WORLD DEVELOPMENT REPORT 2024

ECONOMIC GROWTH IN MIDDLE-INCOME COUNTRIES

Concept Note

Contents

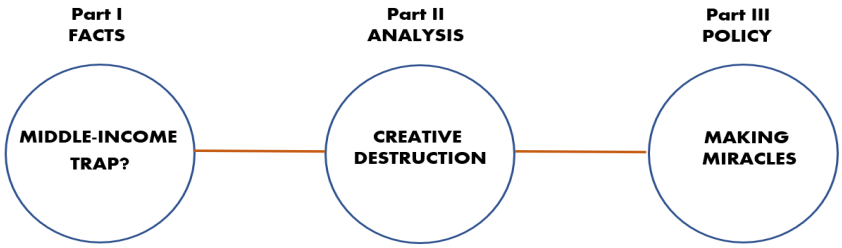
World Development Report 2024 ("WDR2024" or "the Report") will examine the difficulties of economic growth in middle-income countries and propose practical policy recommendations. Constituting about 75 percent of the world's population, the 108 middle-income countries today account for about 40 percent of global economic activity, 50 percent of the world's extremely poor people, and 60 percent of global carbon dioxide emissions.[1]

The Report will summarize the growth record of economies at different income levels. The recent record suggests that middle-income countries have experienced a sharper slowdown during the last decade (Kose and Ohnsorge 2023).[2] It will assess the evidence for and against the existence of a "middle-income trap," a notion that many countries remain in a narrow income band over long periods of time (Spence 2011) and their policies and institutions do not adapt to structural characteristics of middle-income economies (Gill and Kharas 2015). The term "middle-income trap" is popular in policy circles as a mechanism to galvanize countries into action and recalibrate their growth strategy and economic institutions to make them as dynamic collectively as their firms and entrepreneurs are individually.

The Report will then analyze the determinants of structural change using the insights of advances in Schumpeterian growth theory to bear on the problems faced by middle-income countries today. The main insights are related to competition among enterprises, social mobility among households, and the structural transformations needed for steady energy transitions. By itself, each of these insights is not novel; taken together, they have the potential to provide a framework to guide policy makers concerned with boosting economic growth.

Perhaps the most useful part of the Report for policy makers in emerging markets and developing economies will be the third section, which will present specific remedies based both on development successes and struggles during middle-income transitions. Figure 1 outlines the proposed structure of the Report. Box 1 outlines how this Report builds on previous World Development Reports that have examined various dimensions of economic growth.

Figure 1 Report structure



Source: WDR 2024 team.

[1] There are currently 26 low-income economies (defined as those with a GNI per capita, calculated using the World Bank Atlas method, of $1,135 or less in 2022), 54 lower middle-income economies (GNI per capita between $1,136 and $4,465), 54 upper middle-income economies (GNI per capita between $4,466 and $13,845), and 83 high-income economies (GNI per capita of $13,846 or more), according to the World Bank's income classifications (refer to Appendix A for the full list of economies and corresponding GNI per capita). The population shares are computed from World Bank World Development Indicators; the extreme poverty shares from the World Bank Poverty and Inequality Platform; and carbon dioxide emissions from World Resources Institute's Climate Watch data for 2022.

[2] "In 2011–21, EMDE [emerging markets and developing economies] per capita incomes grew 2.0 percentage points a year faster than advanced economy per capita incomes. But that was considerably smaller than the differential of 3.4 percentage points a year during 2000–10. The convergence process was set back in all EMDE regions. Middle-income EMDEs (MICs) were somewhat harder hit than low-income countries (LICs). MIC per capita income growth slipped by 1.4 percentage points, from 4.9 percent in 2000–10 to 3.5 percent in 2011–21 (table A.2). LIC per capita income growth also slowed, by 1.2 percentage points, to 1.7 percent in 2011–21 from 2.9 percent in 2000–10" (Kose and Ohnsorge 2023, page O.2).

Box 1 Building on past WDRs on economic growth

It is difficult to examine a topic of relevance to development, as all *World Development Reports* (WDRs) do, without discussing economic growth. Economic growth is central to achieving the World Bank's twin goals of reducing extreme poverty and boosting shared prosperity. As far back as 1978, the first WDR looked at the challenges that developing countries faced and explored their relationship to the underlying trends in the international economy. Since then, nearly every WDR has discussed some facet of economic growth.

- The second WDR, *World Development Report 1979,* emphasized issues of employment, industrialization, and urbanization in developing countries and the policies necessary to pursue growth and poverty alleviation.
- *The Challenge of Development* (1991) synthesized and interpreted the lessons of more than forty years of development experience, including the importance of the role of the interaction between the state and the market in fostering development and growth.
- *World Development Report 1982*, *The Hesitant Recovery and Prospects for Sustained Growth: Trade and Pricing Policies in World Agriculture* (1986), and *Agriculture and Economic Development* (2008) dealt most frontally with the problem of economic growth and structural change. The three decades that followed have been the best for economic development in recorded history.
- *Poverty and Human Development* (1980) focused primarily on the economic policy choices facing both developing and more advanced economies and on the implications of these choices for growth. *Poverty* (1990) and *Attacking Poverty* (2000/01) examined ways to significantly reduce poverty and ultimately begin to achieve economic growth.
- *World Economic Recession and Prospects for Recovery Management in Development* (1983), *Building Institutions for Markets* (2002), *Governance and the Law* (2017), and *Data for Better Lives* (2021) examined the role that institutions (and how they are managed) can play in economic growth. *Reshaping Economic Geography* (2009) examined the importance of the dimensions of economic geography (density, distance, and division) to growth, while *International Capital and Economic Development* (1985), *Barriers to Adjustment and Growth in the World Economy: Industrialization and Foreign Trade* (1987), *Opportunities and Risks in Managing the World Economy: Public Finance in Development* (1988), and *Financial Systems and Development* (1989) discussed the role of the international financial system (including trade policies and economic reforms) and their implications for growth.
- The importance of investing in human capital for growth is explored at length in *Workers in an Integrating World* (1995), *Equity and Development* (2006), *Development and the Next Generation* (2007), *Gender Equality and Development* (2012), *Jobs* (2013), and *The Changing Nature of Work* (2019).
- Relatedly, *Investing in Health* (1993), *Infrastructure for Development* (1994), *Knowledge for Development* (1998/1999), *Making Services Work for Poor People* (2004), *Digital Dividends* (2016), and *Learning to Realize Education's Promise* (2018) showed the importance of investing in access to knowledge and services for growth, whether in health, education, technology, infrastructure, or other services.

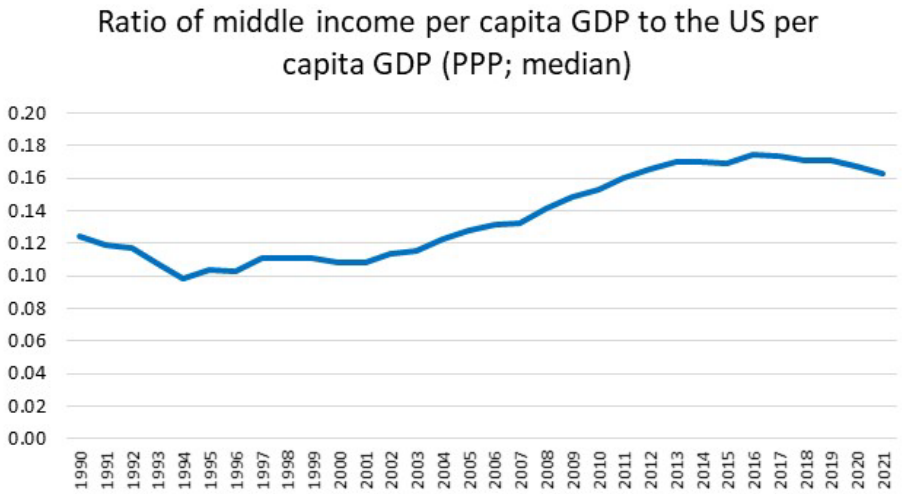
However, WDR2024 is the first WDR that will explore in depth the challenges of economic growth in middle-income countries. By bringing insights from Schumpeterian growth theory to bear on the problems facing policy makers in middle-income countries, the WDR will be the first to focus on "creative destruction" and institutional change as a way to rethink development policies for middle-income countries.

The middle-income trap revisited: difficulties during a stage of development, rather than at a certain level of income

Between 1990 and 2019, 31 middle-income countries transitioned to high-income status. Ten of them—including Hungary and Poland—benefited by joining the European Union (whose economic model is characterized by vigorous trade and capital flows, freer enterprise, and social inclusion) during a period of healthy growth in Europe's advanced economies. Others, such as Kuwait and Saudi Arabia, had the good fortune of being endowed with natural resources and the good management to time policy reforms to coincide with high commodity prices. The rest—mostly East Asian economies such as the Republic of Korea and Taiwan, China—became high-income economies by making early land reforms and investments in education, postponing immediate gratification by saving a lot, keeping imports artificially expensive, and opening up progressively to trade and investment relations with advanced economies.

For countries that were neither extraordinarily fortunate nor fierce, progress through the middle-income stage has been slower. The median middle-income economy still has a per capita income less than one-fifth that of the United States (figure 2). It is understandable why middle-income countries are not satisfied with the status quo.

Figure 2 The median middle-income economy has an income less than one-fifth that of the US



Source: WDR2024 team calculations using the World Bank World Development Indicators (WDI).
Note: PPP = purchasing power parity.

Middle-income countries' chances have not been improving. Over the past decade, the global economy went from healthy to hobbling and from largely integrated to increasingly fragmented (Kose and Ohnsorge 2023). Foreign trade and investment channels are becoming constricted by geopolitical tensions. Meanwhile, the space for government policies has been shrinking as a result of multiple crises and populist pressures. Government debt is also at an all-time high, with many middle-income economies more severely indebted than ever (Kose and Ohnsorge 2023; World Bank 2022b). Moreover, their debt is more expensive than that of any other income group. The monetary policy normalization in many high-income economies is increasing sovereign spreads and borrowing costs for many emerging markets. Climate change concerns have put additional pressure on all countries to change their growth strategies. In some middle-income countries, fragility, conflict, and violence are hampering development. In the past decade, middle-income economies have suffered more deaths from political violence and homicides than low-income countries (World Bank 2022a).

With these headwinds, today's middle-income countries will have to make miracles (Lucas 1993) if they seek to develop at the pace of economies that grew to high-income during the past few decades. They will have to radically transform *enterprises*, meet the *expectations* of an increasingly restless middle class, and transition to *energy* sources that are much less emissions-intensive than the energy sources that today's advanced economies relied upon when they were middle-income countries.

Even without these headwinds, middle-income countries would face long odds in growing to high-income status—a condition the World Bank, back in 2007, called "the middle-income trap" (Gill and Kharas 2007). While the middle-income trap has been treated as a growth problem of countries within a specified range of per capita gross national income (GNI), it is more useful to examine it through the lens of stages of development. Growth necessitates incessant change—in organizing the means of production of goods and services, in the distribution of economic rewards, and in the husbandry of natural resources. The passage through middle-income status may be the phase of growth when change is most frenetic, likely making policy making more challenging than it is in either low- or high-income economies.

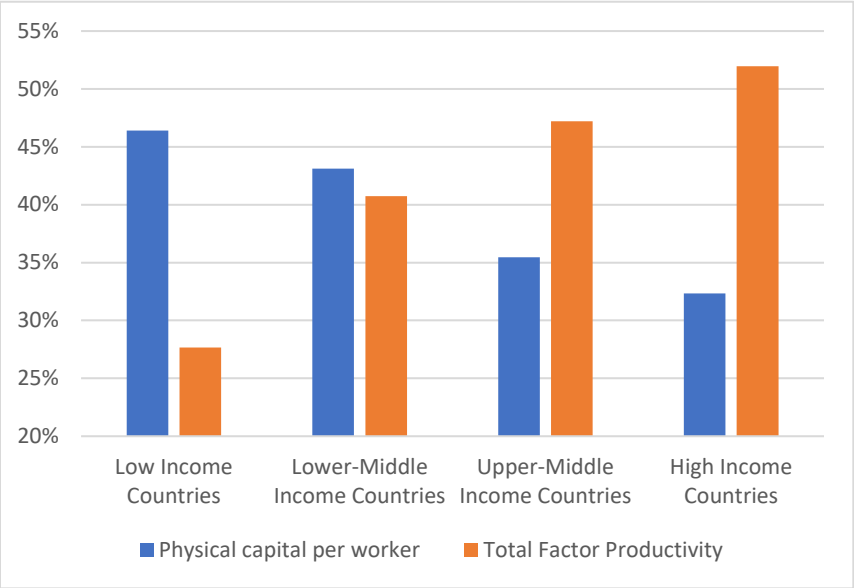
In sustaining economic growth, middle-income countries find themselves at a crossroads. Low-income countries can reap growth dividends from building physical capital and attaining basic levels of education. Consider India in the 1980s, where capital deepening was key to improving growth—in the absence of capital, enterprises and families made use of technologies that were neither new to the country or new to the world. The Indian term *jugaad*[3] became synonymous for tinkering with limited capital, often in ways that were illegal. But *jugaad* with scarce capital can only take a country so far—capital deepening is urgently needed at low levels of development.

For many middle-income countries however, capital deepening is accompanied by the harsh reality of diminishing returns to capital.[4] In fact, countries that choose growth targets above the steady-state level along a balanced growth path will not only have to raise their saving and investment rates substantially to reach the growth target, but they will also need to continually increase them to remain at that target. Furthermore, physical capital is not the main problem. Middle-income economies would have a relative income of about 75 percent of the US based solely on differences in endowments in capital. A decomposition of factor endowments and total factor productivity shows that the contribution of physical capital per worker diminishes in middle- and high-income countries compared to low-income countries (figure 3). So what is holding them back?

[3] *Jugaaḍ* (or "Jugaaṛ") is a colloquial word in Indo-Aryan languages, which refers to a non-conventional, frugal innovation, often termed a "hack." Wikipedia says "It could also refer to an innovative fix or a simple work-around, a solution that bends the rules, or a resource that can be used in such a way. It is also often used to signify creativity: to make existing things work, or to create new things with meager resources."

[4] Diminishing returns to scale are a property of the neoclassical growth model. Applying the long-term growth model (LTGM), a policy tool representation of the model, in developing countries suggests that investment-led growth is unsustainable in the long term because the capital-to-output ratio increases when investment is driving growth (Loayza and Pennings 2022). The LTGM suggests that sustainable growth requires broad-based growth fundamentals, such as rapid productivity growth and human capital growth.

Figure 3 As countries develop, the contribution of physical capital accumulation diminishes

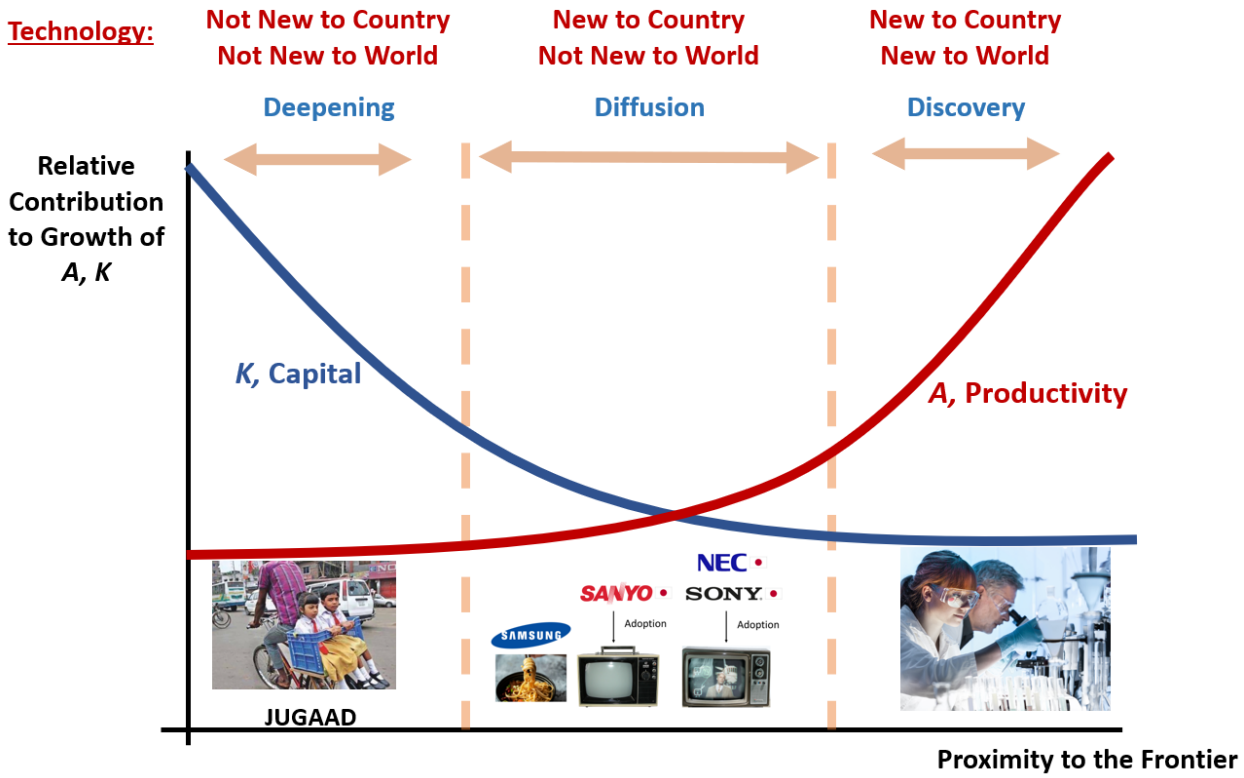


Source: WDR 2024 team calculations using the Penn World Table (PWT) version 10.01 and data from *The Changing Wealth of Nations* (Lange, Wodon, and Carey 2018).
Note: The figure reports the contribution to growth in output per worker of physical capital and total factor productivity. This classification uses the World Bank's income classifications. As a note, human capital per worker contributes 20, 17, 20, and 16 percent respectively in Low, Low-middle, Upper-middle, and High Income countries; natural capital contributes less than 1 percent in Low, Low-middle, Upper-middle countries, and 2 percent in High Income countries.

