

2

Structural Stasis



Key messages

- Economic growth in middle-income countries is different than that for countries at other income levels. Capital returns diminish at later development stages, and therefore countries, to achieve sustained growth, need to also focus on technological progress and improved efficiency in converting capital and labor into goods and services.
- Successful middle-income countries will have to engineer two successive transitions to develop economic structures that can eventually sustain high-income levels.
- The first transition is from a *1i* strategy for accelerating *investment* to a *2i* strategy focusing on both *investment* and *infusion* in which a country brings technologies from abroad and diffuses them domestically. Policy makers in lower-middle-income countries will need to add to investment strategies to infuse modern technologies and business practices from global leaders into their own economies.
- Once a country has succeeded in the first transition, the second transition is to switch to a *3i* strategy, which entails paying more attention to *innovation*. Upper-middle-income countries that have mastered infusion can complement investment and infusion with innovation, thereby developing industrial structures and technical competencies to add value to and advance the global technology frontier.

Introduction

In Brazil in the early 1970s, after several decades of impressive output growth, the average worker in the manufacturing sector was more than 40 percent as productive as his American counterpart. By 2008, this ratio had fallen to 17 percent. Up until about 1980, Brazil implemented protectionist policies from foreign competition and provided incentives to substitute imports by domestic manufacturers. Although all these policies were intended to make Brazil more competitive, they led to a decline in the productivity of Brazilian workers, and enterprises became less competitive than those in the United States.¹

Meanwhile, in Northeast Asia something completely different was happening in the Republic of Korea and Taiwan, China. In the 1970s, the productivity of Korea's manufacturing workers was less than one-tenth of their American counterparts. By 2008, their productivity was greater than 70 percent that of the average American worker in the same sector.² Their enterprises became well known globally because their economies reinvented themselves after they had reached middle-income status—not once, but twice. Both economies grew rapidly to the upper-middle-income level, followed by the high-income level, and subsequently to levels of income and standards of living similar to those of advanced economies such as

Germany, Japan, the United Kingdom, and the United States.

What changed between the 1950s and 1960s (when Brazil was a low-income country), the 1970s (when Brazil achieved rapid growth), and the 1980s and 1990s (when Brazil—and its neighbors such as Argentina and Colombia—became both a middle-income economy and an also-ran)? How did the trajectory of economic development differ in Korea and its neighbors Japan and Taiwan, China?

This chapter explores whether economic growth in middle-income countries is different than that at other income levels. The simple logic is that if it is different, then these countries' development strategies cannot remain the same. The chapter points to evidence consistent with the hypothesis that successful middle-income countries have to engineer two successive transitions to develop economic structures that can eventually sustain high-income levels. The first is to transition from a 1i strategy for accelerating *investment* to a 2i strategy focusing on both *investment* and *infusion* in which a country brings technologies from abroad and diffuses them domestically (table 2.1). Policy makers in lower-middle-income countries will need to add to investment strategies to infuse modern technologies and business practices from global leaders into their own economies.

Once a country has succeeded in infusing global technologies and know-how in specific sectors or industries, it can switch to a 3i strategy by paying more attention to *innovation*. Upper-middle-income countries that have mastered infusion can complement investment and infusion with innovation, thereby developing industrial structures and technical competencies to add value to and advance the global technology frontier.

Infusion is powered mainly by technology transfers embodied in flows of *physical and financial capital*, while innovation requires both of these flows, as well as increasingly vigorous exchanges of *human capital* through engagement with the diaspora and the emigration of talented workers. However, these are not hard-and-fast rules. Some countries have succeeded in attaining high income levels without instituting the structural prerequisites needed to sustain them. They did so by getting rid of obsolete economic arrangements, by weakening the forces of preservation, and by creating the necessary new ones. However, it appears that these countries—such as Argentina and República Bolivariana de Venezuela—also find it difficult to ensure that their income gains are durable, and even more difficult to continue to close the gaps in living standards with economies at the global economic frontier.

Table 2.1 Middle-income countries will need to engineer two successive transitions to develop economic structures that can sustain high-income status

INCOME CLASSIFICATION	INVESTMENT	INFUSION	INNOVATION
Low-income	 Higher priority	 Lower priority	 Lower priority
Lower-middle-income	 Higher priority	 Higher priority	 Lower priority
Upper-middle-income	 Higher priority	 Higher priority	 Higher priority

Source: WDR 2024 team.

Note: The orange dials indicate a strategy that is a priority for that particular income group. The blue dials indicate a strategy that is less of a priority for that particular income group until the priority strategy is successfully achieved.

Economic development = structural change

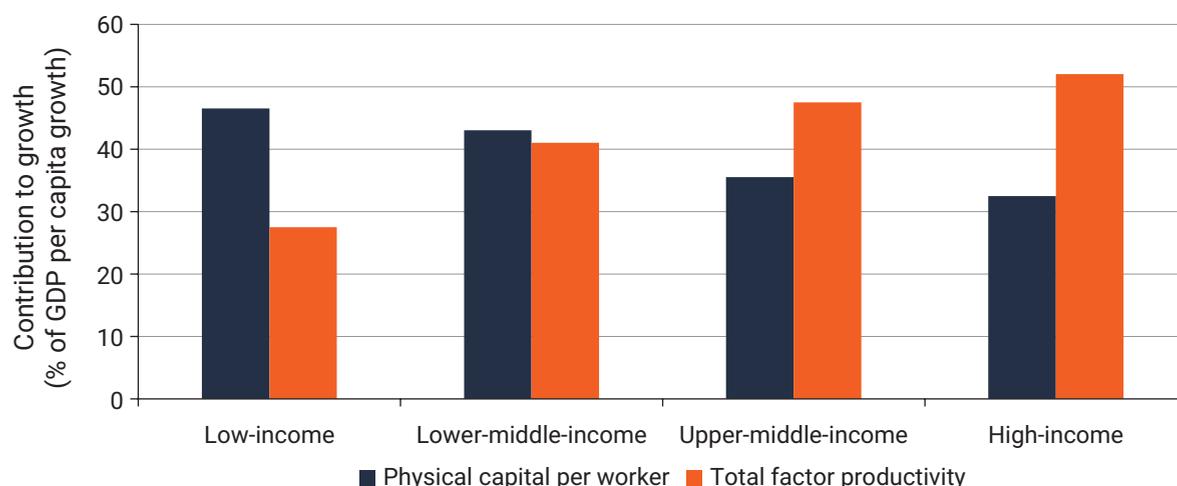
As described in chapter 1, the term “middle-income trap” refers to the risk of an economic slowdown or stagnation if a country fails to adapt its policies and institutions to changing economic and structural needs.³ Strategies based on factor accumulation alone are likely to steadily worsen results—a natural occurrence as the marginal productivity of capital declines. Even if all middle-income countries enjoyed the enabling conditions of peace, freedom, factor mobility, and rule of law, the returns from capital investment alone would decline too sharply to support the countries’ sustained and ongoing economic growth.⁴

