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After more than a half century of experience with attempting to encourage modern development, we have learned that development is both possible and extremely difficult to achieve. Thus, an improved understanding of impediments and catalysts of development is of the utmost importance. Since the late 1980s, significant strides have been made in the analysis of economic development and underdevelopment. In some cases, ideas of the classic theories reviewed in Chapter 3 have been formalised and, in the process, their logical structure and their significance for policy have been clarified and refined. At the same time, the analysis has also led to entirely new insights into what makes development so hard to achieve (as witnessed in sub-Saharan Africa) but also possible to achieve (as witnessed in East Asia). Indeed, this is what makes the study of economic development so very important: it does not happen automatically; it requires systematic effort. But development is far from a hopeless cause; we know it can be done. Theory helps us think systematically about how to organise our efforts to help achieve development—a goal second to none in its importance to humanity.

In this chapter, we review a sample of some of the most influential of the new models of economic development. In some ways, these models show that development is harder to achieve, in that it faces more barriers than had previously been recognised. But greater understanding itself facilitates improvements in development strategy, and the new models have already influenced development policy and modes of international assistance. The chapter concludes with an examination of the "growth diagnostics" framework for appraising the locally **binding constraints** on the ability of a developing nation to further close the gap with the developed world, and accordingly finding and implementing the highest-return policies and investments.

Binding constraints The one limiting factor that if relaxed would be the item that accelerates growth (or that allows a larger amount of some other targeted outcome).

The new research has broadened considerably the scope for modelling a market economy in a developing-country context. One of its major themes is incorporating problems of coordination among **economic agents**, such as among groups of firms, workers, or firms and workers together. Other key themes, often but not always in conjunction with the coordination problem, include the formal exploration of situations in which increasing returns to scale, a finer division of labour, the availability of new economic ideas or knowledge, learning by doing, information externalities, and monopolistic competition or other forms of industrial organisation other than perfect competition predominate. The new perspective frequently incorporates work in the "new institutional economics," such as that of Nobel laureate Douglass C. North,

Economic agent An economic actor—usually a firm, worker, consumer, or government official—that chooses actions so as to maximise an objective; often referred to as "agents."

and introduced in Chapter 2. All of these approaches depart to some degree from conventional neoclassical economics, at least in its assumptions of perfect information, the relative insignificance of externalities, and the uniqueness and optimality of equilibria.[1]

4.1 Underdevelopment as a Coordination Failure

Many newer theories of economic development that became influential in the 1990s and the early years of the twenty-first century have emphasised **complementarities** between several conditions necessary for successful development. These theories often highlight the problem that several things must work well enough, at the same time, to get sustainable development under way. They also stress that in many important situations, investments must be undertaken by many agents in order for the results to be profitable for any individual agent. Generally, when complementarities are present, an action taken by one firm, worker, or organisation increases the incentives for other agents to take similar actions.

Models of development that stress complementarities are related to some of the models used in the endogenous growth approach (described in Appendix 3.3), in ways we will point out later in the chapter, but the **coordination failure** approach has evolved relatively independently and offers some significant and distinct insights.[2] Put simply, a coordination failure is a state of affairs in which agents' inability to coordinate their behaviour (choices) leads to an outcome (equilibrium) that leaves all agents worse off than in an alternative situation that is also an equilibrium. This may occur even when all agents are fully informed about the preferred alternative equilibrium. They simply cannot get there because of difficulties of coordination, sometimes because people hold different expectations and sometimes because everyone is better off waiting for someone else to make the first move. This section spells out the meaning and implications of these perspectives in detail, through both simple models and examples.

Complementarities often involve investments whose return depends on other investments being made by other agents. In development economics, such network effects are common, and we consider some important examples later in this chapter, including the model of the **big push**, in which production decisions by modern-sector firms are mutually reinforcing, and the **O-ring model**, in which the value of upgrading skills or quality depends on similar upgrading by other agents. Curiously, somewhat analogous effects are also common in analyses of frontier technologies in developed countries, particularly information technologies, in which the value of using an operating system, word-processing program, spreadsheet program, instant messaging, and other software or product standard depends on how many other users also adopt it. In both cases, the circular causation of positive feedback is common.[3] This framework may also be used in analyses of the **middle-income trap**, in which countries develop to a degree but chronically fail to reach high-income status, often due to lack of innovation capacity.

Complementarity An action taken by one firm, worker, or organisation that increases the incentives for other agents to take similar actions. Complementarities often involve investments whose return depends on other investments being made by other agents.

Coordination failure A situation in which the inability of agents to coordinate their behaviour (choices) leads to an outcome (equilibrium) that leaves all agents worse off than in an alternative situation that is also an equilibrium.

Big push A concerted, economy-wide, and typically public policy-led effort to initiate or accelerate economic development across a broad spectrum of new industries and skills.

O-ring model An economic model in which production functions exhibit strong complementarities among inputs and which has broader implications for impediments to achieving economic development.

Middle-income trap A condition in which an economy begins development to reach middle-income status but is chronically unable to progress to high-income status. Often related to low capacity for original innovation or for absorption of advanced technology, and may be compounded by high inequality.

An important example of a complementarity is the presence of firms using specialised skills and the availability of workers who have acquired those skills. Firms will not enter a market or locate in an area if workers do not possess the skills the firms need, but workers will not acquire the skills if there are no firms to employ them. This coordination problem can leave an economy stuck in a bad equilibrium—that is, at a low average income or growth rate or with a class of citizens trapped in extreme poverty. Even though all agents would be better off if workers acquired skills and firms invested, it might not be possible to get to this better equilibrium without the aid of government. As we will see, such coordination problems are also common in initial industrialisation, as well as in upgrading skills and technologies, and may extend to issues as broad as changing behaviour to modern "ways of doing things." Such problems are further compounded by other market failures, particularly those affecting capital markets.[4]

Another example typical of rural developing areas concerns the commercialisation of agriculture. As Adam Smith already understood, specialisation is one of the sources of high productivity. Indeed, specialisation and a detailed division of labour are hallmarks of an advanced economy. But we can specialise only if we can trade for the other goods and services we need. Producers must somehow get their products to market while convincing distant buyers of their quality. As Shahe Emran and Forhad Shilpi stress, in the development of agricultural markets, middlemen play a key role by effectively vouching for the quality of the products they sell; they can do this because they get to know the farmers from whom they buy as well as the products. It is difficult to be an expert in the quality of many products, so in order for a specialised agricultural market to emerge, there needs to be a sufficient number of concentrated producers with whom a middleman can work effectively. But without available middlemen to whom the farmers can sell, they will have little incentive to specialise in the first place and will prefer to continue producing their staple crop or a range of goods primarily for personal consumption or sale within the village. The result can be an **underdevelopment trap** in which a region remains stuck in subsistence agriculture.[5]

Underdevelopment trap
A poverty trap at the regional or national level in which underdevelopment tends to perpetuate itself over time.

In many cases, the presence of complementarities creates a classic "chicken and egg" problem: which comes first, the skills or the demand for skills? Often the answer is that the complementary investments must come at the same time, through coordination. This is especially true when, as is generally the case, there is a lag between making an investment and realising the return on that investment.[6] In this case, even if, for some reason, all parties expect a change to a better equilibrium, they will still be inclined to wait until other parties have made their investments. Thus, there can be an important role for government policy in coordinating joint investments, such as between the workers who want skills that employers can use and the employers who want equipment that workers can use. Neither may be in a position (or find it in their self-interest) to take the first step; each may be better off waiting for the other parties to invest first.

As another example, a new or modernising firm using new technologies may provide benefits to other firms that the adopting firm cannot capture; so each firm has an incentive to underinvest in the new technology unless a

sufficient number of others invest. Some of these benefits may include raising demand for key industrial products such as steel, helping pay for the fixed costs of an essential infrastructure such as railroads or container ports, or learning from others' experiences. We will take a closer look at this problem later in the chapter.

The new work expands the scope for potentially valuable government policy interventions, but it does not take their success for granted. Rather, government itself is increasingly analysed in contemporary development models as one of the components of the development process that may contribute to the problem as well as to the solution; government policy is understood as partly determined by (endogenous to) the underdeveloped economy (see Chapter 11). For example, a dictator such as Mobutu Sese Seko, the former ruler of the Democratic Republic of Congo when it was known as Zaire, may prefer to keep his country in an underdevelopment trap, knowing full well that as the economy develops, he will lose power. But rather than concluding that government generally exacerbates underdevelopment rather than facilitates development (as in extreme versions of the neoliberal, or neoclassical counterrevolution school), many development specialists look actively for cases in which government policy can still help, even when government is imperfect, by pushing the economy toward a self-sustaining, better equilibrium. Such **deep interventions** move an economy to a preferred equilibrium or even to a higher permanent rate of growth in which there is no incentive to go back to the behaviour associated with the bad equilibrium. In these cases, government has no need to continue the interventions, because the better equilibrium will be maintained automatically. Government can then concentrate its efforts on other crucial problems in which it has an essential role (e.g., in addressing problems of public health). This onetime-fix character of some multiple-equilibrium problems makes them worthy of special focus because they can make government policy that much more powerful in addressing problems of economic development. But it also makes the policy choices more momentous, because a bad policy today could mire an economy in a bad equilibrium for years to come.

In much of economics, such complementarities are not present. For example, in competitive markets, when there is excess demand, there is counterpressure for prices to rise, restoring equilibrium. Whenever **congestion** may be present, these counterpressures are very strong: the more people there are fishing in one lake, the more fishers try to move to another lake that is less crowded; the more people there are using one road, the more commuters try to find an alternative route. But in the process of economic development, joint externalities are common: Underdevelopment begets underdevelopment, while processes of sustainable development, once under way, tend to stimulate further development.

Coordination problems are illustrated by the **where-to-meet dilemma**: for example, several friends know that they will all be in Buenos Aires on a certain day but have neglected to settle on a specific location within the city. Now they are out of communication and can arrive at a common meeting point only by chance or by very clever guessing. They want to meet and consider themselves better off if they can do so; there is no incentive to "cheat." Thus, the where-to-meet problem is quite different from that of **prisoners' dilemma**,

Deep interventions
A government policy that can move the economy to a preferred equilibrium or even to a higher permanent rate of growth, which can then be self-sustaining so that the policy need no longer be enforced because the better equilibrium will then prevail without further intervention.

Congestion The opposite of a complementarity; an action taken by one agent that decreases the incentives for other agents to take similar actions.

Where-to-meet dilemma
A situation in which all parties would be better off cooperating than competing but lack information about how to do so. If cooperation can be achieved, there is no subsequent incentive to defect or cheat.

Prisoners' dilemma
A situation in which all parties would be better off cooperating than competing, but once cooperation has been achieved, each party would gain the most by cheating, provided that others stick to cooperative agreements—thus causing any agreement to unravel.

another problem often encountered in theories of economic development.[7] But the fact that all gain from coordination does not make the where-to-meet dilemma easy to solve. There are many famous places in Buenos Aires: the Plaza de Mayo, the Cathedral, the colorful Caminito neighbourhood, the Café Tortoni, the Cementerio de la Recoleta, even the casino. Only with luck would the friends end up making the same guesses and meeting in the same place. Arriving at, say, the center of Caminito and not finding the others there, one of our travellers might decide to try the Plaza de Mayo instead. But en route she might miss another of the other travellers, who at that moment might be on his way to check out the Cementerio. So the friends never meet. Something analogous to this happens when farmers in a region do not know what to specialise in. There may be several perfectly good products from which to choose, but the critical problem is for all the farmers to choose *one* so that middlemen may profitably bring the region's produce to market.

The story may lose a bit of its power in the age of texting, cell phones, social media, and e-mail. For example, as long as the friends have each other's contact information, they can come to an agreement about where to meet. Sometimes what seems at first a complex problem of coordination is really a simpler one of communication. But anyone who has tried to establish a meeting time by phone or e-mail with a large number of participants with no formal leader knows that this can be a slow and cumbersome process. Without a clear leader and with a large enough number of participants, no meeting place may be agreed to on short notice before it is too late. And in real economic problems, the people who need to "meet"—perhaps to coordinate investments—do not even know the identity of the other key agents.[8] However, our example does point up possibilities for improved prospects for development with the advent of modern computing and telecommunications technology. Of course, peasant farmers may not have Internet access.

4.2 Multiple Equilibria: A Diagrammatic Approach

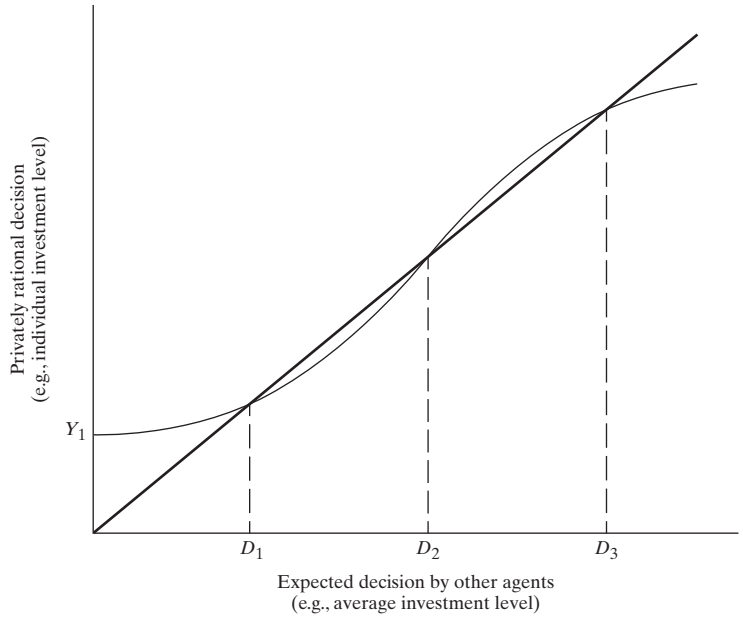
Multiple equilibria
A condition in which more than one equilibrium exists. These equilibria sometimes may be ranked, in the sense that one is preferred over another, but the unaided market will not move the economy to the preferred outcome.

The standard diagram to illustrate **multiple equilibria** with possible coordination failure is shown in Figure 4.1. This diagram, in one version or another, has become almost as ubiquitous in discussions of multiple equilibria as the famous supply-and-demand ("Marshallian scissors") diagram in discussions of single equilibrium analysis.[9]

The basic idea reflected in the S-shaped function of Figure 4.1 is that the benefits an agent receives from taking an action depend positively on how many other agents are expected to take the action or on the extent of those actions. For example, the price a farmer can hope to receive for his produce depends on the number of middlemen who are active in the region, which in turn depends on the number of other farmers who specialise in the same product.

How do we find the equilibria in this type of problem? In the Marshallian supply-and-demand scissors diagram, equilibrium is found where the supply-and-demand curves cross. In the multiple-equilibria diagram,

FIGURE 4.1 Multiple Equilibria



equilibrium is found where the "privately rational decision function" (the S-shaped curve in Figure 4.1) crosses the 45-degree line (also shown in Figure 4.1). This is because in these cases, agents observe what they expected to observe. Suppose that firms expected no other firms to make investments, but some firms did anyway (implying a positive vertical intercept in the diagram). But then, seeing that some firms did make investments, it would not be reasonable to continue to expect no investment! Firms would have to revise their expectations upward, matching their expectations to the level of investment they actually would see. But if firms now expected this higher level of investment, firms would want to invest even more. This process of adjustment of expectations would continue until the level of actual investment would just equal the level of expected investment. At that level, there would be no reason for firms to adjust their expectations any further. So the general idea of an equilibrium in such cases is one in which all participants are doing what is best for them, given what they expect others to do, which in turn matches what others are actually doing. This happens when the function crosses the 45-degree line. At these points, the values on the x-axis and y-axis are equal, implying in our example that the level of investment expected is equal to the level that all agents find best (e.g., the profit-maximising level).

In Figure 4.1, the function cuts the 45-degree line three times. Any of these points could be an equilibrium: that is what we mean by the possibility of multiple equilibria. Of the three, D_1 and D_3 are "stable" equilibria. They are stable

because if expectations were slightly changed to a little above or below these levels, firms would adjust their behaviour—increase or decrease their investment levels—in a way to bring us back to the original equilibrium. Note that in each of these two stable equilibria, the S-shaped function cuts the 45-degree line from above—a hallmark of a stable equilibrium.[10]

At the middle equilibrium at D_2, the function cuts the 45-degree line from below, and so it is unstable. This is because in our example, if a little less investment were expected, the equilibrium would be D_1, and if a little more were expected, the equilibrium would move to D_3. D_2 could therefore be an equilibrium only by chance. Thus, in practice, we think of an unstable equilibrium such as D_2 as a way of dividing ranges of expectations over which a higher or lower stable equilibrium will hold sway.

Typically, the S-shaped "privately rational decision function" first increases at an increasing rate and then at a decreasing rate, as in the diagram. This shape reflects what is thought to be the typical nature of complementarities. In general, some agents may take the complementary action (such as investing) even if others in the economy do not, particularly when interactions are expected to be with foreigners, such as through exporting to other countries. If only a few agents take the action, each agent may be isolated from the others, so spillovers may be minimal. Thus, the curve does not rise quickly at first as more agents take the action. But after enough agents invest, there may be a snowball effect, in which many agents begin to provide spillover benefits to neighbouring agents, and the curve increases at a much faster rate. Finally, after most potential investors have been positively affected and the most important gains have been realised, the rate of increase starts to slow down.

In many cases, the shape of the function in Figure 4.1 could be different, however. For example, a very "wobbly" curve could cut the 45-degree line several times. In the case of telephone service, getting on e-mail, social media, or instant messaging, where the value of taking the action steadily increases with the number of others in the network, the function may only increase at an increasing rate (like a quadratic or exponential function). Depending on the slope of the function and whether it cuts the 45-degree line, there can be a single equilibrium or multiple equilibria, including cases in which either no one ever adopts a new technology or virtually everyone does. In general, the value (utility) of the various equilibria (two in this case) is not the same. For example, it is very possible that everyone is better off in the equilibrium in which more people use the network. In this case, we say the equilibria are Pareto-ranked, with the higher rank to the equilibrium giving higher utility to everyone; in other words, moving to this equilibrium represents a **Pareto improvement** over the equilibrium with fewer users.

Pareto improvement
A situation in which one or more persons may be made better off without making anyone worse off.

The classic example of this problem in economic development concerns coordinating investment decisions when the value (rate of return) of one investment depends on the presence or extent of other investments. All are better off with more investors or higher rates of investment, but the market may not get us there without the influence of certain types of government policy (but note that we may also not arrive at the preferred solutions if we have the wrong kinds of government policy). The difficulties of investment coordination give rise to various government-led strategies for industrialisation that we consider both in this chapter and later in the text (see especially Chapter 12).

The investment coordination perspective helps clarify the nature and extent of problems posed when technology spillovers are present, such as seen in the Romer model described in Appendix 3.3. Given what was learned in examining endogenous growth theory about the possible relation between investment and growth, you can see that an economy can get stuck in a low growth rate largely because the economy is expected to have a low investment rate. Strategies for coordinating a change from a less productive to a more productive set of mutually reinforcing expectations can vary widely, as the example in Box 4.1 and the findings in Box 4.2 illustrate. However, changing expectations may not be sufficient if it is more profitable for a firm to wait for others to invest rather than to be a "pioneer" investor. In that case, government policy is generally needed in

BOX 4.1 Development Policy: Synchronising Expectations: Resetting "Latin American Time"

Kaushik Basu and Jorgen Weibull argue that while the importance of culture is undeniable, the innateness of culture is not. They present a model that shows that punctuality may be "simply an equilibrium response of individuals to what they expect others to do" and that the same society can benefit from a "punctual equilibrium" or get caught in a lateness equilibrium.