Productivity is the missing piece in improving growth over the long term. Initially, policies need to create the incentives for enterprises to enhance productivity by diffusing technologies that may not be new to the world, but are new to the country (figure 4). Scale economies alongside opening to trade and investment, low barriers to entry and exit, and specialized supporting skills and services are important. Consider Samsung, a company that transitioned from being a noodle manufacturer to one that diffused technologies within South Korea when it licensed television technologies from Sanyo and NEC in Japan and produced products for the local market. Technology diffusion also created the demand for specialized workers and machinery.

Finally, in some sectors, countries can move toward discovery, where ideas or products are both new to the country and new to the world. But policies that supported diffusion are unlikely to work for this dynamic. Discovery is inherently a risky venture—and capital markets and access to venture capital will play a role. Rather than scale—a key feature of diffusion—the key driver will be "change" that is ultimately generated by an entrepreneur's desire and leadership (see box 2). Growth can be driven by start-ups (as seen in the United States). Intellectual property will need to be respected, dominance of incumbents will need to be checked, and research universities will need to become centers of excellence.

Figure 4 **Deepening, Diffusion, and Discovery: The stages of technological progress**



Source: WDR2024 team, drawing on the terms developed in the World Bank Group and Development Research Center of the State Council (China) joint report "Innovative China: New Drivers of Growth", published in 2019.
Note: Jugaad (or "Jugaaṛ") is a colloquial word in Indo-Aryan languages, which refers to a non-conventional, frugal innovation, often termed a "hack." Wikipedia says "It could also refer to an innovative fix or a simple work-around, a solution that bends the rules, or a resource that can be used in such a way. It is also often used to signify creativity: to make existing things work, or to create new things with meager resources."

Transitions from Deepening through Diffusion and toward Discovery are not automatic. They involve step changes where economies will need to shed institutions and policies that will not help in the stage ahead. Analyzing these transitions requires a framework that explicitly considers the relationship between entrants and incumbents.

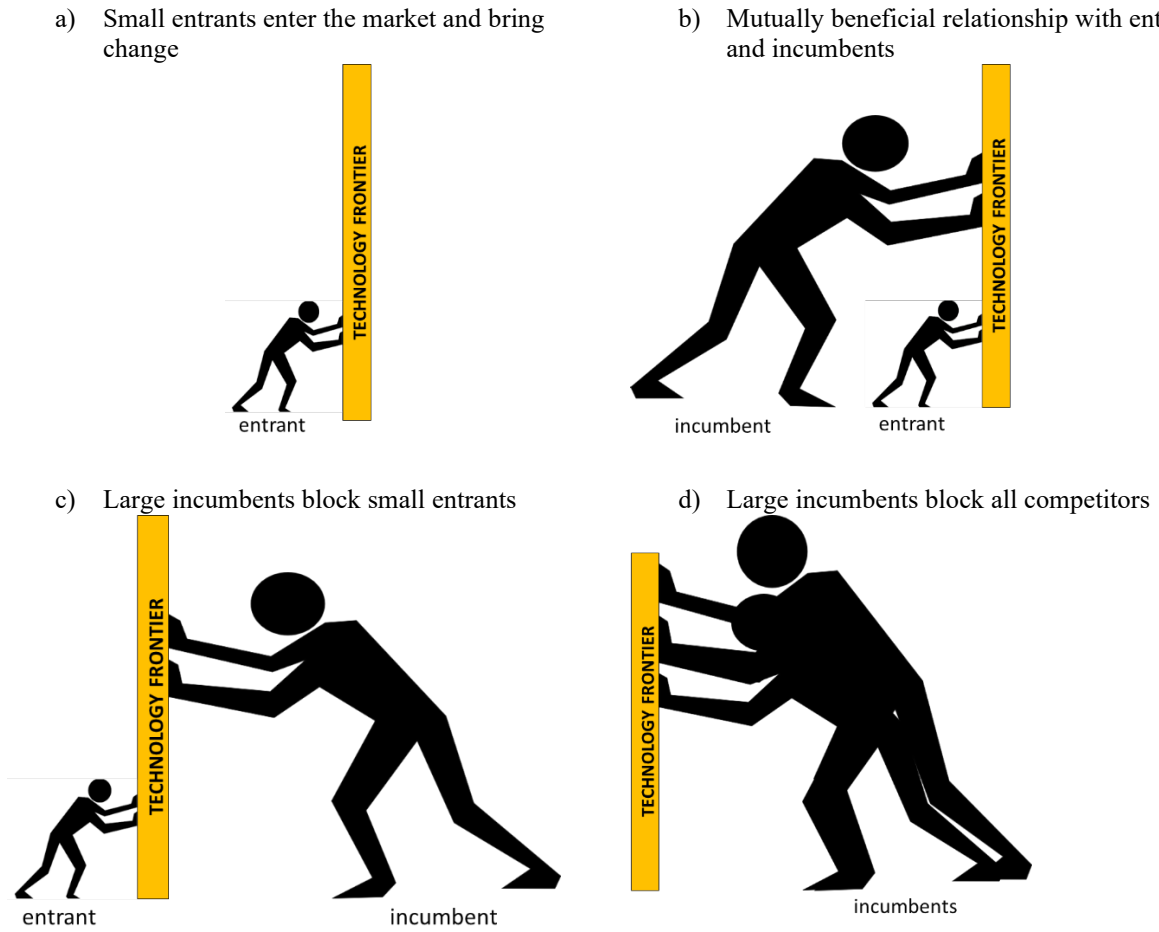
"Creative destruction" as a framework for growth in middle-income countries

How can middle-income countries enable transitions from capital deepening through technological diffusion towards discovery of new ideas and products? These transitions will involve pushing the country's technological frontier either by advancing the economy's technological frontier closer to the world's knowledge frontier (locally diffusing technologies through imitation and adoption) or by expanding the world's knowledge frontier (typically associated with research and development, R&D).[5] WDR2024

[5] The Report will draw on the analytical insights and findings from the World Bank Productivity Project, which has brought frontier thinking on the measurement and determinants of productivity to policy makers. The first report in the series, *The Innovation Paradox* (Cirera and Maloney 2017), sheds light on why countries appear to invest little on technological adoption even though returns are believed to be high. The second report, *Productivity Revisited* (Cusolito and Maloney 2018), questions the measurement of distortions as the primary barrier to productivity growth and explores what it takes to generate an experimental and innovative society where entrepreneurs are better able to identify new technologies and manage risk.

examines these transitions through the relationship between entrants and incumbents in an economy (figure 5). *Entrants bring change* (figure 5, panel a)—enterprises with new products or production processes; workers with new skills and ideas; or energy sources such as renewables that embody new technologies—and they expand a country's technological frontier. *Incumbents bring scale*—and can either have a mutually beneficial relationship with entrants where they jointly expand the technological frontier (figure 5, panel b) or have a predatory relationship where incumbents actively block entrants (figure 5, panel c). However, today's entrants can also become tomorrow's incumbents. Finally, incumbents can either compete to expand the technological frontier or collude to seek rents and block change (figure 5, panel d). These interactions—between entrants and incumbents, as well as among incumbents—is at the heart of creative destruction.

Figure 5 Creative destruction: Different ways that entrants and incumbents interact in moving a country's technological frontier



Source: WDR2024 team.

Over the last three decades, modern economic techniques have been developed to provide careful and calibrated assessments of what is shaping creative destruction (box 2). Modern Schumpeterian growth theory, formalized by Phillipe Aghion and Peter Howitt (1992), highlights that growth results from *an unending cycle of innovations* introduced by profit-driven new entrepreneurs who replace obsolete incumbents through the process of creative destruction. By considering the interactions between incumbents and entrants, the Schumpeterian approach introduces microeconomic concepts from industrial organization to a macroeconomic framework, building a bridge with both economic theory and empirics drawing on rich micro data on firms and individuals. This in turn allows for more tailored policy recommendations. By advocating for a constant reallocation of resources toward producers with novel products or more productive technologies (figure 6), this view underscores the importance of avoiding barriers that hamper this process. By explicitly acknowledging that the processes of diffusion and discovery are costly, it brings to the forefront the importance of an environment that preserves the returns to be reaped from these costs. This Report will make a concerted effort to bring the insights of Schumpeterian growth theory to bear on the problems facing policy makers in middle-income countries.

Box 2 Joseph Schumpeter and creative destruction

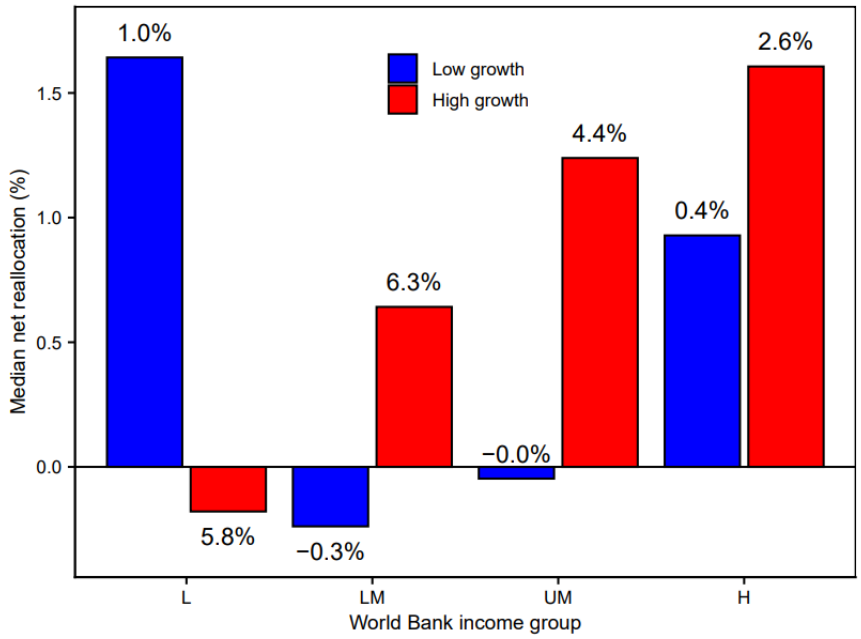
The concept of "creative destruction" was featured in the early writings of many influential political economists such as Werner Sombart (1863–1941) and Friedrich von Wieser (1851–1926) (Campagnolo and Vivel 2012; Reinert and Reinert 2006). However, it became the trademark of Joseph A. Schumpeter (1883–1950), an Austrian economist, who widely popularized the term and made it accessible through his book *Capitalism, Socialism and Democracy*. Schumpeter's view was that *creative talents* with vision would create new products and technologies to change the way we live. "Railroads did not emerge because some consumers took the initiative in displaying an effective demand for their service in preference to the services of mail coaches. Nor did consumers exhibit the wish to have electric lamps or rayon stockings, or to travel by motorcar or airplane, or to listen to radios, or to chew gum" (Schumpeter 1939, 73). What leads to economic growth is the "change" that is ultimately generated by an entrepreneur's desire and leadership. Without "change," a society is doomed.

Source: WDR2024 team.

Schumpeterian growth theory also provides better instruments for diagnosing the economic health of economies because it features:

- *Heterogeneous agents.* The theory is premised on differentiation among firms (such as small and large; new and old) and workers (such as unskilled and skilled; rural and urban). It can usefully be extended to distinguish between energy sources (such as renewable and carbon-intensive; reliable and risky).
- *Continuous dynamics.* The theory recognizes the importance of both creation (start-ups, investment, new skills, and innovation) and destruction (firm closures, skill obsolescence, and stranded assets) in the process of structural change and economic development.
- *Institutional inertia.* The theory provides insights into the forces of preservation of societal arrangements, and status quo biases in industrial organization and public policy.
- *Constructive crises.* Related to inertia, the theory recognizes that economic and environmental crises present opportunities for improvements; with the right policies, from destruction can come creation.

Figure 6 Creative destruction in high-growth middle-income countries: reallocation of productive factors from unproductive to productive firms



Source: WDR2024 Team calculations based on data from Penn World Tables 10.01 (PWT) and Bureau van Dijk (BvD) Orbis. Merged Orbis-PWT data are classified into eight groups—low and high growth countries across the four World Bank income groups. A "high-growth" country is one that has a per capita GDP growth rate that is above the median for its World Bank income group in a given year; otherwise, it is "low-growth." The data cover 138 countries over a period of 23 years for a total of 4.5 million unique firm-year observations.
Note: This figure shows that countries that grow faster than the median of their World Bank income group classification, on average, have higher rates of net job reallocation. These results lend credence to the notion that expanding or higher-growth middle-income countries are characterized by a healthy reallocation of factors toward productive units—what might be termed "creative destruction" (Schumpeter 1942). Growth rates for the country groups are reported above the bars. L = low-income; LM = lower-middle-income; UM = upper-middle-income; H = high-income.

WDR2024 will propose how the forces of creation, preservation, and destruction can be balanced to speed up progress.

- *Creation—a natural force sometimes made weaker by governments*. The forces of creation tend to be strong, unless weakened by government regulations or macroeconomic uncertainty. These forces are always country-specific and involve new interactions through trade, urbanization, and social and spatial mobility. They involve making new goods and services, inventing novel methods of production and distribution, and creating new markets.

- *Preservation—a strong force that often needs to be managed and calibrated*. Creation and growth often need to be supported by continuity, which consists of maintaining institutions, policies, and arrangements that benefit the economy and society. However, having benefited from conducive policies, many enterprises and individuals stop further innovations and block newcomers. Institutions—defined here, as in WDR 2017, as both formal rules of the game and informal conventions—will need calibration so that resources are better channeled into new and innovative activities.

- *Destruction—ordinarily a weak force that is more potent during crises*. Although they are as essential as the forces of creation, the forces of economic destruction are generally weak—except in the case of economic and ecological crises. Crises often create the conditions for destroying outdated arrangements—in labor, capital, land, and energy markets—in ways that are not possible in good times. Therefore, economic contractions must be kept short because the process of creation does not gather speed until recovery starts.

Creative destruction in practice: Enterprise, Expectations, and Energy

WDR2024 will examine the forces of Creation, Preservation, and Destruction through the perspectives of 3E's. Each of these highlight a specific channel for creative destruction:

- **Growth and firm dynamics:** An economy needs both large and small firms because large firms provide scale and small firms bring change. However, in many economies, the symbiotic relationship is broken and the runway from small- to large-scale entrepreneurship is absent. Small firms do not have the means to grow or lack the incentives to do so. Larger producers, often born that way, find it easier to invest in blocking competition than in innovating.

- **Growth and social mobility:** The creative destruction process requires that people across social and economic groups have access to education and opportunity so that they can develop capabilities and skills such as entrepreneurship, as well as scientific, professional, and managerial skills. However, the workforce in middle-income countries is lacking in skills at all levels.

- **Growth and technology**: How do middle-income countries take advantage of global technological developments in digital services, artificial intelligence, and low-carbon technologies and hasten their adoption through their economy? Will middle-income countries follow the paths of technological progress of leaders or can they leapfrog? WDR2024 will examine these issues with a focus on the case of renewable energy—due to both its prominent role in technological innovation, as well as its centrality for climate change mitigation.

Enterprise, Expectations, and Energy are closely related, as each one is characterized by the interactions among entrants and incumbents and among incumbents themselves. Furthermore, new entrepreneurial and business activities require new skills, a wealthier population uses more energy, and the energy transition requires technical skills to invent, adapt, install and manage new systems. The challenges also involve conceptually similar forces of change. Each requires new activities and institutions to be created, while some existing ones will be preserved, and others destroyed. How can these changes be best managed and what are the processes of selection to choose the right actions and institutions to ensure long-term development? What can be secured by market processes, and what needs to be achieved through institutional reform and political leadership?

To understand these processes and answer these questions, a comprehensive conceptual framework must account for a wide range of economic actors. Moreover, sectors of activity vary widely, as do firms within sectors, and the individuals who create enterprises and invest in the ideas and technologies that drive their success. Successful change requires an environment in which promising ideas and talented individuals are able to develop and expand, while less productive and less societally beneficial activities contract to accommodate them. While this may seem evident, it describes a process often blocked by the advantages of incumbents, including the benefits of previous learning by doing—a process that can create lock-in for systems or activities that have become stagnant or inappropriate. Impediments also include sheer inertia, as well as the vested interests of those able to block change. These forces for preserving the status quo matter,

to varying degrees, in the processes of creating dynamic enterprises, enabling social mobility, and leading the energy transition process. Box 3 outlines the contours of the analytic model being developed for WDR2024 to examine the three interlinked challenges of enterprises previously discussed.

Box 3 Main insights of the Schumpeterian "model" being developed for WDR2024

In the Report's analytic model, a final good is produced using many intermediate goods. Each of these intermediates can be produced using renewable energy or fossil fuel-related technologies. Production for each of these intermediates proceeds along a Schumpeterian *quality ladder structure* in which innovation and growth are driven by the quality improvements of existing products. The government can impose a "tax" on using fossil fuel-related technology. Considering market prices and taxes, the producer of the final good chooses between renewable energy and fossil fuel-related technologies in each intermediate goods sector. The equilibrium use of fossil fuel-related technology determines the amount of carbon emitted, and thus the amount and intensity of environmental pollution. Profit-maximizing entrants hire scientists to conduct research and development (R&D) to improve fossil fuel-related or renewable energy technologies. Successful entrants replace incumbents through creative destruction. Market size, which is affected by market conditions and government policy, is one of the key determinants of the direction of technological change. For instance, if fossil fuel-related technologies are more advanced than renewable ones, a laissez-faire economy will allow for more fossil fuel-related innovations, and a transition to renewable energy technology cannot be ensured. Therefore, the government's active involvement is required—initially.