If capital endowments were the only economically relevant difference between middle-income and high-income countries today, the gross national income (GNI) of a typical middle-income country would be about 75 percent that of the United States. In China, for example, its investment to gross domestic product (GDP) ratios have been stratospherically high for decades, but its GNI is less than 25 percent that of the United States. Another way to understand the problem is

that, although there has been considerable convergence in capital to output ratios between low- and middle-income countries and high-income countries, income levels have not converged. And so other factors are clearly at work. A simple decomposition of factor endowments and total factor productivity (TFP) reveals that the contribution of physical capital per worker diminishes at later development stages (figure 2.1). What really matters for growth is TFP growth, which is clumsy longhand for the effects of technological progress and improved efficiency in converting capital and labor into goods and services. In fact, much of the growth in the United States between 1909 and 1949—when it was a middle-income country—stemmed from technical change, not an increase in capital per worker.⁵

If much of growth everywhere is the result of technical change, then conventional thinking would follow that every middle-income country needs to figure out how to quickly institute arrangements that foster technical progress, not only (or primarily) the accumulation of capital. But this interpretation is not helpful for policy making because of the ongoing importance of capital deepening across all categories

Figure 2.1 As economies develop, capital accumulation brings diminishing returns



Source: WDR 2024 team using data from Lange, Wodon, and Carey (2018); PWT (Penn World Table) (database version 10.1), Groningen Growth and Development Centre, Faculty of Economics and Business, University of Groningen, Groningen, the Netherlands, <https://www.rug.nl/ggdc/productivity/pwt/>.

Note: GDP = gross domestic product.

of countries, but especially in middle-income economies.

In fact, the growth of middle-income countries depends on both capital accumulation and technical change, making the growth challenge twice as complex as it is for either low-income countries that primarily must focus on accumulation or high-income countries that must rely largely on technical change, even if a large part of it is in the form of new investment.

Infuse first, then innovate

How have the most successful middle-income countries engineered progress? Modern economic history provides one valuable lesson. Countries that have made technological advances and achieved high-income status did so through two successive transitions.

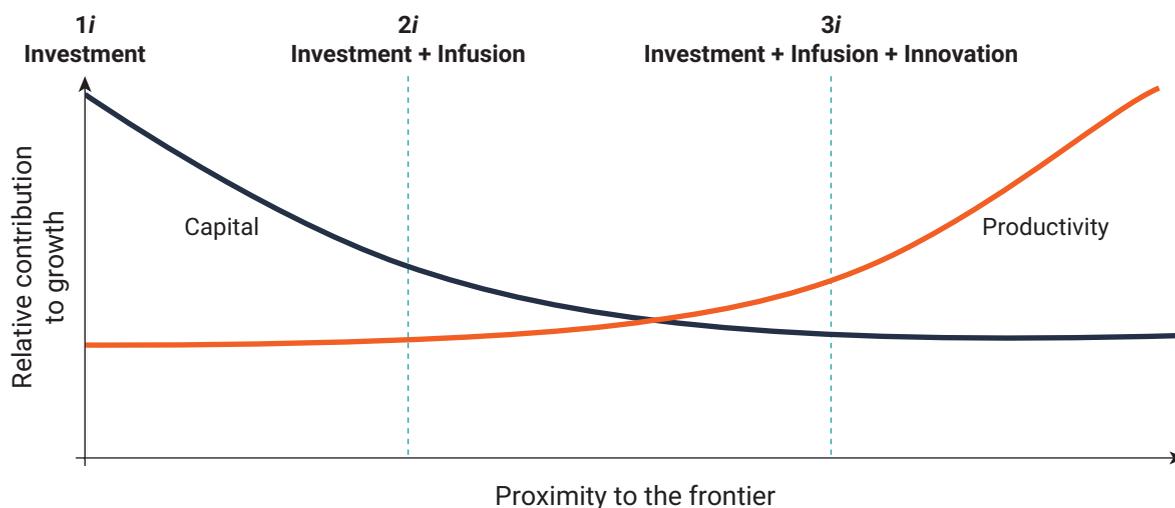
The first set of changes, described as *infusion* in this Report, dominates development strategies in rapidly growing lower-middle-income countries. Policy makers in these countries have emphasized importing modern technologies and business models from more advanced economies

and diffusing this knowledge at scale in their domestic economy. These technologies and models have, often in short order, enabled enterprises to become regional and global suppliers of goods and services.

The second phase of structural change, commonly called *innovation*, occurs mainly in successful upper-middle-income economies. This transition involves a deliberate shift from imitating and adapting technologies used in advanced economies to building home country capabilities to change leading global technologies and products. An increasing number of domestic firms can become global knowledge creators and—eventually—leading innovators themselves.