Estimates suggested that Ecuador lost between 4% and 10% of its GDP due to chronic lateness. As one commentator put it, "Tardiness feeds on itself, creating a vicious cycle of *mañana, mañana.*" Lately, Ecuador has tried to make up for lost time. Inspired by some in the younger generation who are fed up with "Latin American time," government and business have joined in a private-sector-funded drive to get people to show up at their scheduled appointment times. The country has launched a national *campaña contra la impuntualidad* (campaign against lateness), coordinated by Participación Ciudadana (Citizen Participation). The result is a test of the idea that a society can consciously switch from a bad to a good equilibrium through a change in expectations.

The campaign is a timely one. A newspaper is publishing a list each day of officials who are late for public events. A popular poster for the campaign against lateness describes the disease and says, "Treatment: Inject yourself each morning with a dose of responsibility, respect and discipline. Recommendation: Plan, organise activities and repair your watches." Hundreds of public and private institutions have signed up to a promise to be punctual. A popular notice for meeting rooms in the style of hotel "Do Not Disturb" signs has been making the rounds. On one side it says, "Come in: You're on time." When the meeting begins at its scheduled time, it is turned around to the other side, which reads, "Do not enter: The meeting began on time."

In Peru, a similar campaign is under way. If the campaign against lateness proves successful, it will be about more than time. If a social movement to change expectations about punctuality can be made to work, something similar might be tried around the world for fixing even more pernicious problems, such as public corruption.

Sources: Basu, Kaushik and Weibull, Jorgen (2003), 'Punctuality: A cultural trait as equilibrium,' in Richard Arnott et. al. (eds), *Economics for an Imperfect World: Essays in Honor of Joseph Stiglitz*, Cambridge, M.A.: MIT Press; Wilson, Scott (2004), 'In Ecuador, a timeout for tardiness drive promotes punctuality,' *Washington Post Foreign Service*, 4 November, A22; (2003), 'The price of lateness,' *The Economist*, 22 November, 67; (2004), 'Punctuality pays,' *New Yorker*, 5 April, 31. For an interesting critique, see Horowitz, Andrew M. (2007), 'The punctuality prisoners' dilemma: Can current punctuality initiatives in low-income countries succeed?,' paper presented at the Northeast Universities Development Consortium Conference, Harvard University, October.

BOX 4.2 Findings: Village Coordination and Monitoring for Better Health Outcomes

Chapter 4 explains the important role of improved information, shared expectations, and coordination across agents in making development progress. Coordination across households potentially can improve outcomes, for example, by changing norms toward lower fertility and ending harmful practices, and enforcing noncorrupt and efficient public-service provisions. A recent Uganda study by Martina Björkman and Jakob Svensson shows how these mechanisms may work by drawing on evidence from a randomised control trial. The researchers found that, initially, villagers had little information about the scope of health problems in their village compared with outside standards, nor about what to reasonably expect from government-funded health workers. The programme provided villagers with the knowledge and resources to enable them to monitor health workers individually and through their community organisation. This is important to do as a community because both information gathering and monitoring have features of public goods. The results suggest that such a programme can improve the behaviour of health workers and lead to measurably better health outcomes—all for apparently very modest cost outlays.

The study questions were whether the intervention *caused* an increased quantity and quality of health care provision; and whether this resulted in improved health outcomes. The researchers were checking for impacts along the hypothesised "accountability chain" that treatment communities became more involved in monitoring health workers and that the intervention changed the behaviour of health workers. The initial intervention had three components: first, a meeting of villagers; second, a meeting with health care workers; and finally, a meeting including both groups. This was followed by a plan of action and monitoring organised by villagers.

Initially, a "report card" comparing performance of the local health facility with others was prepared. Then facilitators in conjunction with local community leaders and community-based organisations organised a village meeting to hear and discuss the results and develop an action plan. (This is similar to the process of many community-based development activities in Africa and elsewhere.) Participation in the two-afternoon event was carefully planned to include—and hear from—diverse representatives to avoid elite capture. The facilitators "encouraged community members to develop a shared view on how to improve service delivery and monitor the provider," which were "summarized in an action plan." In these meetings, researchers observed some common concerns that "included high rates of absenteeism, long waiting-time, weak attention of health staff, and differential treatment."

The health facility meeting was a one-afternoon, all-staff event where facilitators contrasted the facility's information on service provision with findings from a household survey. Finally, an "interface meeting" was held with community representatives chosen at the community meetings and health workers, where rights, responsibilities, and suggestions for improvements were discussed, resulting in a "shared action plan. . . on what needs to be done, how, when and by whom." Then, "after the initial meetings, the communities were themselves in charge of establishing ways of monitoring the provider."

The programme was associated with (and apparently caused) positive health outcomes, including relatively higher weights of infants, fewer deaths of children less than five years old, and greater utilisation of health facilities. Evidence showed that as a result of the programme, treatment practices also improved the "quality and quantity of health care provision," suggesting that increases "are due to behavioural changes." In particular: equipment (such as a thermometer) was used more often; waiting time was reduced; clinic cleanliness improved; better information was provided to patients; appropriate supplements and vaccines for children were provided more often; and absenteeism by health

workers declined. The programme was estimated to improve health outcomes to a degree similar to findings from high-impact medical trials. However, such trials assume the health system is working fine and only benefits from improved procedures and medications; in contrast, this approach focused on getting health workers to do what they were supposed to do in the first place.

Some checks confirmed the programme more likely had its impact through community participation rather than other mechanisms, but it is still possible that other mechanisms such as health workers responding to learning about patient rights rather than community pressure played some role; so we may not yet be certain how the programme worked. This type of question is important to investigate because understanding mechanisms helps with designing other programmes effectively.

Overall, the researchers surmised that "lack of relevant information and failure to agree on, or coordinate expectations of, what is reasonable to demand from the provider were holding back individual and group action to pressure and monitor the provider."

The authors caution that: "Before scaling up, it is also important to subject the project to a cost-benefit analysis. . . . A back-of-the-envelope calculation suggests that. . . . the estimated cost of averting the death of a child under five is around $300." If this estimate holds up to more systematic analysis, it would be an unusually cost-effective programme. The authors concluded by noting that "future research should address long-term effects, identify which mechanisms or combination of mechanisms are important, and study the extent to which the results generalize to other social sectors."

There remain some other questions. As hinted, it is uncertain whether these improvements can be sustained over time—at least without periodic outside facilitation—for example, if the initial interest for participants is in being part of a foreign-sponsored programme and this motive fades over time, or if long-term threats to collective organisation including free riding and capture rear their heads. So it would be valuable to return to these villages to look at conditions after a few years. It is not clear yet how well or how cost-effectively this approach would work elsewhere—the "external validity" question again. Even if the programme does indeed work through the mechanism of empowerment, as seems quite likely, the real powers that be may not have allowed such outcomes if material interests of rulers were threatened by the programme. Moreover, as the researchers note, an approach that combined more monitoring from the top of the health ministry in combination with the bottom-up monitoring of communities, as done in this programme, could have even larger positive impacts. Finally, people and their communities have limited time; so inducing a shift of time to the health system monitoring activity in this programme could cause a decrease in the amount of other valuable community activities.

Sources: Martina Björkman and Jakob Svensson, "Power to the People: Evidence from a Randomized Field Experiment on Community-Based Monitoring in Uganda," *Quarterly Journal of Economics*, 124 (2), pp 735–769, May 2009; and supplementary appendix.

addition to a change of expectations. This explains why attention to the potential presence of multiple equilibria is so important. Market forces can generally bring us to one of the equilibria, but they are not sufficient to ensure that the best equilibrium will be achieved, and they offer no mechanism to become unstuck from a bad equilibrium and move toward a better one.

A similar multiple-equilibria situation will be encountered in our analysis of the Malthus population trap in Chapter 6. In this population trap, fertility decisions need in effect to be coordinated across families—all are better off if the average fertility rate declines, but any one family may be worse off by being the

only one to have fewer children. We also see coordination failures in processes of urbanisation and other key elements of economic development.

In general, when jointly profitable investments may not be made without coordination, multiple equilibria may exist in which the same individuals with access to the same resources and technologies can find themselves in either a good or a bad situation. In the view of many development economists, it is plausible that many of the least-developed countries, including many in sub-Saharan Africa, are essentially caught in such circumstances. Of course, other problems are also present. For example, political pressures from potential losers in the modernisation process can also prevent shifts to better equilibria. In addition, modern technology may not yet be available in the country. The technology transfer problem is another important concern in economic development. In fact, another problem illustrated by the graph in Figure 4.1 could be that the amount of effort each firm in a developing region expends to increase the rate of technology transfer depends on the effort undertaken by other firms; bringing in modern technology from abroad often has spillover effects for other firms. But the possibility of multiple equilibria shows that making better technology available is generally a necessary but not a sufficient condition for achieving development goals.

4.3 Starting Economic Development: The Big Push

Many models of development that were influential in earlier years, such as the Lewis model examined in Chapter 3, assume perfectly competitive conditions in the industrial sector. Under perfect competition, it is not clear why starting development would be so difficult, provided at least that the needed human capital is developed, the technology transfer problem is adequately addressed, and government provides other essential services. But development seems hard to initiate even when better technologies are available—they often go unused. Apparently, people do not have the incentives to put the new technology to work. Beyond this, perfect competition does not hold under conditions of increasing returns to scale. And yet, looking at the Industrial Revolution, it is clear that taking advantage of returns to scale has been key. Many development economists have concluded that several market failures work to make economic development difficult to initiate, notably **pecuniary externalities**, which are spillover effects on costs or revenues.

Pecuniary externality
A positive or negative spillover effect on an agent's costs or revenues.

Perhaps the most famous coordination failures model in the development literature is that of the "big push," pioneered by Paul Rosenstein-Rodan, who first raised some of the basic coordination issues.[11] He pointed out several problems associated with initiating industrialisation in a subsistence economy, of the type introduced in Chapter 1. The problem is easiest to perceive if we start with the simplifying assumption that the economy is not able to export. In this case, the question becomes one of who will buy the goods produced by the first firm to industrialise. Starting from a subsistence economy, no workers have the money to buy the new goods. The first factory can sell some of its goods to its own workers, but no one spends all of one's income on a single good. Each time an entrepreneur opens a factory, the workers spend some of their wages on other products. So, the profitability of one factory depends on whether another

one opens, which in turn depends on its own potential profitability, and that in turn depends on the profitability of still other factories. Such circular causation should now be a familiar pattern of a coordination failure problem. Moreover, the first factory has to train its workers, who are accustomed to a different way of life. The cost of training puts a limit on how high a wage the factory can pay and still remain profitable. But once the first firm trains its workers, other entrepreneurs, not having to recoup training costs, can offer a slightly higher wage to attract the trained workers to their own new factories. However, the first entrepreneur, anticipating this likelihood, does not pay for training in the first place. No one is trained, and industrialisation never gets under way.

The big push is a model of how the presence of market failures can lead to a need for a concerted economy-wide and probably public-policy-led effort to get the long process of economic development under way or to accelerate it. Put differently, coordination failure problems work against successful industrialisation, a counterweight to the push for development. A big push may not always be needed, but it is helpful to find ways to characterise cases in which it will be.

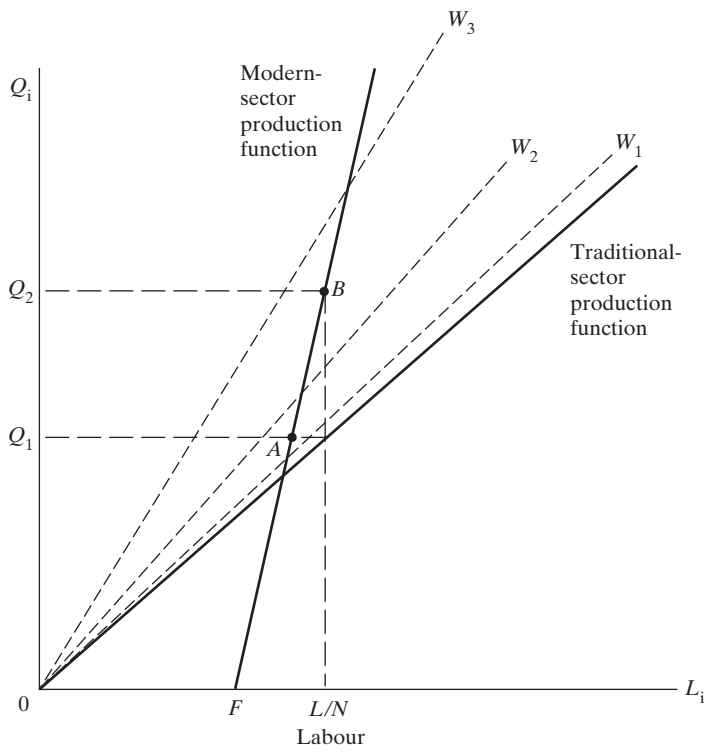
Rosenstein-Rodan's arguments became a major part of the way development economists thought about development problems in the 1950s and 1960s, and they have continued to be taught in development courses. Its recent appeal is also due in part to its perceived value in explaining the success of the East Asian miracle economies, notably that of South Korea. One value of using a formal model is to get a clearer sense of when the need for coordination is more likely to present a serious problem. A breakthrough model by Kevin Murphy, Andrei Shleifer, and Robert Vishny, demonstrated the logic of this approach more rigorously. The approach of these authors was in turn simplified and popularised by Paul Krugman in his 1995 monograph, *Development, Geography, and Economic Theory*, and became the classic model of the new development theories of coordination failure of the 1990s.[12]

4.3.1 The Big Push: A Graphical Model

Assumptions In any model (indeed, in any careful thinking), we need to make some assumptions, sometimes seemingly large assumptions, to make any progress in our understanding. The analysis of the big push is no exception to this rule. The assumptions we use for the big push analysis here can be relaxed somewhat, though at the expense of requiring more mathematical technique, but it should be noted that we cannot relax our assumptions as much as we are accustomed to doing in simpler microeconomic problems, such as those that assume perfect competition. Here we cannot meaningfully assume perfect competition in the modern sector, where increasing returns to scale and hence natural monopoly, or at least monopolistic competition, prevail. To paraphrase Paul Krugman, if we think development has something significant to do with increasing returns to scale, then we will have to sacrifice some generality to address it. We will make six types of assumptions:

1. *Factors.* We assume that there is only one factor of production—labour. It has a fixed total supply, L.
2. *Factor payments.* The labour market has two sectors. We assume that workers in the traditional sector receive a wage of 1 (or normalised to 1, treating the wage as the numeraire; that is, if the wage is 19 pesos per day, we simply

FIGURE 4.2 The Big Push



call this amount of money "1" to facilitate analysis using the geometry in Figure 4.2). Workers in the modern sector receive a wage $W > 1$ (that is, some wage that is greater than 1).

As a stylised fact, this wage differential is found in every developing country, even if it needs some explanation (see Chapter 7). The underlying reason for this differential *may be* a compensation for disutility of modern factory types of work. If so, in equilibrium, workers would receive no net utility benefits from switching sectors during industrialisation; but if economic profits are generated, this will represent a Pareto improvement (in this case because investors are better off and no one is worse off), and average income would rise (there can also be income redistribution so that everyone may be made better off, not just no one worse off). Moreover, if there is surplus labour in the economy or if modern wages are higher than opportunity costs of labour for some other reason,[13] the social benefits of industrialisation are all the greater.[14] Finally, note that we are examining one example of a model in which a driving force for an underdevelopment trap is the relatively high wages that have to be paid in the modern sector. We do this because it is an approach that is easy to characterise graphically and that has received a lot of attention. As will be described later, however, high modern wages is only one circumstance in which a coordination problem may exist. In fact, we will

see that there may be coordination failure problems even if modern-sector wages are no higher than those in the traditional sector.

3. *Technology.* We assume that there are N types of products, where N is a large number.[15] For each product in the traditional sector, one worker produces one unit of output. This is a less stringent assumption than it appears because again we have a certain freedom in choosing our unit of measurement; if a worker produces three pairs of shoes per day, we call this quantity one unit. This is a very simple example of constant-returns-to-scale production. In the modern sector, there are increasing returns to scale. We want to introduce increasing returns in a very simple way. Assume that no product can be produced unless a minimum of, say, F workers are employed. This is a fixed cost. Because we are keeping things simple to facilitate analysis of the core issues, we have not put capital explicitly in the model; thus the only way to introduce a fixed cost is to require a minimum number of workers. After that, there is a linear production function in which workers are more productive than those in the traditional sector. Thus labour requirements for producing any product in the modern sector take the form $L = F + cQ$, where $c < 1$ is the marginal labour required for an extra unit of output. The trade-off is that modern workers are more productive, but only if a significant investment cost is paid up front. As this fixed cost is amortised over more units of output, average cost declines, which is the effect of increasing returns to scale. We assume symmetry: the same production function holds for producing any product in the modern sector.

4. *Domestic demand.* We assume that each good receives a constant and equal share of consumption out of national income. The model has only one period and no assets; thus there is no saving in the conventional sense. As a result, if national income is Y, then consumers spend an equal amount, Y/N, on each good.[16]

5. *International supply and demand.* We assume that the economy is closed. This makes the model easy to develop. The most important conclusions will remain when trade is allowed, provided that there are advantages to having a domestic market. These advantages likely include initial economies of scale and learning to achieve sufficient quality, favourable product characteristics, and better customer support before having to produce for distant and unknown consumers. These are very realistic considerations. Evidence suggests that export-led economies such as South Korea have benefited enormously from the presence of a substantial domestic market to which early sales are directed.[17] Moreover, export-led economies have benefited from an active industrial policy aimed at overcoming coordination failures (see Chapter 12). The points will also hold if there are necessary inputs that are not tradable, such as certain types of services. Alternative models focusing on infrastructure investments can also imply the need for a big push, even with a fully open world economy.[18]

6. *Market structure.* We assume perfect competition in the traditional (cottage industry) sector, with free entry and no economic profits. Therefore, the price of each good will be 1, the marginal cost of labour (which is the only input). We assume that, at most, one modern-sector firm can enter each market. This

limitation is a consequence of increasing returns to scale. Given the assumptions about preferences, the monopolist faces unit-elastic demand, so if this monopolist *could* raise its price above 1, it would be profitable to do so.[19] However, if price is raised above 1, competition from the traditional-sector producers will cause the modern-sector firm to lose all of its business. Therefore, the monopolist will also charge a price of 1 if it decides to enter the market.[20] Because the monopolist charges the same price, it will monopolise this particular market if it enters but will also produce the same quantity that was produced by the traditional producers. Because this firm is the only one using modern techniques and, in producing all other products, workers receive a wage of 1, national income will be essentially the same, so more units of output cannot be sold.[21] We also assume that at the point the monopolist would choose to produce, it is able to produce at least as much output as the traditional producers for that same level of labour; otherwise, it would make no sense to switch out of the traditional techniques.

Conditions for Multiple Equilibria With these six assumptions, we can characterise cases that will require a big push. To begin, suppose that we have a traditional economy with no modern production in any market. A potential producer with modern technology (i.e., a technology like the one described previously, with fixed costs and increasing returns) considers whether it is profitable to enter the market. Given the size of the fixed cost, the answer depends on two considerations: (1) how much more efficient the modern sector is than the traditional sector; and (2) how much higher wages are in the modern sector than in the traditional sector.

