to  $a$ , given  $b$  and  $p$ , and the second maximizes  $v^2[a; b, p(a, b)]$  with respect to  $b$ , given  $a$  and  $p$ .

An interior equilibrium is a solution to the reaction functions

$$(B-9) \quad v_a^1[a^*, b^*, p(a^*, b^*)] = 0$$

and

$$(B-10) \quad v_b^2[a^*, b^*, p(a^*, b^*)] = 0.$$

There may exist multiple values of  $(a^*, b^*)$  that solve these equations if there are complementarities between the two groups of actors, which is captured by the condition that  $v_{ab}^i > 0$ .

## Notes

The authors thank Abhijit Banerjee, Arnold Harberger, Gustav Ranis, and Debraj Ray for helpful comments. The first draft of this chapter was prepared while Hoff was a visiting faculty member at Princeton University and Stiglitz was vice president (Development Economics) and chief economist, World Bank. Financial support for Hoff from the John D. and Catherine T. MacArthur Foundation is gratefully acknowledged.

1. For instance, Brazil's import substitution policy yielded growth rates averaging 10 percent per year for nine years (1968–76), but evidently it was not sustainable, or at least was not sustained. Brazil's "liberalization" strategies of the 1980s finally began to yield fruit in the 1990s, although growth was more modest than in the earlier period and the growth spurt was shorter lived; it, too, seems to have stalled in the global financial crisis of 1998. It is too soon to know whether, and for how long, growth will be restored.

2. The low-income country with the most sustained economic growth has been China, which has not privatized, still has a somewhat restricted trade regime, and has only gradually eliminated price distortions.

3. We use the term *neoclassical theory* as shorthand for models that postulate maximizing agents who interact through a *complete* set of perfectly competitive markets. This narrow definition of neoclassical theory is for convenience only. Much of the early work in institutional economics was neoclassical in spirit because it argued that institutions filled in for missing markets in such a way as to lead to efficiency, once the costs of writing and enforcing contracts were taken into account. Douglass North's early work (which one might call "North I") exemplifies that position. That work argued that superior institutions would ultimately eliminate inferior ones so that efficiency would be achieved (see North and Thomas 1970, 1973). North's later work, which one might call North II because its conclusions differ sharply from those of his earlier work, disparages the prospects for understanding economic history as a more or less inevitable movement toward more efficient institutions: "Throughout most of history, the experience of the agents and the ideologies of the actors do not combine to lead to efficient outcomes" (North 1990: 96; see also North 1994). A review is in Hoff (1992).

4. Table B-1 lists our central examples.

5. See, for example, Stiglitz (1989). Floro and Yotopoulos (1991) and Hoff, Braverman, and Stiglitz (1993) provide many case studies demonstrating the importance of market failures in rural credit markets of developing countries.

6. The link between distribution and efficiency is demonstrated in a framework of *bargaining* in William Samuelson (1985). One of the first general equilibrium models to relate inequality to aggregate functioning was Dasgupta and Ray (1986). Models of economies with *principal-agent* relationships that demonstrate the link between distribution and efficiency include Bowles (1985), Braverman and Stiglitz (1989), Banerjee and Newman (1993), Hoff (1994), Hoff and Lyon (1995), Legros and Newman (1996), Aghion and Bolton (1997), Mookherjee (1997a, 1997b), and Hoff and Sen (2000). This link is also studied in models of *collective action* by Bardhan and Ghatak (1999) and in a *political economy* model by Robinson (1999). We briefly discuss in Part II evidence from Engerman and Sokoloff (1997) and Engerman, Haber, and Sokoloff (1999) of the political channels by which initial inequality of wealth affects institutions and growth.

7. Similarly, a firm's incentives will depend on its net worth (Greenwald, Stiglitz, and Weiss 1984; Bernanke and Gertler 1990; Greenwald and Stiglitz 1993).

8. It is easy to lose sight of this, perhaps because the "first generation" of principal-agent models (Ross 1973; Stiglitz 1974a) were *partial* equilibrium models. We are indebted to Ray's comment in this volume for underlining this point. What might be called the "second generation" of principal-agent models differs from the first in that it analyzes moral hazard under *general* equilibrium, where agency problems may affect wage rates (Banerjee and Newman 1993; Legros and Newman 1996), interest rates (Aghion and Bolton 1997; Piketty 1997), and the path of asset prices (Hoff and Sen 2000).



9. There is a vast literature on this topic. A very selective list of interesting results includes Azariadis and Drazen (1990), Krugman (1991), Ljungqvist (1993), Acemoglu (1995), and Mookherjee and Ray (1998). A simple diagrammatic treatment of the effect of an initial wealth distribution on the steady state is Banerjee (2000).

10. For example, once high wages induce a labor-saving innovation, it is not the case that a subsequent fall in the wage “undoes” the innovation. For a broader discussion, see Landes (1998).