The term *infusion* has been carefully chosen to connote both deliberately imitating technology and business practices from abroad and expediting their diffusion at home (figure 2.2). Not surprisingly, countries that have been relatively open to economic developments abroad *and* have been successful at instituting general secondary education and technical and vocational training programs at home have done better than those that failed to do one or both.

Figure 2.2 A middle-income country will need to engineer two successive transitions to achieve high-income status: Infusion, followed by innovation



Source: WDR 2024 team.

Note: The curves illustrate the relative contributions of capital and productivity to economic growth (y-axis) according to countries' proximity to the frontier (represented by leading economies). Countries farther out on the x-axis are closer to the frontier.

The mechanics of the innovation stage of economic development are more difficult, and so this stage has received much attention.⁶ Like others, this Report warns developing countries against attempts to “leapfrog” (that is, to prematurely attempt to transition) to the innovation stage (generally through the use of industrial policy interventions). What is more novel in this Report is its emphasis on the changing nature of knowledge exchanges and the successful impact of such exchanges on fostering development by benefiting from the international mobility, not only of capital and know-how but also of highly skilled people. The prerequisites needed to capitalize on the global nature of human capital—such as policies to attract entrepreneurs from the diaspora and ensure greater freedom of expression—are more difficult to institute and can stymie progress.

Successful infusion efforts have marked reversals of fortune in several parts of the world marred by war and violence:

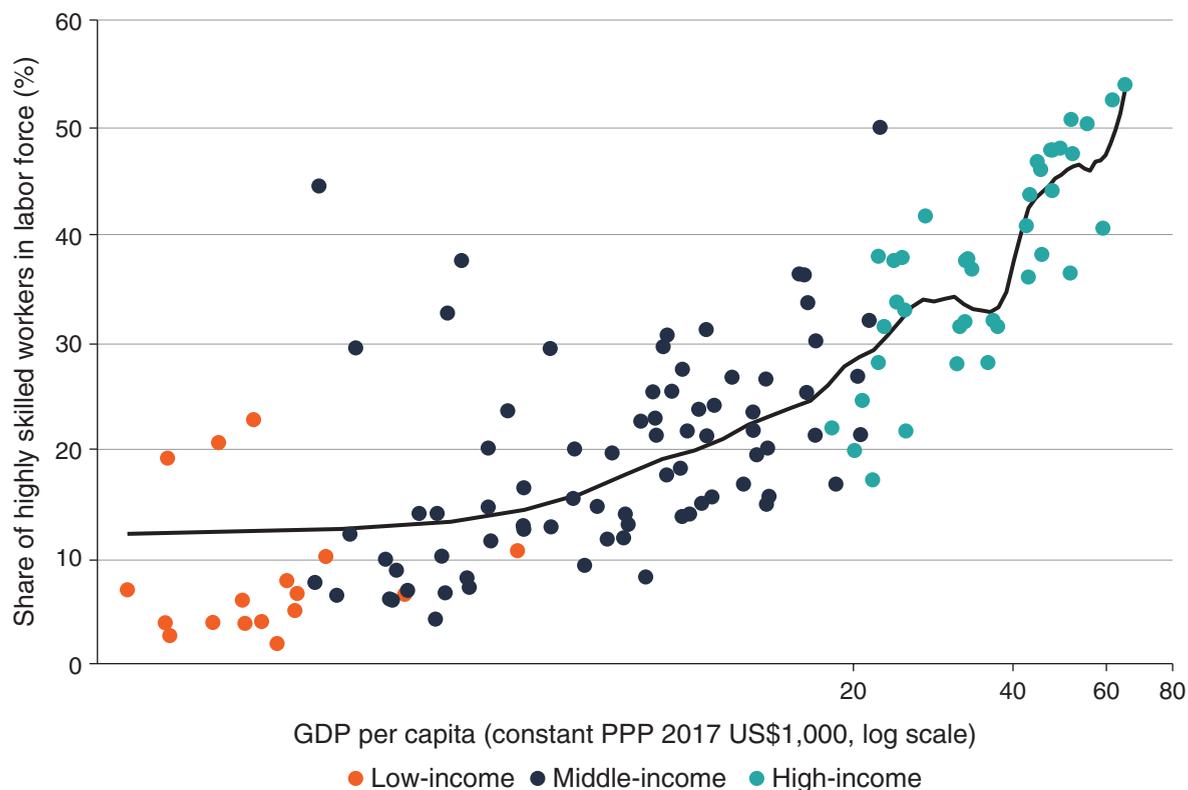
- *Postwar Europe.* The onset of the European Golden Age was powered by infusion. The two world wars in the first half of the twentieth century destroyed much of Europe’s capital stock and skills. And the exodus of talent in the interwar years meant that Europe lagged behind the United States in technology.⁷ The Marshall Plan was developed to transfer technologies from the United States to Europe. European managers were sent to the United States to acquire skills, and businesses could obtain loans to purchase technologically advanced American capital goods under the US Productivity Program. As a result, Europe rapidly adopted modern technologies and best practices, allowing Western European countries to accomplish in 30 years what might otherwise have taken twice as long.⁸
- *Korea.* An important component of industrial policy in Korea was incentives for technological investment. In particular, Korea subsidized the adoption of foreign

technologies and innovation through tax credits. Specifically, firms received tax credits for royalty payments or research and development (R&D) expenditures. The policy first subsidized technology adoption when the technology gap with foreign firms was large. But as Korean conglomerates caught up with foreign firms, the approach gradually shifted toward supporting innovation. Korean policy makers ensured that public support was monitored and evaluated, and data on innovation grants were made publicly available.

