8

Rewarding Merit

Key messages

- Middle-income countries can allocate talent and human capital more efficiently by opening up education, employment, and business opportunities to all who have talent and display acquired ability. Economic development policies should not target an ideal income distribution but pay attention to enhancing mobility.

- Middle-income countries should avoid solely targeting firms for support by size. Instead, they could also assess the value that firms add to the economy through jobs, exports, technology infusion, and innovation. Countries’ policies should target support to those firms that display the most potential for growth, while letting go of unproductive firms, modernizing organizational models to manage firms, and connecting entrepreneurs with money (financing opportunities), mentors, and markets.

- Middle-income countries will need to adopt policies that support the diffusion of lower-carbon energy technologies, incentivize the efficient use of energy, and consider the social and ecological costs of greenhouse gas emissions. They should consider all options for decoupling their growing economies from the growth of these emissions.

Moving forward by promoting merit activities

To strengthen the forces of creation, middle-income countries will need to shift their policies and institutions toward promoting merit activities—that is, those with positive effects on general well-being and that aid in the efficient use of talent, capital, and energy.

Specifically, middle-income countries should put three considerations at the center of economic policy making: the economic and social mobility of people; the value added by firms; and the greenhouse gases (GHGs) emitted by the economy.

- The economic and social mobility of people. Governments should adopt policies that will enable an economy to allocate talent and human capital more efficiently—in particular, by opening up education, employment, and business opportunities to all those who have talent and display acquired ability. Because advancing the sophistication of an economy can increase income inequality, economic development policies should not target an ideal income distribution. Instead, by rewarding talent and effort, policies can generate both higher social
and economic mobility, which leads to faster growth. However, perceptions of mobility matter. When perceptions of the opportunities for future mobility are high, social tolerance of inequality is also high, and vice versa.

- **The value added by firms.** A similar principle applies to firms. Dynamic, productive young firms should be able to expand, and less productive firms should be able to contract and exit, thereby enhancing value added across the economy through efficient resource utilization. Policies should not target firms for support by size, but instead should assess the value that firms add to the economy through jobs, exports, technology infusion, and innovation.

- **The GHG emissions of an economy.** A similar principle also applies to energy. Government policies should aid in the diffusion of lower-carbon energy technologies, encourage the efficient use of energy, and consider the social and ecological costs of GHG emissions. Because today’s middle-income countries account for two-thirds of global GHG emissions and all new emissions growth, they will need to consider all options to decouple their growing economies from higher GHG emissions.

### The economic and social mobility of people

The introduction of global technologies must go hand in hand with a search for the technical workers and specialized professionals needed for firms to adopt technologies, along with competent managers to run firms. Meanwhile, more engineers are needed to build and maintain infrastructure, teachers to educate students, doctors to treat patients, and highly qualified men and women to run governments. Chapter 5 highlighted that middle-income countries face two related challenges. First, talent is scarce in those countries because they do not accumulate human capital. Second, middle-income countries are not as effective as high-income countries in allocating talent to tasks. Middle-income countries must then focus on improving social mobility—going beyond narrowly focusing on inequality. In doing so, these countries will need to revise how they reward talent by upgrading their talent pool, selecting efficient learners, expanding occupation choices and rewards, and nurturing scientific inquiry and enhancing research capabilities, and installing a socially responsible safety net to protect those who may lose their livelihoods in the creative destruction process.

#### Upgrading the talent pool

**Support high-quality secondary and higher education**

Countries that transitioned from middle- to high-income status in recent decades sought to accumulate human capital, which begins with developing foundational skills. As a result, their upper-secondary enrollment and graduation rates, as well as their tertiary education enrollment rates, steadily increased (figure 8.1). Countries that did not transition to high-income status have attained levels of tertiary education that are close to the levels achieved by countries at the time of their transition, but enrollment in and completion of upper-secondary education have lagged for a wider swath of the population. For significant shares of the population in countries that have not transitioned to high-income status, education stops in the early teen years, or earlier, especially for girls and members of minorities. Unless these countries secure foundational skills, their talent pipeline will remain weak.