11. Indeed, Stiglitz (1969) showed in a variant of the Solow model that the distribution of income did not even depend on initial conditions.

12. We place “equilibrium” and “evolution” within quotation marks because neoclassical analysis ignores institutions and yet, as we have argued, institutions do affect resource allocations. Moreover, institutions evolve in response to changes in endowments, technology, and policy, and these interactions can be among the most important influences on development.

13. Formally, suppose each resource owner who enforces his property rights hires  $L$  workers and that the value of their output is  $F(L)$ . His rents are thus  $F(L) - w(x)L$ , where  $w$  is the wage function, which decreases with the fraction  $x$  of resource owners who enforce their property rights.

14. See, for example, Bardhan (2000) and Greif (1997). Greif notes, “Since the relative efficiency of a particular system of [contract enforcement] depends on the economic environment as well as [social, cultural, and political factors], there is no reason to expect a particular system in a particular society to be economically efficient” (257).

15. To see this, note that until screening institutions are created, heterogeneous but observationally identical goods trade at the same price. The price depends on average quality, which is like a common-property resource in that (a) it yields an income flow to producers, (b) the income flow depends on the actions of all producers, who can lower or raise it according to whether they are low- or high-quality producers, and (c) no producer has private property rights to it. If a technical change induces new entry of marginal, low-quality producers, they can lower average quality by so much that no producer gains from the technical change. The intuition is the same as that of the tragedy of the commons.

16. Here we focus on applications of the theory of coordination problems to development. Cooper (1999) treats applications to macroeconomics.

17. In Part I we discussed a fourth example arising from complementarities in the process of property rights enforcement (de Meza and Gould’s 1992 model). In this model, complementarities in the enforcement actions of property owners lead to multiple equilibria, some with higher aggregate social surplus than others. But the equilibrium outcomes are not Pareto-rankable (in this model, the workers always prefer less enforcement), and so a *coordination failure* cannot arise.

18. The idea that the set of markets might be inefficient is demonstrated also in Hart (1975). A recent treatment is Makowski and Ostroy (1995). Regarding the problem of why one cannot have complete markets, even in the absence of

the kinds of asymmetric information problems emphasized in Stiglitz (1975), Matsuyama (1997: 145) notes, “Even if one succeeded in making the list of everything, it would be impossible to open markets for all: even with very small costs of setting up markets, all the resources in the economy would be absorbed so that nothing would be left over to be used in performing these activities.”

19. For example, when any set of firms in a country establish themselves as successful exporters, foreign buyers are more likely to establish local offices, which in turn raises the return to each entrepreneur’s efforts to expand its exports. This issue is highlighted in Morawetz’s (1981) case study of Colombia’s garment industry.

20. Durlauf (1999) surveys recent work on group effects with endogenous stratification. The contribution of this literature is to study interdependencies in behavior or outcomes across agents in which the grouping of individuals within a given interaction environment (e.g., a neighborhood, school, or firm) is *endogenous*, not fixed.

21. For seminal work on thick market complementarities (in a Keynesian context) see Diamond (1982).

22. Malaria kills primarily children. Natives of Africa who survive to adulthood have some resistance to the disease, which nonnatives lack.

23. A general statement is found in Hayek (1978); an application to the conduct of monetary policy is in Lucas (1973, 1976); and an application to developing countries is in Krueger (1993).

24. For example, Farrell (1987) shows that a clumsy compromise made by a bureaucrat with imperfect information can be a better starting point for bargaining between two parties than either party’s most-preferred outcome. Hoff and Lyon (1995) show that when there is adverse selection in the credit market and lenders cannot enforce exclusivity in credit contracts, the government can create a Pareto improvement by a tax-transfer policy that transforms part of an individual’s risky future income into a (virtually) riskless transfer payment that can serve as collateral. The increase in collateral mitigates incentive problems and thereby reduces borrowing costs, which makes everyone better off.

25. Other examples of temporary policy that can force a shift from one to another equilibrium are bankruptcy law and a ban on child labor. Miller and Stiglitz (1999) present a model in which a bankruptcy law that establishes stronger debtor rights eliminates the “bad” equilibrium in which there are large numbers of bankruptcies as a result of the large transfers associated with large creditor-friendly bankruptcies. Basu and Van (1998) show how child labor laws can eliminate a “bad” equilibrium with child labor. In the good equilibrium that results, no one actually wants to have his children work.

26. The example in Part I of credentialing illustrates a case of multiple Pareto-ranked equilibria in the disclosure of information; see also Grossman (1989).

27. Palfrey and Rosenthal (1984) present a model in which the *larger* the number of potential beneficiaries of a discrete public good, the *less* likely the public good is to be supplied.

28. In the next section we discuss the case, which is especially relevant in transition economies, of organized resistance *within the government* to privatization.