- *Malaysia.* Malaysia became a successful industrialized country through infusion-centered and export-oriented growth that replaced import substitution policies in the mid-1980s. Technology embodied in foreign direct investment (FDI) was important for developing and structuring the country’s industrial base. Malaysia offered a spectrum of tax incentives to attract FDI through the Promotion of Investment Act in 1986.⁹ Malaysia’s growth in the 1980s was marked by large productivity gains from adopting and diffusing technology. But Malaysia did not perform as well as Singapore in attracting entrepreneurs of Malaysian origin living abroad.

As these examples show, *infusion*, tapping into global knowledge, and a country’s institutional structure play a key role in supporting the economic growth of middle-income countries beyond just increasing a country’s income per capita. And the key to infusion at scale is openness and exchange—through paths such as trade, FDI, pro-competition regulation, licensing, migration, and knowledge exchanges. A combination of investment and infusion can engineer high growth through investments in physical capital (infrastructure), structural change that improves the allocation of productive resources across firms and sectors, and technological convergence through the adoption and infusion of foreign technologies.¹⁰

Figure 2.3 The demand for highly skilled workers increases in middle-income countries



Source: WDR 2024 team using DataBank: Jobs, World Bank, Washington, DC, <https://databank.worldbank.org/source/jobs>; WDI (World Development Indicators) (Data Catalog), World Bank, Washington, DC, <https://datacatalog.worldbank.org/search/dataset/0037712>.

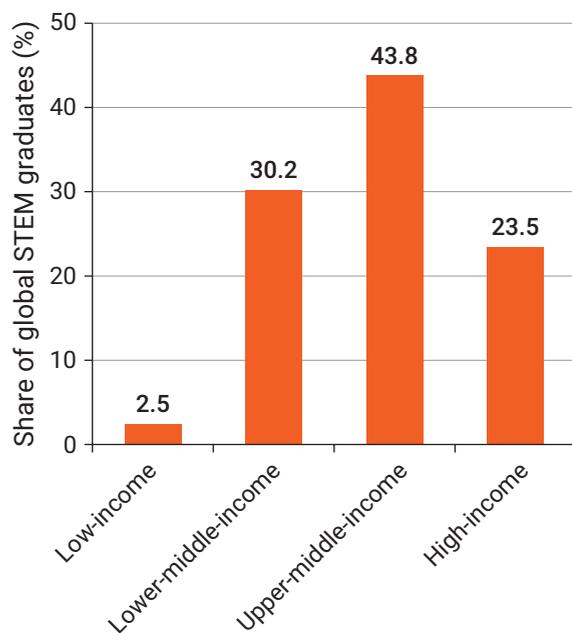
Note: Skilled workers consist of the top three International Standard Classification of Occupations (ISCO) codes (“Legislators, sr. officials, managers”; “Professionals”; “Technicians and associate professionals”). See ISCO (International Standard Classification of Occupations), International Labour Organization, Geneva, <https://ilostat.ilo.org/methods/concepts-and-definitions/classification-occupation/>. GDP = gross domestic product; PPP = purchasing power parity.

To undertake infusion at scale, however, countries need both globally competitive firms and specialized talent. As firms adopt newer technologies, their need for engineers, scientists, managers, and other highly skilled professionals increases. The variety and skill content of work also increase in middle-income countries (figure 2.3). In fact, the central feature of the Industrial Revolution and its aftermath was the slow shift from tacit knowledge that is not codified or easily expressed (as embodied in craftsmanship and simple production techniques) to more formal knowledge created by mathematicians, physicists, chemists, medical doctors, and people schooled in “engineering science.”¹¹ Today, graduates from

the science, technology, engineering, and mathematics (STEM) fields play a central role in generating and spreading ideas and technologies. Encouragingly, three-quarters of STEM graduates are now in middle-income countries, and Chinese and Indian STEM graduates make up about half of global STEM graduates (figure 2.4).

The example of Korea, the only country ever to sustain economic growth that averaged more than 5 percent for more than 50 years, is especially illustrative. How did Korean industry do it? Domestic firms such as Samsung embarked on a journey that began with infusion. By licensing technologies from Sanyo and NEC in Japan, Samsung transitioned from making noodles

Figure 2.4 STEM graduates are increasingly concentrated in middle-income countries, thereby increasing opportunities for technology infusion



Source: WDR 2024 team.

Note: The primary data for the calculation of the percentage share of science, technology, engineering, and mathematics (STEM) graduates in tertiary education are from UIS.Stat (dashboard), Institute for Statistics, United Nations Educational, Scientific, and Cultural Organization, Montreal, <http://data.uis.unesco.org/>. The STEM data set covers 144 countries.

to manufacturing televisions for domestic and regional markets (figure 2.5, panel a).¹² This transition created a higher demand for engineers, managers, and skilled professionals that was monitored, and the targets were met by the Ministry of Education through both providing the needed education in public universities and regulating private institutions. Korea also generated a demand for more specialized capital: for economies at the infusion stage, investment remains important.

The first *World Development Report* (1978) highlighted the need to differentiate between strategies of imitation and innovation in driving growth in middle-income countries.¹³ A large part of middle-income country growth happens