Innovation and talent

In the model, firms invest in R&D by hiring scientists. The innovation capacity of the economy depends on the quality of the talent pool. Individuals are born with varied talents, parental and family resources, and reference groups (such as gender, social class, ethnicity). After observing their own credentials, each individual with a talent level z decides whether to attend school and pursue advanced training (in the model, in the form of doctoral studies) to become a scientist or work at a lower-skilled job. It is worth noting that the model is an abstraction—and attainment of a PhD is one type of technical training, albeit a good predictor of a person becoming an inventor. Yet a growing economy will need a wide range of professional, managerial, and technical skills, and people need the incentives and opportunities to acquire these skills.

Training slots and scientists

Pursuing a post-secondary education is costly, and financial frictions imply that young people with wealthier parents/families can afford schooling more easily. In addition, social bias might prevent some talented young people from attending university, even if they are born to wealthy parents/families. In the model, universities offer training slots, and society allocates young people into these slots. Societies that can fill the university slots with more talented young trainees have a more robust scientist pool. This implies that societies with very high income inequality or social bias—all else equal—will be less innovative.

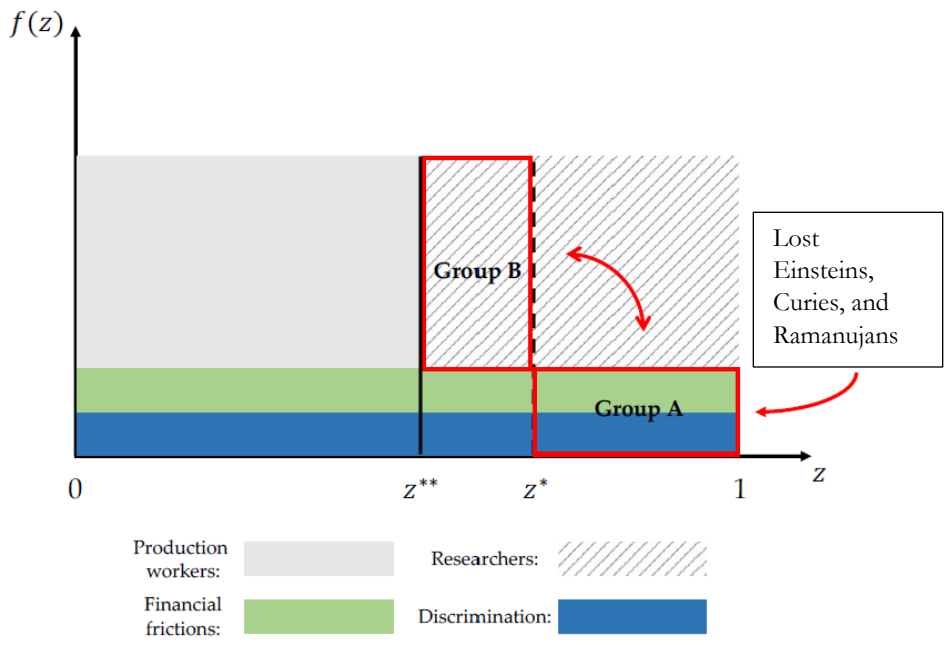
Slots claimed and scientists gained or lost

The implication is that in the absence of financial frictions or social biases, every individual above a talent threshold z^* would be willing to attend university. But financial frictions and discrimination eliminate some talented individuals from the education system and generate "lost Einsteins, Curies, and Ramanujans," as indicated by Group A in box figure B3.1. Those unclaimed slots by the talented individuals are filled by less talented ones between z^* and z^{**} (Group B)—simply because they were fortunate enough to be born into a higher social status and to wealthier parents/families. Education policy becomes at least as important in this environment as industrial policy. Therefore, policy complementarity is an important prediction of this framework: Policies that provide economic incentives for investment and innovation are more effective when combined with effective education policies.

In this framework, firms hire scientists to develop either new fossil fuel-related or renewable energy technologies. The fossil fuel-related technologies are initially more advanced. Imposing a heavy carbon tax to ensure a transition to renewable energy technology can be too costly because it will have significant negative "level effects" by reducing

the current amount of production. But policy makers can rely on renewable energy technology R&D subsidies to mitigate the negative level effect. While this may result in a society experiencing slower growth until renewable energy technology catches up with fossil fuel-related technology, market forces can prevail once the transition occurs, eventually reducing the need for government intervention.

Figure B3.1 Financial frictions and discrimination repress top talent



Source: WDR 2024 team.

Imitate or innovate

The Report will consider several extensions to the model. The first extension considers a scenario in which firms can decide to "innovate" a brand-new technology or "imitate" an existing technology from the global technological frontier. This implies that when a country is far from the frontier, it may be more profitable to imitate due to the "advantage of backwardness," as discussed in Gerschenkron (1962), since innovation is too costly and imitation possibilities are abundant. These countries can continue to imitate until they converge to the frontier and run out of technologies that they can directly copy. Hence a country can begin with a more imitation-oriented growth strategy until it advances to a certain level of income, after which it needs to switch to an innovation-oriented growth strategy. In the case of the renewable energy technological transition, the "imitation" channel can speed up this transition and reduce the J-curve dip–depth of the slowdown caused by the transition.

Fixed and variable costs

Another extension considers fixed costs for R&D. In addition to paying a variable cost for hiring scientists, firms must also incur sizable, fixed set-up costs. This extension implies that scale economies are important and only firms that are above a certain threshold in size can invest in R&D. When its firms are too small to invest, a country may become trapped in a low-innovation equilibrium and may not be able to break out of the middle-income trap. Hence, the model also predicts that resource consolidation may be needed when a country's firms are too small to invest in R&D. Furthermore, governments in small countries may lack the resources to finance R&D.

Source: WDR2024 team.

Enterprises

Enterprises are the engines of a modern economy. They are fueled by openness and unleashed when barriers to entry, exit, and competition are lowered, boosting output and fueling innovation. Continued growth at higher levels demands creative destruction, as new activities replace old ones. Open trade encourages competition and enables the most productive enterprise to expand. In a healthy economy where efficiency and innovation are unhindered, enterprises behave in a particular way. Small and large firms, for instance, exhibit a mutually beneficial relationship, one that can be considered symbiotic. A large firm's profitability is a young entrant's aspiration, and the threat of entry is the fuel to more innovation. Small-scale entrepreneurship is a temporary state. The enterprise is either forced out of the economy or innovates its way up to larger markets and more sophisticated products. A static snapshot of an innovative economy would feature a few small firms and many larger more innovative ones, while a moving picture would show firms entering, exiting, and growing, reallocating labor and capital along the way in an uplifting cycle.

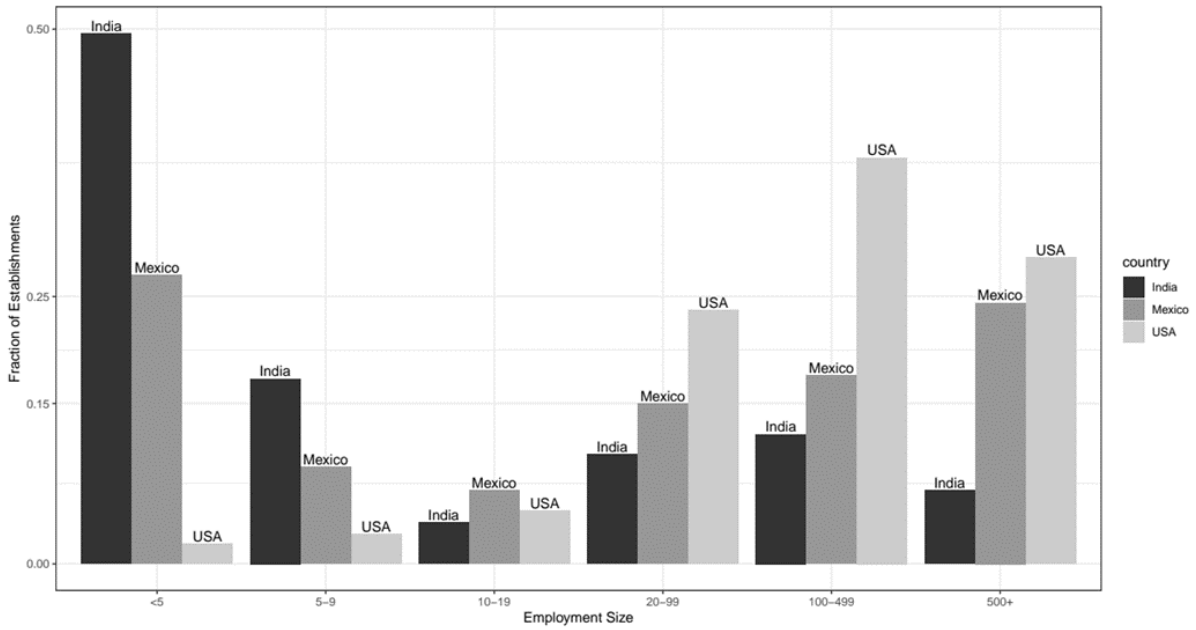
In an unhealthy economy, the symbiotic relationship is broken and the runway from small to large-scale entrepreneurship is absent. Small firms do not have the means to grow to larger scale or lack the incentives to do so. Larger producers, often born that way, find it easier to invest in blocking competition than in innovating. A snapshot of this economy would be drastically different, featuring a concentration of micro-scale enterprises and a few large corporations. The moving picture of this economy, in turn, would be grim, with unproductive newcomers replacing old, but equally unproductive ones, and large firms enjoying their dominant positions due to lack of competition.

Figure 7 provides a snapshot of the enterprise size distribution in two representative middle-income countries (India and Mexico) with sufficient data to assess the health of their economies relative to that of an advanced economy (the United States). The figure highlights how differences in the strength of creative destruction manifest in the shapes of the firm size distributions. Microenterprises account for a significant share of employment in India and Mexico, while they are insignificant in the United States. More strikingly, establishments with more than 100 employees in the United States account for about three-fourths of employment, far above India and Mexico.

It may appear from the snapshot that there is more creative destruction in India and Mexico than in the United States because there is a large share of employment in microenterprises. Because entrants are an important source of creative destruction and start smaller than incumbents, the snapshot may suggest that India and Mexico have a strong innovation channel. However, the moving picture in figure 8 refutes any such interpretation; there is almost no growth over the life cycle of firms in India and Mexico. Rather than a manifestation of innovation, the prevalence of small-scale entrepreneurship in India and Mexico is a sign of low-productivity entrepreneurs seeking subsistence.

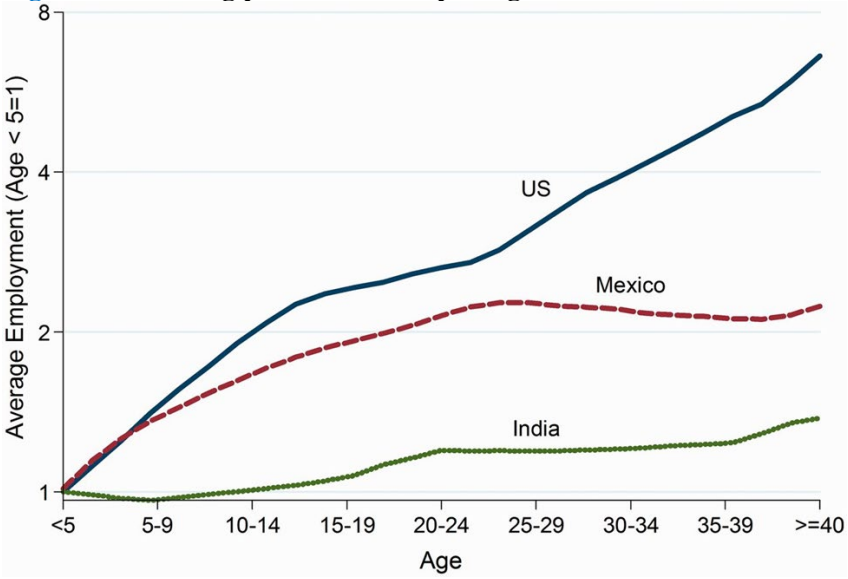
Other countries follow similar patterns. Research done for the Report shows that more advanced economies produce with bigger plants, likely because of a more active symbiotic relationship between small and large firms. The positive relationship between firm size and development extends to services as well, most notable in information technology (IT), retail, and wholesale services (Nayyar, Hallward-Driemeier, and Davies 2021).

Figure 7 A snapshot of the enterprise size distribution in India, Mexico, and the United States



Source: WDR 2024 team, with thanks to Leonardo Iacovone for sharing the tabulations for Mexico.
Note: The figure reports the fraction of employment accounted for by establishments of various size classes. The data for India come from the 2005 Economic Census; the data for Mexico come from the 2018 Economic Census; and the data for the United States are drawn from the Business Dynamic Statistics for 2019. India and the United States illustrate the manufacturing sector only.

Figure 8 A moving picture of enterprise growth in India, Mexico, and the United States



Source: Hsieh and Klenow 2014.
Note: The figure shows the average employment across cohorts of enterprises of a given age in India, Mexico, and the United States. The numbers are expressed relative to the average size of firms 5-year-old or younger (Y axis).

While cross-country comparisons of firm size and its evolution during episodes of growth acceleration point toward a reallocation of resources to larger firms, the evidence also suggests that large firms may become entrenched with decision-makers in a way that threatens competition, creates a barrier to firm entry, and hampers economic growth. For example, Rijkers, Baghdadi, and Raballand (2017) investigate distortions created by Tunisia's investment laws to favor and protect businesses with ownership ties to a prominent local family. The authors provide evidence of entry regulations being captured by the family's business interests, limiting competition and discouraging potential entrants.

The Report will argue that measures of business dynamism, such as the entry rate of new firms and the rates of labor turnover across firms of various ages and sizes, are important for assessing the extent to which employment concentration is of concern or not. To this end, the team will compile panel databases across countries to construct indicators of business dynamism similar to those characterized in the recent debate around the productivity slowdown in advanced economies (Akcigit and Ates 2021).

Why is creative destruction weak among enterprises in middle-income countries?

A series of policy-induced distortions weaken the natural forces of creation and destruction. Some slow the speed of entry of new enterprises, such as the political connectedness of firms. Others manifest in the growth prospects and the allocation of resources among existing firms. Notably, each of these exert opposing forces on the firm size distribution. Thus, the Report will examine patterns of deviation between distributions of firm sizes in advanced and middle-income countries to shed light on the relevant mix of policies at play.

Distortions to firm entry

- *De jure regulation of entry.* Firm creation is a primary driver of creative destruction and innovation. Barriers to entry are, in effect, barriers to innovation, and government-imposed regulatory hurdles are important sources of barriers to entry. Despite the prevalence of such barriers, governments have been adopting reforms across developing nations, albeit with mixed results in terms of fostering creative destruction. Bruhn and McKenzie (2013) document modest benefits from entry reforms on the number of formal firms, whereas Schiffbauer, Sampi, and Coronado (2022) find large positive effects on firm-level productivity from the removal of local barriers to entry in Peru. The mixed evidence suggests that the constraining effect of de jure barriers to entry is minor compared to other arrangements that are blocking competition and preserving economic rents.

- *Predatory practices of large incumbents.* Large enterprises are important drivers of innovation and creative destruction. However, weak institutions may invite these firms to protect their profitability by deterring competition rather than innovating their way out of competition.

- *State-owned enterprises (SOEs).* Outside of critical sectors with large economies to scale and dependence on natural resources, SOEs have long been seen as a barrier to creative destruction. On the one hand, they represent the ultimate example of entrenchment between large corporations and the state. In the same way that such a relationship has been proven to be detrimental to innovation in the contexts of Tunisia and Italy, recent research for China finds the progressive and spatially dispersed dismantlement of SOEs to be the primary cause for rising creative destruction and local convergence across municipalities in China (Brandt et al. 2020).

  On the other hand, SOEs distort the allocation of credit, receiving much-needed funding that favor SOEs and condemning other firms to internal savings to finance their innovation and growth. In China, bank-provided financing accounts for 20-40 percent of SOEs' investments—considerably higher than the share for private enterprises (between 5 and 10 percent) (Song, Storesletten, and

Zilibotti 2011). Fast growth can still be engineered if other distortions are reversed, as evidenced in China since 1998 and as described in Song, Storesletten, and Zilibotti (2011). However, the survival and persistence of SOEs and the associated credit market distortions jeopardizes the duration and degree of the growth acceleration.

Distortions to firm growth and innovation

Countries have instituted a wide range of adverse policies that contribute to lackluster innovation from existing producers and increase resource misallocation.

- *Subsidies to small and medium enterprises.* Perhaps one of the most popular policy tools that governments adopt with the intended aim to promote job creation and growth in middle-income countries is the direct subsidization of small-scale entrepreneurship. Either through subsidized credit, tax exemptions, and size-dependent enforcement of taxation, governments subsidize small producers' operation costs relative to larger firms. Even when tax codes do not create explicit provisions based on firm size, weak tax collection capacity may force governments to concentrate tax enforcement on larger firms, effectively creating a size-dependent distortion with similar implications (Bachas, Fattal Jaef, and Jensen 2018). When this occurs, incentives for innovation are weakened and resources become inefficiently reallocated into small-sized firms, a force that also works to reduce aggregate growth.

- *Financial frictions.* Most new and young firms need finance to cover innovation costs and sustain their growth prospects. Yet financial markets are prone to multiple market failures, ranging from a limited commitment from debtors to informational asymmetries between borrowers and lenders. Rather than helping mitigate these failures, many governments make access to credit and distribution of credit even more difficult. Without credit, creative destruction is repressed and firms must resort to self-financing, a process that takes time and may never achieve the scale necessary to sustain "risky" innovative investments.