29. In the transition economies, it has been argued that privatization of natural monopolies and highly concentrated industries should proceed even when the government is too divided between pro- and antireform forces to create a regulatory regime prior to privatization (Boycko, Shleifer, and Vishny 1996). But this argument would seem to violate the following straightforward criterion of consistency: if one argues that government cannot implement a policy  $\alpha$  (e.g., industry regulation) because of a trait  $\beta$  (a divided government), then one cannot also argue that government should do a policy  $P$  (privatization) unless one can show that  $P$  is consistent with trait  $\beta$ . If the reformers have enough power to impose privatization, the argument that they cannot impose regulation is consistent—in the above sense—only if privatization is less costly to the ministries than regulation would be; that is, *because the ministries privatize to themselves* (Hoff and Stiglitz 2000).

30. Such issues arise, of course, in industrial as well as developing countries. Successful reforms require some form of commitment (some fixed costs of undoing the reforms). For instance, when the United States abolished its distortionary farm subsidies—giving farmers a lump-sum payment as compensation—many economists lauded the reform. Others were more skeptical. The strength of the farm lobby was undiminished. Why, having received the lump-sum subsidy, would farmers not subsequently try to restore their distortionary subsidies? There was no real commitment on this point—and how could there be? To be sure, they would wait for a “bad year,” with plummeting prices, to press for relief, for a reinstatement of subsidies. And that is precisely what seems to be happening.

31. Besley and Coate (1998: 151–52) provide a definition of *political failure* that is parallel to that of *market failure*. One begins in each case by defining the set of technologically feasible utility allocations. For the case of political failure, this reflects the available policy instruments—for example, taxes, transfers, and investments. Political institutions are then modeled. By analogy with a *market failure*, a *political failure* arises when equilibrium policy choices result in an outcome in which it is technologically feasible (given available tax and transfer instruments, information, and so on) to implement a Pareto-improving policy, but that policy is not an equilibrium choice.

32. For instance, financial interests will make cogent arguments for an independent central bank and, using that cover, push not only for a central bank that is independent but for one whose governance is not representative of the parties affected by macroeconomic policies.

33. For an empirical and theoretical analysis casting doubt on the centrality of transparency as a cause of the crisis, see Furman and Stiglitz (1999).

34. See Rostow (1952, 1960); Adelman and Morris (1965); Abramovitz (1986); Stiglitz (1995a); Temple and Johnson (1998).

35. As North and Thomas argue in *The Rise of the Western World* (1973: 2), “innovation, economies of scale, education, capital accumulation . . . are

not causes of growth; they *are* growth.” Easterly and Levine (2000) document four stylized facts of economic growth that they argue are not well explained by the factor accumulation models.

36. See Stiglitz (1988). In fact, among countries with not too disparate capital-labor ratios, factor prices would be equalized simply by trade (Samuelson 1948).

37. Capital market constraints make consumption levels backward-looking: consumption today ( $c_t$ ) will depend on the time profile of income in the past. For simplicity, suppose  $c_t = f(y_{t-1})$  where  $y_{t-1}$  is last period's income and  $f' > 0$ . When the growth rate is high,  $y_{t-1}/y_t$  is low. Hence,  $c_t/y_t$  is low, which implies that the saving rate is high. In this way, constraints on borrowing against future income can make saving rates an increasing function of growth.

38. Stiglitz (1973) showed in a variety of models that expectations can play a key role in determining savings and the long-run accumulation path of the economy. He noted that expectations may even cause an economy to oscillate between different techniques and saving rates, neither converging to a balanced growth path nor diverging from it; the economy “simply ‘wobbles along’” (141). These results do not depend on incorrect expectations but may hold where expectations of prices in the immediate future are fulfilled.

39. Note that the model presented in the previous section exhibited aggregate increasing returns to scale. If capital and labor were both mobile, they would all end up on the same island. If only capital was mobile, it would move disproportionately to the island with the clustering of skilled labor. Incomes per capita would persistently differ across the two islands.

40. For a discussion of the role of multinationals in diffusing new technologies, see World Bank (1999b). For a discussion of the implications of alternative hypotheses for market equilibrium, see Dasgupta and Stiglitz (1988).

41. Earlier we showed that there can exist multiple equilibria arising from economies of scale associated with nontraded goods (see pp. 409–10). Similarly, the hypothesis in Lucas (1988) that early developers can “choose” industries with steep learning curves fails to explain their sustained higher incomes and growth rates. First, it assumes that the learning cannot be transmitted across national boundaries. Second, it fails to note that if some industries have steeper learning curves, faster rates of productivity growth will typically be reflected in faster rates of decline in relative prices; see Skeath (1993).

42. For an elaboration on this point, see Rodrik (1995); Stiglitz (1998a).

43. A general framework with many other examples of pecuniary externalities in a setting of moral hazard and adverse selection is in Greenwald and Stiglitz (1986). For a framework emphasizing pecuniary externalities arising from innovation, see Makowski and Ostroy (1995).

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