In Figure 4.2, production functions are represented for the two types of firms for any industry.[22] The traditional producers use a linear technique with slope 1, with each worker producing one unit of output. The modern firm requires F workers before it can produce anything, but after that, it has a linear technique with slope $1/c > 1$. Price is 1, so revenues PQ can be read off the Q axis. For the traditional firm, the wage bill line lies coincident with the production line (both start at the origin and have a slope of 1). For the modern firm, the wage bill line has slope $W > 1$. At point A, we see the output that the modern firm will produce if it enters, provided there are traditional firms operating in the rest of the economy. Whether the modern firm enters depends, of course, on whether it is profitable to do so.

Using Figure 4.2, first consider a wage bill line like W_1 passing below point A. With this relatively low modern wage, revenues exceed costs, and the modern firm will pay the fixed cost F and enter the market. In general, this outcome is more likely if the firm has lower fixed costs or lower marginal labour requirements as well as if it pays a lower wage. By assumption, production functions are the same for each good, so if a modern firm finds it profitable to produce one good, the same incentives will be present for producing all goods, and the whole economy will industrialise through market forces alone; demand is now high enough that we end up at point B for each product. This shows that a coordination failure need not always happen: it depends on the technology and prices (including wages) prevailing in the economy.

If a wage bill line like W_2 holds, passing between points A and B, the firm would not enter if it were the only modern firm to do so in the economy because

it would incur losses. But if modern firms enter in each of the markets, then wages are increased to the modern wage in all markets, and income expands. We may assume that price remains 1 after industrialisation. Note that the traditional technique still exists and would be profitable with a price higher than 1. So to prevent traditional firms from entering, modern firms cannot raise prices above 1.[23] The modern firm can now sell all of its expanded output (at point B), produced by using all of its available labour allocation (L/N), because it has sufficient demand from workers and entrepreneurs in the other industrialising product sectors. As can be seen in Figure 4.2, with prevailing wage W_2, point B is profitable after industrialisation because it lies above the W_2 line. Workers are also at least as well off as when they worked in the traditional sector because they can afford to purchase an additional quantity of goods in proportion to their increased wage,[24] and they have changed sectors (from traditional to modern) voluntarily. All of the output is purchased because all of national income is spent on output; national income is equal to wages plus profits, the value of which is output of each product times the number of products N.[25]

Thus, with a prevailing wage such as W_2, there are two equilibria: one in which producers with modern techniques enter in all markets, and profits, wages, and output are higher than before; and one in which no modern producer enters, and wages and output remain lower. The equilibrium with higher output is unambiguously better but, in general, the market will not get there by itself.

A final possibility is found in a wage bill line like W_3, passing above point B. In this case, even if a modern producer entered in all product sectors, all of these firms would still lose money, so again the traditional technique would continue to be used. In general, whenever the wage bill line passes below point A, the market will lead the economy to modernise, and whenever it passes above A, it will not. The steeper (i.e., more efficient) the modern-sector production technique or the lower the fixed costs, the more likely it is that the wage bill will pass below the corresponding point A. If the line passes above B, it makes no sense to industrialise. But if the wage line passes between points A and B, it is efficient to industrialise, but the market will not achieve this on its own. Be sure to note that these are three different wages that might exist, depending on conditions in a particular economy at one point in time, not three wages that occur successively.

Again, the problematic cases occur when the wage bill line passes between A and B, thus creating two equilibria: one in which there is industrialisation and the society is better off (point B) and one without industrialisation (point A). The market will not move the economy to point B because of a coordination failure.[26] In this case, there is a role for policy in starting economic development. There is no easy test to determine where a traditional economy, such as Mozambique, is located on this continuum. But at least we can begin to understand why development often has not gotten under way, even when technology is available.

It is worth stressing that Figure 4.2 is used to depict potential multiple equilibria in greater specificity than was possible with Figure 4.1. The point is not that the need for a big push for industrialisation often (or perhaps ever) arises from workers requiring relatively high industrial wages; this example is perhaps the most straightforward to depict in detail among the several reasons why a big push might be needed with demand spillovers. And throughout much of this chapter we consider numerous other potential causes of multiple equilibria.

Note that, in general, it is not necessary for all product sectors to industrialise to get a sufficient push for some to do so. It is only necessary that a sufficient number industrialise in order to generate enough national income (through the higher industrial wage and positive profits from the industrialised product sectors) to make industrialisation minimally profitable. Also note that each firm's failure to take into account the impact of its investments on demand for other firms' goods represents a very small distortion by itself. But when added up across all of the product sectors, the resulting distortion—namely, the failure to industrialise at all—is very large indeed.

We could also have cases of semi-industrialisation, in which benefits or costs accrue in different amounts to different product sectors or in which there are different types of spillovers from firm to firm. For example, this is plausible when the level of required fixed costs declines the more product sectors industrialise, because there are more local examples from which to learn.[27] With this alternative type of externality, no wage premium is necessary for multiple equilibria to be present. In this case, if there are clusters of two or more firms that have large effects on each other's fixed costs, F, but not on firms outside of the cluster, the result can be an equilibrium in which only the industries in this cluster change to modern techniques. Thus, in this circumstance, we could have three or more equilibria; we could also have enclave economies, in which a modern sector exists side by side with traditional cottage industries in other product sectors.[28]

Technological externality
A positive or negative spillover effect on a firm's production function through some means other than market exchange.

Notice that this model has not assumed the existence of any type of **technological externality**, in which the presence of one advanced firm can, through "learning by watching" other firms' production methods or some similar effect, generate spillovers to other firms that can raise their productivity as well as lower their costs. This is another type of market failure that can also lead to inefficiently low investment; we considered one such possibility when we examined the Romer endogenous growth model in Appendix 3.3.

4.3.2 Other Cases in Which a Big Push May Be Necessary

The need for a big push can result from four conditions beyond those described previously:

1. *Intertemporal effects.* Even if the industrial wage rate is 1 (i.e., the same as the traditional-sector wage), multiple equilibria can occur if investment must be undertaken in the current period to get a more efficient production process in the next period.[29] Investment in the first period depresses aggregate demand in the first period but increases it in the second (or later) period. But investment will be undertaken only if it is profitable, that is, if demand is expected to be high enough in the second period, and this may require that many product sectors invest simultaneously. Once again, however, the market does not ensure that industrialisation will occur, even when it is (Pareto-)preferred, because of pecuniary externalities. Again the source of the multiple equilibria is that one firm's profits do not capture its external contribution to overall demand for modern-sector products because it also raises wage income in the future periods when other entering modern firms will be seeking to sell their own products. When there is a case for a big push, industrialisation makes the society better off (is Pareto-preferred) because first-period income is decreased only by the fixed cost, but second-period income is sufficiently increased by

both the wage and profits in other product sectors to more than offset this.[30] Note once again that a part of the profits can, in principle, also be subject to income redistribution so that everyone may be made better off rather than just some people made better off and no one made worse off.

2. *Urbanisation effects.* If some of the traditional cottage industry is rural and the increasing-returns-to-scale manufacturing is urban, urban dwellers' demand may be more concentrated in manufactured goods (e.g., foods must be processed to prevent spoilage due to the time needed for transportation and distribution). If this is the case, one may need a big push to urbanisation to achieve industrialisation.[31]

3. *Infrastructure effects.* By using infrastructure, such as a railroad or a port, an investing modern firm helps defray the large fixed costs of that infrastructure. The existence of the infrastructure helps investing firms lower their own costs. But investing firms thereby contribute indirectly to lowering the costs of other firms (by lowering the average cost of infrastructure use). Infrastructure, such as roads, railroads, and ports, is not tradable; by definition, it is located in a particular region. And openness to foreign investment cannot always solve the problem because investors do not know whether firms will develop to make use of the infrastructure.[32] The critical point is that when one product sector industrialises, it increases the size of the market for the use of infrastructure services that would be used by other product sectors and so makes the provision of these services more profitable. But it is also possible that efficient industrialisation may not take place, even if the infrastructure is built, if other coordination problems are present.

4. *Training effects.* There is underinvestment in training facilities and projects because entrepreneurs know that the workers they train may be enticed away with higher wages offered by rival firms that do not have to pay these training costs. There is also too little demand by workers for training because they do not know what skills to acquire. (In addition to not knowing whether firms will make investments requiring these skills, people are not born with perfect information about their comparative advantage; basic education helps workers discover it.) This is part of the economic case for mandatory public education. Note that in this case, openness to trade cannot resolve the coordination failure unless there is free mobility of labour across borders, which has yet to develop perfectly even within the European Union, where there are few formal barriers to such mobility, and is far from emerging for any developing country. In any case, relying on expatriate skilled workers is hardly an adequate solution to a country's own underdevelopment. Actually, infrastructure and trained workers are subsets of a general case of jointly used intermediate goods. Another example is joint research facilities for small firms in an "industrial district" (see Chapter 7).

4.3.3 Why the Problem Cannot Be Solved by a Super-Entrepreneur

Some readers may wonder, why can't one agent solve the coordination failure problems by capturing all the rent? In other words, why not have a super-entrepreneur who enters into all of the markets that need to be coordinated

and receives the profits from all of them? For some types of coordination failures, this solution is ruled out in advance. For example, regarding education and skill development, there is a legal constraint on bonded labour. But in terms of our industrialisation problem, why can't one agent become a super-entrepreneur in each of the N markets simultaneously? There are at least four significant theoretical answers and one decisive empirical answer.

First, there may be capital market failures. How could one agent assemble all the capital needed to play the super-entrepreneur role? Even if this were logistically imaginable, how would lenders have confidence in their investments? In particular, how could a penalty for default be imposed?

Second, there may be costs of monitoring managers and other agents and designing and implementing schemes to ensure compliance or provide incentives to follow the wishes of the employer; these are often referred to as **agency costs**. Monitoring is too expensive once the scale of a firm gets too large. Even if the plan is to sell off the industries, these industries must be developed simultaneously. The super-entrepreneur is likely to know more about the firms than the potential buyers do. In other words, if the firm is so profitable, why would its owners be selling? Thus, potential purchasers of the industries face a problem of **asymmetric information**, often known as the "lemons problem."[33]

Agency costs Costs of monitoring managers and other employees and of designing and implementing schemes to ensure compliance or provide incentives to follow the wishes of the employer.

Asymmetric information A situation in which one party to a potential transaction (often a buyer, seller, lender, or borrower) has more information than another party.

Third, there may be communication failures. Suppose someone says to you, "I am coordinating investments, so work with me." Should you do so? How do you know this person will eventually be the coordinator? There is a potentially huge profit to be made by assuming the super-entrepreneur role, so many agents might wish to play it. If many try to claim the role, with which one should you coordinate? Even if each agent personally encounters only one pretender to the super-entrepreneur role, that pretender may still not be the right one (i.e., the coordinator with whom you can make money).

Fourth, there are limits to knowledge. Even if we stipulate that the economy as a whole has access to modern technological ideas, this does not mean that one individual can gain sufficient knowledge to industrialise (or even gain enough knowledge about whom to hire to industrialise).

Finally, there is the empirical reason that no private agent has been observed playing the role of super-entrepreneur. Whether because of problems of monitoring, knowledge, capital markets, or other diseconomies of scope, "solving" problems with ever-larger firms clearly provides no answer. For example, it is rare enough to find a firm producing steel and even a significant fraction of the products using steel, let alone one firm owning all the industries backwardly linked from steel or forwardly linked from steel-using industries to industries further down the production chain. Nor can the problem be solved by direct government production (at least without unacceptable cost), as the extreme case of the former Soviet Union demonstrates. Rather, public coordination of actions of private investors is generally needed to solve the problem—a common interpretation of the role of industrial policy in East Asia.

In a Nutshell Thus we have seen that under some conditions, pecuniary externalities associated with the development process can lead to multiple equilibria, which may create a case for a big push policy. Our main example (the moderate wage premium case) and each of the other examples have as a common feature a process by which an investing (industrialising) firm captures only part of the

contribution of its investment to the profits of other investing firms. In these examples, firms adopting increasing-returns-to-scale technologies are having one or more of the following effects: raising total demand, shifting demand toward manufactured goods, redistributing demand toward the (later) periods in which other industrialising firms sell, reducing the fixed costs of later entrants, or helping defray the fixed costs of an essential infrastructure. Each of these has external beneficial effects on other industrialising firms.

4.4 Further Problems of Multiple Equilibria

4.4.1 Inefficient Advantages of Incumbency

The presence of increasing returns in modern industries can also create another kind of bad equilibrium. Once a modern firm has entered, it has an advantage over any rivals because its large output gives it low average costs. So, if an even better modern technology becomes available to a potential rival, it may not be easy for the new technology to supplant the old. Even though the new technique has a lower per-unit cost for any given level of output, the firm with the old technique has an advantage because its large output lets it produce at a lower per-unit cost than that of the new technique, which starts out with a small customer base and a large fixed cost. As a result, firms may need access to significant amounts of capital to cover losses while they build their customer base. If capital markets do not work well, as they often do not in developing countries (see Chapter 15), the economy may be stuck with backward, less cost-effective industries.[34]

4.4.2 Behaviour and Norms

Movement to a better equilibrium is especially difficult when it involves many individuals changing their behaviour from one of rent seeking or corruption to honesty and the value of building a reputation to reap the gains from cooperation (e.g., with business partners). Your choice of partner may determine much. If you naively cooperate with an opportunistic, predator type, you may be worse off than by going it alone. Only by cooperating with other good-willed cooperators may you reach the best outcome. Moreover, past experience may lead people to expect opportunistic behaviour, at least among certain groups of potential business partners, which in turn raises the incentives for the potential partners to actually act that way. If there is nothing to be gained and something to be lost by being honest, the incentives lie in being dishonest. On the other hand, in some settings, individuals take it on themselves to enforce norms rather than leaving this task to government. If many people work to enforce a norm such as honesty, each individual's enforcement burden is relatively low. You can have equilibria where most people resist corruption, and so corruption is rare; and you can have equilibria where few resist corruption, and corruption is common.

In Chapter 2, particularly Section 2.6, we have already examined the fundamental role of institutions in understanding very long-run economic development performance. We cannot rely on good organisations to prevail in competition if the rules of the game tend to reward the bad organisations. Rather, the critical

importance of policies for developing or reforming institutions is highlighted, such as reform of the framework of property rights, antitrust, clean government rules, and other laws, regulations, and industry association norms that set the rules of the game for economic life. Once the new behaviour assumes the status of a norm, it is much easier to maintain. Some neoclassical theorists have at times implied that good institutions would be developed through the market mechanism. Bad institutions would be outcompeted by good institutions. But reform of institutions aiding and abetting coordination failure—for example, by permitting or encouraging corruption—is itself subject to coordination failure.

Once cooperative relationships (e.g., in business) become a norm, more people may adopt cooperative behaviour. But norms of all kinds are subject to inertia. Although norms may have been adaptive when they originated, they are hard to change, even when they become dysfunctional. An example is a value such as that to be a good citizen (or a good Hindu, Muslim, Christian, animist, etc.) one must have a large number of children. This value may have been adaptive at a premodern stage, but today it inhibits development. Another example may be to distrust anyone who is not a member of your family. This may be helpful in a tribal context, and caution is always advisable, but this extreme injunction hardly encourages the formation of successful business partnerships in a modern economy.

4.4.3 Linkages

There are several ways to undertake a big push, encouraging the simultaneous expansion of the modern sector in many industries. One strategy for solving coordination problems is to focus government policy on encouraging the development of industries with key backward or forward **linkages**. This could mean subsidies or quid pro quos for domestic industries to enter these key industries, as was done in South Korea; it could mean incentives for multinational firms to enter in key industries and provide advanced training, a policy followed in Singapore; or it could mean establishing a few key public enterprises to act as pioneers in an industry (that could later be sold), as was done in South Korea and Taiwan.[35] The theory of linkages stresses that when certain industries are developed first, their interconnections or linkages with other industries will induce or at least facilitate the development of new industries. Backward linkages raise demand for an activity, while forward linkages lower the costs of using an industry's output; both may involve interactions between the size of the market and increasing returns to scale and hence pecuniary externalities. In other words, linkages are especially significant for industrialisation strategy when one or more of the industries involved has increasing returns to scale, of which a larger market may take advantage. For example, when the manufacture of power looms expands, enabling a reduction in the price of power looms, there are forward linkage effects due to increased output of woven cloth made by the power looms. When increased demand for chemicals used in textile manufacture causes expansion of the chemical industry that enables it to produce at a larger scale and hence lower cost, a backward linkage can occur. Both examples illustrate a pecuniary externality effect (a lowering of cost) when there are increasing returns in the linked industry.

Linkages Connections between firms based on sales. A backward linkage is one in which a firm buys a good from another firm to use as an input; a forward linkage is one in which a firm sells to another firm. Such linkages are especially significant for industrialisation strategy when one or more of the industries (product areas) involved has increasing returns to scale that a larger market takes advantage of.

The linkage approach targets investment in a key linkage as a start to overcoming a coordination failure and generating positive feedback. Such a policy

would select industries with a larger number of links to other industries and greater strength of those links. In choosing among industries with several strong links (and passing a cost-benefit test), one policy would generally select industries that have a smaller likelihood of private investment, because that is where the most intransigent bottlenecks are most likely to be found. If an investment is profitable, it is more likely that an entrepreneur will come along to fill that niche.[36] This observation provides a reason to interpret with some caution studies that show state-owned enterprises to be less efficient than private ones. If government systematically enters vital but less profitable industries because of their beneficial effects on development, it is unreasonable to hold these enterprises to the same profit standards as those of the private firms. This is certainly not to say that state-owned enterprises are generally as efficient as privately owned ones; in fact, there is much evidence to the contrary.[37] We can say, however, that a blanket statement, such as has often been made in publications from agencies such as the World Bank, that government should never be in the business of production, even temporarily or in any industry, is sometimes unreasonable in the light of linkages and other strategic complementarities that a developing economy needs to address.

4.4.4 Inequality, Multiple Equilibria, and Growth

Other important work being done on growth and multiple equilibria addresses the impact of inequality on growth. The traditional view has been that some inequality may enhance growth because the savings of the rich are higher than those of the poor. If at least some savings to be mobilised for investment purposes must come from within a country, then according to this view, too high a degree of equality could compromise growth. However, the poor save at much higher rates than previously believed, when savings are properly measured to include expenditures on health, children's education, and improvements on a home.

Moreover, where inequality is great, the poor may not be able to obtain loans because they lack collateral; indeed, one definition of what it means to be poor is to be entirely or mostly lacking in a source of collateral. Poor persons unable to get a loan to start a business due to such capital market imperfections may get stuck in subsistence or wage employment, although they (and perhaps potential employees) could do much better if they had access to financing or if there were a more even distribution of income. For example, Abhijit Banerjee and Andrew Newman show that multiple equilibria, including equilibria involving outcomes with virtually all citizens enjoying high incomes and outcomes with predominantly low-income people, can exist when imperfect credit markets provide too few people with the opportunity to become entrepreneurs.[38]

Similarly, if the poor lack access to credit, they may not be able to obtain loans to finance otherwise very productive schooling. If the poor are unable to bequeath much to their next generation, families can be trapped in poverty from generation to generation; however, if schooling could somehow be achieved, they could escape from this **poverty trap**. It is best to keep in mind a rather expansive definition of what is meant by a *transfer* from parents to be used for human capital accumulation by their children. It is more than tuition and more than forgone wages or work on the farm to help the family because it goes well beyond the cost of formal schooling and may be thought of as the building of a

Poverty trap A bad equilibrium for a family, community, or nation, involving a vicious circle in which poverty and underdevelopment lead to more poverty and underdevelopment, often from one generation to the next.

whole array of "capabilities" (see Chapter 1) that one acquires almost as a simple by-product of growing up in an affluent, educated family.