- *Trade barriers.* International trade constitutes a powerful incubator of creative destruction. On the one hand, foreign markets open the door to achieving scale independently of local geographic and demographic conditions. When enterprises develop new products or improve technologies, the returns to these innovations do not decrease when leveraged on a larger scale. Thus, freer international trade represents a necessary condition for middle-income countries to find investment in innovation profitable. On the other hand, domestic markets become attainable to foreign producers when trade barriers are reduced, thereby providing a necessary force for competition to keep domestic producers active and creative.

  However, international trade is not a substitute for domestic policies that promote free entry and competition. The increased fragmentation of production in recent decades allowed producers worldwide to shop for the cheapest intermediate inputs from multiple sources. Without domestic competition policies that keep market power in check, those cost reductions will not translate into lower consumer prices. Moreover, a large fraction of modern economic activity takes place in non-tradable sectors, for which trade is only a potential source of cost reduction but not a threat to monopoly power.

  Lastly, the Report will characterize the behavior of international trade during episodes of growth accelerations. For instance, Chile's and Korea's convergence dynamics were accompanied by rising shares of exports and imports in total economic activities. The Report will explore the extent to which these trends accompany other episodes of acceleration. While the wide range of open but

stagnant middle-income countries demonstrate that trade, by itself, does not cause growth, the Report will argue that trade is a necessary condition to attain sustained growth.

Economic and social inertia

Economic and social inertia are also powerful forces holding back creation and destruction. They are not necessarily induced by policy; rather, they may be an outcome of social norms and technological barriers.

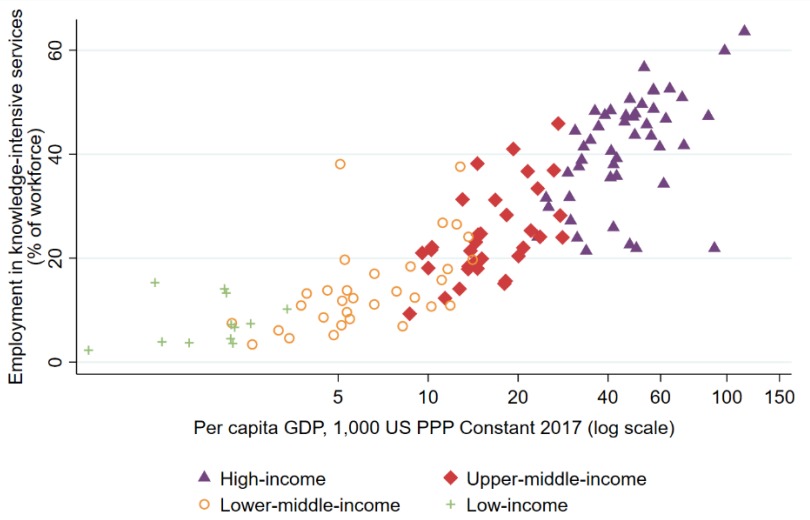
- *Economies of scale and coordination failures.* An older view of underdevelopment is that coordination failures condemn countries to poor technologies and stagnation. According to this view, significant government-induced investments are needed to escape the forces of preservation. The Report will discuss the extent to which these growth-enhancing government interventions underpinned some successful episodes of accelerations, with a particular emphasis on Korea's mix of industrial policies.

- *Market size, trade, and infrastructure.* Innovating is costly, and so the process is encouraged when inventors profit from the innovations at scale. To this end, free trade is essential for creative destruction in countries where geographic and demographic factors reduce the size of local markets. Infrastructure plays a similar role by facilitating the flow of goods and services to distant markets. However, expanding market size is not a sufficient condition for economic growth, despite its necessary role in fostering competition and creative destruction. As is the case with financial development, many middle-income countries remain in the "middle-income trap" despite various trade liberalizations and expansions in roads, ports, railroads, and telecommunications. The Report will discuss how each of these determinants of market size played out during episodes of growth.

Expectations of upward social mobility

Middle-income growth requires an expansion of technical, professional, and managerial skills and knowledge (figure 9). In dynamic economies, talented individuals can obtain the best educational opportunities, match with jobs that are compatible with their skills, have incentives to create and innovate, and are free to migrate to places where they can flourish. In reality however, many barriers exist and fewer workers are employed in knowledge-intensive occupations.

Figure 9 Fewer people are employed as managers, professionals and technicians in middle-income countries

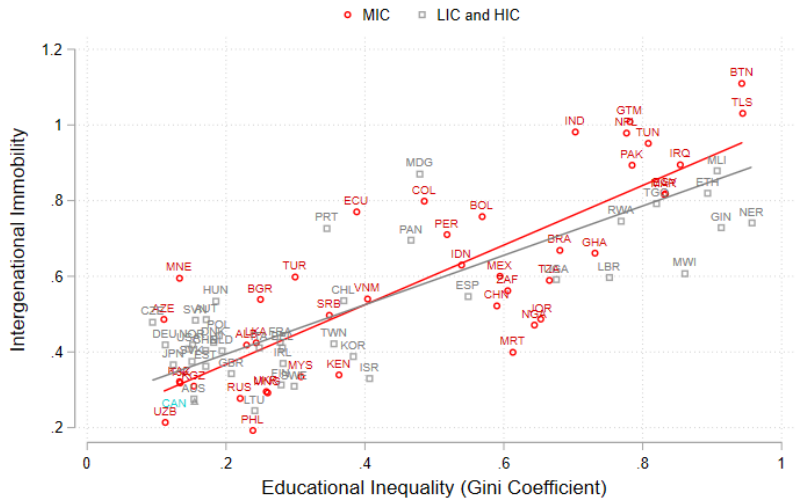


Source: World Development Indicators and WIPO based on ILOSTAT Database of Labour Statistics.
Notes: Data on per capita GDP is from 2019 and it is expressed in thousands PPP dollars (2017 constant prices). Data on knowledge-intensive employment is from 2011-2021, and it is the sum of people in categories 1 to 3 as a percentage of total people employed, according to the International Standard Classification of Occupations (ISCO). Categories included in ISCO-08 are: 1 Managers; 2 Professionals; 3 Technicians and Associate Professionals. Number of countries per income group: 48 high-income, 33 upper-middle-income, 32 lower-middle-income, and 13 low-income.

- First, the development of talent hinges on the *expectation of social mobility*—that all children, regardless of the circumstances of their birth, can move up the economic and social ladder. Every society has selection rules that shape who gains access to opportunities. When these rules are fair, an economy may experience higher income inequality as innovative workers reap benefits. However, such inequality will still be associated with high social mobility and greater chances of talent rising to the top. Society's selection rules—shaped by institutional arrangements, history, and cultural norms—are frequently biased against the less fortunate, resulting in a society with *high inequality and low social mobility* (figure 10). The World Bank's Global Database on Intergenerational Mobility (GDIM) shows that educational mobility in middle-income countries is quite low—about 40 percent lower than that in a high-income country (Van der Weide et al. 2021). Since the 1950s, educational mobility has improved across birth cohorts both for lower-middle-income and upper-middle-income countries. Yet, even for children born in the 1980s, educational mobility was 47 percent lower in lower-middle-income countries and 16 percent lower in upper-middle-income countries than in their high-income counterparts.

  Just as entry barriers raised by lobbying and political connections of incumbent firms can slow creative destruction, lack of equitable access to opportunities from biased social selection rules favoring incumbent elites hampers the development of the very talent needed to fuel and sustain creative destruction. Creative destruction is also required to allow newcomers in the elite echelon to challenge and compete with incumbents.

Figure 10 High inequality and low social mobility reflect societal rules biased against the less fortunate and are of greater concern in middle-income countries



Source: World Bank, Global Database on Intergenerational Mobility (GDIM).
Note: The figure shows intergenerational relative immobility measured by the slope of a regression of children's schooling on their parent's schooling.

- Second, there are barriers to the production of new ideas. This starts with how talent is nurtured in the education system and extends to whether individuals can develop and diffuse ideas and innovations across firms and places. Where entrepreneurs and innovators live and work affect their chances to find and share ideas and create new activities. Barriers range from the livability of cities to the formation of innovation clusters to forging links domestically and internationally.

- Third, the ability to move across firms and locations allows resources to shift from the old technologies toward new ones. And mobility barriers—due to either government regulations or lack of fluidity in markets—cause misallocation of resources and intergenerational persistence.

- Finally, while the creative destruction process is fundamental to growth, not every individual stands to gain from it in the short term. An inherent aspect of a dynamic economy is the destruction of some jobs and the obsolescence of some skills (WDR 2019 – World Bank 2018c). Those affected by this destruction often have "stranded assets": their skills are no longer in demand in the labor market. In addition, many countries face the challenges of either an aging or unskilled labor force. While most firms can go out of business, people adversely affected by creative destruction must be cared for to avoid social and political discontent leading to retrenchment or reinstatement of policies that do not promote growth and development in the long term.

The economic costs of suppressing talent are significant. A large and costly source of talent misallocation is gender inequality. In 1960 about 94 percent of doctors and lawyers in the United States were white men; by 2008, the share had declined to 62 percent. Considering that innate talent is unlikely to feature such a concentration across gender and races, the occupational distribution in 1960 reflects the misallocation of talent and the observed convergence represents an improvement. These improvements in gender and racial equality explain 20 to 40 percent of the observed growth between 1960 and 2010 in the United States (Hsieh et al. 2019). Foregone growth due to suppressing talent is likely much larger in lower-income and middle-income countries, where these gaps are larger than in the United States.

These countries also have lower female labor force participation and larger gender gaps than in the United States. Women face particularly significant barriers to starting and growing firms. Studies have shown that removing barriers to entrepreneurship for women in India would double female labor force participation and raise real income by 40 percent (Chiplunkar and Goldberg 2021). Another source of talent misallocation is migration costs, which limit labor market access and the efficient sorting of workers across places (World Bank 2023b). In Indonesia, reducing migration costs to levels similar to those in the United States—a high-mobility benchmark—would lead to a 7.1 percent productivity boost (Bryan and Mortens 2019).

Against this backdrop, this section of the WDR2024 will analyze three main elements that may limit a person's access to opportunities and create barriers: (i) parental and family characteristics (Parents); (ii) where that person grows up, lives, and works (Place); (iii) prejudice arising from societal norms, gender, and ethnicity (Prejudice). The Report will summarize the evidence for each based on an extensive literature review. In doing so, the Report will analyze the state of social mobility in middle-income countries, as well as barriers to education, labor market, and finance opportunities, providing estimates of the ensuing talent misallocation, whenever possible. The discussion on social mobility will highlight the role of social norms in female labor force participation, and of social prejudice and social networks in access to jobs, land, housing, and credit.

There are several implications to policies that fail to promote social mobility:

- *Talent development requires the removal of barriers to equitable opportunities*. Countries can start by identifying their barriers while taking into account the country's development stage relative to the technological frontier (Aghion et al. 2009).

- *Focusing on the quality of education—while clearly necessary—may not be effective in raising talent when entry barriers to labor and credit markets are high and opportunities are limited in poorer neighborhoods*. A comprehensive approach to removing barriers in all markets will therefore be needed, recognizing the complementarity in public actions. For example, policies removing entry barriers to labor or credit markets will be more effective when combined with improvements in education systems and neighborhood quality.

- *The individuals facing high entry barriers are also more likely to lose their job*. A lower-skilled worker, for example, is more vulnerable to job lay-offs than a high-skilled one, particularly in the new world of work (World Bank 2018c). Those affected by this destruction often have a "stranded asset" problem, in that their skills are no longer in demand in the labor market. In addition, many countries face the challenges of either an aging or unskilled labor force. Designing and financing social protection systems that mitigate these downsides are therefore crucial policy concerns.

Switching from diffusion to discovery requires the development of research capabilities, particularly for countries near the technological frontier. Even when they build the human capital necessary to conduct research and innovation, middle-income countries often struggle with brain drain and are net exporters of highly qualified individuals. For example, foreign-born scientists account for more than 60 percent of the Nobel prize winners based in the United States in recent decades (World Bank 2018b). These talented scientists have chosen to work in the United States because of the availability of generous funding opportunities, research facilities, and the productivity spillovers arising from a dense network of collaborators and scientists.

Many governments seek to find ways to address the impacts of brain drain, particularly in cases when the education of emigrants is publicly financed. However, recent evidence from developed countries shows that the productivity gains from allowing innovators to move to the country where they are most productive

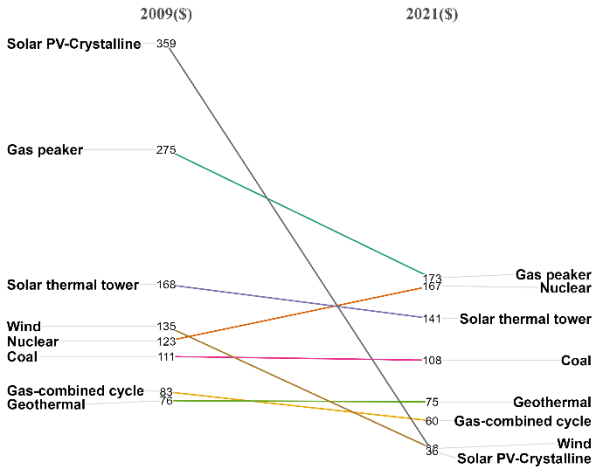
leads not only to higher productivity overall, but also to knowledge spillovers back to their country of origin. These productivity spillovers are large and can offset the origin country's direct losses from brain drain (Prato 2022). Allowing talent mobility—and maintaining ties with scientists and innovators who move abroad—can therefore better address the impacts of brain drain.

Energy transformation and emissions

At the heart of the Schumpeterian growth model is the idea that long-term growth results from innovation. Growth involves creative destruction in which new technologies render old ones obsolete. This Report will argue that one of the most important waves of technological change in the coming decade will be that driven by the low-carbon transition. There are three reasons:

- *Rapid cost declines that have already occurred over the past decade and the potential for technology cost "tipping points" in the next few years.* In the past decade, the declines in the cost of key low-carbon technologies have been substantial (figure 11)—with the costs of solar energy down by 90 percent, wind energy by 72 percent, and lithium-ion batteries by 90 percent (Lazard 2021; Trancik and Ziegler 2023). The cost of solar energy passed parity with fossil fuels in the median country in 2021. Other low-carbon technologies, such as electric vehicles (EVs), are forecast to reach cost parity with non-EVs globally within the next two to three years.

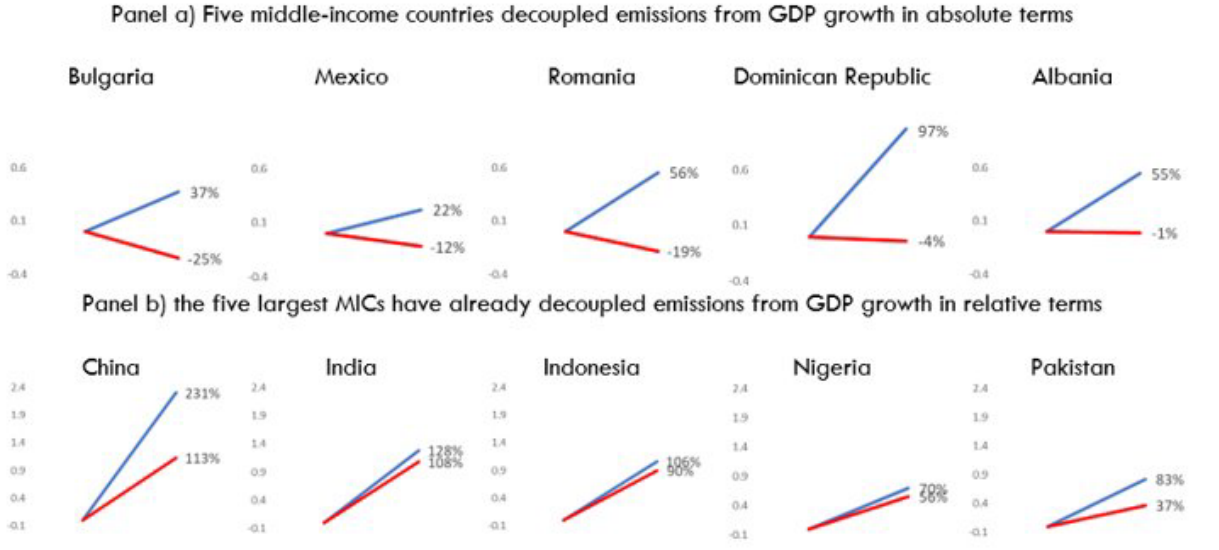
Figure 11 Costs to produce wind and solar energy have been declining rapidly



Source: Data are from Lazard Levelized Costs of Energy.
Note: The figure shows levelized costs of energy in US dollars per MegaWatt-Hour ($/MWh). PV = photovoltaics.

- *The emerging policy landscape, which is very likely to accelerate the low-carbon transition.* The past two decades saw breakthroughs on climate policy in the two largest economies—the United States and China—that shape global prices, markets, and technology provision. As of early 2023, 91 percent of global GDP was covered by a net zero emissions target. In fact, a growing number of middle-income countries are decoupling emissions from growth (figure 12). These pledges imply sizable changes in low-carbon investment, industrial policy, pricing, and regulation. Recent policy shifts in the United States (with the Inflation Reduction Act, IRA) and China (with the carbon neutrality pledge and ban on overseas coal financing) will also have important implications for the development and diffusion of low-carbon technologies globally.

Figure 12 A growing number of middle-income countries are decoupling emissions from growth



Source: Our World in Data. Note: emissions are consumption emissions, adjusted to account for net emissions embodied in trade. Note: includes only 66 MICs with a consistent time series of data from 2005 to 2020.

- *Increasing returns to scale, peer effects, and path dependence in low-carbon technologies*. All of these trends could lead to nonlinearities in the pace of technological progress, with the potential for a sudden shift from an equilibrium with limited adoption to one with rapid and widespread adoption. The International Energy Agency (IEA 2022) estimates that more renewable power will be installed in the next five years than over the past twenty years. Several key renewable- energy technologies, including solar energy and electric vehicles, have already passed, or are forecast to imminently pass, cost "tipping points," implying likely widespread deployment (see, for example, Lam and Mercure 2022; Nijsse et al. 2022; Way et al. 2022).