How should countries allocate education spending between foundational and advanced skills? In setting priorities, countries may want to consider the principle of progressive...
universalism, which advocates investing progressively in higher education as quality for all is reached at lower educational levels. The “universal” component advocates high-quality education for all. The “progressive” component recognizes that efforts and resources are limited and prioritizes the early years of a child’s life, as well as outreach to disadvantaged students who face the greatest learning hurdles. The Republic of Korea adopted this approach. In the 1950s, it enforced compulsory education and devoted nearly 80 percent of its education budget to primary education, thereby increasing enrollment rates from about 40 percent to 90 percent in 10 years. Korea then shifted its efforts and spending to secondary education and attained equally rapid success. Only later did it invest substantially in tertiary education. Throughout this period, Korea focused not only on enrollment but also on learning—for all. Because its efforts to improve foundational skills were focused and deliberate, Korea was able to pivot to advanced skills in a relatively short period of time. An emphasis on foundational skills for all was key to the success of school reforms in other countries as well (box 8.1).

Strengthening foundational skills does not always require more money, but it does require efficient spending. In fact, countries that spend more do not necessarily have better learning outcomes.

Figure 8.1 Middle-income countries that transitioned to high-income status first focused on foundational skills


Note: Solid lines show averages for countries that were middle-income countries in the early 1990s and transitioned to high-income status any time before 2019 (23 countries for enrollment rates and 15 countries for completion rates). Dashed lines indicate the current average for middle-income countries that have not yet transitioned. Gross enrollment rate is the ratio of total enrollment, regardless of age, to the population of the official age group for the education level. Completion rate is the percentage of individuals three to five years older than the theoretical age of completion of the level’s last grade who have completed the level’s last grade. For countries that have transitioned, data are for 1981–2022 for enrollment rates and 1990–2021 for completion rates. The number of years since graduation is computed as the calendar year minus transition year. For countries not yet transitioned, data are for the most recent year available. HICs = high-income countries; MICs = middle-income countries.
Box 8.1 Developing foundational skills: Learning from Finland and Chile

The successful reforms implemented by countries that graduated from middle- to high-income status have shared three elements. First, they broadened access to foundational skills to create a large, deep talent pool of high school graduates. Second, they relied on student assessments to collect information on learning and evaluate progress toward achieving policy goals. Third, education reforms were part of a deliberate long-term growth strategy.

Finland. In the early 1970s, Finland replaced its two-track school system (students were divided into two tracks, general secondary and vocational, after the first four years of education) with a nine-year comprehensive school system (all students followed the same national curriculum until age 16 and then chose a track). In addition, teacher training became more selective and rigorous. Finally, curricula setting went from highly centralized to more decentralized. These reforms broadened the talent pool, which may have helped weaken the relationship between parental income and, for example, the likelihood of becoming an inventor. Reform also targeted higher education, making access more equitable and holding institutions accountable for their contributions to the economy.

Chile. Since the 1980s, students in Chile have had access to universal vouchers to attend private schools. In 2008, a reform was enacted to raise the voucher amount for disadvantaged students, provide additional funding to schools with large shares of such students, and create an accountability system for schools receiving vouchers. Critically, a test-based assessment system was created in the 1980s and is still being used to gauge results. The opening of private universities was encouraged, new sources of student funding became available through scholarships and loans, and the supply of short-cycle higher education programs grew rapidly. Against the backdrop of these reforms, the share of high school students scoring above minimum proficiency levels in the worldwide assessment, the Programme for International Student Assessment (PISA), rose from 53 percent to 68 percent between 2000 and 2018, and net enrollment rates in higher education have grown from less than 5 percent to about 45 percent since 1970. Furthermore, college access has become more equitable for men and women and for students from different socioeconomic backgrounds. However, the share of disadvantaged students among top performers in the high school math exit exam has barely changed over the past five decades, suggesting that, although many disadvantaged students have gained access to college, their elementary and high schools are not yet preparing them for admission to Chile’s top universities.