In a formal model of this problem, Oded Galor and Joseph Zeira examined the implications of missing credit markets for growth and the distribution of both income and human capital. They developed an endogenous growth model that points up the importance of both human capital and distribution, and of the interaction between the two, for economic growth and development as well as for more short-term macroeconomic adjustments. Their analysis contains two critical assumptions: (1) imperfect capital markets, which, as will be described in detail in Chapter 15, is a typical condition of these markets; and (2) indivisibilities in human capital investment, which means that markets treat investment in human capital as coming in discrete packages, such as a year of school, if not larger blocks, such as primary, secondary, and tertiary education. The second assumption does not seem unreasonable, both because of the nature of learning and because of the screening nature of markets for human capital. A threshold level of knowledge is necessary before an employer will be willing to pay for it. Further, because education acts as a screen for inherent ability, as will be discussed in Chapter 8, we have the well-known "sheepskin effect"; that is, there is a very large jump in the return to human capital when an individual passes primary school and again when the person obtains a secondary school diploma and so on. This is not because the last course taken conveys so much more knowledge than the ones preceding it but because the degree itself is what enables the individual to prove that an entire regimen of requirements has been met. Note that indivisibilities in amounts of investment imply a region of increasing returns to scale, as in the fixed costs of the big push model. Once again, increasing returns play a key role in generating multiple equilibria.[39] Empirically, many studies have found a negative impact of inequality on growth, especially for the period after 1980.[40]

4.5 Michael Kremer's O-Ring Theory of Economic Development

Another innovative and influential model that provides important insights into low-level equilibrium traps was provided by 2019 Nobel Laureate in Economics Michael Kremer.[41] The notion is that modern production (especially in contrast to traditional crafts production) requires that many activities be done well together in order for any of them to amount to a high value. This is a form of strong complementarity and is a natural way of thinking about specialisation and the division of labour, which along with economies of scale is another hallmark of developed economies in general and industrial production in particular. The name for Kremer's model is taken from the 1986 *Challenger* disaster, in which the failure of one small, inexpensive part caused the space shuttle to explode. The O-ring theory is interesting in part because it explains not only the existence of poverty traps but also the reasons that countries caught in such traps may have such exceptionally low incomes compared with high-income countries.

4.5.1 The O-Ring Model

The key feature of the O-ring theory is the way it models production with strong complementarities among inputs. We start by thinking of the model as

describing what is going on inside a firm, but as we will see, this model also provides valuable insights into the impact of complementarities across firms or industrial (product) sectors of the economy.

Suppose that a production process is broken down into n tasks. There are many ways of carrying out these tasks, which for simplicity we order strictly by level of skill, q, required, where $0 \leq q \leq 1$. The higher the skill, the higher the probability that the task will be "successfully completed" (which may mean, for example, that the part created in this task will not fail). Kremer's concept of q is quite flexible. Other interpretations may include a quality index for characteristics of the good: consumers would be willing to pay more for higher-quality characteristics. For example, suppose that $q = 0.95$. Among other interpretations, this can mean: (1) that there is a 95% chance that the task is completed perfectly, so the product keeps maximum value, and a 5% chance that it is completed so poorly that it has no value; (2) that the task is always completed well enough that it keeps 95% of its maximum value; or (3) that the product has a 50% chance of having full value and a 50% chance of an error reducing the value of the product to 90%. For simplicity, assume that the probability of mistakes by different workers is strictly independent. The production function assumed is a simple one: output is given by multiplying the q values of each of the n tasks together, in turn multiplied by a term, say, B, that depends on the characteristics of the firm and is generally larger with a larger number of tasks. Suppose also that each firm hires only two workers. Then the **O-ring production function** looks like this:[42]

O-ring production function A production function with strong complementarities among inputs, based on the products (i.e., multiplying) of the input qualities.

$$BF(q_i\, q_j) = q_i\, q_j \tag{4.1}$$

That is, to make things simple, for this exposition we let the multiplier, B, equal 1. In addition to the form of the production function, we make three other significant types of simplifying assumptions: (1) firms are risk-neutral, (2) labour markets are competitive, and (3) workers supply labour inelastically (i.e., they work regardless of the wage). If we consider capital markets, we assume that they are competitive as well. For now, we also assume that the economy is closed.

One of the most prominent features of this type of production function is what is termed *positive assortative matching*. This means that workers with high skills will work together and workers with low skills will work together. When we use the model to compare economies, this type of matching means that high-value products will be concentrated in countries with high-value skills. In this model, everyone will like to work with the more productive workers, because if your efforts are multiplied by those of someone else, as they are in Equation 4.1, you will be more productive when working with a more productive person. In competitive markets, your pay is based on how productive you are. A firm with a higher-productivity worker can more afford to pay a higher wage and has the incentive to bid higher to do so, because the value of output will be higher with two productive workers, say, than with one low- and one high-productivity worker. As a result, there will be a strong tendency for the most productive workers to work together.

This can be seen easily if we imagine a four-person economy. Suppose that this economy has two high-skill q_H workers and two low-skill q_L workers. The four workers can be arranged either as matched skill pairs or unmatched skill pairs. Total output will always be higher under a matching scheme because

$$q_H^2 + q_L^2 > 2q_Hq_L \tag{4.2}$$

Recall that $(x - y)^2 > 0$ for any x that is not the same as y, so let x stand for q_H and y stand for q_L. Then $x^2 + y^2 > 2xy$, the same as in Equation 4.2. (Or try this by plugging in any values $q_H > q_L$.) This generalises to larger numbers of workers in the firms and the economy; the result is that workers sort out by skill level.[43]

Because total value is higher when skill matching rather than skill mixing takes place, the firm that starts with high-productivity workers can afford to bid more to get additional high-productivity workers, and it is profitable to do so. Of course, every firm would like to hire the most productive worker, but it would be in that worker's interest to team up with other high-productivity workers. Think of firms being formed while workers try to determine for which firm they want to work. After the high-productivity workers pair off, they are out of the picture. The less productive workers are then stuck with each other. If there are many classes of skill or productivity, first the highest-skill workers get together, then the next highest, and so on, such that skill matching results as a cascading process. For example, a symphony orchestra will be adversely affected as a whole by hiring one single poor performer. So an otherwise excellent orchestra has every incentive to bid the most for an outstanding performer to replace the poor performer. Similarly, the best jazz performers play and record together rather than each leading a group of poorer players. The restaurant with the very best chef also hires mature, highly trained, full-time waiters, while a fast-food restaurant does not hire a famous chef.

This sorting process is perhaps most vividly easy to remember through the analogy to Nobel laureate Gary Becker's famous "marriage market" model, which is a somewhat different case[44] but offers some additional intuition. If prospective spouses care only about attractiveness, every man wants to marry the most attractive woman, and every woman wants to marry the most attractive man, so the most attractive man and woman will marry. They are now out of the picture, so next, the second most attractive man and woman marry. This process continues until the least attractive man and woman marry. Of course, beauty is in the eye of the beholder, and most people care about things besides attractiveness in a mate such as kindness, intelligence, wealth, beliefs, interests, commitment, and sense of humour; but the marriage model serves as a memorable analogy. The result in the business world is that some firms and workers, even an entire low-income economy, can fall into a trap of low skill and low productivity, while others escape into higher productivity.

Although this model may seem abstract, a numerical example can show how the firms with high-skill workers can and will pay more to get other high-skill workers, or will have more incentive to upgrade skills among existing workers. Suppose that there are six workers: three have $q = 0.4$ and are grouped together in equilibrium, while the other three have $q = 0.8$. Now suppose that the q of one of the workers in the first firm rises from 0.4 to 0.5 (perhaps due to training). Similarly, suppose the q of one worker in the second firm rises from 0.8 to 1.0. In each case, we have a 25% increase in the quality of one worker. As you may expect, a 25% increase in the quality of one worker leads to a 25% increase in output quality. But starting from a higher level of quality, that 25% clearly translates into a much larger point increase. In the example, the first firm goes from $(0.4)(0.4)(0.4) = 0.064$ to $(0.4)(0.4)(0.5) = 0.080$; this is a difference of $0.080 - 0.064$, which is a point change of 0.016; and $0.016/0.064 = 0.25$, which

is a 25% increase. For the second firm, we move from (0.8)(0.8)(0.8) = 0.512 to (0.8)(0.8)(1.0) = 0.640; the change in this case is 0.128, which is again 25%. However, the point value of the increase is much greater—eight times greater—for a doubled point-value investment (0.2 in the second firm versus 0.1 in the first firm). If a firm can increase quality in percentage terms at constant marginal cost, or even a not-too-quickly rising cost, there is a virtuous circle in that the more the firm upgrades overall, the more value it obtains by doing so. Accordingly, *wages will increase at an increasing rate as skill is steadily raised*. As Kremer shows, the O-ring model is consistent with competitive equilibrium.[45]

The O-ring result of positive assortative matching relies on some rather strong assumptions. How important are each of these, and how much can they be relaxed? Two points are crucial: (1) workers must be sufficiently imperfect substitutes for each other, and (2) we must have sufficient complementarity of tasks. As long as these conditions hold, the basic results will follow.

To see why workers must be imperfect substitutes, suppose they were perfect substitutes. Specifically, suppose there are two skill levels, q_L and $q_H = 2q_L$, so every q_H worker can be replaced by two q_L workers with no other change. Thus q_H workers will be paid twice the amount that q_L workers are paid. We can draw no predictions about what combination of worker skill levels a firm—or an economy—will use, so we can learn nothing about low-skill-level equilibrium traps. In fact, there is empirical evidence for imperfect substitutability across worker types in firms.

To see why we must have complementarity of tasks, suppose that there were two tasks indexed by g and h but with no complementarity between them. To be specific, suppose that our q_H worker is hired for the g task, and a q_L worker is hired for the h task; then

$$F(q_H\, q_L) = g(q_H) + h(q_L)$$

Here skills are imperfect substitutes for each other, because only one type of worker can be hired for each task (i.e., no two-for-one type of substitution is possible here). However, because tasks are not complementary, the optimal choice of skill for the g task is independent of that of the h task, and again no strategic complementarities are present.[46]

4.5.2 Implications of the O-Ring Theory

The analysis has several important implications:

- Firms tend to employ workers with similar skills for their various tasks.
- Workers performing the same task earn higher wages in a high-skill firm than in a low-skill firm.
- Because wages increase in q at an increasing rate, wages will be more than proportionally higher in developed countries than would be predicted from standard measures of skill.
- If workers can improve their skill level and make such investments, and if it is in their interests to do so, they will consider the level of human capital investments made by other workers as a component of their own decision about how much skill to acquire. Put differently, when those around you

have higher average skills, you have a greater *incentive* to acquire more skills. This type of complementarity should by now be a familiar condition in which multiple equilibria can emerge; it parallels issues raised in our analysis of the big push model. Kremer shows that a graph such as that in Figure 4.1 can apply to choices about how much skill to acquire.

- One can get caught in economy-wide, low-production-quality traps. This will occur when there are (quite plausibly) O-ring effects across firms as well as within firms. Because there is an externality at work, there could thus be a case for an industrial policy to encourage quality upgrading, as some East Asian countries have undertaken in the past (see Chapter 12, Section 12.6, and its end-of-chapter case study of South Korea and Taiwan). This could be relevant for a country trying to escape a possible middle-income trap.
- O-ring effects magnify the impact of local production bottlenecks because such bottlenecks have a multiplicative effect on other production.
- Bottlenecks also reduce the incentive for workers to invest in skills by lowering the expected return to these skills.

Following Kremer, consider a simple illustration of these bottleneck effects. Suppose that n tasks are required to produce a good. Let q be the standard skill level of these n tasks. But now let the actual skill level of two workers be cut in half in all firms. With an O-ring production function, output would fall by 75% (the result of cutting output in half once and then again). But then the marginal product of quality also falls by 75% for all the remaining $n - 2$ tasks, and thus so does the incentive to invest in increasing skill. The strong assumption of our simple O-ring production function may overstate the case, but the point that strategic complementarities can cause low-skill equilibria remains.

As workers reduce their planned skill investments, this further reduces the level of skill in the economy and thereby lowers further the incentive to invest in skill. To some extent, such bottlenecks could be ameliorated by international trade and investment, because foreign inputs and investors provide an alternative source of inputs from outside the bottlenecked economy. One explanation of why economies that have cut themselves off from the international economy, such as India before 1991 or China before the 1980s, have not fared as well as those that are more integrated, such as South Korea, could well be their failure to take advantage of foreign inputs or investments; the O-ring analysis helps explain why the impact could be so great. Trade cannot solve all problems of industrialisation, but the O-ring model helps explain why trade can play a key role as part of an industrialisation strategy.

The model also has implications for the choice of technology. When skill is scarce, a firm is less likely to choose a technique with higher value but complicated production technology with many tasks, because the costs of doing any one of those tasks poorly are magnified. In this way, the value of production is increasing in the complexity of the product, assuming that the product is completed successfully. Given positive assortative matching, firms producing products or using technologies that must be deployed at large scale or many steps will be induced to employ high-quality employees. Mistakes are costly to firms with large numbers of workers and production steps; therefore, such

firms place exceptional value on high-quality, skilled workers who are unlikely to make mistakes.[47] This indicates one reason why rich countries with high-skill workers tend to have larger firms and specialise in more complex products; it also helps explain why firm size and wages are positively correlated within and across countries.

Finally, under some additional assumptions, the model can also help explain the international brain drain. It is often observed that when a worker of any given skill moves from a developing to a developed country, he or she immediately receives a higher wage for using those same skills. A version of the O-ring model is one way of explaining this.

Thus Kremer's O-ring model points out many of the implications of strong complementarities for economic development and the distribution of income across countries. As Kremer concludes: "If strategic complementarity is sufficiently strong, microeconomically identical nations or groups within nations could settle into equilibria with different levels of human capital."[48]

4.6 Economic Development as Self-Discovery

In simple models with perfect information, it is assumed that firms, and developing economies as a whole, already know their comparative advantage. But individuals must discover their own comparative advantage in labour markets; for example, no one is born knowing they are well suited to become an economist or international development specialist. Somewhat analogously, nations must learn what activities are most advantageous to specialise in. As Ricardo Hausmann and Dani Rodrik show, this is a complex task—and one prone to market failure.[49] It is not enough to tell a developing nation to specialise in "labour-intensive products," because even if this were always true, there are a vast number of such products in the world economy of today, and underlying costs of production of specific products can differ greatly from country to country. So it is socially valuable to discover that the true direct and indirect domestic costs of producing a particular product or service in a given country are low or can be brought down to a low level. It is valuable in part because once an activity is shown to be profitable, it can usually be imitated, at least after some lag, spawning a new domestic industry. An example is the ready-made garment industry in Bangladesh, which spread from the first pioneers as dozens of entrepreneurs entered the market. But as markets are eventually open to competing firms, they will take away potential profits from the original innovator. And since, due to this **information externality**, innovators do not reap the full returns generated by their search for profitable activities, there will be too little searching for the nation's comparative advantage—too much time carrying on with business as usual and too little time devoted to "self-discovery." The term *self-discovery* somewhat whimsically expresses the assumption that the products in question have already been discovered by someone else (either long ago, or recently in a developed economy); what remains to be discovered is which of these products a local economy is relatively good at making.

Information externality The spillover of information—such as knowledge of a production process—from one agent to another, without intermediation of a market transaction; reflects the public good characteristic of information (and susceptibility to free riding)—it is neither fully excludable from other uses, nor nonrival (one agent's use of information does not prevent others from using it).

Hausmann and Rodrik also point out another market failure: there can be too much diversification after the point where the nation discovers its most advantageous products to specialise in. This is because there may be an extended period

in which entry into the new activity is limited. Hausmann and Rodrik conclude that in the face of these market failures, government policy should counteract the distortions by encouraging broad investments in the modern sector in the discovery phase. In fact, they also argue that policy should in some cases work to rationalise production afterward, encouraging movement out of higher-cost activities and into the lower-cost activities, paring down industries to the ones with the most potential for the economy. The authors draw parallels with some of the successful export and industrial policy experiences of East Asia, a topic to which we will return in Chapter 12.

The authors note three "building blocks" of their theory: there is uncertainty about what products a country can produce efficiently; there is a need for local adaptation of imported technology so that it cannot be used productively "off the shelf"; and once these two obstacles have been overcome, imitation is often rapid (reducing the profitability of pioneers). They present a number of case examples that show the reasonableness of each of these assumptions in practice, such as the unexpected emergence of the information technology industry in India and the surprising differences in the exports from various countries with similar apparent comparative advantages, such as Bangladesh (hats but not bedsheets) and Pakistan (bedsheets but not hats); the history of local adaptations of various types of Western technology in East Asia (such as shipbuilding in South Korea); and the rapid diffusion of new products and techniques in the local economy (often facilitated by the movement of personnel across firms), as seen in the growth of the cut-flower export industry in Colombia.

4.7 The Hausmann-Rodrik-Velasco Growth Diagnostics Framework

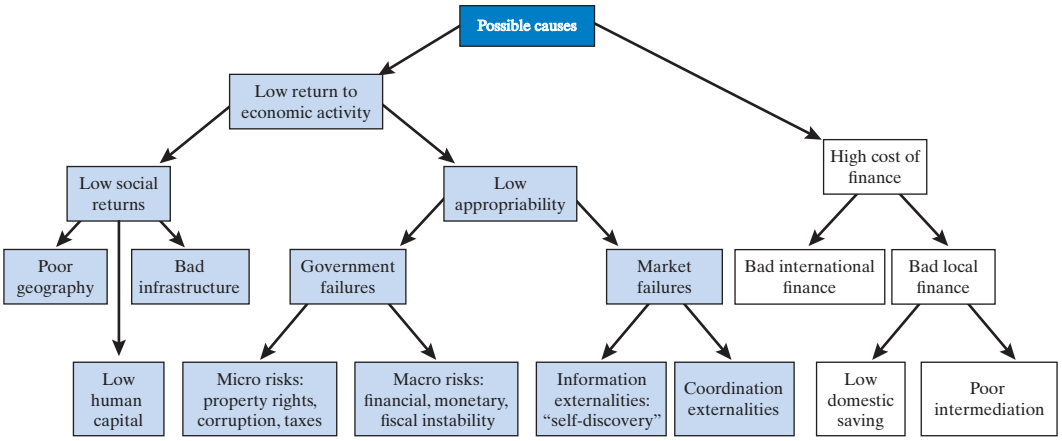
Encouraging efficient investment and widespread entrepreneurship plays a prominent role in accelerating growth and promoting development more broadly. But the once-popular idea of finding a "one size fits all" policy for economic development is now generally recognised as a myth. Different countries face different binding constraints on achieving faster rates of growth and economic development. A key mission for economic development specialists is to help determine the nature of the constraints for each country. Ricardo Hausmann, Dani Rodrik, and Andrés Velasco (HRV) propose a **growth diagnostics** decision tree framework for zeroing in on a country's most binding constraints on economic growth. HRV explain that targeting the most binding constraint has important advantages over other approaches to policy selection.[50]

Growth diagnostics
A decision tree framework for identifying a country's most binding constraints on economic growth.