These changes have the potential to spur creative destruction at potentially unprecedented speed and scale. While supporting the creation of new jobs, innovation, new production, and new trade, decarbonization will prove disruptive for carbon-intensive incumbent firms, industries, and regions. Several large middle-income countries—including China, India, and Indonesia—will need to grow while also transitioning their energy systems away from coal. Fossil-fuel–exporting middle-income countries— including Kazakhstan and Nigeria—will need to grapple with diversifying their economies and minimizing transition risks. Just as coal, oil, and natural gas have shaped economic geography, the low-carbon transition is altering patterns of comparative advantage and the drivers of growth and structural transformation in middle-income countries. This implies that the path to high-income status in the 2020s will most likely differ from that of the past, with the potential need for updating policies.

There are several factors favoring persistence in the high-carbon economy:

- *Path dependence*. Innovation in general—and in fossil fuel–related technologies, in particular—tends to be path dependent. Most within-firm innovation is incremental in nature rather than path breaking. The greater the stock of patents in fossil fuel-related technologies, the more likely a firm is to continue to file patents in those technologies (Aghion et al. 2016). In other words, firms have a greater incentive to preserve the status quo in fields where they have already acquired capabilities and technical skills (Aghion, Antonin, and Bunel 2021). Radical or disruptive innovation, by contrast, is more likely to occur in smaller, newer firms. Creative destruction in renewable-energy

technologies may therefore require a policy response to break the path dependence and incentivize firms to change their existing paths.

- *Positive technological externalities*. The invention, innovation, and manufacturing of low-carbon technologies have positive externalities on other producers and consumers, resulting in their underprovision. The production of low-carbon technologies has constant marginal and average costs, meaning that unit costs fall with the total volume of each good produced by the industry, due to learning-by-doing effects in producing green goods or renewable energies (van der Ploeg and Venables 2022). Swanson's Law suggests that for every doubling of solar capacity installed, the cost of a solar panel drops by around 20 percent. More broadly, four key low-carbon technologies (solar energy, wind energy, batteries, and electrolyzers) have been shown to follow Wright's Law, with costs declining as a power function of cumulative deployment—implying increasing returns to scale and a high likelihood of further rapid cost declines (Way et al. 2022). How do firms fully internalize these positive externalities? The Report will commission research to shed light on this question, including analyzing the impact of government subsidies.

- *Coordination failures and the first-mover problem*. Today's high-carbon economies are supported by mutually reinforcing actions and investments. Technical progress has followed a specific path, raising the efficiency of extracting and burning fossil fuels. Cities have been built around high-carbon modes of transportation (private motor vehicles). Social attitudes and personal preferences support high carbon consumption. And political pressure groups represent carbon-intensive interests. For businesses and society, the investment returns to continuing with high-carbon activities are high due to the already existing complementary high-carbon sunk investments.

  Moving to a less carbon-intensive economy with more renewable energy may yield positive benefits for all, but there are negative returns for any single action to change course. Why? Because each investment along the path (such as batteries, EVs, and interoperable charging points) reinforces the other. Market mechanisms cannot enable a shift from the carbon-intensive to the carbon-extensive or carbon-free equilibrium unless "large agents" undertake these responsibilities. As discussed earlier, large firms can help coordinate. Will Tesla produce batteries, electrical vehicles, charging points, and design cities? What if large firms have preferential relationships with the state (as discussed in the section on Enterprise)? And with the high fixed costs of developing energy infrastructure and the imperfect competition in energy markets, creative destruction in the energy sector faces even greater barriers, which may call for a greater role by the state.

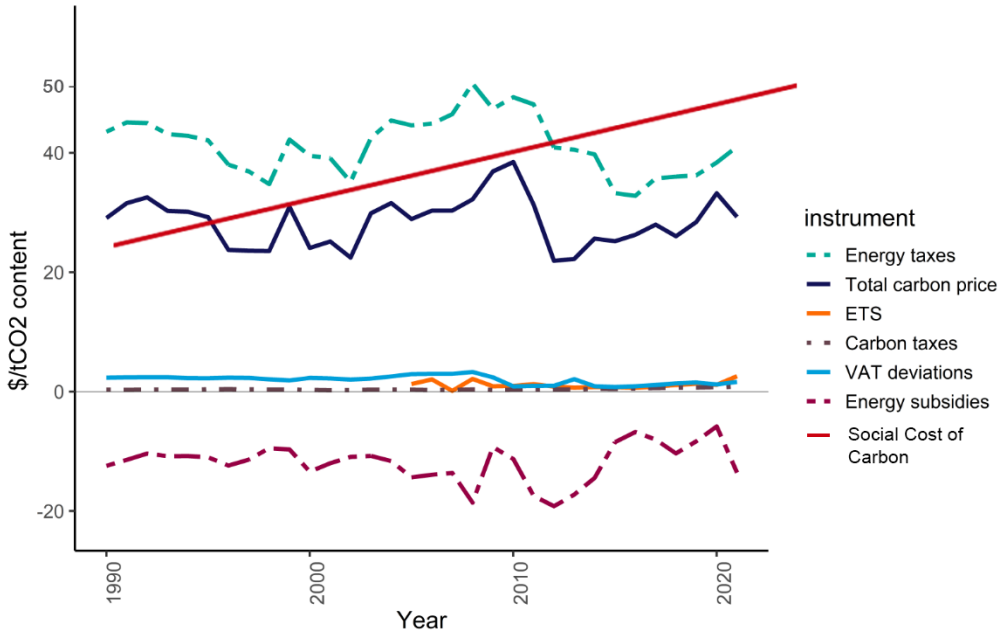
The Report will consider the role of the state in enabling the low-carbon and renewable-energy transition. Advocates of state-led policies call for the state to create markets by being the "investor of first resort." The state can underwrite the scale of investments required to advance the climate agenda. It can coordinate multiple actors around the common goal of decarbonization. And it can ensure that the costs and benefits of a green transition are distributed equitably across society. While the state is being called on to lead the low-carbon transition, it is also entrenched in high-emitting sectors in some countries. In such countries, state ownership comprises more than 50 percent in competitive segments such as generation and less than 20 percent in natural monopoly sectors such as distribution and transmission of electricity (World Bank Business of the State database). Important questions remain over how the state should steer the low-carbon transition, which WDR2024 will discuss.

The Report will first examine the policy landscape for the low-carbon energy transition and the implications for middle-income countries. For decades economists solely focused on the need for carbon pricing to address the negative externality of carbon emissions. Yet a growing literature has instead advocated for subsidies to address the positive externalities of low-carbon technology production and the market failures

that result in their under-provision. These include path dependence; learning by doing in low-carbon innovation; and increasing returns to scale in renewable energy.

At the same time, there are new improvements in measuring the implicit and embedded carbon pricing in different policy instruments, shedding light on the incentives built into the existing legacy landscape that has implicitly and indirectly favored fossil fuels. While direct carbon pricing covers a very small share of total global emissions and at relatively low rates, indirect forms of carbon pricing have widespread use, covering a substantial share of global emissions at significant rates per unit of CO_2 (figure 13; Agnolucci et al. 2022). The Report will benefit from a new database being jointly collected by the World Bank (Development Economics, DEC) and Australian National University which will feature useful information on the policy landscape in G20 countries related to carbon taxes versus subsidies for green technology from 1990 to the present. This Report will evaluate how these new policy incentives are evolving, the policy mix that will be the most conducive to creative destruction, and the implications of these policies for growth in middle-income countries.

Figure 13 Carbon prices are significantly lower than the social cost of carbon, largely due to fossil fuel subsidies



Source: Adapted from Agnolucci et al. 2022.
Note: ETS = Emissions Trading System; VAT = value aded tax. According to the High-Level Commission on Carbon Prices, a range of US$40-80 per ton of CO2e in 2020, rising to US$50-100 per ton of CO2e by 2030 is in line with achieving the core objective of the Paris Agreement. Following the High-Level Commission on Carbon Prices, the current World Bank guidance note (Guidance Note on Shadow Price of Carbon in Economic Analysis) suggests using a low and high estimate of the carbon price starting at US$40 and US$80, respectively, in 2020 and increasing to US$50 and US$100 by 2030, corresponding an increase at an average rate of 2.25 percent per year in real terms between 2020 and 2030. Tthe low estimate, US$40 in 2020(in 2017 prices), is used here. In line with the World Bank methodology, historic rates of increase in the social cost of carbon are assumed to be on the order of 2.25 percent per year. At this rate, the cost per ton CO2eq emitted in 1990 is about US$ 25.6 (in 2021 US$) and US$ 50 in 2022 (in 2021 US$).

The Report will subsequently examine the diffusion of green innovation. The low-carbon transition is a growing source of new jobs, firms, products, trade, and investment flows. In 2021, the number of renewable-energy jobs overtook the number of fossil-fuel jobs for the first time (IEA 2022). In 2022, there

were 1.6 million new online job advertisements related to low-carbon technologies in 34 mainly advanced economies, up 60 percent from 1 million in 2021 (Bastos et al. 2022). Growth has also been rapid in renewable-energy financing, which hit $1.3 trillion in 2022, up 19 percent from 2021 (IRENA and CPI 2023).

The Report will then assess how this technological wave will compare with past waves and whether there will be a renewable-energy productivity J curve. Literature stemming back to Solow (1987) has suggested that technological revolutions are accompanied by initially-slowing productivity growth. For example, the technologies driving the British industrial revolution led to "Engels' Pause," a half-century-long period of capital accumulation, industrial innovation, and wage stagnation (Acemoglu and Robinson 2013; Allen 2009). Brynjolfsson (2022) has shown that this has been the case for Artificial Intelligence. Whether the low-carbon transition will have similar effects remains an open question. Endogenous growth models of the renewable-energy transition, such as that of Acemoglu et al. (2016), assume the transition from fossil fuel-related energy to renewable energy production will result in a dip in growth in the short term because there is a technology "gap" between renewable energy and fossil fuel-related technologies. However, this result would not hold if renewable energy technologies have caught up with fossil fuel-related technologies earlier than expected. An emerging alternative viewpoint has suggested that with renewable energy technologies being cheaper than fossil fuel-related ones and declining in relative cost, the transition may, in fact, accelerate growth through lower-cost energy inputs (Way et al. 2022). An important issue here is the role of mid-carbon fuels such as natural gas—and if intermediate energy sources will block a future transition to renewable energy. Persistence stemming from technological externalities, path dependence, and first-mover problems may hamper the transition.

Finally, the Report will discuss how middle-income countries can contribute to the shift to renewables worldwide by reducing the costs of green intermediates such as solar, wind and battery power. Several middle-income countries—notably, China—are already playing a key role in the manufacturing of low-carbon technologies, while other middle-income countries are increasingly integrated in low-carbon value chains. Countries such as Morocco and Namibia are seeking to become renewable-energy hubs and exporters. A broader question is whether middle-income countries should be incurring the upfront costs of developing new technologies like green hydrogen or whether high-income countries should take the lead, followed by middle-income countries adopting the technology when it is mature. Middle-income countries are also increasingly important consumer markets, playing a key role in the relative demand for high- and low-carbon technologies and goods.

Creative destruction as policy: Competition, Contestability, and Coordination

Part 3 of the Report will draw on lessons from case studies of countries that have designed and implemented specific policies to accelerate growth. The team has commissioned work on European Integration (Bulgaria, Estonia, Poland), the experience of Korea, and lessons from Spain. Other cases focusing on specific aspects of creative destruction will also be integrated. This part of the Report will also discuss how middle-income countries can use insights from Schumpeterian growth theory to initiate and sustain economic growth, which include the following:

1. *Policies that promote growth in technologically advanced countries/sectors do not necessarily promote growth in less advanced countries/sectors* (Aghion and Howitt 2006). There is a powerful reason for this: innovation and implementation are affected differently by the same policies. For example, tighter competition policy in a relatively less advanced country might slow down technology development by local firms discouraged by the threat of foreign entry, whereas in more

advanced countries, firms will be spurred to increase R&D investments when threatened by competition.

2. *A country's growth strategy and economic institutions have to be as dynamic as its firms and entrepreneurs*. Scholars such as Gerschenkron (1962) and Phelps (1966) highlight that not every country needs to innovate at all times. Developing countries can turn what Gerschenkron (1962) terms their "economic backwardness" into an advantage if they can unleash the incentives to imitate the rest of the world. For instance, Acemoglu, Aghion, and Zilibotti (2006) highlight that innovation requires high-skilled entrepreneurs, whereas imitation can be achieved by less-skilled entrepreneurs. The form of technological progress may depend on a country's distance to the global technological frontier and its human capital composition. While the former can directly affect the return to imitation (and thus the opportunity cost of innovation), the latter can directly affect the cost of innovation because it will require more effort for a poorly educated workforce to innovate. The key is to develop requisite institutions that affect timely transitions from imitation to innovation, so that countries are not trapped with structures that no longer have any use.

3. *Contestability and policy coordination are the bedrock of a dynamic economy*. Technological progress (be it in the form of diffusion or discovery) involves better technologies replacing obsolete ones and younger entrepreneurs and new skills replacing unproductive incumbents. In other words, *churn* (turnover among technologies, firms, and workers) is a reality in every aspect of technological progress. The process of economic growth cannot be understood without considering the dynamic implications and political economy of *contestability* (the possibility of incumbents getting challenged by newcomers). Growth strategies also need to recognize the importance of combining and amplifying policies that enhance growth (*policy coordination*). Economic policies that reward firms for their innovative efforts should be combined with the right education policies and policies that encourage high-skilled immigration, which in turn can provide those firms with the much-needed technical staff to undertake the relevant adoption and R&D. A country that undergoes these different stages of growth will need to recognize the importance of policy coordination along its path to the global technological frontier.

Specifically, the Report will examine the driving forces of creative destruction—*Competition*, *Contestability*, and policy *Coordination*—and calibrate policy priorities to suggest ways that middle-income countries can match the dynamics of their firms, entrepreneurs, and capabilities. This section will address three current policy imperatives: (1) keeping markets competitive; (2) making elite echelons contestable; and (3) engineering a steady energy transition.

Keeping markets competitive

Big firms, both private and state-owned, have a central role in investment and innovation. But by exercising varying types of state capture, they put stresses on competition regimes. Global trade, which has been growing since the 1950s, has helped regulators keep domestic markets competitive, but rules-based trade has been under threat since the 2000s. This raises the question: Can middle-income countries regulate private enterprise and grow as quickly as in the past without the spur of productivity-promoting competition regimes in global markets? The answer is No, because competition from domestic policies and global trade/foreign direct investment (FDI) are complements, not substitutes.

Competition and innovation-led growth drive productivity gains that support broad-based economic growth. The expectation of profit motivates the decisions of investors and the behavior of entrepreneurs. Policies, regulations, and the institutions that enforce them in an economy shape these decisions and

behaviors in favor for, or against, development. The Schumpeterian growth framework highlights three salient points:

1. *Competition policies are crucial for strengthening churn (entry, exit, and turnover) among firms*. A massive volume of small firms may suggest insufficient competition rather than a lack of financing. In India, for instance, a glut of small firms is not merely a reflection of frictions that those small firms face, but rather an indication of a lack of competition stemming from larger firms (Akcigit, Alp, and Peters 2021). Pro-competitive policies can make the more innovative firms expand and push out unproductive firms. Outward orientation in global value chains can expand the size of the market for producers, creating space for innovators. The elimination of nontariff barriers to trade and openness to foreign investors creates contestability from outside producers and investors.

2. *Response to competition varies by type of firms.* Firms close to the technological frontier are likely to *escape* competition by innovating (the creative side of the Schumpeterian process); firms far from the technological frontier will lose markups and are likely to be *cleansed* from the market (the destruction side of the Schumpeterian process). In Chile, for instance, firms in the 85th to 95th percentile bracket of the TFP (revenue) distribution experienced a boost in productivity of 31 percent compared to other firms in the relevant market, following intervention by the competition agency. By contrast, firms below the 55th percentile suffered declines in productivity, markups, product quality, and innovation (Sampi, Urrutia, and Vostroknutova 2022). In Mexico, there is evidence of "destruction" in the lower part of the productivity distribution following competition with imports from China, after its entry into the World Trade Organization (WTO) (Iacovone et al. 2013).

3. *Strategic behavior of incumbent firms to preserve their market position stifles creative destruction*. It is essential to ensure that market opportunities do not only support entrenched incumbents.

Policy makers will need to get the "dosage" of competition right. If there is too little competition in markets, incumbent firms will not innovate. Unopposed, large firms that dominate the market can erect barriers to entry to reap monopoly rents, further stifling competition and inclusive growth. If there is too much competition, innovation may become unprofitable, particularly R&D and frontier innovation that require large investments. Entrants may not find start-up attractive, while incumbents may exert their influence to counteract competition or seek rents.

Another aspect is to coordinate competition from freer trade with domestic policies and business practices: stronger contract enforcement, lower barriers to entry, less restrictive access to credit, and labor regulations that do not tax larger firms in excessive proportion. In Vietnam for example, the gains from trade were muted by the entrenchment of large firms and the state (Baccini et al. 2019). In China, removing export quotas allowed the more productive private enterprises to participate in export markets, improving the allocation of resources (Khandelwal et al. 2013). The Report will distill key ideas on trade and development (Atkin and Donaldson 2021) and trade and innovation (Akcigit and Melitz 2021) for policy insights.