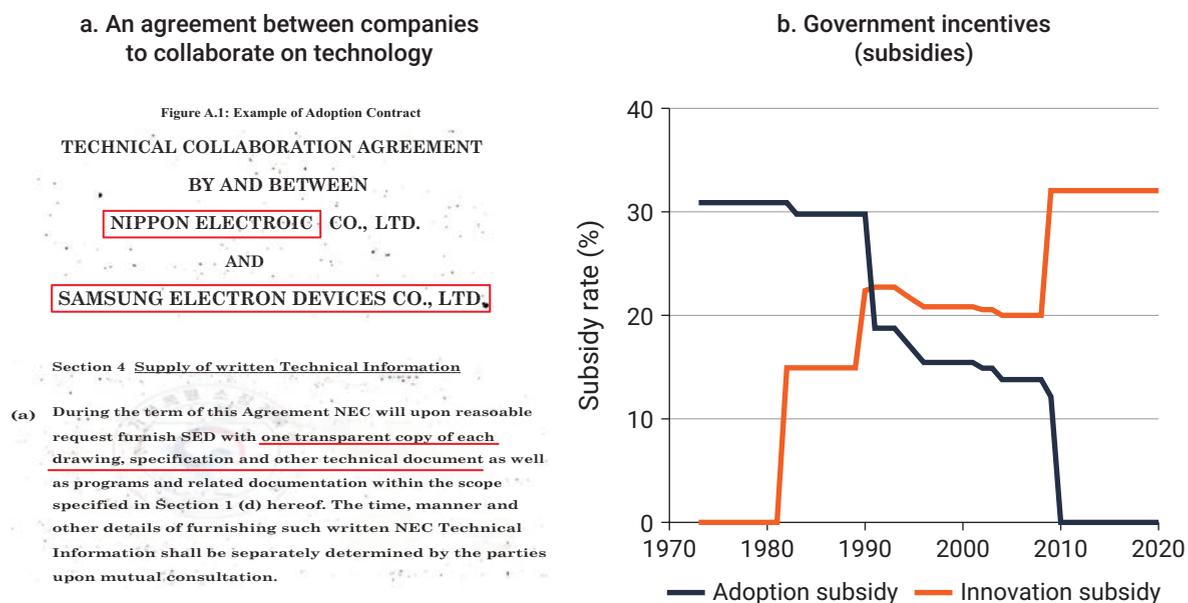
through a combination of investment and imitation (see box 2.1 for a description of how Japan connected with global knowledge). But eventually the gains from imitation begin to subside. As an economy approaches the global technology frontier, policies that supported growth eventually become a burden for sustaining further development.¹⁴ When Samsung reached that point, it moved toward innovation—nudged by support from the Korean government, which had calibrated its incentives to encourage imitation first and support innovation much later (figure 2.5, panel b). To nurture innovation, institutions must give inventors and entrepreneurs incentives and ensure that they can acquire the technical and financial resources to carry out their designs.¹⁵

Once a middle-income country has infused its economy with technology from global innovators and is sustaining rapid growth, it can aspire to converge to the global technology frontier by preparing to join those innovators—that is, to become an *innovation economy*. To reach this point, however, governments must have done everything possible in the infusion phase to not just prepare the economic structure for the different next stage, but also reform and strengthen supporting institutions. Those who falter in infusion or try to leapfrog will find it much more challenging to transition toward innovation.

A comparison of Estonia, Poland, and Bulgaria is illustrative. Transitioning from central planning, Estonia reached 80 percent of Western European income by 2021, Poland 75 percent, and Bulgaria 50 percent (box 2.2). Estonian independence in 1991 catalyzed a swift transition to high levels of innovation. By contrast, Bulgaria protected many incumbent state-owned enterprises (SOEs) from competition and stymied efficient resource allocation, preventing the contraction of low-productivity sectors. As for Poland, it privatized many of its SOEs and championed competition.

Middle-income countries lag noticeably behind high-income countries in terms of the “novelty” of their knowledge, as well as in producing new

Figure 2.5 Calibrating policies to a country’s stage of development: From imitation to innovation in the Republic of Korea



Sources: Panel a: National Archives of Korea, <https://www.archives.go.kr/english/index.jsp>. Panel b: Choi and Shim 2024.
 Note: Panel b shows the adoption subsidy rate alongside the innovation (R&D) subsidy rate, calculated using the tax credit rate and the corporate tax rate. For example, a 30 percent subsidy rate indicates that firms can receive a reimbursement equivalent to 30 percent of their expenditures on adoption fees or R&D. R&D = research and development.

Box 2.1 The Meiji Restoration reconnected Japan with global knowledge

The turning point for Japan’s rapid industrialization was the Meiji Restoration in the late 1800s. The government embarked on a project, Shokusan Kogyo (industrial development and promotion of industries).^a Under it, Japan began investing in modernizing infrastructure (such as telegraph, rail, and electricity) and deploying demonstration factories to facilitate private sector learning and technological diffusion and to assume the first-mover risks of deploying technology. Trade flows were a critical factor in launching Japan toward the technological frontier.

Government-sponsored trips to the United States and Europe were also instrumental in acquiring technical expertise from frontier countries. The 1871–73 Iwakura Mission to both areas proved critical to facilitating the knowledge transfers needed to push Japan to the technology frontier. The statesmen and students who participated set out to study Western institutions, economic structures, educational systems, and industrial capabilities. Although German and English industry impressed senior diplomats,^b Mission staff took an interest in US applications of new technologies and the productivity gains reaped from such innovations.^c

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Box 2.1 The Meiji Restoration reconnected Japan with global knowledge (continued)

In 1888, engineers in the newly formed Ministry of Communications were dispatched to the United States, among other Western countries, to collect information on the state-of-the-art technology needed to construct the country's telecommunications network.^d The ministry officials who attended this trip visited US telecommunications firms such as Western Electric, brought back equipment such as switchboards, and urged the Japanese government to implement Western Electric's systems for the country's network.^e Foreign expertise was transmitted to Japanese students through foreign practitioners who taught in domestic technical schools (usually in English, indicating that some of the professors must have been American).^f The government also sent engineering students to Western countries. By the end of the 1880s, one-quarter of the students who had traveled abroad had visited the United States.

a. Genter (2020); Odagiri and Goto (1996).

b. Beasley (1972).

c. Swale (2008).

d. Ohno (2019).

e. Mason (1992).

f. Ohno (2019).