If a developing nation experiences a relatively low level of private investment and entrepreneurship, what steps should it take? The basic decision tree for addressing this question is seen in Figure 4.3, with arrows leading to the ten bottom boxes (that is, the boxes from which no arrows extend further). At the first stage of the tree, the analyst seeks to divide countries between those for which the main problem is a low underlying rate of return and those for which the problem is an abnormally high cost of finance. Let us consider the former case first, following the left arrow pointing to "Low return to economic activity."

FIGURE 4.3 Hausmann-Rodrik-Velasco Growth Diagnostics Decision Tree

Problem: Low levels of private investment and entrepreneurship



Source: Hausmann, Ricardo, Rodrik, Dani and Velasco, Andrés (2006), 'Getting the diagnosis right,' *Finance and Development* 43. Reprinted with permission.

Low returns to investors may be due to the fact that there are intrinsically low underlying **social returns** to economic activities. Alternatively, low returns may be caused by what is termed *low private appropriability*, meaning limited ability of investors to reap an adequate share of the rewards of their otherwise profitable investments. Considering these cases in turn, *low social returns* may be caused by one of three factors.

Social returns The profitability of an investment in which both costs and benefits are accounted for from the perspective of the society as a whole.

First, as noted in Chapter 2, *poor geography* such as tropical pests, mountains and other physical barriers, distance to world markets, and landlocked status (which may render port access politically dubious or economically costly) may limit the ability of a low-income country to initiate and sustain economic development, especially when other compounding factors are present. When these constraints are most binding, development policy must initially focus on strategies for overcoming them. Second, *low human capital*—skills and education as well as health of workers—are complementary with other factors in production, affecting the returns to economic activity. For example, if economic returns are most affected by lack of literacy and numeracy, this becomes a development policy priority. (The importance of health and education was also stressed in Chapter 2, and this will be examined in depth in Chapter 8.) Third, every developing nation must provide the vital infrastructure needed to achieve and sustain a modern economy, beginning with basic physical structures such as roads, bridges, railroads, ports, telecommunications, and other utilities. With *bad infrastructure*, the otherwise high-return economic activities may prove unprofitable. In some countries, inadequate and imbalanced infrastructure is the main factor preventing an acceleration of growth, and in such cases, policies focusing on providing better infrastructure would boost investment and growth the most.

But the problem may lie not with the underlying social return to economic activities but with *low appropriability*, meaning that investors cannot reap an adequate share of returns to investment. We get to low appropriability from the right arrow emanating from "Low return to economic activity." In turn, appropriability problems can be due to either *government failures* or *market failures.* In the HRV diagram, government failures are divided between *micro risks* and *macro risks*. Micro risks address fundamental institutional weaknesses such as inadequacy of property rights, government corruption, and excessively high effective taxation. That is, the return to economic activity may be high enough, but elites rather than investors may capture a large fraction of the returns and make investments unattractive. Despite the difficulty of effectively reforming institutions when reform threatens the interests of elites (see Chapter 2), such reform must become the development priority when micro risks are binding. As the case study of China at the end of this chapter demonstrates, reform can sometimes be accomplished in stages through transitional institutions. Appropriability may also be limited by macro risks—the failure of government to provide financial, monetary, and fiscal stability.

The fundamental problem may also be large-scale market failures of the type stressed in this chapter. These may include the *self-discovery* problems pointed up by Hausmann and Rodrik and reviewed in Section 4.6. They may also take the form of *coordination externalities*, such as seen in the big push model of underdevelopment, examined in Section 4.3 or failure to respond to complementarities of skills, as in Section 4.5. Other types of market failure and government failure are examined in Chapter 11.

In yet other cases, the main problem may not be underlying low rates of return but rather an abnormally *high cost of finance*. The possibilities are outlined following the right arrow from the top box in Figure 4.3 to "High cost of finance." Here the problem may be *bad international finance*—inadequate access to foreign sources of capital or problems with debt, examined in Chapter 13; or the problem may reside in *bad local finance*, due either to low availability of loanable funds through domestic financial markets, traced to low *domestic saving*, or to *poor intermediation* owing to an inadequate or overregulated banking system that is unable or unwilling to channel funds to the economic activities with high returns.

In summary, one size does not fit all in development policy. Economic development strategies focusing on resource mobilisation through foreign assistance and other capital flows, along with increased domestic national saving, can be most effective when domestic returns are both high *and* privately appropriable. In contrast, strategies focusing on market liberalisation and opening up the economy can be most effective when social returns are high and the most serious obstacle to private appropriation is government-imposed excessive taxes and restrictions. Finally, strategies focusing on industrial policy (elaborated on in Chapter 12) can be most effective when private returns are low, not because of what a government does (errors of commission), but because of what a government does not do (errors of omission).

Ricardo Hausmann, Bailey Klinger, and Rodrigo Wagner suggest four "principles of a differential diagnosis" that growth diagnosticians should be able to point to if they have correctly identified a country's binding constraint.[51]

We can think of doing growth diagnostics as somewhat analogous to how a doctor diagnoses a patient. A review of each of the four key approaches is instructive:

Shadow Price The change in the objective function due to an increase in the supply of a constrained input.

1. *The* **(shadow) price** *of the constraint is high.* A *shadow price* is the change in the objective function due to an increase in the supply of a constrained

input. Usually, shadow prices cannot be observed directly, but we can look for signals of them by observing actual or implied market prices and other symptoms of unmet demand. In this regard, low quantity is not necessarily a signal of factor scarcity. For example, the quantity of finance supplied in an economy may be low because of low demand, in which case it is not a binding constraint; but if it is low because of scarce supply, it is quite likely to be a binding constraint. We can seek clues from rates of return, rationing, and congestion. In some countries average schooling is low, but returns to schooling are also low, suggesting that the market is not finding additional education to be providing high productivity. Market prices differ from shadow prices in effective rationing; for example, congestion may affect transportation; and there may be poor or no provision of power, water, or telecommunications. Sometimes, a constraint can be inferred indirectly. Road congestion may lead to high cost per container distance; and high tuition in private training schools may focus attention on education.

2. *Movements in the constraint produce significant movement in the objective.* For example, if we hypothesise that access to finance is binding, then increases in the availability of finance through interest rate reductions should have a positive impact on the investment rate, and vice versa. Thus, the relationship between real interest rates and investment should provide an important clue. As Hausman and others noted, for Brazil when real interest rates rise, investment falls, and vice-versa, whereas for Mexico investment fell despite falling real interest rates, and later rose with a moderate increase in interest rates; thus it is more likely that finance binds for Brazil than for Mexico.
3. *People attempt to overcome or bypass the constraint.* There are many other potential clues as to which constraints bind in economic behaviour. For example, if key problems are found in contract enforcement you may see the emergence of extra-legal contract enforcement mechanisms, e.g. trading within social groups or "mafias" enforcing contracts. If the problem is electricity infrastructure you should see businesses investing in generators; if it is low appropriability due to extremely high tax rates then expect greater use of cash for business transactions. If the constraint is crime and security, expect large outlays for private security guards. It is a useful exercise to consider additional examples.
4. *Agents less intensive in (less affected by) a binding constraint are more likely to thrive.* Key features of the most successful parts of the economy can be informative about binding constraints affecting other (existing or potential) sectors. Analysts learn both from what they do see, and what they do not see. Another kind of clue: if successful firms have "crony" relationships with political rulers, governance might be a problem for other sectors.

With these points in mind, Hausmann, Klinger, and Wagner propose a five-step process for a growth diagnostics exercise. First, describe the growth process and determine a relevant question; second, go through a "differential diagnosis" of the type just reviewed; third, posit a "syndrome" of symptoms; fourth, test further implications, to see the extent one can corroborate evidence of the syndrome; and fifth, as necessary, reiterate steps three and four until a clear conclusion can be reached.

HRV illustrate their approach with case studies of El Salvador, Brazil, and the Dominican Republic. They argue that each case exhibits a different "diagnostic signal" of the most binding constraint, as seen in Box 4.3. HRV stress that an approach to development strategy that determines one or two policy priorities on this diagnostic basis will be more effective than pursuing a long laundry list

BOX 4.3 Findings: Three Country Case Study Applications of Growth Diagnostics

El Salvador

HRV argue that this economy is constrained by a lack of productive ideas. The binding constraint is a lack of innovation and demand for investment to replace the traditional cotton, coffee, and sugar sectors, or low "self-discovery." So, the best strategy focus for El Salvador would be to encourage more entrepreneurship and development of new business opportunities.

Brazil

HRV identify the country's binding constraint as lack of sufficient funds to invest, despite an abundance of productive ideas. They argue that private returns in Brazil are high, and therefore other flaws (inadequate business environment, a low supply of infrastructure, high taxes, high prices for public services, weak contract enforcement and property rights, and inadequate education) are not as binding in Brazil. So investment is instead constrained by Brazil's inability to mobilise sufficient domestic and foreign savings to finance needed investments at reasonable interest rates. Although Brazil could increase national savings to a degree by reducing government expenditure, this might not be politically feasible. If so, HRV suggest that higher taxes and user fees and lower infrastructure and human capital subsidies might work. "If the country can move to a faster growth path and if waste does not grow with GDP, it may outgrow its burdens and gradually improve its tax and spending system as fiscal resources become more abundant." In subsequent work, Hausmann has emphasised the importance of "creating a financially viable state that does not over-borrow, over-tax or under-invest" to successfully raise domestic savings.

Dominican Republic

HRV conclude that the Dominican Republic is constrained by core public goods in product sectors key for growth. The country began a new reform sequence during the 1980s, after it could no longer rely on sugar and gold exports. It followed a narrow strategy of investing in needed public goods for two emerging product (or service) sectors with high potential, tourism and *maquila* assembly manufacturing. The keys were security and infrastructure near the main tourist destinations and special trade policy benefits for the light manufacturing assembly (*maquila*) sector. As the economy grew from these sources, other constraints were hit, notably in the financial sector; getting past them (particularly a costly financial crisis) was bumpy, but the binding constraints stayed or became visible, so policymakers could focus on relaxing them to keep growth going.

Sources: Ricardo Hausmann, Dani Rodrik, and Andrés Velasco, "Growth diagnostics," in *One Economics, Many Recipes: Globalization, Institutions, and Economic Growth*, by Dani Rodrik (Princeton, N.J.: Princeton University Press, 2007), ch. 2; Ricardo Hausmann, "In search of the chains that hold Brazil back," October 31, 2008, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1338262. An excellent practicum is found in 'Doing growth diagnostics in practice: A "Mindbook."' See http://www.cid.harvard.edu/cidwp/177.html. The World Bank offers a set of growth diagnostics exercises at its website: http://web.worldbank.org/.

of institutional and governance reforms that may not be targeted toward the most binding constraints.

It is often difficult to observe a binding constraint directly. In practice, growth diagnostics usually involves some economic detective work. To evaluate whether a proposed constraint is binding, a growth diagnostician looks for evidence on its implications. If the constraint is excessive taxation, we can expect to see high movement into the informal sector or underground economy. If the constraint is infrastructure, we can expect to see significant congestion. If the constraint is education, we can expect to see high rates of return to education. In general, the analyst looks for economic behaviour consistent with agents trying to get around a constraint.

Growth diagnostics is also subject to some limitations and criticisms. One implicit assumption is that development can be equated with growth, which in turn is held back by investment. This is a useful analytical assumption for this and a range of other purposes, but it does not and cannot provide a complete understanding of development purposes, mechanisms, and constraints. And of course, it is often not a simple matter to find a single binding constraint. There can be uncertainty about the "position" of each constraint in the economy, so we can only make a probabilistic assessment of which one is binding. If there are important complementarities between two investments, combining them (in some sense) should be considered. Further, the fact that one constraint is not binding today does not mean that we can neglect it when there are long gestation periods before current investments become productive. For example, consider investments in education: students require several years of schooling followed by experience before these investments become productive. So, although education may not be binding for a particular country such as Bolivia at a particular point in time, this does not mean that it will not become binding at a later time; in response, we may need to make investments today. Clearly, identifying and addressing constraints that are likely to become binding in the future is even more challenging than targeting today's more visible bottlenecks. Finally, growth diagnostics has been criticised for its focus on overall average growth, and not prioritising growth of lower-income citizens; however, an "inclusive growth diagnostics" study by USAID and UKAID shows how growth diagnostics can be extended in this way, as reported in Box 4.4.

Growth diagnostics has already had an effect on the work of development agencies. For example, the Inter-American Development Bank (IDB), the regional development bank for the western hemisphere, has been commissioning growth diagnostic studies of many member economies while training staff and nationals in the skills needed to conduct their own growth diagnostics. Economists at the World Bank and elsewhere have applied the method to countries in Africa, Asia, and Latin America. And developing-country scholars have applied the approach to their own countries. Although growth diagnostics might be criticised as "more art than science," at the very least this new approach forces the analyst to focus on country-specific circumstances and thus get to know the individual country very well. This is one of the reasons that growth diagnostics offers a valuable complement to econometric studies.

BOX 4.4 Findings: Inclusive Growth Diagnostics: The Case of Bangladesh

A team of analysts drawn from the UK and US aid agencies, UKAID and USAID, used growth diagnostics methods to identify the binding constraint(s) for growth in Bangladesh. One of their goals was to go beyond growth as a general objective, and consider inclusive growth in the context of opportunities for women. The team began with a general review of the potential constraints that led them to rule out some possibilities, narrowing their focus to five plausible candidate binding constraints: finance; market failure (coordination and information externalities); government failure (specifically corruption); human capital (specifically education); and infrastructure (specifically narrowed to electricity).

Their assessment found it impossible to make a strong case for finance, though the evidence was inconclusive overall—for example, firm-level surveys were not citing financing as being a problem—but recommended that the sector would need attention looking ahead. They similarly found the evidence for contract enforcement as a binding constraint to be inconclusive.

For human capital, the team noted enormous if unheralded strides, including in girls' education. Meanwhile, the returns to education were not particularly high; firms did not cite education levels as a problem; education does not explain international migration patterns; and there was "no clear relationship between labour intensity and growth by industry." They concluded that, while education is not the binding constraint, they stated that its low average quality and high variance could make it a possible emerging constraint going forward.

They concluded that corruption could be binding in some sectors, or close to binding; the authors termed it "*a* most binding constraint." While corruption is an important concern, it was likely not binding on growth at this time, based on factors such as benchmark indexes and firm survey responses. While the number of bribes paid is substantial, it is around the middle of comparator countries—and far below Cambodia and Philippines. Moreover, there was no clear relationship found between corruption and investment. The authors found market failures important concerns, but unlikely to be currently binding given the severity of other problems.

The authors termed electricity infrastructure "*the* most binding constraint," based upon a range of relevant evidence. Regarding a high shadow price, the team reported that the cost of non-grid electricity is several times that of bulk electricity tariff rates. Regarding movements in the constraint shifts objective, they found that electricity availability has been followed (likely causally) by higher electricity-using investment. Regarding bypassing of constraints, they found that firms—and government—use expensive private generators; the authors also connected this constraint to the building of export processing zones. (However, regarding whether less-intensive users of electricity thrive, they found the evidence less clear.) The team also proposed that greater electricity capacity and reliability would likely lead to increased formal sector employment.

In summary, the authors concluded that investment in electricity capacity would have the largest impact on growth, plus favourable impacts on employment and incomes for women.

Source: USAID-UKAID: *Bangladesh Inclusive Growth Diagnostic*, June 2014: https://www.usaid.gov/sites/default/files/documents/1865/Bangladesh%20Inclusive%20Growth%20Diagnostic%20-%20Final%20Report.pdf.

4.8 Conclusions

The important point is not that people keep doing inefficient things. This is not in itself very surprising. The deeper point is that people keep doing inefficient things because it is rational to keep doing them, and it will remain rational as long as others keep doing inefficient things. This leads to a fundamental problem of coordination failure. Sometimes firms and other economic agents will be able to coordinate to achieve a better equilibrium on their own. But in many cases, government policy and aid will be necessary to overcome the resulting vicious circles of underdevelopment.

The purpose of economic development theory is not only to understand underdevelopment but also to devise effective policies to redress it. The analysis of coordination failure problems in this chapter affirmed that early development theorists such as Paul Rosenstein-Rodan identified important potential problems that are ignored in conventional competitive equilibrium models.[52] The new perspectives offer some important overall lessons for policy, but they are not simple lessons with easy applicability, and indeed they present something of a two-edged sword. On one side, the analysis shows that the potential for market failure, especially as it affects the prospects for economic development, is broader and deeper than had been fully appreciated in the past. Rather than the small "deadweight triangle losses" of conventional economic analysis of monopoly, pollution externalities, and other market failures, coordination failure problems can have more far-reaching effects and consequently much greater costs.[53] For example, the interactions of slightly distorted behaviours by potential investors failing to consider the income effects of the wages they pay may produce very large distortions, such as the outright failure to industrialise. This makes the potential benefit of an active role for government larger in the context of multiple equilibria.

The coordination failures that may arise in the presence of complementarities highlight potential policies for deep interventions that move the economy to a preferred equilibrium, or even to a higher permanent rate of growth that can then be self-sustaining. For example, once a big push has been undertaken, government coordination may no longer be necessary. The unaided market can often maintain industrialisation once it is achieved, even when it cannot initiate or complete the process of industrialisation. For another example, we will see in Chapter 8 that, in some cases, the presence of child labour represents a kind of bad equilibrium among the families with children who work, one that might be fixed with appropriate policy. After successfully abolishing child labour, it is possible that the regulations will not have to be actively enforced to keep child labour from making a resurgence (because most parents send their children to work only because they have to). If there is no incentive to go back to the behaviour associated with the bad equilibrium, government has no need to continue the interventions. Instead, government can concentrate its efforts on other crucial problems in which it has an essential role (e.g., problems of public health). This onetime-fix character of some multiple-equilibria problems makes them worthy of special focus because they can make government policy much more powerful in addressing problems of economic development. Among other implications, the prospect of deep interventions can mean that the costs of

implementing policy can be reduced and that carefully targeted development assistance could have more effective results.

The other edge of the sword, however, is that with deep interventions, the potential costs of a public role become much larger. Policy choices are more momentous because a bad policy today could push an economy into a bad equilibrium for years to come. This is because government can be a major part of the problem, playing a key role in perpetuating a bad equilibrium such as a high-corruption regime, in part because some government officials and politicians may benefit personally from it. Bad policy can even initiate a move to a worse equilibrium than a country began with. To expect government to be the source of reform that moves the economy to a better equilibrium in countries where government has been part of the complex nexus of a bad equilibrium can be naive. For example, as the 2001 Nobel laureate Joseph Stiglitz pointed out, development officials should have been more suspicious of corrupt government officials' embracing of the World Bank's doctrine of thoroughgoing privatisation in the late 1980s and early 1990s. Why would corrupt officials have done so if they benefited from a stream of rents captured from public enterprises? The answer, Stiglitz suggests, is that these officials found that by corrupting the process of privatisation, they could get not only a stream of corrupt rents from the annual operations of the enterprise but also a share of the present discounted value of the whole future operations of the enterprise.[54] The results of corrupt privatisation in Russia in particular have been devastating for its economy, preventing it from enjoying the benefits of the market and potentially keeping it in a suboptimal equilibrium for many years to come. Even when a government is not corrupt, the potential impact of a well-intentioned but flawed government policy is much greater when it can push the economy to a fundamentally different equilibrium, which may be difficult to reverse. This is all the more problematic in the many cases in which "history matters" in a developing economy—that is, when past conditions determine what is possible today.