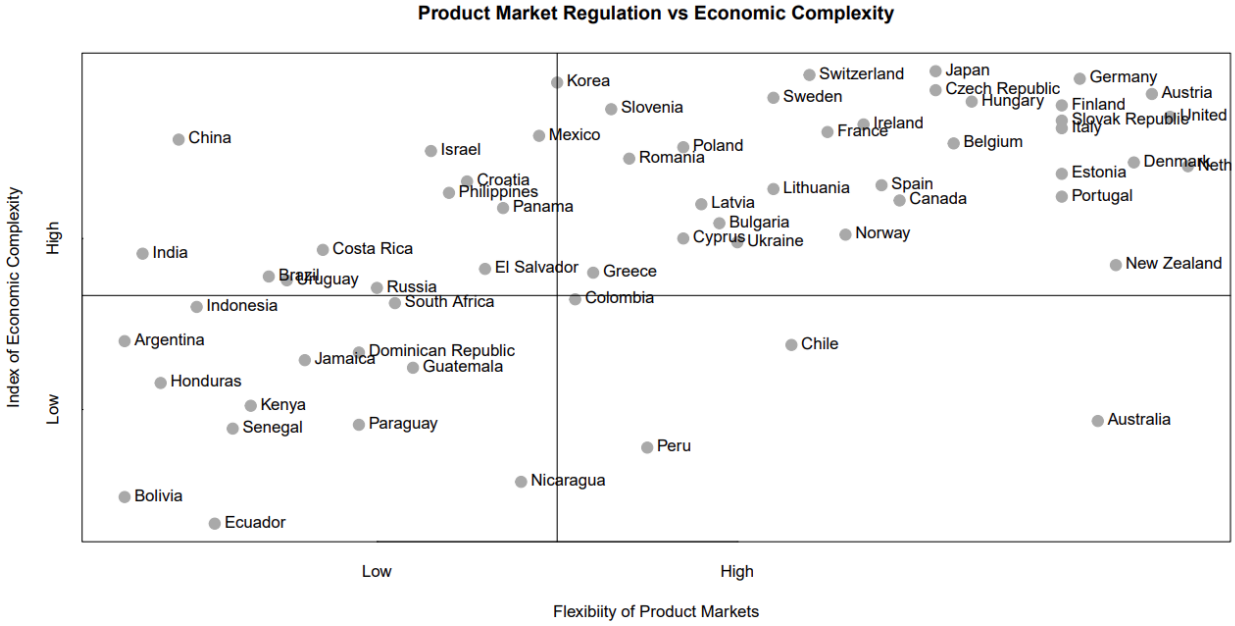
This section of the Report will discuss the importance of synchronizing domestic and international (trade and FDI) policies to enable creative destruction. In particular, it will crystallize an often-opaque idea: *In a context of multiple distortions, as is the case in middle-income countries, isolated attempts at improving one aspect of the economy may magnify the damaging effect of existing distortions, leading to minimal or no gains from the reform*. This is particularly true in the context of openness to international trade and FDI, an area in which many middle-income countries have made progress without yielding the expected results. The Report will argue that for freer trade to pay off, a fair chance should be given to the domestic producers to survive foreign competitors and thrive in the bigger markets. Domestic competition policies will have a

central role to play: they enable churn, so that once the economy enters the big league, it has its best players on the roster.

The WDR team is collaborating with the Market, Competition and Technology team in the Trade, Investment and Competitiveness Global Practice to examine anticompetitive behaviors (from the interaction of players, whether private or public) and restrictive regulations (the rules of the game that affect the way in which agents operate and interact with each other and with the state) that thwart competition. This collaboration will feature novel work showing how competition is weakened through economic cartels or through abuse of market power. The chapter will also provide an assessment of market distortions in middle-income countries based on a metanalysis of country private sector diagnostics (CPSDs) and country economic memoranda (CEMs).

The discussion will also provide a typology to help policy makers identify how to calibrate the "dosage" of competition policy and prescribe specific diagnostics. The typology is based on a 2x2 matrix, as shown in figure 14. The vertical axis ranks countries on an Economic Complexity Index (ECI), produced by the Harvard Growth Lab.[6] The developers of this index emphasize that countries improve their ECI by increasing the number and complexity of the products they successfully export. The chapter will use the ECI as one of several proxies for a countries' proximity to the technological frontier. The horizontal axis plots the flexibility of product markets, as measured by the Product Market Regulations (PMR) database (World Bank 2023a). The chapter will also consider other indices that reflect market structure and potential of strategic predatory behavior, such as the Lerner Index and Herfindahl–Hirschman Index.

Figure 14 Ranking countries according to their product market regulation and economic complexity



Source: WDR 2024 team, drawing on Hausmann et al. 2013 and World Bank 2023a.
Note: The figure illustrates the ranking of countries in terms of their Product Market Regulation Indicator (World Bank 2023a) (horizontal axis) and the rankings based on the Economic Complexity Index (Hausmann et al. 2013) (vertical axis). The threshold to classify countries into low or high flexibility in the product markets range is determined by the average value of the Product Market Indicator in the dataset. Countries whose indicators are above the threshold are grouped as "low flexibility," while countries whose indicators are below the threshold are qualified as "high flexibility." Similarly, the threshold to separate countries into low and high complexity is based on the average value of the Economic Complexity Index among the full sample of countries in the database. Countries whose value are below the threshold are deemed "low complexity," while countries above it are classified as "high complexity."

[6] https://atlas.cid.harvard.edu/rankings.

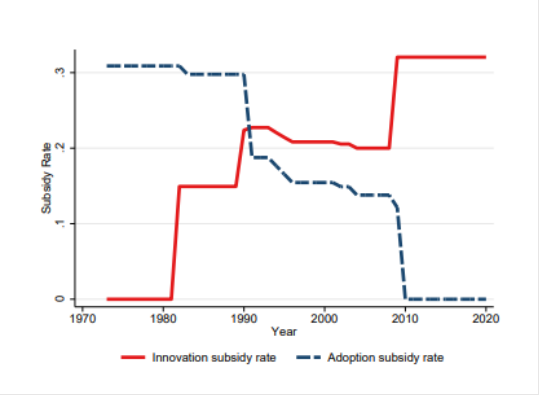
The countries in the top right quadrant of figure 14, many of them high-income, exhibit a combination of flexible product markets (characterized by good regulations) and a high degree of technical sophistication (high complexity). The top left quadrant includes countries with "weak bones" that nevertheless have a complex economy, such as Brazil, China, India, and the Philippines. The priority for these countries would be to finetune their regulations to enable a switch from imitation to innovation. Korea ranks high in economic complexity but could improve the calibration of its competitive institutions. However, Korea has adjusted its incentive regime to accelerate its firms' transition from imitation to innovation (box 4). The bottom right quadrant includes countries that have "strong bones" (that is, a healthy business environment) and that also aim to have a more complex economy, but do not. These countries include Australia, Chile, and New Zealand. The majority of middle-income countries lie in the bottom left quadrant. These countries need to improve capabilities as well as their business environment.

To manage the strategic behavior of incumbent firms in preserving their market position, contestability will need to be introduced. Further, policy complementarities will need to be explored for sectors where scale economies matter and where co-location or clustering of economic activity is needed for innovation to thrive (urban agglomerations or special economic zones).

Box 4 The Korean government recalibrated its incentives to encourage the transition from imitation to innovation

Korea's extraordinarily rapid transition to a high-income economy was buttressed by a bedrock of early land reforms and investments in education, and by postponing immediate gratification through high savings. The World Bank's Long-Term Growth Model highlights that rapid improvements in education per worker followed by capital deepening were key engines of growth, but it was productivity growth that sustained overall economic growth throughout—particularly from 1980 onward (Jeong 2018). A notable feature was that as domestic firms such as Samsung started closing the productivity gap with foreign firms, the gains from imitation via adoption fell, nudging them toward innovation. The Korean government recalibrated its incentives to encourage this transition, transforming its 1973 adoption subsidy to support innovation (Choi and Shim 2022; figure B4.1).

Figure B4.1 Over a fifty-year period, Korea recalibrated its policy support away from imitation and toward innovation



Source: Choi and Shim 2022.

Making elite echelons contestable

Elite bargains have lifted millions from poverty but also increased perceptions of inequality and—perhaps more important—of socioeconomic immobility and unfairness. During the last decade, this has triggered populist discontent in seemingly successful middle-income countries such as Colombia and Peru. Political instability invariably comes with a huge economic cost. This leads to the question: Can middle-income countries create the necessary conditions for growth if socioeconomic mobility is stalling?

The Schumpeterian growth framework highlights three salient points: (1) Talent is the essential ingredient for innovation, and education unlocks the power of talent. Providing equal education opportunities is critical for talented young people to rise in society; (2) Innovation requires technical knowledge; and (3) Discrimination, except talent-based, is detrimental to innovation. A dynamic economy requires a mobile society, and therefore Countries cannot afford to waste talent in their quest for economic growth. However, talent is wasted when access to better opportunities in the education, labor, land, housing, and credit markets depends on the status of one's parents or on where they live. In many cases, choices are tainted by social prejudice. By contrast, countries can fully leverage their pool of talent when equitable opportunities are afforded to all, allowing their top talent to rise to become entrepreneurs, professionals, managers, scientists, and innovators.

To build a mobile society, countries will need to recognize that unequal outcomes are inevitable and go hand in hand with equitable access to opportunities. In a society where individuals compete based on ability and effort rather than social, political, or economic background, not everybody will reap the same rewards; yet these differential rewards are precisely what motivates individuals to invest in human capital, scientists to produce new knowledge, and firms to adopt or develop technologies. The policy imperative is to provide all individuals with equitable opportunities to pursue those rewards, while preserving the incentives for hard work, risk-taking, and innovation. Through these means, the tremendously costly cycle of social immobility can be disrupted.

In the spirit of creative destruction, countries need to create opportunities, skills, and safety nets; phase out (destroy) ineffective arrangements and policies that lead to talent misallocation; and overcome the forces to preserve the status quo that conspire against such phasing out. Creating opportunity calls for removing entry barriers in all markets, thereby sparking the expectation of social mobility that drives human capital investment. Removing barriers to internal migration, providing high-quality local public goods and services, promoting adult literacy, and securing merit-based hiring are examples of opportunity-enhancing policies. Furthermore, countries may benefit from embracing international migration of skilled workers as a source of knowledge spillovers. For disadvantaged groups, targeted programs may be needed to counter the pernicious effects of social prejudice.

Policy makers will need to provide *access* to *quality* opportunities with the maximum possible *effectiveness*. The 3C principles—Competition, Contestability, and Complementarity—can guide the design of the relevant policies.

- **Competition** ensures that individuals have access to *quality* opportunities. It is not sufficient, for instance, for individuals to gain access to jobs if those jobs do not match their skills and reward their talent—and similarly for schools, colleges, neighborhoods, and cities. An important aspect of quality is variety, because not all individuals desire the same type of job, school, or residential location. Examples of competition include: educational systems that feature multiple providers and give students the choice of provider; labor markets where individuals compete for jobs based on talent, so companies can hire the best available talent; cities that build infrastructure and amenities to attract talent; and policies that facilitate the migration of talent, within and across countries. Competition, by its very nature, promotes

innovation. Only when schools, firms, and local governments are allowed to compete can they create new arrangements, products, and services. Competition is, indeed, the great incubator of new things.

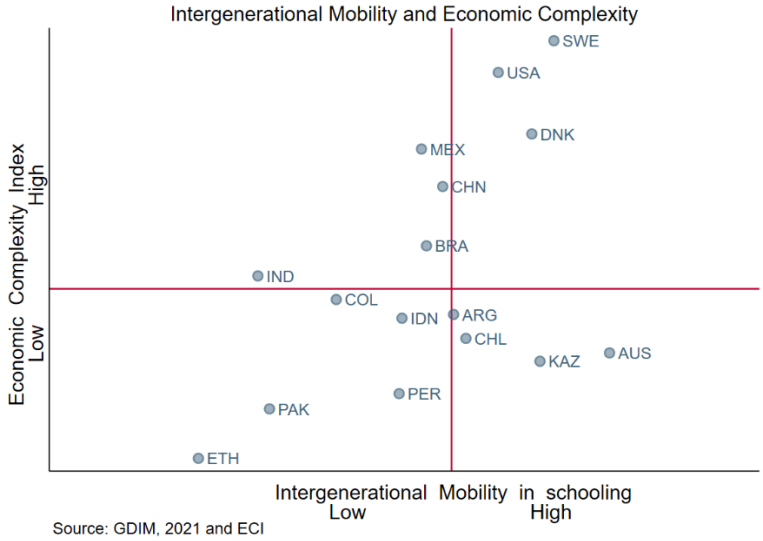
- **Contestability** seeks to share *access* and power—to weaken the barriers that prevent individuals from accessing opportunities in the various markets, distribute the power concentrated with the gatekeepers who erected the barriers in the first place, and dispel the notion of social unfairness. The first step is identifying the ways in which family, location, and social norms or divisions affect access to markets. The second is contesting them through policies that promote access and accountability. For example, financial aid for education based on need or ability can expand access to education, and merit-based hiring can expand access to labor markets. But access to markets is not sufficient, as these markets may feature an entrenched establishment—such as unions or public agencies—whose initial goal may have been to contest elites but have become entrenched and uncontestable over time. Holding them accountable for their performance or power is therefore critical, as is the transparency of information that makes this possible. To be sure, contestability will elicit resistance on the part of those who currently enjoy privileges, but it is a critical first step toward social mobility as well as the perception—and reality—of social fairness.

- **Coordination** maximizes the *effectiveness* of policies by exploiting the synergies between them and by promoting linkages in the economy. For example, expanding access both to education and jobs will enhance social mobility more than expanding access to only one of these markets. Similarly, promoting linkages between universities and industries will facilitate student access to the labor market, while contributing to knowledge exchange and innovation.

The appropriate policies to create opportunities and nurture skills depend on the sophistication and breadth of a country's capabilities. Figure 15 presents another matrix, comparing intergenerational mobility and technical sophistication. The top right quadrant represents countries with high technical sophistication and high social mobility. Countries in the bottom left quadrant (low sophistication and low mobility) will need to first consider ways to foster the development of foundational skills. While still attending to those issues, countries in the bottom right quadrant (low sophistication and high mobility) will need to focus on the relevance of their educational systems to the needs of their labor market. Countries in the top left quadrant (high sophistication and low mobility) will need to focus on removing entry barriers and develop advanced skills—including technical, managerial, and professional—as well as research and development capabilities, which become a priority as countries approach the technological frontier.

In addition to creating opportunities and skills, policy makers will need to develop a safety net to protect or retrain those who lose jobs in the creative destruction process—particularly older and less skilled individuals—while financing this safety net in a sustainable fashion. Phasing out the policies and arrangements that have lost their effectiveness is just as important as creating opportunities, skills, and a safety net. But to do so, policy makers will need to overcome the forces that protect the status quo—the privilege of specific segments of society or the opposition from actors that block change and become entrenched, even if their initial purpose was socially beneficial. Particularly in countries with multiple barriers to social mobility, no single policy will be sufficient; rather, complementary policies will be required to address the multiple barriers and enhance each other's effectiveness.

Figure 15 Ranking countries according to their intergenerational mobility and technical sophistication



Source: WDR 2024 team, drawing on the World Bank, Global Database on Intergenerational Mobility (GDIM) database and the Economic Complexity Index (Hausmann et al. 2013).
Note: Intergenerational mobility increases rightward along the x-axis and economic complexity (a proxy for technological sophistication and capabilities) increases upward along the y-axis. The horizontal and vertical red lines indicate the sample average for the Economic Complexity Index and intergenerational mobility, respectively. Data labels use International Organization for Standardization (ISO) country codes.

Engineering a steady energy transition

Since the Industrial Revolution, economic growth has been based on emissions-intensive activities. Economic benefits have come with growing environmental costs. After economic progress spread to parts of East Asia, South Asia, and Sub-Saharan Africa, climate change became an important part of international development. Over the last decade, as global extreme poverty has fallen below 10 percent and the share of global GDP produced by emerging market economies has neared 50 percent, climate action has become the central focus of multilateral institutions such as the United Nations, the European Union, multilateral development banks, and international financial institutions such as the International Monetary Fund (IMF). The growing pressure on middle-income countries to cut emissions raises the question: *How can middle-income countries become high-income economies without the use of fossil fuels when no economy ever has?*

Clearly, one of the most pressing policy issues for the world economy is the rapid reduction of global carbon emissions. An important aspect of this challenge is the transition to renewable energy sources. Firms and households are choosing between renewable energy versus fossil fuel-related energy options and effectively solving a maximization problem where the market value of renewable-energy sources (less the switching cost) is weighed against the market value of fossil fuel-related energy sources. The solution to this maximization problem for a firm may differ from what is best for society. As a result, economies may end up with an "*innovation paradox*" (Ciera and Maloney 2017) where socially desirable switches and green innovations may not be undertaken by incumbent firms or energy companies. Existing fossil fuel-related technology investments of the incumbents, as well as existing government policies that subsidize fossil fuel-related energies and technologies can hamper the transition to green technologies and renewable energy sources.

Several factors are crucial to determining the direction of technological change:

Market size. Market size is affected by market conditions and government policy. For instance, if fossil fuel-related technologies are cheaper than renewable ones, a laissez-faire economy may lead to more fossil fuel-related innovations, and a transition to renewable technology cannot necessarily be ensured. Hence, governments would need to be actively involved initially. For example, it has taken decades for the renewable-energy technologies of solar photovoltaics and batteries to reach their current stage of development. The economy may experience slower growth until a sufficiently large market size is achieved and renewable technologies catch up with fossil fuel-related technologies. More importantly, the evolution of existing and new technologies is inherently uncertain and there is no guarantee that each technology will be successful. However, the involvement of government may also end up delaying the transition, especially when taxpayers' funds are spent on subsidizing the old fossil fuel-related technology. As in the case of India, if fossil fuels are heavily subsidized, this would reduce the *competition* between renewable and fossil fuel-related energy sources by artificially increasing the market value of fossil fuel-related energy. Removing inefficient fossil fuel subsidies would need to be an integral part of the policy mix to transition from fossil fuel-related energy sources to renewable energy sources. Sectoral policies such as government feed-in tariff programs have been particularly significant in helping to create a market for renewable energy, first in Germany in the 1990s, and then in Italy, Spain, the United States, China, and India by the 2010s. Notably, as technologies matured, feed-in tariffs have been replaced by more cost-efficient procurement methods, such as auctions (for example in Brazil, India, South Africa, and more recently in the Middle East and North Africa and Sub-Saharan Africa) which have achieved the record lowest prices per unit of electricity.