Box 2.2 Three ways to evade the middle-income trap: Swiftly (Estonia), steadily (Poland), or slowly (Bulgaria)

Over the last three decades, Bulgaria, Estonia, and Poland have transitioned simultaneously from central planning to market economies, and Estonia and Poland have moved from middle-income to high-income status.^a By 2021, Estonia had reached 80 percent of Western European income, Poland 75 percent, and Bulgaria 50 percent.^b This remarkable leap from income per capita of between 20 and 30 percent of Western European levels in the early 1990s occurred at different speeds, which provides valuable policy insights.

Policy insight 1: Comprehensive reforms unlock productivity and prosperity

Structural reforms, specifically privatization and market liberalization, have played a crucial role in speeding up income convergence among Central and Eastern European economies, as documented in an extensive cross-country study by Matkowski, Prochniak, and Rapacki (2016). They find that the rate of convergence has significantly benefited from enhancements of institutions, economic freedom, and governance quality.

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Box 2.2 Three ways to evade the middle-income trap: Swiftly (Estonia), steadily (Poland), or slowly (Bulgaria) (*continued*)

Higher investment rates, a skilled labor force, low budget deficits, and lower tax burdens have been associated with accelerated economic growth.

Estonian independence in 1991 catalyzed a swift transition to high levels of productivity growth driven by a strategic divestment of public sector assets, trade liberalization, and a flat tax system. These policies opened up the market for new entrants, attracted a surge in foreign direct investment (FDI), and boosted private sector productivity. The magnitude of FDI inflows to Estonia during the 1990s was seven times that to Bulgaria and three times that to Poland.^c Estonia maintained its status as a leading innovator in the region, with the highest research and development (R&D) intensity—1.75 percent of its gross domestic product (GDP) in 2021—and a high ranking in the Global Innovation Index (GII).^d

As for Poland, early “big bang” reforms, trade competition, and hard budget constraints for state-owned enterprises (SOEs) systematically activated a cycle of creative destruction, closing the gap with advanced countries, as evidenced by an increase in R&D expenditure to 1.3 percent of GDP in 2021, as well as higher GII scores.

Policy insight 2: Incentives for incumbents to drive innovation are crucial

Productivity growth is a dominant driver of income convergence. Between 1996 and 2021, Estonia displayed robust annual productivity growth of 3.8 percent, followed by Poland at 2.6 percent and Bulgaria at 1.4 percent. Lowering barriers to entry and streamlining regulation—enhanced by accession to the European Union (EU)—have initiated a virtuous cycle that has sustained productivity growth. In this cycle, competition spurs innovation, which then fuels further competition, ultimately raising societal well-being.

During Bulgaria’s initial phase of its transition, many incumbent SOEs were shielded by regulatory safeguards and anticompetitive practices. This environment hampered productivity growth by delaying the shift of resources toward more productive sectors. Throughout much of the period preceding EU accession, growth among Bulgaria’s high-productivity industries was limited. At the same time, low-productivity sectors that relied on low-skilled labor—such as construction, retail, and ground transportation—continued to expand. Unlike Estonia and Poland, Bulgaria took nearly a decade longer to free up resources for more productive uses. Even now, some industries benefit from regulation that inhibits healthy competition.

Poland’s mass privatization program is a compelling example of how to catalyze a virtuous cycle of competition and innovation, despite some challenges. By redistributing equity from more than 500 SOEs—which constituted up to 5 percent of the nation’s wealth—to 27 million citizens, Poland created incentives for both new and established companies to champion competition. In Poland’s early transition, the implementation of hard budget constraints, established so that SOEs would avoid reliance on unlimited government support, led to a monumental shift in attitude toward market competition. Even iconic SOEs such as the Stocznia Gdańsk shipyard, where Lech Walesa’s Solidarność (Solidarity) movement began, triggering the collapse of communism in Central and Eastern Europe,

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Box 2.2 Three ways to evade the middle-income trap: Swiftly (Estonia), steadily (Poland), or slowly (Bulgaria) (*continued*)

were not bailed out. The alignment of managerial incentives—both explicit and implicit—propelled creative destruction. Managers at Polish SOEs shifted their attention from production targets to profitability and market share.^e These managers became the primary agents of restructuring and innovation, facing both financial constraints and competition.

Policy insight 3: Skilled labor is essential for moving from infusion to innovation

As economies mature, the returns from capital become dependent on a supply of sophisticated workers. Continual enhancements in firm efficiency and workforce skills are vital to staying competitive in the rapidly changing productivity landscape.

The success stories of Estonia and Poland illustrate strategic ways to close the technology gap—initially by adopting existing technology and subsequently by developing innovative capacity. Poland narrowed its productivity gap primarily by adopting older technologies from more advanced economies rather than through the transfer of new, cutting-edge technologies.^f Domestic investments in innovation further accelerated Poland’s move toward the technology frontier, enhancing firms’ ability to contribute to global technological progress. Labor also played a critical role in the transformation in Poland, according to a breakdown of the growth in total factor productivity.^g A notable 20 percent of the contribution came from labor alone, a figure driven not by a reduction in workforce numbers but by the enhanced quality and diversity of the labor force. A significant rise in the proportion of individuals between the ages of 25 and 34 with a tertiary education, which increased from 15 percent to 42 percent between 2000 and 2012, had a significant impact on output growth.^h

Bulgaria’s experience illustrates how shortages of skilled labor can impede new investment and the growth of high-productivity ventures. The educational landscape in Bulgaria has lagged in quality, participation, equity, and intergenerational mobility. Certain segments of the population still struggle with the acquisition of basic skills, undermining their potential contribution to productivity. Prioritizing human capital development to take advantage of adoption and innovation is essential, especially in view of the demographic changes in many middle-income countries, which are at risk of “growing old before becoming rich,” as the saying goes.