Both government failure and market failure (including coordination problems and information externalities) are real, but public- and private-sector contributions to development are also vital. Therefore, we need to work toward the development of institutions in which actors in the public and private sectors have incentives to work productively together (directly and indirectly) in such a way as to create the conditions necessary to break out of poverty traps. In achieving this goal, the international community also has a vital role to play, providing ideas and models and serving as a catalyst for change, as well as providing some of the necessary funding.

The growth diagnostics approach is a valuable tool for domestic and international analysts who start with a detailed understanding of a developing country; it can be helpful in identifying binding constraints on national growth and the policy priorities to address them.

In summary, the contributions of the new theories of development reviewed in this chapter include: a better understanding of the causes and effects of poverty traps, achieved by more precisely pinning down roles of different types of strategic complementarities; explaining the role of expectations; clarifying the importance of externalities; illuminating the potential scope for deep interventions; and improving our understanding of both the potential role of government and the constraints on the effectiveness of that role—when government itself

becomes a player in an underdevelopment trap. Finally, the new approaches point out more clearly the real potential contributions of outside development assistance that extend beyond provision of capital to modelling new ways of doing things.

As democratic government spreads in the developing world, the new understandings of underdevelopment traps can make for a more effective guide to policy design than was available even a few years ago. As Karla Hoff has aptly summarised, "Governments fail, even in democracies, just as markets do. But a positive development of recent years is to try more limited interventions to harness the spillovers among agents, and to try to sequence policy reforms in a way that makes it more likely for good equilibria to emerge." [55]

In later chapters, as we consider pressing issues affecting developing countries today, we will be using the insights provided by both the classic theories and the new models of development and underdevelopment to inform our understanding of both the nature of the problems faced and the potential benefits and pitfalls of policies designed to help overcome them.

Case Study 4

China: Understanding a Development "Miracle"

An Extraordinary Performance

China is the world's standout development success story. In the four decades since launching a series of economic reforms, China went from being one of the poorest countries in the world to become a solidly upper-middle-income economy. China's real income per capita by 2018 was approaching 14 times what it was in 1978, when reforms began. From 1978 to 2018, the economy of China grew at an average rate of nearly 9% per year, the highest growth rate of any country in history for that length of time. China has also experienced the world's most dramatic reductions in extreme poverty, measured in the rate of improvement as well as numbers of people. The World Bank's 2015 estimate is that only about 1% of China's population lives on less than the $1.90 per day extreme poverty line; in 1981 about 88% lived below this income (12% lived below the secondary poverty line of $3.80 per day in 2015, compared with 99% in 1981). This means that hundreds of millions fewer people were living in extreme poverty. China achieved these results/outcomes as the world's most populous nation, today still accounting for some 18% of global population. The results have been transformational for global development. China now faces major challenges; continued and sustainable progress will depend upon its success in addressing them.

Debate on Sources of Success

For such a stunning record, the roots of China's success remain a source of disagreement. "Success has a thousand fathers," as the saying goes, and all the major traditional and new schools of thought on development want to claim China as their case in point. China is hailed as an example of the benefits of markets, trade, and globalisation. Yet by conventional measures, institutions in China remain quite weak. For example, the World Bank's 2017 "Ease of Doing Business" index ranks China only No. 78—just behind Ukraine and Kyrgyz and just ahead of Panama and Kenya. Manufactured exports are a key to China's growth, and market incentives have played a primary motivational role in business decisions. But China has also adopted highly activist industrial policies, pushing exports of increasingly higher skill and technology content (see Chapter 13); moreover, it embarked on its period of rapid growth around 1980, more than a decade before significant trade liberalisation. But often overlooked is that China's agricultural productivity growth was also very high. Moreover, much of China's growth in the 1980s and early 1990s was due to rural township and village enterprises, which had a quasi-cooperative and quasi-municipally owned character. There has been less privatisation of state-owned enterprises than in most developing countries. In the meantime, countries in Africa, Latin America, and elsewhere that have most closely followed the free-market model have generally not done anywhere near as well. While all schools may find something in China to let them claim it as vindication of their favoured development policies, it is also clear that if China were performing dismally, each could (and likely would) find reasons why its own theories, including neoliberal (or free-market neoclassical counterrevolution) theory, predicted such a failure. We begin by examining prominent explanations for China's remarkable success.

Regional "Demonstrations" Geographic proximity to countries that have already developed successfully can be beneficial for facilitating trade, investment, and—perhaps most importantly—access to productive ideas. The presence of regional "demonstration"

models has played a crucial role for China. Japan was emulated by other countries in the East Asian region; and Hong Kong and Taiwan provided influential examples for China. South Korea and Taiwan focused on export-oriented industrialisation strategy (see the end-of-chapter case study for Chapter 12). Successive development by countries in a region has been dubbed the "flying geese" phenomenon.

Using Leverage for Maximum Technology Transfer By the late 1980s, the locus of regional growth shifted to China as investors began to pour investments into the country, in large part because of the allure of its huge eventual market size. Government played off potential investors who wanted access to China's potentially billion-plus consumers, demanding and getting extensive technology transfer, public and private Chinese business partnerships, local content, and other concessions. Although the market was limited at first by both low incomes and government policies, early investors found high incentives to export from several special economic zones on the southeast coast. These investors discovered that China offered very cheap labour with unusually high skills and work habits for its income level at that time. This access was also leveraged to gain technology transfer. More recently, tariff and other import liberalisation has targeted high-tech components, and the Go Global policy actively encourages outward investment in other designated strategic sectors; both are ways to gain additional technology expertise, as previously seen in the case of Korea (see the case study for Chapter 12).

Export-Led Investment and Growth Structural transformation has been key for development in China with a rapid move from an agriculture-based economy to a manufacturing economy, facilitated through opening of existing coastal cities and creation of new coastal enterprise zones, followed by massive rural-to-urban migration. Once early investments built up a sufficient "critical mass," agglomeration benefits of concentrated economic activity kicked in (see Chapter 7). The more producers located in China, the greater the benefits for an increasing number of suppliers to operate there. At this point, both domestic and foreign investments started to "feed on themselves" in a cumulative causation. China then joined the World Trade Organization (WTO) in 2001, which required additional reforms in China's economy. WTO membership reduced investor uncertainty and led to accelerated manufactured goods exports as well as foreign (inward) direct investment. When wages began to rise, companies could set up production farther west, or migrants could move to the new industrial centres. Given China's population of hundreds of millions of low-income farmers, expectations were formed that this process of wage restraint could continue for an extended time. A string of wage increases beginning in 2010 challenged these expectations as economists presented evidence that China had reached the "Lewis turning point" (see Chapter 3).

Investment Coordination After the bloody crackdown on Tiananmen Square protests in 1989, there was considerable doubt about whether the reforms would continue and therefore whether investment and growth would remain high (making other investments profitable). The paramount leader Deng Xiaoping paid a 1991 visit to the southern China regions that had been leading in growth and reform and proclaimed, "You should be bolder and develop faster." Coincidence or not, a rapid burst of investment and growth, as well as policy reform, followed his speech and its subsequent publication. It has been suggested that in effect this served to coordinate expectations and led to the shift from a lower-growth to a higher-growth equilibrium. Much more generally, the government of China has used its centralised authority to coordinate investments across industries. These examples are consistent with theories of development examined in Chapter 4. Moreover, government negotiation of licences and other business agreements helped ensure that China got more favourable deals than many other developing countries that relied on private company-level business transactions; in this, the smaller-scale but significant role model lessons from South Korea may also have been influential.

Health and Education Investments The central planning of China's first three decades after the 1949 Communist revolution were by most measures a failure. Industry was highly inefficient. As many as 35 million people died in a late-1950s famine caused by poor central planning decisions and political pressures that led party and government officials

to regularly overstate the harvest prospects. As Amartya Sen stresses, famines rarely occur in democratic countries with a free press. Such disasters were only partly offset by the early and ongoing emphasis on basic health and education in China and then on reductions of fertility through China's one-child policy (see Chapter 6). But these basic first steps on education, health, and eventually fertility helped set the stage for growth and poverty reduction when later combined with market incentives. One of the results was the relatively higher educational and skill level of factory workers for given wages. China is also well known for its one-child policy, implemented in 1980. It probably had some effect in reducing fertility at an earlier stage of development, and led to highly favourable timing for receiving the "demographic" dividend—a period in which children have become a much smaller share of the population; but retired persons are not yet a significantly larger share of the population. This period has now passed, and the total workforce is now shrinking annually. (See Box 6.3 in Chapter 6 on population policy in China.)

Productivity Growth There has been considerable debate about whether rapid growth in China and other East Asian countries is the result of capital accumulation or productivity gains. Alwyn Young, Paul Krugman, and others have concluded that South Korea and other "Asian Tigers" grew more from investing heavily in capital assets such as machinery and factories than by improved productivity. Zuliu Hu and Mohsin Khan concluded that productivity gains explained more than 42% of China's growth in the formative 1979–1994 period and that productivity had overtaken investment by the early 1990s as the largest source of growth. This was considered surprising, in part because of the breathtaking pace of capital investments in China. On the other hand, when China's rapid growth began in the late 1970s in the areas close to Hong Kong, while it was clear that a large volume of investment funds was flowing from capital-abundant Hong Kong (a British crown colony at the time) to capital-scarce China, the bigger story was the flow of productive ideas over the Hong Kong border, a barrier that had long prevented the transfer of both capital and know-how. Of these two factors, it often seemed that availability of ideas was more important than availability of finance. Research by Xiaodong Zhu, Loren Brandt, and their co-authors provided documentation that productivity growth, rather than mere factor accumulation, has been an important source of China's rapid growth of output. In particular, Zhu has presented evidence that productivity growth in the nonagricultural, nonstate-owned sector is the most important source of growth in China. Noting that productivity is still well below that of the United States, he also argues that there should still be significant opportunities for productivity to continue to grow rapidly in China by adopting foreign technology, learning best production practices, and improving institutions and policies, particularly to allocate capital more efficiently. Ashoka Mody and Fang-Yi Wang examined the causes of industrial growth in China and concluded that regional factors played a central role, noting that "China made judicious use of the advantages of backwardness by targeting areas that were less developed and less encumbered by the legacy of existing institutions." Special economic zones "successfully attracted investments from overseas Chinese to particular locations" (as the authors note, this was facilitated by close proximity to Hong Kong and Taiwan). They also note that "the contribution of foreign expertise is greatly enhanced by available human capital." Thus, the China case also illuminates complementarities—a major theme of Chapter 4.

Reform on the Margin

Another key innovation is the way China developed and implemented the reform process itself. As examined in detail in Chapter 2, developing inclusive institutions that protect property rights and enforce contracts, and place checks on executive authority and the power of elites such as through the rule of law, have demonstrated importance in long-term economic development. China appears to be an outlier, in that such protections are weak. Yet it is extremely difficult to navigate the course from bad to good institutions. It is rarely possible to follow a straight line on the map, as a vortex of obstacles are encountered, and the ship of state itself may be the cause of many of the problems. The process of getting the institutions right is one of starting with a clear understanding of both formal and informal local rules, and moving toward an eventual goal even when it cannot be seen clearly—in the presence of initial and then newly emerging constraints and

opportunities, chartering what may seem to outsiders as large deviations off-course. A metaphor used by the post-Mao paramount leader Deng Xiaoping may also reflect in part this type of step-by-step, graduated process—"crossing the river by feeling the stones."

In China, the way market incentives were introduced and used seems to have been almost as important as the fact that they were introduced. A striking feature of economic development in China has been the very gradual implementation of reforms. China's approach has been the opposite of a number of eastern European and central Asian "transition" countries, notably Russia, which opted for a "big bang"—that is a sudden comprehensive changeover to a free-market economy. (Hungary and Slovenia are two countries in that region that pursued a more gradualist strategy.) China has introduced new and transitional institutions that exist side by side with previous institutions of central planning for extended periods. In much of the former Soviet Union and eastern Europe, central planning was abolished almost immediately, and economic depression, with drops in output of up to 50%, ensued before gradual recovery. In contrast, China kept the central planning system partially intact for an extended period. Previous quotas for buyers and sellers at fixed planned prices were maintained. Reform was instead introduced on the margin. After filling their quotas, producers were free to buy and sell at market-determined prices; resales were generally not prohibited. This "dual-track" system simulated the allocational efficiency of a more competitive market economy and created strong incentives for firms to improve efficiency and increase output, in a manner less threatening to the status quo.

Moreover, while in other transition and developing countries state-owned enterprises (SOEs) were sold off to private investors fairly quickly, in China these remained in government hands for an extended period, and in many cases have still not been privatised. The government tried to reform them internally, with limited success. But at the same time, China has allowed and encouraged a new, more efficient sector to grow up around them. In recent years, China has privatised or closed many of the smaller SOEs. Many larger SOEs continue to operate in a relatively inefficient manner, and some economists have suspected for years that their accumulating indebtedness will eventually pose significant financial risks to the economy. The counterargument proposes that if the economy can continue to grow rapidly, it is also possible that China may "stay ahead of this problem." As employment opportunities continue to expand, and older workers retire, more of the larger SOEs could be privatised or closed—this view will be put to the test as China's growth rate slows.

Further, for the first nearly two decades of reform, from the late 1970s to the mid-1990s, at the local level, township and village enterprises (TVEs) were encouraged. The TVEs were vaguely owned by local government, but their private entrepreneurs and employees held "vaguely defined" property rights, as Martin L. Weitzman and Chenggang Xu termed them. These TVEs accounted for a very large share of industrial output growth in China. Finally, after the Chinese economy had grown nearly fourfold, the majority of these TVEs were privatised in the late 1990s—by this point the private entrepreneurs had triumphed (or their underlying control became clarified). But the TVEs played a unique role in spurring growth and spreading the benefits of development to rural areas. Reforms in the late 1970s and 1980s favoured agriculture and entrepreneurship in the rural areas where most of the poor lived, and poverty fell as income rose. From at least the early to mid-1990s, the terms of trade shifted toward industry and urban areas. Yasheng Huang makes a strong case that this represented an important turning point, associated with growing inequality and other serious challenges.

Still, strong average growth continued through many changes. As outlined by Yingyi Qian, China's transitional institutions have served a dual purpose: to improve efficiency while compensating the losers (and thereby preserving legitimacy or at least reducing the chance of political backlash). Provided that the quotas were enforced—and for the most part they seem to have been in the transition in China—the dual-track allocation system protected the interests of those who had benefited from and planned on receiving inputs at fixed, low prices. As a result, these agents did not oppose or undermine reforms and indeed could benefit further to the degree they could learn to produce more efficiently and operate in markets effectively. The system was largely phased out many years later, after the economic

landscape had changed dramatically. The vague local-government ownership of the TVEs provided protection for investors who feared government hostility toward private property and worried about expropriation. The impression that these companies were owned by the township or village protected the de facto private owners. Once reform proceeded to a certain point, these de facto owners were able to "take off the red hat," as the saying went in China, and assume full ownership in exchange for considerations to local government, and taxes replaced direct revenue transfer out of the TVEs. Qian shows how similar arguments apply to fiscal and financial reforms. Under the reforms, local government continued to have a responsibility to provide revenue to the central government, but local government was allowed to keep a large share of collections on the margin before local and central revenue collection was fully separated. Government also allowed anonymous banking accounts for a long transition period, to credibly constrain the ability of the government to arbitrarily impose high individual taxes on successful entrepreneurs. Qian judged the programme a success despite the fact that this diverges from what is considered normal best practice in advanced Western countries.

Yingyi Qian's insightful explanation is that "The difference between China and Russia is not at all that China has established best-practice institutions and Russia has not. The difference lies in the institutions in transition." He proposes that "the real challenge in reform facing transition and developing countries is not so much knowing where to end up, but searching for a feasible path toward the goal." In this, he stresses that "the general principle of efficiency-improving and interest-compatible institutional change is simple, but the specific forms and mechanisms of transitional institutions often are not. Successful institutional forms usually are not a straightforward copy of best-practice institutions. . . They need not be because room exists for efficiency improvement that does not require fine tuning at the beginning. They should not be because the initial conditions are country and context-specific, requiring special arrangements." Qian's interpretation is that to understand these mechanisms it is helpful to "appeal to the counterintuitive second-best argument, which states that removing one distortion may be counterproductive in the presence of another distortion."

Finally, for peasants in parts of China where the rural sector has done well, earlier land reforms have been among the causes—with the revolution setting the stage and the late-1970s reforms giving greater incentives to individual farmers. Land reform has been notoriously difficult to implement in other parts of the world (see Chapter 10). Remittances from migrant workers have fuelled a service-sector boom in some rural areas, and prices received by farmers have generally risen, particularly near urban areas. However, in recent years, involuntary farmer land displacements and other hardships have led to local conflicts.

China's Current Challenges

Since 1980, China has grown more than four-and-a-half-times faster than the United States, as measured by per capita output. As a result, China has been closing the relative gap in living standards. In 1980, China's real income per person was only about 2% of that in the United States, but by 2017, it had grown to about 28%. If China's output per person continued to grow at its unprecedented post-reform rate of about 8.3% and the United States at its very long-run rate of 1.9%, China would catch up in average real living standards by around 2040. If the current growth rate differential of about 4% can be maintained, China would catch up by around 2052. Despite its extraordinary record to date and considerable resources at its disposal, the substantial challenges that China faces in its attempt to reach developed country status should not be underestimated. To continue growing at its 2018 rate of close to 6%, China will also need to alter the focus of its economic growth.

Transitioning from Investment-Led to Consumption-Led Growth Savings have been extremely high in China. In 2007, China's *net* savings rate reached about 40%, higher than any other country (excepting a few small oil-rich economies). China's savings rates have been high even in relation to the high rates that have generally prevailed in East Asia. Associated with high savings has been an unsustainably high investment rate (as well as the trade surplus). High savings rates are not consistent with the pivot toward increasing local consumption as an engine of growth. Since 2008, the savings rate

has been falling steadily if slowly to about 25%. It is now generally accepted in China and internationally that continuing to grow at such high rates is essentially impossible. Before China grew rapidly, South Korea did so, and before South Korea, Japan did. The later a country starts modern economic growth, the faster it can grow because the distance from traditional methods to the frontier technology of the day grows greater over time. But the pace of catch-up generally slows as an economy gets closer to the technology frontier and needs to innovate. Policymakers in China are actively attempting to meet this challenge. The focus of industrial policy has turned to robotics, artificial intelligence, biotechnology, and other frontier sectors.

Poverty and Vulnerability Life can indeed be harder than ever for millions remaining in poverty, particularly rural farmers in some parts of the country facing the loss of security, official corruption, including official land grabs from peasants, rising local taxes, and minimal improvements in technology or skills. In addition to those officially classified as poor, it is also widely acknowledged that the social safety net remains very thin, especially for others in the bottom 40% of the income distribution, and for persons of retirement age. At the same time, despite the growth in average wages, inequality in China—once quite low—has been rising dramatically; inequality has now reached approximately the same level as in the United States, one of the most unequal among the developed countries.