Trade. Another aspect of competition is trade. The imports and exports of low-carbon technologies, which are concentrated in a few firms and a few countries, with a prominent role of China, have created a high degree of dependence. There are growing reasons for reducing dependence on China, but China's importance in production also creates strong incentives for accommodation. Cooperation can bring forward the cost- and price- tipping points for some low-carbon technologies, so the speed of the energy transition is an important policy question. A full-on trade war between the United States, the European Union (EU), and China will have major implications for the energy transition, including impacts on other middle-income countries that would adopt these innovations. The Report will examine these questions on market size and is commissioning papers from relevant academic experts.

Contestability. Sharing access to the incumbent grid and weakening the barriers that prevent innovation can also increase market size, making renewable energy more economical. Some reforms of market structure (i.e., unbundling, wholesale competition), while expected to improve technical and financial performance, may under some circumstances discourage low-carbon options. On the one hand, integrated firms can coordinate the development of the network to accommodate the generation of renewable energy. Moreover, a "single buyer" model allows policy makers to choose from a mix of low-carbon generators in a centralized and smoother way. On the other hand, the advantage of a more competitive structure (over a vertically integrated one) is that new entrants can spot opportunities that incumbents have not exploited; and it is generally more conducive to better investment decisions and innovative outcomes. Accordingly, which countervailing effect dominates is an empirical matter. Furthermore, a well-designed carbon price provides the right incentives to decarbonize the entire economy. It encourages companies to innovate more and emit less. The greater the program's scope, the more effective it can be. Yet the number of countries that have adopted carbon prices and, more importantly, the coverage of such programs, have been limited.

Learning. This is another important reason for the delayed transition. The learning curve to switch has costs in terms of time and effort. Moreover, incumbent firms that operate with fossil fuel-related technology may enjoy cost savings. This might lead to *contestability* problems and the aforementioned innovation paradox.

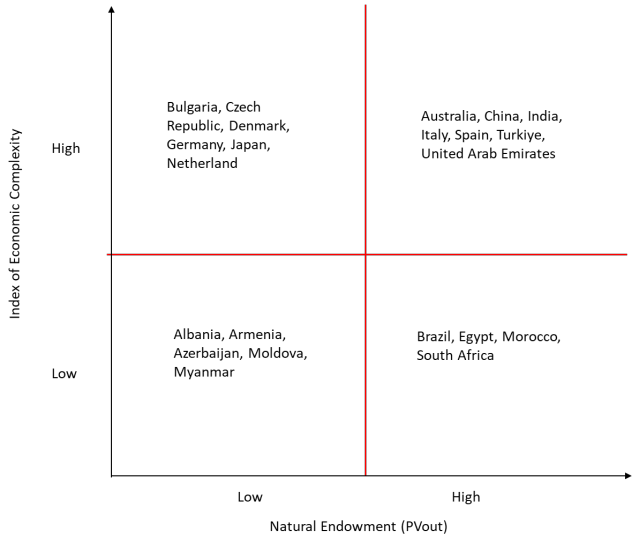
Unless they are compensated for their potential losses, incumbent firms would not be willing to incur the switching cost to renewable technologies.

Managing stranded assets. Assets in the fossil fuel industries are at risk of losing market value due to unanticipated breakthroughs in renewable technology and governments stepping up climate policies in light of the Paris commitments. Stranded assets arise due to uncertainty about the future timing of global warming and substantial investment adjustment costs across sectors and over time. Stranding of assets primarily affects the largest oil, gas, and coal companies that have been responsible for at least one-third of global warming, but it also affects carbon-intensive industries such as steel, aluminum, cement, and plastics. A disorderly transition to the carbon-free economy will lead to stranded assets and legal claims. Institutional investors will need to be aware of these financial risks. Since stranded assets also include countries reliant on coal, the redundancy of some workers' skills could lead to fiscal distress and populist pressures.

Resource endowment. A country's likelihood of switching from fossil fuel-related energy sources depends heavily on its resource endowment. For instance, if solar radiation is not sufficiently powerful, the market value of producing such renewable energy would be low and would not justify the switch for an incumbent firm or energy company. But irradiance is not the full story in measuring the solar potential of a region—it is also influenced by temperature (the hotter it is, the less efficient it is), type of terrain, orography, etc. Taking these factors into account, the solar potential of each location within a country can be computed—the so-called PVout, the ratio between energy obtained (in kilowatt-hours, kWh) and installed power (in terms of kilowatt peak, kWp). This provides an assessment of the efficiency and productivity of solar plants in each region. Hence, a necessary condition for a country to switch to a renewable energy source is to have the potential to create an abundant supply of that energy. On the other hand, countries with rich endowment of fossil fuels may find it more difficult to embrace the energy transition due to the forces of inertia and the uneven playing field from fossil fuel subsidies.

*Coordination***.** Having a strong demand for energy from a technologically advanced production sector would create a strong synergy and favorable market conditions. Therefore, countries can exploit the complementarities between their geographical endowments for renewable-energy supply and the demand from technologically advanced production sectors to coordinate the right market conditions for a successful transition. Countries in the top right quadrant in figure 16 (including India and China) are characterized by the highest potential for solar PV (proxied by the PV-out index) and technological sophistication. Countries in the bottom left quadrant have low endowments and low technological sophistication, limiting their potential for solar PV. Among countries in the top right quadrant, Australia became a natural leader in solar PV, as it is one of the few countries exploiting its potential. Untapped markets with a large solar resource endowment but still low capacity include countries such as the Arab Republic of Egypt, Morocco, and South Africa, which have the potential for growth in their own consumption as well as exports. Finally, among markets such as Germany, Japan, and the Netherlands, despite limited solar endowments, good policies largely contributed to the successful diffusion in installed capacity of solar power.

Figure 16 Ranking countries according to their Economic Complexity and potential for a renewable-energy technology (solar photovoltaics)



Sources: WDR 2024 team, drawing on Hausmann et al. 2013 for the Economic Complexity Index.
Note: PVout = the ratio between energy obtained in kilowatt-hours (kWh) and installed power in terms of kilowatt-peak (kWp).

The WDR 2024 team will work closely with the INF Practice Group in developing this section of the Report.

Consultations and timetable

The WDR will benefit from the guidance and advice of an Academic Advisory Committee (see appendix B) and a High-Level Advisory Committee (see appendix C). The team has consulted with counterparts in Chile, China, India, Italy, Kenya, Mexico, Morocco and the United Kingdom, with further consultations planned in the fall.

The team will also be commissioning a series of background papers and country case studies that will further delve into topics covered by the WDR.

Bank-wide review of the full draft Report is planned for November 2023, and a Board discussion is planned for early 2024. WDR 2024 will be published in the spring of 2024.

The WDR 2024 team

Somik Lall (Lead Economist, DEC) is the Director for the Report. Professor Ufuk Akcigit (University of Chicago) is the Lead Academic, and Joyce Ibrahim (DEC) is the Task Team Leader. The core team comprises Roberto N. Fattal Jaef (DEC), Maria Marta Ferreyra (HED), Kenan Karakulah (DEC), Tatjana Kleineberg (DEC), Mathilde Lebrand (DEC), Dino Merotto (HSP), Forhad Shilpi (DEC), Katherine Stapleton (EEA), Maria Vagliasindi (INF), Ekaterina Vostroknutova (EFI), and Tony Venables (University of Oxford). EFI/FCI and IFC teams will contribute to the Report. Victor Ajayi, Deniz Aycan, Narcisse Cha'ngom, Matteo Gasparini, Karry Jiao, Yonatan Litwin, Theo Naff, Juan Porras, Karthik Sridhar, Gabriel Suarez Obando, Mariana Santi, Berkay Saygin, Adesola Sunmoni, Facundo Ulivarri, and Natalia Valdebenito serve as research analysts. Sandi Loe Lwin is providing administrative support.

The Report is sponsored by the Development Economics Vice-Presidency. Indermit Gill, Senior Vice President and Chief Economist, will oversee its preparation.

Appendix A List of economies by income classification

LOW-INCOME ECONOMIES

Economy	Region	GNI per capita (Atlas method) (US$)
Afghanistan	South Asia	390
Burkina Faso	Sub-Saharan Africa	840
Burundi	Sub-Saharan Africa	240
Central African Republic	Sub-Saharan Africa	480
Chad	Sub-Saharan Africa	690
Congo, Dem. Rep.	Sub-Saharan Africa	590
Eritrea	Sub-Saharan Africa	*
Ethiopia	Sub-Saharan Africa	1,020
Gambia, The	Sub-Saharan Africa	810
Guinea-Bissau	Sub-Saharan Africa	820
Korea, Dem. People's Rep.	East Asia & Pacific	*
Liberia	Sub-Saharan Africa	680
Madagascar	Sub-Saharan Africa	510
Malawi	Sub-Saharan Africa	640
Mali	Sub-Saharan Africa	850
Mozambique	Sub-Saharan Africa	500
Niger	Sub-Saharan Africa	610
Rwanda	Sub-Saharan Africa	930
Sierra Leone	Sub-Saharan Africa	510
Somalia	Sub-Saharan Africa	470
South Sudan	Sub-Saharan Africa	*
Sudan	Sub-Saharan Africa	760
Syrian Arab Republic	Middle East & North Africa	760*
Togo	Sub-Saharan Africa	990
Uganda	Sub-Saharan Africa	930
Yemen, Rep.	Middle East & North Africa	*

* Estimated to be low income (GNI per capita of $1,135 or less).

LOWER MIDDLE-INCOME ECONOMIES

Economy	Region	GNI per capita (Atlas method) (US$)
Algeria	Middle East & North Africa	3,900
Angola	Sub-Saharan Africa	1,900
Bangladesh	South Asia	2,820
Benin	Sub-Saharan Africa	1,400
Bhutan	South Asia	3,040
Bolivia	Latin America & Caribbean	3,450
Cabo Verde	Sub-Saharan Africa	4,140
Cambodia	East Asia & Pacific	1,700
Cameroon	Sub-Saharan Africa	1,660
Comoros	Sub-Saharan Africa	1,610
Congo, Rep.	Sub-Saharan Africa	2,060
Côte d'Ivoire	Sub-Saharan Africa	2,620
Djibouti	Middle East & North Africa	3,180
Egypt, Arab Rep.	Middle East & North Africa	4,100
Eswatini	Sub-Saharan Africa	3,800
Ghana	Sub-Saharan Africa	2,350
Guinea	Sub-Saharan Africa	1,180
Haiti	Latin America & Caribbean	1,610
Honduras	Latin America & Caribbean	2,740
India	South Asia	2,380
Iran, Islamic Rep.	Middle East & North Africa	3,900
Jordan	Middle East & North Africa	4,260
Kenya	Sub-Saharan Africa	2,170
Kiribati	East Asia & Pacific	3,280
Kyrgyz Republic	Europe & Central Asia	1,410
Lao PDR	East Asia & Pacific	2,360
Lebanon	Middle East & North Africa	4,970
Lesotho	Sub-Saharan Africa	1,260
Mauritania	Sub-Saharan Africa	2,160
Micronesia, Fed. Sts.	East Asia & Pacific	4,130
Mongolia	East Asia & Pacific	4,210
Morocco	Middle East & North Africa	3,710*
Myanmar	East Asia & Pacific	1,210
Nepal	South Asia	1,340
Nicaragua	Latin America & Caribbean	2,090
Nigeria	Sub-Saharan Africa	2,140
Pakistan	South Asia	1,580
Papua New Guinea	East Asia & Pacific	2,730

Philippines	East Asia & Pacific	3,950
Samoa	East Asia & Pacific	3,630
São Tomé and Príncipe	Sub-Saharan Africa	2,410
Senegal	Sub-Saharan Africa	1,640
Solomon Islands	East Asia & Pacific	2,220
Sri Lanka	South Asia	3,610
Tajikistan	Europe & Central Asia	1,210
Tanzania	Sub-Saharan Africa	1,200**
Timor-Leste	East Asia & Pacific	1,970
Tunisia	Middle East & North Africa	3,840
Ukraine	Europe & Central Asia	4,270***
Uzbekistan	Europe & Central Asia	2,190
Vanuatu	East Asia & Pacific	3,560
Vietnam	East Asia & Pacific	4,010
Zambia	Sub-Saharan Africa	1,170
Zimbabwe	Sub-Saharan Africa	1,500

* Includes Western Sahara.
** Covers mainland Tanzania only.
*** Based on data from official statistics of Ukraine and Russian Federation as well as the United Nations; by relying on these data, the World Bank does not intend to make any judgment on the legal or other status of the territories concerned or to prejudice the final determination of the parties' claims.

UPPER MIDDLE-INCOME ECONOMIES

Economy	Region	GNI per capita (Atlas method) (US$)
Albania	Europe & Central Asia	6,770
Argentina	Latin America & Caribbean	11,620
Armenia	Europe & Central Asia	5,960
Azerbaijan	Europe & Central Asia	5,630
Belarus	Europe & Central Asia	7,240
Belize	Latin America & Caribbean	6,800
Bosnia and Herzegovina	Europe & Central Asia	7,660
Botswana	Sub-Saharan Africa	7,350
Brazil	Latin America & Caribbean	8,140
Bulgaria	Europe & Central Asia	13,250
China	East Asia & Pacific	12,850
Colombia	Latin America & Caribbean	6,510
Costa Rica	Latin America & Caribbean	12,670
Cuba	Latin America & Caribbean	*
Dominica	Latin America & Caribbean	8,460
Dominican Republic	Latin America & Caribbean	9,050

Ecuador	Latin America & Caribbean	6,310
El Salvador	Latin America & Caribbean	4,720
Equatorial Guinea	Sub-Saharan Africa	5,320
Fiji	East Asia & Pacific	5,270
Gabon	Sub-Saharan Africa	7,540
Georgia	Europe & Central Asia	5,620**
Grenada	Latin America & Caribbean	9,340
Guatemala	Latin America & Caribbean	5,350
Indonesia	East Asia & Pacific	4,580
Iraq	Middle East & North Africa	5,270
Jamaica	Latin America & Caribbean	5,670
Kazakhstan	Europe & Central Asia	9,470
Kosovo	Europe & Central Asia	5,590
Libya	Middle East & North Africa	7,260
Malaysia	East Asia & Pacific	11,780
Maldives	South Asia	11,030
Marshall Islands	East Asia & Pacific	7,920
Mauritius	Sub-Saharan Africa	10,760
Mexico	Latin America & Caribbean	10,410
Moldova	Europe & Central Asia	5,340***
Montenegro	Europe & Central Asia	10,400
Namibia	Sub-Saharan Africa	4,880
North Macedonia	Europe & Central Asia	6,640
Palau	East Asia & Pacific	12,790
Paraguay	Latin America & Caribbean	5,920
Peru	Latin America & Caribbean	6,770
Russian Federation	Europe & Central Asia	12,830****
Serbia	Europe & Central Asia	9,140
South Africa	Sub-Saharan Africa	6,780
St. Lucia	Latin America & Caribbean	11,160
St. Vincent and the Grenadines	Latin America & Caribbean	9,110
Suriname	Latin America & Caribbean	4,880
Thailand	East Asia & Pacific	7,230
Tonga	East Asia & Pacific	4,930
Türkiye	Europe & Central Asia	10,590
Turkmenistan	Europe & Central Asia	*
Tuvalu	East Asia & Pacific	7,210
West Bank and Gaza	Middle East & North Africa	4,610

* Estimated to be upper middle income (GNI per capita of $4,466 to $13,845).
** Excludes Abkhazia and South Ossetia.
*** Excludes Transnistria.

**** Based on data from official statistics of Ukraine and Russian Federation as well as the United Nations; by relying on these data, the World Bank does not intend to make any judgment on the legal or other status of the territories concerned or to prejudice the final determination of the parties' claims.