- a. Gross national income (GNI) per capita and gross domestic product (GDP) per capita data in this report are as of July 2023. As of July 2023, Bulgaria was classified by the World Bank as an upper-middle-income country, with a GNI per capita (Atlas method, current US dollars) of US\$13,350, short of crossing the high-income country threshold of US\$13,846.
- b. These figures are measured using purchasing power parity for the four largest EU economies.
- c. These figures capture net FDI per capita accumulated by the end of 1999.
- d. See GII (Global Innovation Index) (dashboard), World Intellectual Property Organization, Geneva, https://www.wipo.int/global_innovation_index/en/.
- e. Pinto, Belka, and Krajewski (1993).
- f. Kolasa (2008).
- g. Gradzewicz et al. (2018).
- h. Bukowski et al. (2006).

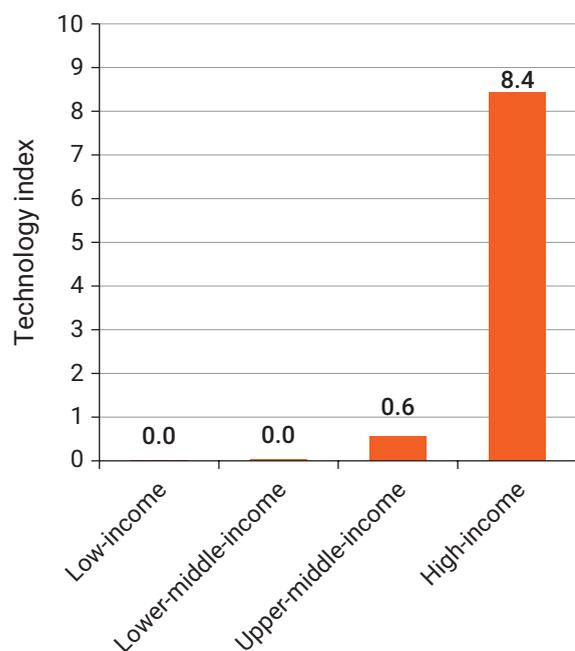
knowledge (figure 2.6). Innovation is concentrated in a handful of high-income economies: Germany; Japan; the Republic of Korea; Taiwan, China; and the United States. The magnitude and impact of new research in other countries is quite limited (figure 2.7).

To support innovation, countries will have to find ways to make existing firms (incumbents)—both industrial conglomerates and economic elites—innovative and more productive and to make way for newcomers. To be sure, the emerging markets are already hotbeds of entrepreneurial activity. Novel products are being used by millions, and new production methods are increasing consumer choices and lowering prices. Jack Ma, cofounder of China-based Alibaba, and

Narayana Murthy, cofounder of India-based Infosys, have grown their enterprises to scale and created thousands of jobs by successfully competing in global markets and even pushing the technology frontier outward. Still, too many markets are hobbled by excessive business regulations, government patronage, and limited international competition. In such an environment, powerful owners and unproductive large firms can stifle growth, lobbying to protect their preferential access and monopoly rents when they could instead be investing in productivity-enhancing technology.

As policy makers shift their emphasis toward innovation, they should first combine a lot of investment with a lot of infusion (box 2.3).

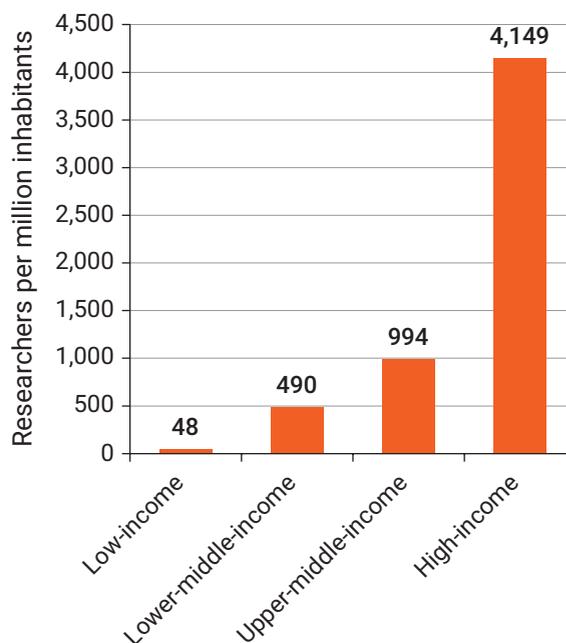
Figure 2.6 The innovation gap between high-income countries and others is substantial



Source: WDR 2024 team.

Note: The technology index is constructed using the number of granted patents per capita and network centrality. Network centrality is calculated to measure a country's "frontierness" in technology and is defined by the citations in a country's patents of other countries' patents in a given period. Therefore, the technology index embeds both patent importance and scale.

Figure 2.7 Middle-income countries significantly lag behind high-income countries in research capacity



Source: WDR 2024 team.

Note: The primary data for number of researchers per million inhabitants are from UIS.Stat (dashboard), Institute for Statistics, United Nations Educational, Scientific, and Cultural Organization, Montreal, <http://data.uis.unesco.org>.

Box 2.3 The magic of investment accelerations

Investment is a fundamental pillar of economic progress. Not only does investment growth allow countries to enhance their stocks of physical capital such as factories, offices, roads, bridges, schools, and clinics, but it is also a necessary condition for infusing global technologies in domestic production possibilities. Because technology is embodied in capital, a country will find it challenging to advance technologically without scaling up investment.

Investors look for macroeconomic stability and ease of doing business in deciding where, in what, and how much to invest. The experiences of Colombia, Türkiye, and the Republic of Korea are examples. In 2001, Colombia implemented a comprehensive reform package to stabilize its economy by restraining public spending, increasing central bank independence, and introducing a floating exchange rate. Similarly, in the early 2000s Türkiye implemented a primary surplus target, the central bank became independent, and reforms to improve the business climate and liberalize the banking sector were adopted. Earlier, Korea implemented two rounds of reform packages. In the mid-1980s, Korea adopted a balanced budget, improved the business climate by promoting competition, and liberalized trade. A second round of reforms in the late 1990s improved the independence of the central bank, consolidated government finances, strengthened the financial sector, and liberalized the capital account.