Environment and Pollution China has to address a severe environmental crisis. Many of the most polluted cities in the world are located in China—although India's cities are now worse—and result in severe health problems. Water resource problems, erosion, and loss of habitat undermine the prospects for sustainable development. The extreme air pollution is now causing not just misery but deaths and other serious and growing health problems. This became the centre of national and international attention during the 2013 Beijing "airpocalypse," when pollution indicators exceeded 40 times World Health Organization standards; many other cities such as Tianjin and Harbin have been severely affected. There are very few historical precedents for prolonged pollution exposure of this magnitude. But a joint study by China, United States, and Israel university researchers estimated that air pollution in China had already decreased live expectancy north of the Huai River by a shocking 5.5 years, including increases in lung cancer, heart attack, and stroke. China is striving to develop its renewable energy sector. Moreover, China's looming water shortages threaten to curtail industry, coal production, and agriculture. Some of China's environmental challenges result from global climate change; but many if not most result from poor national management of the environment. Coal accounted for about two-thirds (66%) of China's electricity production in 2016. Coal generates more greenhouse gases than any other significant energy source; and coal plants produce other dangerous local air pollution. Coal production also uses a lot of water. The expansion of coal use is placing major demands on China's increasingly scarce water supply; there are growing demands stemming from irrigation; and water is being diverted to expanding cities. There is great stress on the Yellow River and other watercourses. Finally, China is the world's largest emitter of greenhouse gases such as CO_2; and emissions have been growing rapidly (see Chapter 10).

Product and Worker Safety Since 2007, highly publicised scandals concerning the safety of food, drugs, and other consumer products threatened the international public image of Chinese-made products. Indeed, product safety standards remain rather low, and their regulation is lax. Foreign and local investors, and government, all share in the blame. China's regulatory institutions will need to catch up with the progress made in other aspects of national economic development. In other countries, public pressure has played a central role in spurring protections for consumers and workers; this requires more freedom of expression and capacity to organise.

Avoiding the Middle-Income Trap Officials and researchers in China are also concerned about susceptibility to the "middle-income trap" and are engaging discussions with Latin American countries on this topic. Huang Yiping and Jiang Tingsong stressed that what "really trapped many Latin America and Middle East middle-income countries was lack of innovation capability. . . This will also be the real test for China." IMF reports have increasingly

emphasised this conclusion. The alternative is probably wasteful and unsustainable investment that would result in serious economic crises. The question for China will be how it can maintain somewhat more modest but historically still high growth, of perhaps 5.5 to 6.5%, sustainably over the next two decades. An economy growing at this rate must have a different structure of investment than an economy growing at 9–10% (as China did for much of the post-reform period). Making these adjustments will not be easy. Developing innovative capacity will be an important part of the answer; first steps are being taken, but better institutions may be needed to sustain the momentum. Strengthening intellectual property rights protections should help spur innovation, as should greater access to information. Another priority is to improve secondary education quality, and widen higher education quality in addition to increasing access, for those outside the advanced and affluent parts of the country.

Addressing Structural Imbalances in International Trade China's very large export surplus has come under great criticism, as this was widely argued to be one of the underlying causes of the global financial crisis, and ongoing tensions. The "trade war" with the Trump administration is the most prominent example. One cause of the surpluses has probably been the undervaluation of China's exchange rate, though this has at least narrowed considerably. Undervaluation has been used by a number of East Asian economies as an industrial strategy for encouraging expansion of the manufacturing sector (notably in the 1960s and 1970s by South Korea and Taiwan, see Chapter 12), but those economies were much smaller than that of China. As recently as 2009, analysts estimated rates of overvaluation of up to 40%. By 2017 the IMF concluded that the renminbi was no longer undervalued, but in line with fundamentals—by then, the imbalance was likely the result of market overvaluation of the US dollar. China's overall (global) external surplus as a share of GDP has decreased since 2009 (see Chapter 12 for details on measurement and analysis of international trade). Inevitably, more China-based firms will engage in direct foreign investment in their export destination countries such as the United States, just as Japan and South Korea did before. Finally, the eventual substance and impacts of the so-called trade war initiated under the Trump administration remains unclear, as does whether the advertised resolutions will prove fragile and recur in different and potentially more dangerous forms. A major concern is that trade complaints—which can be petty, if not based on outright misunderstanding of market economics—are often bundled together with far more serious evidence of illegal hacking and economic espionage, making resolution both more important and potentially more difficult.

Intellectual Property Rights Protection Strengthening protection of intellectual property rights is again vital for spurring innovation. In other countries, intellectual property protections have been strengthened at the point at which pressures for increased innovativeness grew. There is ample international experience to learn from, so there is no reason this has insurmountable obstacles. Increasing protections should also help to defuse international conflict. Independent analysts do not doubt that China has been substantially poaching foreign intellectual property; the scale of China's economy, and the "efficiency" of industrial cyber-espionage appears to make the current disputes qualitatively different than other cases of industrial espionage. If intellectual property rights enforcement improves in China, it should benefit the country's continued development. Investments in products and services with high intellectual property content are often more productive and profitable—a growing priority in China.

Risks of Declining Investment Efficiency In parallel, investment as a share of GDP, long over 40%, reached an unprecedented 48% by 2010, before moderating slightly. Part of the uptick in recent years was due to an active response to the 2008 global economic crisis. The adjustment to sustainable investment and growth rates will be extremely difficult to accomplish without major and possibly prolonged disruptions. Yet the scope of the problem may also be somewhat exaggerated by the way national statistics are prepared, which as Jun Zhang and Tian Zhu argued does not account for hidden consumption by the growing number of high-income citizens, the rent-equivalent consumption of owner-occupied housing, and reported corporate expenses that are actually more like private consumption. The

statistics (including international trade and finance data) must be considered and better understood as a whole. But while the percentages are in doubt, the fact of extraordinarily high investment—with evidence showing that a significant amount of it is at very low productivity—has not been challenged. All economies have some waste; the question is how much waste and how well it is buffered. Many foreign investments appear likely to lose money, as do domestic investments that seem predicated on high growth rates that will not be attained again. Some slower-growing regions have built massive housing developments that have the aspect of near ghost towns. A significant number of developments will likely yield very low if not negative returns. The risks of large-scale poor investment choices are apparent in China. But while misallocations are likely substantial, it remains to be seen whether the overbuilding will necessarily result in the financial disaster of some media depictions.

Managing Urbanisation The scope of urbanisation in China has been called the largest migration in human history, and indeed it has been breathtaking. For the first time in its history, China has become a more urban than rural society, with the halfway mark believed to have been crossed around 2011; in 1980, more than 80% of Chinese citizens lived in rural areas. More than 100 cities in China have a population of over one million. Before 2030, China may reach the "urban billion" mark. In the south, Shenzhen was transformed from a fishing village near Hong Kong to a megacity of over 10 million people in just a couple of decades. Chongqing, featured in a Chapter 1 vignette, grew from about 2 million in the 1970s to more than 15 million. But conditions of ordinary people in many cities do not correspond to the media images of postmodern skyscrapers, as most are moving to large tracts of sometimes bleak, uniform apartment buildings, crawling in epic traffic jams through a vast urban sprawl—and indeed inhaling the "breathtaking" air pollution—in a picture simultaneously of public overinvestment in some areas and underinvestment in others. Creation of new cities was in part to plan the urban transition. Eventually, some of these seemingly empty new cities will be successful. To jumpstart the process, government is apparently directing or nudging former farmers, SOE workers, and state employees to move to these locations while connecting them to rapid transit. In any case, the scale of urbanisation in China is unprecedented. Even if many of the new cities are more successful than many analysts predict, managing continued growth in the growing megacities will remain a difficult challenge.

Demographic Challenges China has a rapidly ageing population. For the last dozen years of the twentieth century and first dozen years of the twenty-first century, China benefited from a "demographic dividend" (see Chapter 6), during which an unusually large fraction of its population has been of working age (neither too young nor too old to be active in the workforce). This "dividend" occurs in the process of economic development after the drop in births per woman but before the previous larger cohorts retire, allowing for rapid income growth. However, a large fraction of its working population is beginning to retire. The workforce has been shrinking since approximately 2014 (even earlier by some definitions). One increasingly pressing challenge is to extend and implement a modern pension system. With low fertility rates and higher mobility it will be insufficient to rely on children to care for their ageing parents, and a rapid expansion of institutional care facilities will be needed. Another is to respond to a shrinking workforce and the need to support a large retired population. It is a challenge common to many modern societies but may be particularly acute in China due to its one-child policy that has been in effect since about 1980, greatly accelerating the demographic transition. There was a relaxation of this policy in 2013, allowing urban families for which husband or wife is an only child to have a second child (previously this was allowed only if each was an only child); in 2016 the policy was further relaxed to allow a second child more generally. In 2019 the prospects of eliminating all remaining fertility restrictions and actively encouraging a second child were discussed publicly. But even full relaxation may have very limited impact on fertility because the change in norms seems strongly established, and perhaps more importantly because of the high cost of raising children in China's cities. Moreover, other countries in the region that reached high-income status in the twentieth century including Japan, South Korea, Taiwan, Hong Kong, as well as Singapore, have birth rates well below replacement levels

(see Chapter 6), though the transition to an ageing society may prove more rapid in China. A widely used phrase to capture this issue is "China must get rich before it gets old." Likely it will take a decade or two before the question can be answered. The very high ratio of males to females (see Chapter 8) remains another serious demographic challenge that may lead to continued distortions. There are several explanations of China's historically unprecedented high savings rates (which reached almost 50% by some measures), but many of them relate to the unusual demographic challenges; they include "life-cycle" saving for retirement by an ageing population that lacks social security, precautionary savings due to increased income uncertainty because of fears about catastrophic family events such as major illnesses or layoffs, and poor financial intermediation. In addition, in an influential theory of Shang Jin Wei and Xiaobo Zhang, there is competitive saving by parents of sons who now greatly outnumber daughters due to China's growing sex-ratio imbalance and compete for prospective wives by offering larger houses and other wealth. High savings may be associated with the apparent property bubble that some economists in China believe has become dangerous—yet China has demonstrated a capacity for managing challenges, and considerable reserves for addressing crises.

Challenges of State-Owned Enterprise (SOEs) The private sector in China has grown from being virtually nonexistent in 1978 to over 80% of the economy. But as noted above, SOEs remain important, with nearly 20% of employment. They also receive more government subsidies, including research and development funds; but as Shang-Jin Wei, Zhuan Xie, and Xiaobo Zhang show, they are less innovative and productive. As China strives to become an innovation-driven economy, the most serious long-term economic risk of SOEs could be to act as a net drag on growth and innovation. At the same time, a large amount of credit has been funnelled to SOEs, which some financial analysts argue could be a threat to the financial system.

Risks of Financial Crisis Since about 2008 there have been widespread concerns that China has overinvested to a point at which many investments are of dubious quality, particularly in real estate and some infrastructure and industrial sectors. Analysts including scholars, World Bank and IMF economists, and investment rating agencies have expressed concerns about systemic financial risks in China. Total borrowing in relation to GDP has risen dramatically, from an estimated 120% in 2008 to about 260% in 2016; and some analysts consider these figures to be underestimates. There are concerns about the risk of "bubbles" (see Chapter 13) developing in financial and real estate markets, due to high rates of debt-financed investment, along with declining investment profitability, and increasingly opaque "shadow" banking to higher-risk borrowers—often done "off the books" by otherwise state-regulated banks, as well as unconventional lenders. Off-balance-sheet credit has been estimated at about $9 trillion. Private online financial services have grown rapidly but operated largely outside the existing banking supervisory system. Local governments also have run up high levels of indebtedness, which S&P estimated in 2018 at between $4 to 6 trillion. The huge indebtedness of the SOE sector, local government loans, and other public debt is argued to be a key factor that could lead to a significant financial crisis. Other analysts argue that China can "grow its way out of" these problems. But without adequate return, it may become impossible for borrowers to pay interest and principal on debt. After years of warnings, in 2017 the government began showing strong signs of addressing these risks seriously. The 2017 five-year government policymaking work conference identified at least five vulnerabilities needing to be addressed to reduce systemic financial risks: unusually high corporate debt; shadow (unregulated) banking business; liquidity risks; capital market institutional weaknesses; housing and other real estate bubbles; and uncertainties surrounding the growth of online financial services. A new Financial Stability and Development Commission was created to close loopholes in financial regulations and provide coordination across regulatory agencies. The *People's Daily* reported in July 2017 that China "should improve its emergency response mechanism and put in place a set of complete contingency measures to preempt and address" financial risks. Large banks are being required to increase their reserves. Financial holding companies are receiving greater scrutiny. High-level warnings have been issued of punishment for banking officials who

fail to follow newly restrictive policies. In 2018, there was a significant slowdown in credit growth. Some international raters, prominently the Financial Stability Board, as well as Fitch Ratings, lowered some bank risk assessments, although noting that indicators generally remained at much riskier levels than a few years ago. As many countries have learned, even earnest attempts to address financial fragility can fail. But the greater apparent openness about crisis risks, as witnessed in the central bank's November 2018 annual report on financial stability issues, and plans for significantly stronger requirements and supervision of large banks, may itself be a sign of institutional strength to keep problems in check. Foreign purchase of China's central government debt has been rising. The fact that China does not rely on foreign funds differentiates it from economies such as Greece, Turkey, and Argentina; this will not prevent a financial crisis but may limit its severity. The extent of the imbalances suggests a difficult transition from investment-led to consumption-led growth, while it is also part of the longer-term solution. Adjusting to prevent and respond to financial crisis greatly benefits from strong institutional foundations. Without reliable rule of law and other checks and balances it remains unclear how much stronger the foundations of financial institutions can be built, even if the expansion of high-level oversight proves as extensive in practice as advertised. Absent further reforms, the question of whether China can avoid crisis—and, more importantly, the types and size of any long-term effects—remains unanswered.

Institutional Limitations and Rising Inequality
There are also apparently broader institutional and political weaknesses. On the one hand, some analysts make a case for the potential strengths of more authoritarian regimes, at least in early stages of development and when leadership fosters a developmental state. But on the other hand, this may become entrenched and make for a less flexible response to changing circumstances and difficulties in escaping a possible middle-income trap. Risks of corruption are much higher when institutions are weak, and many reports suggest that corruption is serious and widespread in China. Before 2015, some leaders in China called for urgent political reforms; but since then authoritarian characteristics have only strengthened. The net long-run effects of the anti-corruption drive under President Jinping Xi remain unclear; while corruption appears to have decreased to a notable extent, critics claim that enforcement is largely aimed at political opponents. Moreoever, the dramatically worsened inequality in China may undermine not just political stability but ultimately opportunities for future growth as well as capacity for reform (for details on the challenges of rising inequality for growth and development, see Chapter 5). And despite the extraordinary economic growth in China, Richard Easterlin has found that improvements in happiness and satisfaction in the country simply have not kept pace, particularly among the bottom third. Relatedly, China will need to find a way to continue its ongoing institutional reforms, whether through implementing new and productive transitional institutions or more fundamental change. In their classic 2012 book, *Why Nations Fail*, Daron Acemoglu and James Robinson argued that institutional weaknesses will ultimately stall development in China. In their analysis, institutions in China closely resemble the "extractive" political systems of other failed states where crony capitalism is the norm, vested interests are protected, and potentially disruptive entrepreneurs are blocked. The outcomes depend upon political choices. Acemoglu and Robinson conclude with their bold prediction that growth in China will ultimately be "unlikely to translate into sustained economic development."

Political Responses to Institutional Issues
Undoubtedly, the needed reforms will be politically difficult to undertake. Despite many announced economic and social policy changes, left unambiguous was that the Communist Party monopoly on political control would remain unchallenged. Like many developing countries, China has been plagued by official corruption. The anti-corruption drive under paramount leader Jinping Xi has led to high-profile arrests and sentencing of officials, sometimes for stashing staggering stockpiles of ill-gotten cash in their homes. But the full implications of the crackdown are more ambiguous, as independent political analysts note that those punished are almost always members of opposing political factions. *Transparency International* rates China with a middling score of 41 (in a range of 0–100) in its Corrupt Perceptions Index—just above India and Turkey (40) and just below Burkina Faso and Lesotho (42); nonetheless,

this represents a modest improvement over recent years. However, *Transparency International* also reported in 2018 that "civil society organizations. . . are permanently under threat from authorities." As China has innovated transitional institutions before, it is possible that it can do so in the political arena. No doubt China's severe restrictions on Internet use, including the "Great Firewall" regarding foreign content, is a net negative for development. For growth, information is pivotally important in an advanced economy for flexibility as well as innovation; censorship reduces this opportunity. For human development, it reduces capabilities. Moreover, while the government experimented with holding some local elections, that experiment appears to have been abandoned. It is also possible that the negative impacts may be significantly reduced for some time. The Chinese state has begun using the web for controlled citizen feedback and responsiveness on the margin. As Maria Repnikova argued in her 2017 book, local officials are being judged and rated by how well they handle online complaints and suggestions, and may lose their jobs if rated poorly. Such an institution is highly unusual as a partial substitute for elections, but it resembles what many companies do with customer feedback. It could bring about some parts of the efficiency benefits of democracy, at least enough so to keep the development process progressing until a new stage of democratisation becomes necessary to avoid stagnation. However, difficulties in sustaining even very local-level elections with any degree of openness raise doubts about the potential for democratic transition. Martinez-Bravo, Gerard, i Miquel, Qian and Yaoy present evidence that local elections emerged in China because it benefited the national government and party; their significance later declined because they found the benefits they gained were no longer greater than the costs. Finally, political reform may become even more difficult as China now has high (and still-growing) inequality.

The argument that China could have grown even more quickly in the post-reform period with democratic and less state-directed institutions is difficult to make, most fundamentally because China has grown significantly faster and for a longer period than any other economy in history. Moreover, if we point to foreign technology transfer as the main engine of growth in China, there is the question of whether that could have occurred without government requirements for technology transfer as a condition for investment and market access—something that probably required government planning as a "developmental state." And realising this objective may have been possible only in China, with its unique market. Of course there is no way to rule out that China could have grown even faster with less market intervention. At this juncture two questions are present: first, recalling the capabilities framework for development of Chapter 1, whether basic rights are taken for granted in many though not all high-income countries such as freedoms of speech, press, open and rules-based legal process, religious practice, and peaceful demonstration can be established; and second, whether autocratic, party-governed institutions can be successful as China strives to achieve an advanced economy.

To What Extent Can the China Model Be Replicated?

There are limits to the lessons of China's growth for other developing countries. China is quite homogeneous, overwhelmingly populated by members of the Han ethnic group. In much of Africa and other parts of the world, ethnic diversity is associated with slower growth, though only in countries that also have incomplete or nonexistent political freedoms. China, like much of East Asia, has relatively poor natural resource endowments. Many development specialists have concluded that this lack is, perhaps paradoxically, more a benefit than a drawback. Natural resource abundance encourages political infighting for control over the revenues, while manufacturing success is more essential when a country lacks natural resources to fall back on. It requires more initiative and more efforts to upgrade technology and skill. And it is more difficult to seize control of industrial and especially intangible assets than natural resources.

In terms of geographic advantages, East Asia is also much less plagued than Africa and other developing regions by problems such as malaria and other tropical diseases for which medicines are not readily available, the difficulties and disadvantages of tropical agriculture, and the problems of landlocked countries. Finally, there may be limits to the ability of other countries to carry out China's brand of centrally designed and implemented policies for

transition and directed growth when broader democratic freedoms are in place. Democracy may help countries on average, and becomes all but essential as an economy approaches fully developed status. (This question of whether a democracy can develop as quickly as China is addressed further in the case study of India at the end of Chapter 5.)

The experience of China assures us that the East Asian "miracle" is not a fluke due to special local factors in economies such as South Korea and Taiwan. It gives us much greater confidence when we say that "real development is possible." On the other hand, there are clear limits to the ability of other developing regions to emulate the success of China. Not only do other developing countries differ in geography, demography, institutions, and allure to foreign investors, but also other regions may find themselves starved for investments that are redirected to China while remaining unable to compete with China's impressive combination of low wages, high skills and know-how, and agglomeration of economic activity. Some East Asian countries have greatly benefited from the surge in import demand from China. The commodity price boom of the first decade of this century that stimulated demand in several countries in Africa was significantly attributable to growth in China.