HIGH-INCOME ECONOMIES

Economy	Region	GNI per capita (Atlas method) (US$)
American Samoa	East Asia & Pacific	*
Andorra	Europe & Central Asia	*
Antigua and Barbuda	Latin America & Caribbean	18,280
Aruba	Latin America & Caribbean	29,460
Australia	East Asia & Pacific	60,430
Austria	Europe & Central Asia	56,140
Bahamas, The	Latin America & Caribbean	31,530
Bahrain	Middle East & North Africa	27,180
Barbados	Latin America & Caribbean	19,350
Belgium	Europe & Central Asia	48,700
Bermuda	North America	125,240
British Virgin Islands	Latin America & Caribbean	*
Brunei Darussalam	East Asia & Pacific	31,410
Canada	North America	52,960
Cayman Islands	Latin America & Caribbean	65,190
Channel Islands	Europe & Central Asia	*
Chile	Latin America & Caribbean	15,360
Croatia	Europe & Central Asia	19,470
Curaçao	Latin America & Caribbean	18,430
Cyprus	Europe & Central Asia	30,540**
Czechia	Europe & Central Asia	26,590
Denmark	Europe & Central Asia	73,200
Estonia	Europe & Central Asia	27,640
Faroe Islands	Europe & Central Asia	69,560*
Finland	Europe & Central Asia	54,360
France	Europe & Central Asia	45,860
French Polynesia	East Asia & Pacific	*
Germany	Europe & Central Asia	53,390
Gibraltar	Europe & Central Asia	*
Greece	Europe & Central Asia	21,740
Greenland	Europe & Central Asia	*
Guam	East Asia & Pacific	*
Guyana	Latin America & Caribbean	15,050
Hong Kong SAR, China	East Asia & Pacific	54,370
Hungary	Europe & Central Asia	19,010

Iceland	Europe & Central Asia	68,220
Ireland	Europe & Central Asia	81,070
Isle of Man	Europe & Central Asia	79,300
Israel	Middle East & North Africa	54,650
Italy	Europe & Central Asia	37,700
Japan	East Asia & Pacific	42,440
Korea, Rep.	East Asia & Pacific	35,990
Kuwait	Middle East & North Africa	39,570
Latvia	Europe & Central Asia	21,500
Liechtenstein	Europe & Central Asia	*
Lithuania	Europe & Central Asia	23,690
Luxembourg	Europe & Central Asia	91,200
Macao SAR, China	East Asia & Pacific	44,980
Malta	Middle East & North Africa	33,550
Monaco	Europe & Central Asia	*
Nauru	East Asia & Pacific	17,870
Netherlands	Europe & Central Asia	57,430
New Caledonia	East Asia & Pacific	*
New Zealand	East Asia & Pacific	48,460
Northern Mariana Islands	East Asia & Pacific	*
Norway	Europe & Central Asia	95,510
Oman	Middle East & North Africa	20,150
Panama	Latin America & Caribbean	16,750
Poland	Europe & Central Asia	18,350
Portugal	Europe & Central Asia	25,800
Puerto Rico	Latin America & Caribbean	24,560
Qatar	Middle East & North Africa	70,500
Romania	Europe & Central Asia	15,660
San Marino	Europe & Central Asia	47,120*
Saudi Arabia	Middle East & North Africa	27,590
Seychelles	Sub-Saharan Africa	14,340
Singapore	East Asia & Pacific	67,200
Sint Maarten (Dutch part)	Latin America & Caribbean	31,500*
Slovak Republic	Europe & Central Asia	22,060
Slovenia	Europe & Central Asia	30,600
Spain	Europe & Central Asia	31,680
St. Kitts and Nevis	Latin America & Caribbean	19,730
St. Martin (French part)	Latin America & Caribbean	*
Sweden	Europe & Central Asia	62,990
Switzerland	Europe & Central Asia	89,450
Taiwan, China	East Asia & Pacific	
Trinidad and Tobago	Latin America & Caribbean	16,330
Turks and Caicos Islands	Latin America & Caribbean	24,160
United Arab Emirates	Middle East & North Africa	48,950

United Kingdom	Europe & Central Asia	48,890
United States	North America	76,370
Uruguay	Latin America & Caribbean	18,030
Virgin Islands (U.S.)	Latin America & Caribbean	*

* Estimated to be high income (GNI per capita of $13,845 or more).
** Data are for the area controlled by the government of Cyprus.

Source: Data are based on the World Bank Group's country income classifications as of July 1, 2023. https://blogs.worldbank.org/opendata/new-world-bank-group-country-classifications-income-level-fy24.

Appendix B Academic Advisory Committee

Name	Title	Institution
Daron Acemoglu	Elizabeth and James Killian Professor of Economics	Massachusetts Institute of Technology
Philippe Aghion	Professor of Economics	London School of Economics and Political Science
Gerardo Esquivel	Professor of Economics	El Colegio de México
Ricardo Hausmann	Rafik Hariri Professor of the Practice of International Political Economy	Harvard Kennedy School
Robert Pindyck	Bank of Tokyo-Mitsubishi Ltd. Professor in Finance and Economics and Professor of Applied Economics	MIT Sloan School of Management
Danny Quah	Li Ka Shing Professor in Economics	Lee Kuan Yew School of Public Policy, National University of Singapore
Jahen F. Rezki	Professor of Economics	Universitas Indonesia
Carlos Urzua	Professor of Economics	Tecnológico de Monterrey
Qiyuan Xu	Deputy Director	Institute of World Economy and Politics at Chinese Academy of Social Sciences (CASS)
Fabrizio Zilibotti	Tuntex Professor of International and Development Economics	Yale University

Appendix C High-Level Advisory Committee

Name	Title
Masood Ahmed	President, Center for Global Development
Ann Bernstein	Executive Director, Centre for Development and Enterprise, South Africa
Poonam Gupta	Director General, National Council of Applied Economic Research (NCAER), and member of the Economic Advisory Council to the Prime Minister of India
Homi Kharas	Senior Fellow - Global Economy and Development, Center for Sustainable Development, Brookings Institute
Mario Marcel Cullell	Minister of Finance, Chile
Mustapha Nabli	Former Central Bank Governor and former Minister of Planning and Economic Development, Tunisia
Njuguna Ndung'u	Minister of Finance, Kenya
José Antonio Ocampo	Former Minister of Finance, Colombia
Normunds Popens	Acting Director General, Directorate-General for Regional and Urban Policy (DG REGIO), European Commission
Omar Razzaz	Former Prime Minister and former Minister of Education, Jordan

References

Acemoglu, Daron, Philippe Aghion, and Fabrizio Zilibotti. 2006. "Distance to Frontier, Selection, and Economic Growth." *Journal of the European Economic Association* 4 (1): 37–74.

Acemoglu, Daron, Ufuk Akcigit, Douglas Hanley, and William Kerr. 2016. "Transition to Clean Technology." *Journal of Political Economy* 124 (1): 52–104.

Acemoglu, Daron, and James A. Robinson. 2013. "Economics versus Politics: Pitfalls of Policy Advice." *Journal of Economic Perspectives* 27 (2): 173–92.

Aghion, Philippe, Céline Antonin, and Simon Bunel. 2021. *The Power of Creative Destruction: Economic Upheaval and the Wealth of Nations.* Cambridge, MA: Harvard University Press.

Aghion, Philippe, Leah Platt Boustan, Caroline Minter Hoxby, and Jérôme Vandenbussche. 2009. "The Causal Impact of Education on Economic Growth: Evidence from the U.S." Department of Economics, Harvard University (March). Unpublished.

Aghion, Philippe, Antoine Dechezleprêtre, David Hémous, Ralf Martin, and John Van Reenen. 2016. "Carbon Taxes, Path Dependency, and Directed Technical Change: Evidence from the Auto Industry." *Journal of Political Economy* 124 (1).

Aghion, Philippe, and Peter Howitt. 1992. "A Model of Growth through Creative Destruction." *Econometrica: Journal of the Econometric Society* 60 (2): 323–51.

Aghion, Philippe and Peter Howitt. 2006. "Joseph Schumpeter Lecture. Appropriate Growth Policy: A Unifying Framework." *Journal of the European Economic Association* 4 (2-3): 269–314.

Agnolucci, Paolo, Carolyn Fischer, Dirk Heine, Mariza Montes de Oca León, Kathleen Patroni, Joseph Pryor, and Stéphane Hallegatte. 2022. "Measuring Total Carbon Pricing." World Bank, Washington, DC.

Akcigit, Ufuk, Harun Alp, and Michael Peters. 2021. "Lack of Selection and Limits to Delegation: Firm Dynamics in Developing Countries." American Economic Review, 111 (1): 231-75.

Akcigit, Ufuk, and Sina T. Ates. 2021. "Ten Facts on Declining Business Dynamism and Lessons from Endogenous Growth Theory." *American Economic Journal: Macroeconomics* 13 (1): 257–98.

Akcigit, Ufuk, and Marc Melitz. 2021. "International Trade and Innovation." NBER Working Papers 29611, National Bureau of Economic Research.

Atkin, David G. and Donaldson, Dave 2021. The Role of Trade in Economic Development (September 2021). NBER Working Paper No. w29314. National Bureau of Economic Research, Inc.

Bachas, Pierre Jean, Roberto N. Fattal Jaef, and Anders Jensen. 2018. "Size-Dependent Tax Enforcement and Compliance: Global Evidence and Aggregate Implications." World Bank Policy Research Working Paper 8363, World Bank, Washington, DC.

Bacolod, Marigee, Jorge De la Roca, and María Marta Ferreyra. 2021. "In Search of Better Opportunities: Sorting and Agglomeration Effects among Young College Graduates in Colombia." *Regional Science and Urban Economics* 87 (March): 103656.

Bandiera, Oriana, Ahmed Elsayed, Anton Heil, and Andrea Smurra. 2022. "Economic Development and the Organization of Labour: Evidence from the Jobs of the World Project." G2LM LIC Working Paper No. 69, Gender, Growth and Labour Markets in Low Income Countries Programme.

Bell, Alex, Raj Chetty, Xavier Jaravel, Neviana Petkova, and John Van Reenen. 2019. "Who Becomes an Inventor in America? The Importance of Exposure to Innovation." *Quarterly Journal of Economics* 134 (2): 647–713.

Bloomberg NEF. 2023. "The 10 Big Things to Watch across World's Energy Markets in 2023." BloombergNEF, January 4, 2023. https://www.bloomberg.com/professional/blog/the-10-big-things-to-watch-across-worlds-energy-markets-in-2023/.

Brandt, Loren, John Litwack, Elitza Mileva, Luhang Wang, Yifan Zhang, and Luan Zhao. 2020. "China's Productivity Slowdown and Future Growth Potential." World Bank Policy Research Working Paper 9298, World Bank, Washington, DC.

Bruhn, Miriam, and David McKenzie. 2014. "Entry Regulation and the Formalization of Microenterprises in Developing Countries." *World Bank Research Observer* 29 (2): 186–201
Bryan, Gharad, and Melanie Morten. 2019. "The Aggregate Productivity Effects of Internal Migration: Evidence from Indonesia." *Journal of Political Economy* 127 (5): 2229–68.
Brynjolfsson, Erik. 2022. "The Turing Trap: The Promise & Peril of Human-like Artificial Intelligence." *Daedalus* 151 (2): 272–87.
Chiplunkar, Gaurav, and Pinelopi K. Goldberg. 2021. "Aggregate Implications of Barriers to Female Entrepreneurship." NBER Working Paper 28486, National Bureau of Economic Research, Cambridge, MA.
Choi, Jaedo and Shim, Younghun, 2022. Technology Adoption and Late Industrialization. Available at http://dx.doi.org/10.2139/ssrn.4308957.
Cirera, Xavier, and William F. Maloney. 2017. *The Innovation Paradox: Developing-Country Capabilities and the Unrealized Promise of Technological Catch-Up*. Washington, DC: World Bank.
Cusolito, Ana Paula, and William F. Maloney. 2018. *Productivity Revisited: Shifting Paradigms in Analysis and Policy.* Washington, DC: World Bank.
Gerschenkron, Alexander. 1962. *Economic Backwardness in Historical Perspective: A Book of Essays,* vol. 584. Cambridge, MA: Belknap Press of Harvard University Press.
Gill, Indermit Singh, and Homi Kharas. 2007. *An East Asian Renaissance: Ideas for Economic Growth*. Washington, DC: World Bank.
Gill, Indermit S. and Kharas, Homi, 2015. The Middle-Income Trap Turns Ten. World Bank Policy Research Working Paper No. 7403, World Bank.
Gill, Indermit Singh, and Martin Raiser. 2012. *Golden Growth: Restoring the Lustre of the European Economic Model*. Washington, DC: World Bank.
Hausmann, Ricardo, Cesar A. Hidalgo, Sebastian Bustos, Michele Coscia, Alexander Simoes, and Muhammed A. Yildirim. 2013. *The Atlas of Economic Complexity*. Cambridge, MA: MIT Press.
Hsieh, Chang-Tai, Erik Hurst, Charles I. Jones, and Peter J. Klenow. 2019. "The Allocation of Talent and US Economic Growth." *Econometrica* 87 (5): 1439–74.
Hsieh, Chang-Tai, and Peter J. Klenow. 2014. "The Life Cycle of Plants in India and Mexico." *Quarterly Journal of Economics* 129 (3): 1035–84.
IEA (International Energy Agency). 2022. *World Energy Employment*. Main Report (September). Paris: IEA. https://www.iea.org/reports/world-energy-employment.
IRENA and CPI (International Renewable Energy Agency and Climate Policy Initiative). 2023. *Global Landscape of Renewable Energy Finance, 2023*. Abu Dhabi: IRENA. https://www.irena.org/Publications/2023/Feb/Global-landscape-of-renewable-energy-finance-2023.
Jones, Charles. 2016. "The Facts of Economic Growth." Chapter 1 in *Handbook of Macroeconomics,* Volume 2A, edited by John B. Taylor and Harold Uhlig, 3–69. Elsevier.
Kahn, Matthew E., and Somik Lall. 2022. "Will the Developing World's Growing Middle- Class Support Low-Carbon Policies?" NBER Working Paper 30238, National Bureau of Economic Research, Cambridge, MA.
Kharas, Homi, and Indermit Gill. 2021. "Growth Strategies to Avoid the Middle-Income Trap." In *Trapped in the Middle? Developmental Challenges for Middle-Income Countries*, edited by José Antonio Alonso and José Antonio Ocampo. Oxford, United Kingdom: Initiative for Policy Dialogue.
Kose, M. Ayhan, and Franziska Ohnsorge, eds. 2023. *Falling Long-Term Growth Prospects: Trends, Expectations, and Policies*. Washington, DC: World Bank.
Lange, Glenn-Marie, Quentin Wodon, and Kevin Carey, eds. 2018. *The Changing Wealth of Nations 2018: Building a Sustainable Future.* Washington, DC: World Bank Group.
Lazard. 2021. "Levelized Cost of Energy, Levelized Cost of Storage, and Levelized Cost of Hydrogen 2021." *Insights*, October 28, 2021. https://www.lazard.com/perspective/levelized-cost-of-energy-levelized-cost-of-storage-and-levelized-cost-of-hydrogen/

Loayza, Norman, and Steven Pennings. 2022. *The Long-Term Growth Model: Fundamentals, Extensions, and Applications*. Washington, DC: World Bank Group.
Lucas Jr., Robert E. 1988. "On the Mechanics of Economic Development." *Journal of Monetary Economics* 22 (1): 3–42.
Lucas Jr., Robert E. 1993. "Making a Miracle." *Econometrica*, 61 (2): 251–72.
Nayyar, Gaurav, Mary Hallward-Driemeier, and Elwyn Davies. 2021. *At Your Service?: The Promise of Services-Led Development*. Washington, DC: World Bank.
Phelps, Edmund S. 1966. "Models of Technical Progress and the Golden Rule of Research," *Review of Economic Studies* 33 (2): 133–45.
Prato, Marta. 2022. "The Global Race for Talent: Brain Drain, Knowledge Transfer, and Growth." SSRN Abstract 4287268 (November), Social Science Research Network, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4287268.
Rijkers, Bob, Leila Baghdadi, and Gael Raballand. 2017. "Political Connections and Tariff Evasion, Evidence from Tunisia." *World Bank Economic Review* 31 (2): 459–82.
Romer, Paul M. 1990. "Endogenous Technological Change." *Journal of Political Economy* 98 (5), Part 2: S71–S102.
Sampi, James, Ana Urrutia, and Ekaterina Vostroknutova. 2022. Antitrust Enforcement, Markups, and Productivity: Evidence for selected South America countries. World Bank
Schiffbauer, Marc, James Sampi, and Javier Coronado. 2022. "Competition and Productivity: Evidence from Peruvian Municipalities." *Review of Economics and Statistics* 1–45. https://doi.org/10.1162/rest_a_01257.
Schumpeter, Joseph. 1942. *Capitalism, Socialism, and Democracy.* Harper & Brothers.
Shukla, Soumitra. 2022. "Making the Elite: Top Jobs, Disparities, and Solutions." International Finance Discussion Paper 1331r1, Board of Governors of the Federal Reserve System, Washington, DC.
Solow, John L. 1987. "The Capital-Energy Complementarity Debate Revisited." *American Economic Review* 77 (4): 605–14.
Song, Zheng, Kjetil Storesletten, and Fabrizio Zilibotti. 2011. "Growing Like China." *American Economic Review* 101 (1): 196–233.
Spence, Michael. 2021. "Some Thoughts on the Washington Consensus and Subsequent Global Development Experience." *Journal of Economic Perspectives* 35(3, Summer): 67–82.
van der Ploeg, Frederick, and Anthony J. Venables. 2022. "Radical Climate Policies." Policy Research Working Paper 10212, World Bank, Washington, DC.
van der Weide, Roy, Christoph Lakner, Daniel Gerszon Mahler, Ambar Narayan, and Rakesh Ramasubbaiah. 2021. "Intergenerational Mobility around the World." Policy Research Working Paper 9707, World Bank, Washington, DC.
Way, Rupert, Matthew C. Ives, Penny Mealy, and J. Doyne Farmer. 2022. "Empirically Grounded Technology Forecasts and the Energy Transition." *Joule* 6 (9): 2057–82.
World Bank. 1979. *World Development Report 1979*. Oxford University Press.
World Bank. 1982. *World Development Report 1982*. Oxford University Press.
World Bank. 2014. *The Unfinished Revolution: Bringing Opportunity, Good Jobs and Greater Wealth to All Tunisians*. Development Policy Review. Washington, DC: World Bank. http://documents.worldbank.org/curated/en/658461468312323813/The-unfinished-revolution-bringing-opportunity-good-jobs-and-greater-wealth-to-all-Tunisians
World Bank. 2017. *World Development Report 2017: Governance and the Law*. Washington, DC: World Bank.
World Bank. 2018a. *World Development Report 2018: Learning to Realize Educations Promise*. Washington, DC: World Bank.
World Bank. 2018b. *Moving for Prosperity: Global Migration and Labor Markets*. Policy Research Report. Washington, DC: World Bank. http://hdl.handle.net/10986/29806.
World Bank. 2018c. *World Development Report 2019: The Changing Nature of Work*. Washington, DC: World Bank.

World Bank. 2022a. *Fragility, Conflict, and Violence in Middle-Income Countries*. Washington, DC: World Bank.
World Bank. 2022b. *World Development Report 2022: Finance for an Equitable Recovery.* Washington, DC: World Bank.
World Bank. 2023a. "Markets and Competition OECD-WBG PMR Indicators for Selected Non-OECD Countries (2013–2018)." Last update January 19, 2023. https://datacatalog.worldbank.org/search/dataset/0038692.
World Bank. 2023b. *World Development Report 2023: Migrants, Refugees, and Societies.* Washington, DC: World Bank.