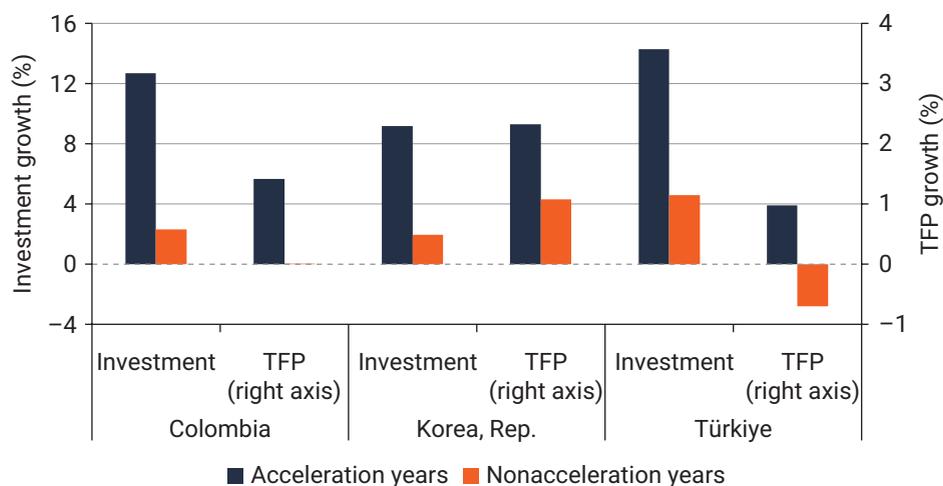
Following these reform efforts, all three countries experienced investment accelerations: Colombia from 2001 to 2007, Türkiye from 2003 to 2008, and Korea in 1985–96 and from 1999 to 2007. Investment accelerations are periods with a sustained increase in investment growth. During these periods, investment as well as productivity grew much faster than in nonacceleration years (figure B2.3.1). More broadly, across a sample of 104 economies, including 69 emerging market and developing economies (EMDEs) and 35 advanced economies covering the years 1950 to 2022, 192 episodes of investment acceleration occurred in which per capita investment growth averaged at least 4 percent per year over at least six years.^a On average, an EMDE has experienced about 1.7 investment accelerations. During these accelerations, investment growth more than tripled to 10 percent a year over that of nonacceleration years; output growth increased by 2 percentage points; and productivity growth quadrupled to 1.7 percent per year.

In the sample of 104 economies, 82 percent of the transitions from middle-income status to high-income status that occurred over the last three decades happened during or shortly after investment accelerations. Sectoral shifts gained momentum during investment accelerations because output grew substantially faster in the manufacturing and services sectors than before the acceleration. Accelerations were also often periods during which more progress was made in reducing poverty, living standards improved, and the pace of convergence to advanced economy income per capita levels increased.

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Box 2.3 The magic of investment accelerations (continued)

Figure B2.3.1 Investment growth accelerations: Colombia, Republic of Korea, and Türkiye



Sources: Dieppe 2021; Feenstra, Inklaar, and Timmer 2015; World Bank 2024; Database Profiles (dashboard), Our Data, Haver Analytics, New York, <https://www.haver.com/our-data>; WDI (World Development Indicators) (Data Catalog), World Bank, Washington, DC, <https://datacatalog.worldbank.org/search/dataset/0037712>.

Note: Investment refers to gross fixed capital formation. The sample period is 1980–2022. Bars are simple averages of growth in investment and total factor productivity (TFP). Acceleration years cover the full duration of the episodes. Nonacceleration years exclude acceleration years that are not included in this box (see World Bank 2024, box 3.1).

a. World Bank 2024.

And they should not bet the farm—or even a field—on leapfrogging. Infusion is imperative. A review of the literature on middle-income traps highlights that countries often try to make premature leaps from investment to innovation. According to Gill and Kharas (2015, 28–29),

[Some countries tried] to leapfrog prematurely into “knowledge economies,” with none of the institutional infrastructure in place to accomplish this. Poor quality universities, low levels of

human capital, limited venture capital, regulatory barriers and incomplete rule of law present significant barriers to becoming an innovation-driven economy. Middle-income countries that invest heavily and prematurely in trying to become “knowledge economies” can find low returns to such investments. The combination of wasted fiscal spending and a faulty growth diagnostic can lead to substandard performance—another example of the middle-income trap.

Notes

1. Nassif, Feijó, and Araújo (2015).
2. Branstetter and Kwon (2018).
3. Gill and Kharas (2007).
4. Mokyr (2018).
5. Solow (1957). *Technical change* is an economic term meaning a change in the amount of output produced from the same amount of inputs.
6. Lucas (1988); Romer (1990).
7. Toniolo (1998).
8. Fernández-Villaverde and Ohanian (2018). In the 1950s, for example, Italian firms benefited from sponsored training trips for their managers, enabling them to acquire modern management practices from firms in the United States. Some firms also received loans to

- procure modern machinery from the United States (technology transfer). Specifically, firms that engaged in both management and technology transfers witnessed the most substantial long-term productivity growth, highlighting the important role of infusion (Giorcelli 2019).
9. Chuah, Loayza, and Nguyen (2018).
10. Acemoglu, Aghion, and Zilibotti (2006); Gerschenkron (1962); König et al. (2022); Zilibotti (2017).
11. Mokyr (2023).
12. Choi and Shim (2023).
13. World Bank (1978).
14. Zilibotti (2017).
15. Mokyr (2023).

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