China has a good chance of continued relatively high, albeit moderated, growth, provided it manages the next phase of its transition carefully. In the meantime, many developing countries that have hoped to rely more on manufactured exports, and even middle-income countries that hoped to move more quickly to high-income status, view the success of China as much as a threat as an opportunity. Growth in China will continue to be a central theme in the global development drama—both in its huge economic impact domestically and for other low- and middle-income countries, and the evolving policy debate spurred by its extraordinary achievements. ■

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Concepts for Review

Agency costs
Asymmetric information
Big push
Binding constraint
Complementarity
Congestion
Coordination failure
Deep intervention
Economic agent
Growth diagnostics
Information externality
Linkages
Middle-income trap
Multiple equilibria
O-ring model
O-ring production function
Pareto improvement
Pecuniary externality
Poverty trap
Prisoners' dilemma
Shadow price
Social returns
Technological externality
Underdevelopment trap
Where-to-meet dilemma

Questions for Discussion

1. Can you think of additional examples of complementarities from everyday life? Does the S-shaped curve of Figure 4.1 shed any light on them? Do you think your examples help as a metaphor for economic development problems?
2. What role do you think international trade and foreign investment can play in solving some of the problems identified in the big push model? In the O-ring model? What limitations to your arguments can you think of?
3. The word *trap* suggests that there may be a way to escape. Do you think developing countries can escape all of the traps described in this chapter? Which ones would be most difficult to escape? How could the developed world be of assistance in these cases? Could developed countries do more?
4. Why might high levels of inequality lead to lower rates of growth and development? Why might it be difficult to get out of this kind of trap?
5. Why is the government sometimes a part of the problem of coordination failure rather than the solution? Does this make the problem hopeless? What could be done in this case?
6. One of the characteristics of some developing economies is the relatively low level of trust of people outside one's extended family. How might the models explored in this chapter shed light on this problem?
7. Can you think of an example of O-ring production from everyday life? Do you think your example is a good metaphor for development problems?
8. Modern economic models sometimes require strong assumptions. What do you think are some of the trade-offs between a more rigorous, logically cohesive model with strong assumptions but clear inferences and a description of problems followed by a verbal discussion of possible implications? Do you think the two approaches can be used together to inform each other?
9. What kinds of market failures are present in the economic self-discovery framework, and how may they be overcome?
10. Consider growth diagnostics. Constraint categories are the boxes from which no further arrows emanate. Can you think of a fundamental constraint not included in the ten end boxes? (That is, an important category qualitatively different enough to require its own branch on the decision tree?) If so, how would you treat it in the growth diagnostics framework?
11. In growth diagnostics, to determine the binding constraint there are many potential clues in economic behaviour. Specifically, we can expect that people will attempt to bypass the constraint; for example, if the problem is electricity infrastructure you should see businesses investing in generators. Consider additional examples beyond those raised in the chapter.
12. Identify and describe the key explanations for China's development success as raised in the China case study. Review some of the recent news and research on China. To what extent do you think any of it confirms, and to what extent calls for adjustments in, the overview in the China case study?
13. Following from question 12, consider the emerging limitations and constraints on future development

in China. Again, review some of the recent news and research on China. To what extent do you think any of it calls for adjustments in the importance of any of these limitations?

14. As you read later chapters, think about whether the models described in this chapter are useful in shedding additional light on the nature of the problems considered. Some of the later problems you might consider are child labour, poor health and nutrition among the poor, high fertility, environmental degradation, availability of credit for the poor, urbanisation, protectionism in international trade by developed and developing countries, reform of government, and land reform.

Notes

1. See Karla Hoff and Joseph E. Stiglitz, "Modern economic theory and development," in *Frontiers in Development Economics,* eds. Gerald M. Meier and Joseph E. Stiglitz (New York: Oxford University Press, 2000).
2. For example, the two approaches have converged when low-growth paths resulting from a coordination failure have been explicitly examined within an endogenous growth framework. See Oded Galor and Joseph Zeira, "Income distribution and macroeconomics," *Review of Economic Studies* 60 (1993): 35–52.
3. For an insightful discussion of how perspectives of this approach are applied to "new economy" issues, see Carl Shapiro and Hal Varian, *Information Rules: A Strategic Guide to the Network Economy* (Boston: Harvard Business School Press, 1999).
4. The problems cannot be solved even by perfect labour contracting (which is generally impossible in any case) if there is a risk of involuntary separations between firms and their employees (e.g., firm bankruptcies or death or serious illness of an employee). For a particularly insightful formal model, see Daron Acemoglu, "Training and innovation in an imperfect labour market," *Review of Economic Studies* 64 (1997): 445–464.
5. For an interesting formal model of this problem with supporting empirical evidence from rural Bangladesh, See Shahe Emran and Forhad Shilpi, "Marketing externalities and market development," World Bank Policy Research Working Paper Number WPS 2839, 2002: http://documents.worldbank.org/curated/en/685901468769259082/pdf/multi0page.pdf. See also Shahe Emran and Forhad Shilpi, "The extent of the market and stages of agricultural specialization," *Canadian Journal of Economics* 45, No. 3 (2012): 1125–1153.
6. Alicia Adsera and Debraj Ray, "History and coordination failure," *Journal of Economic Growth* 3 (1998): 267–276; Debraj Ray, *Development Economics* (Princeton, N.J.: Princeton University Press, 1998), ch. 5.
7. For an introductory overview of the prisoners' dilemma problem, see Robert Gibbons, *Game Theory for Applied Economists* (Princeton, N.J.: Princeton University Press, 1992), pp. 2–7.
8. Even under perfect information conditions, however, coordination can remain a problem.
9. Technically, Figure 4.1 assumes that agents are homogeneous and depicts a symmetrical Nash equilibrium, but this can be generalised to cases in which agents differ. An example of an upward-sloping supply curve intersecting a downward-sloping demand curve—to produce a single equilibrium—can be seen in Figure 5.13, for the case of a labour market.
10. Technically, what is depicted is a set of symmetrical Nash equilibria. The S-shaped curve is the reaction curve of a representative agent to the average behaviour of the other agents.
11. Paul Rosenstein-Rodan, "Problems of industrialization of eastern and southeastern Europe," *Economic Journal* 53 (1943): 202–211.
12. See Kevin M. Murphy, Andrei Shleifer, and Robert W. Vishny, "Industrialization and the big push," *Journal of Political Economy* 97 (1989): 1003–1026; Paul Krugman, *Development, Geography, and Economic Theory* (Cambridge, Mass.: MIT Press, 1995), ch. 1. For an alternative exposition and an algebraic development of the model, see Kaushik Basu, *Analytical Development Economics* (Cambridge, Mass.: MIT Press, 1997), pp. 17–33.
13. One reason could be an efficiency wage effect, in which workers work harder to avoid being fired when paid a high wage, thereby raising productivity enough to pay for the higher wage.
14. We are assuming that modern-sector workers would be changing the sectors (from traditional to

modern) in which they work voluntarily; that is, they are not slave labour.

15. In the formal model of Murphy, Shleifer, and Vishny, there is a continuum of products, but that need not concern us here.

16. This consumption pattern means that there is unit-elastic demand; this is the type of demand function that follows from a Cobb-Douglas utility function with equal preference weights for all goods, such as a utility function given by the products of the amounts of each type of good consumed. Technically, Murphy, Schleifer, and Vishny assume that there is one representative consumer who supplies all labour and receives all profits and, with their other assumptions, set up the model so that Figure 4.2 and other parts of the analysis can be thought of either as the economy as a whole or as any particular market, but these considerations need not concern us here.

17. See, for example, Hollis B. Chenery, Sherman Robinson, and Moshe Syrquin, *Industrialization and Growth: A Comparative Study* (New York: Oxford University Press, 1986).

18. For work in this field, see, for example, Andrés Rodriguez-Clare, "The division of labour and economic development," *Journal of Development Economics* 49 (1996): 3–32. Rodriguez-Clare starts with three plausible conditions that have had wide theoretical and empirical support since Adam Smith in the first two cases and Alfred Marshall in the third: there are productivity gains from the division of labour, the division of labour is limited by the extent of the market, and, as explained in Chapter 7, efficiency gains are derived from the proximity of suppliers and users of certain inputs. Given these assumptions, Rodriguez-Clare then shows that a small, open economy may be caught in an underdevelopment trap in which a "shallow division of labour" (i.e., a low variety of specialised inputs) is self-reinforcing. This in turn leads to a low rate of return to capital, so foreign investment or domestic capital accumulation may not materialize to help solve the problem. For another illustration, see Dani Rodrik, "Coordination failures and government policy: A model with applications to East Asia and Eastern Europe," *Journal of International Economics* 40 (1996): 1–22. See also Murphy, Shleifer, and Vishny, "Industrialization," sec. 6.

19. Recall from microeconomics that we can write marginal revenue as $P(Q)[1 - 1/\eta]$, where P is price and η is the (absolute value of) price elasticity of demand. With unit elasticity, $\eta = 1$; then note that this producer has positive constant marginal costs. Therefore, profits may be indefinitely increased by decreasing output and raising price accordingly.

20. In other words, the producer acts as a limit-pricing monopolist.

21. Wages have risen to w, but this product sector is by definition a very small part of the economy, so we can ignore income effects, which are negligible.

22. The graph was suggested by Krugman. See *Development, Geography, and Economic Theory*.

23. Thus conditions for monopoly limit pricing are still present.

24. With a price of 1, the quantity of goods purchased by workers is equal to the wage bill.

25. To see this, note that after the big push, total wages in the economy are $w_2(L/N)N$, and total profits are $[1Q_2 - w_2(L/N)]N$. Summing these, we get $1Q_2N$, the value of total output.

26. Expressed differently, the problem is that market failure is present. In particular, as Krugman points out, the interaction between a firm's internal economies of scale and the existence of perfectly elastic labour supplies at low wages together generate pecuniary externalities that inhibit the entry of modern firms. In other words, by generating an increase in aggregate demand, each firm makes a contribution to a mutually profitable big push to industrialisation, even though individually each firm would lose money by industrialising alone. Thus, although the economies of scale are internal to the firm, when combined with the presence of a traditional sector paying low wages, de facto external *pecuniary* positive externalities are generated. Again, this is because each firm's production has the effect of raising other firms' revenues, making them more profitable. A simple characterisation of the conundrum is that if there is only one modern firm, profits are greater in the traditional sector, but if there is a modern firm in every activity, profits are greater in the modern sector.

27. Formally, $F = F(N)$, where F is falling as N rises.

28. For details of one insightful formal model that casts the big push model in relatively accessible algebraic terms, see Stefano Paternostro, "The poverty trap: The dual externality model and its policy implications," *World Development* 25 (1997): 2071–2081.

29. Note that formally, in this case, *efficient* means "laboursaving," but the point is more general.

30. As Murphy, Schleifer, and Vishny show, there is also a plausible equilibrium condition that an increased interest-rate effect is not too large.

31. Openness to trade will not resolve this problem because the development of cities in *other* countries does not generally assist with national development. Urbanisation is discussed further in Chapter 7.

32. In principle, if it is known that a sufficient number of modern firms will enter, the infrastructure problem can be solved by using perfect price discrimination, but if firms have different fixed costs that are not observable by the infrastructure provider or if perfect price discrimination is not possible for some other reason, the infrastructure may not be built, even when it is efficient to do so. See Murphy, Shleifer, and Vishny, "Industrialization," sec. 6. For an accessible algebraic derivation using a diagram similar to Figure 4.2, see Pranab Bardhan and Chris Udry, *Development Microeconomics* (New York: Oxford University Press, 1999), pp. 208–211.

33. The term *lemons* derives from poor-quality used cars. As is well known, new cars lose a significant part of their value as soon as they leave the showroom. This is because the mere fact that a car is offered for sale is taken as valuable information about the car in itself. People wanting to buy a car are generally not expert mechanics, so they need to search for some shorthand information to help them decide what a car is worth; obviously, owners of a poor-quality car are more likely to offer it for sale. Analogies to this "lemons problem" have many other applications in economics, such as in financial markets (see Chapter 15). Also see George Akerlof, "The market for lemons," *Quarterly Journal of Economics* 84 (1970): 488–500.

34. For an excellent survey of some of the new developments covered in this section, see Hoff and Stiglitz, "Modern economic theory and development." Another good discussion of this and related topics is found in Ray, *Development Economics,* ch. 5.

35. See Alice Amsden, *Asia's Next Giant: South Korea and Late Industrialization* (Oxford: Oxford University Press, 1989) and *The Rise of the Rest* (New York: Oxford University Press, 2001); Carl J. Dahlman, Bruce Ross-Larson, and Larry E. Westphal, "Managing technical development: Lessons from the newly industrializing countries," *World Development* 15 (1987): 759–775; Richard Luedde-Neurath, *Import Controls and Export-Oriented Development: A Reassessment of the South Korean Case* (Boulder, Colo.: Westview Press, 1986); Howard Pack and Larry E. Westphal, "Industrial strategy and technological change: Theory versus reality," *Journal of Development Economics* 22 (1986): 87–128; Joseph Stern et al., *Industrialization and the State: The Korean Heavy and Chemical Industry Drive* (Cambridge, Mass.: Harvard University Press, 1995); Gordon White, ed., *Developmental States in East Asia* (New York: St. Martin's Press, 1988); and Stephen C. Smith, "Industrial policy and export success: Third World development strategies reconsidered," in *US Trade Policy and Global Growth*, ed. Robert Blecker (New York: Sharpe, 1996), pp. 267–298. On linkages, see also Masahisa Fujita, Paul Krugman, and Anthony J. Venables, *The Spatial Economy: Cities, Regions, and International Trade* (Cambridge, Mass.: MIT Press 1999).

36. This perspective helps account for the popularity of input-output analysis in development planning and policy formulation, especially in earlier years, although it is an imperfect tool for this purpose (see Chapter 11).

37. For some evidence, see William L. Megginson and Jeffry M. Netter, "From state to market: A survey of empirical studies on privatization," *Journal of Economic Literature* 39 (2001): 321–390.

38. See Abhijit V. Banerjee and Andrew F. Newman, "Occupational choice and the process of development," *Journal of Political Economy* 101 (1993): 274–298.

39. Galor and Zeira's model rests on an alternative way to characterise imperfect capital markets—that the rate of interest for borrowers is greater than that for lenders. One can verify the reasonableness of this assumption with a brief visit to any bank. The model is a simple two-period, overlapping-generations model. See Galor and Zeira, "Income distribution and macroeconomics."

40. Torsten Persson and Guido Tabellini, "Is inequality harmful for growth?" *American Economic Review* 84 (1994): 600–621; see also Chapter 5 of this text.

41. Michael Kremer, "The O-ring theory of economic development," *Quarterly Journal of Economics* 108 (1993): 551–575. A good exposition of the model, which provides alternative proofs to the ones found in Kremer, is found in Basu, *Analytical Development Economics*.

42. More generally, there are n tasks; for simplicity, we continue to assume that one, and only one, worker must perform each of the n tasks, but conceptually, n should be thought of as tasks rather than number of workers. If, and only if, all tasks are performed successfully, output per worker is given by B, which

is given in value terms (or if thought of in quantity terms, price is normalised to 1). Conventional capital, k, may also be used (if not, simply set $k = 1$), which is introduced in the formula, with diminishing returns (of course, capital might also be of varying quality). Expected output y is given by

$$E(y) = K^{\alpha}\left(\prod_{i=1}^{n} q_i\right)nB$$

In general, we must multiply by n because otherwise the firm can only lose value by adding more differentiated tasks. In the O-ring theory, Kremer analyses what happens when $B = B(n)$, where $B'(n) > 0$, as a way of endogenising technology choice.

43. For a more formal and more general demonstration that firms would choose to employ workers of the same skill level (or as close to identical as possible), let us continue the example from note 42. A necessary condition for a maximum with respect to each of the labour qualities q is

$$\frac{dw(q_i)}{dq_i} \equiv \frac{dy}{dq_i} = \left(\prod_{j \neq i} q_j\right)nBK^{\alpha}$$

This equation tells us that in equilibrium, the value of the marginal product of skill is equal to the marginal cost of skill in wage payments. In other words, the firm finds that the added value of replacing one worker with another with higher skill while leaving the skill levels of all other workers constant is equal to the resulting increase in the wage bill. Next, note that the second derivative, or the derivative of the marginal product of skill for the ith worker with respect to the skill level of the other workers, is positive; that is,

$$\frac{d^2y}{dq_i d} = \left(\prod_{j \neq i} q_j\right) = nBK^{\alpha} > 0$$

This positive cross-derivative indicates that firms with high-skilled workers in all but one task receive the greatest benefits from having a high-skilled worker in the remaining task, and so they can and would bid the most for high-skilled workers.

44. Technically, this type of marriage market matching process does not depend on the presence of positive cross-derivatives, as in note 43, but results only from individual preferences, along with the assumption of nontransferable utility (meaning that there can be no side payments). Thus there are two types of situations in which positive assortative matching may occur.

45. Of course, in the real world, other forces may keep wages from steadily increasing at an exponential rate with improvements in task quality; but this feature of the model does not have to be taken as applying literally as something that would always and continuously hold to appreciate this insight into a source of the enormous wage differentials across countries observed in practice.

46. See Michael Kremer and Eric Maskin, "Wage inequality and segregation by skill," NBER Working Paper No. 5718, 1996.

47. See Kremer, "O-ring theory," for a formal statement of this result and for extensions to cases of endogenous skill investments under imperfect information.

48. Ibid., p. 574. The multiple equilibrium analysis is found on pp. 564–571.

49. Ricardo Hausmann and Dani Rodrik, "Economic development as self-discovery," *Journal of Development Economics* 72 (2003): 603–633. A related and insightful earlier analysis was provided by Karla Hoff, "Bayesian learning in an infant industry model," *Journal of International Economics* 43 (1997): 409–436.

50. Ricardo Hausmann, Dani Rodrik, and Andrés Velasco, "Growth diagnostics," in *One Economics, Many Recipes: Globalization, Institutions, and Economic Growth,* by Dani Rodrik (Princeton, N.J.: Princeton University Press, 2007), ch. 2; Ricardo Hausmann, Bailey Klinger, Rodrigo Wagner, "Doing growth diagnostics in practice: a 'mindbook,'" CID Working Paper No. 177, 2008: http://siteresources.worldbank.org/INTDEBTDEPT/Resources/468980-1218567884549/mindbook.pdf.

51. Ricardo Hausmann, Bailey Klinger, and Rodrigo Wagner, Doing Growth Diagnostics in Practice: A 'Mindbook,' CID Working Paper No. 177, 2008: http://siteresources.worldbank.org/INTDEBTDEPT/Resources/468980-1218567884549/mindbook.pdf].

52. Paul Krugman, *Development, Geography, and Economic Theory*, (Cambridge: MIT Press, 1995.)

53. Hoff and Stiglitz, "Modern economic theory and development."

54. Seminar presentation by Joseph E. Stiglitz at the World Bank, May 27, 1999; and ibid., p. 421.

55. Karla Hoff, "Beyond Rosenstein-Rodan: The modern theory of coordination problems in development," in *Annual World Bank Conference on Development Economics, 1999* (Washington, D.C.: World Bank, 2000), p. 146.