a. See, for example, Aghion et al. (2023) and Pekkarinen, Uusitalo, and Pekkala Kerr (2009) for Finland; World Bank (2021) for Ireland; Lee, Jeong, and Hong (2014) for the Republic of Korea; Guyon, Maurin, and McNally (2012) for Northern Ireland; and Jakubowski et al. (2016) for Poland.
c. Aghion et al. (2023).
d. Aguirre (2021); Fontaine and Urzúa (2018); Murnane et al. (2017); Solis (2017); Vegas (2018).
e. Gallegos, Barrios-Fernández, and Neilson (2024).
A comparison across 46 countries of 150 interventions in early childhood and primary and secondary education reveals that some of the most cost-effective programs deliver the equivalent of three additional years of high-quality schooling (comparable with that of the highest-performing education systems) for just US$100 per child.

The three most cost-effective interventions are targeted information campaigns about the benefits, costs, and quality of schooling; interventions to target teaching instruction by learning level rather than grade; and improved pedagogy through structured lesson plans providing student materials, teacher professional development, and monitoring. Other policies—such as early childhood development and merit-based scholarships—are costlier and yet are still highly effective.

Develop advanced skills
To build a pool of talent with advanced skills, middle-income countries must substantially upgrade their higher education systems. These systems need to be aware of the skills in demand or they run the risk of producing unemployable graduates whose skills are not relevant to the labor market. In Latin America and the Caribbean, shorter-term higher education programs that interact more with employers and help students in their job search contribute more to students’ labor market outcomes than other such “short-cycle” programs. Although short-cycle programs pursue such connections more often than bachelor’s programs, the connections are equally important for both.

Lack of experience often holds back university graduates from finding jobs. Education models that incorporate work experience attempt to break this cycle and facilitate the school-to-work transition. Examples include dual training programs, apprenticeships, co-operative education, and integrated curricula. In Ecuador, Corporación Formados provides students with dual training based on the German model to produce not only technical workers in manufacturing but also middle managers (who, according to firms, are undertrained), as well as sales and banking specialists. The co-op model alternates between terms of classroom-based instruction and terms of paid work, and it relies on partnerships between institutions and employers. Institutions in middle-income countries offering co-ops include the Universidade de São Paulo in Brazil, Nelson Mandela University in South Africa, and TOBB University of Economics and Technology in Türkiye. The integrated curriculum model is exemplified by Indonesia’s Merdeka Belajar (Emancipated Learning) initiative. Educational authorities oversee large-scale curriculum coordination among universities, firms, and other institutions, which allows students to spend up to a third of their time in work settings inside or outside the country. Universities also train practitioners who are interested in learning how to teach and pair them with mentors.

Countries can use public funding for higher education to pursue country-level strategic goals and promote equitable access to higher education. Expanding the base of science, technology, engineering, and mathematics (STEM) graduates may be one such strategic goal. China, for example, has dramatically expanded its tertiary-educated population over the last few decades by means of policies at home and training overseas, as well as its base of STEM graduates. Targeted scholarships can increase student interest in STEM careers, including the life sciences, physical sciences, engineering, mathematics, computer science, and the health sciences. When coupled with information and mentoring interventions, they are particularly effective at attracting females to STEM fields. To promote equitable access to higher education, some countries provide need-based financial aid—such as Brazil’s ProUni and South Africa’s National Student Financial Aid Scheme (NSFAS); unsubsidized student loans—such as those provided by Tanzania’s Higher Education Students’ Loan Board (HESLB); and subsidized student loans—such as Malaysia’s Student Loan Fund Corporation (PTPTN).
Countries can provide incentives to align the attainment and use of actual skills in the workplace and entrepreneurship. For example, short-term technical and vocational education and training (TVET) programs depend for their success on connecting to employers, and offering incentives to industry can help. In Finland, institutions sign student performance contracts with the government and are held accountable for their outcomes. The government of Denmark also signs performance contracts with universities. The country relies on local advisory councils formed by representatives of governments, institutions, and enterprises for short-term programs and training. Councils periodically discuss local skill needs and decide how many programs are needed to address them, closing programs as needed. Denmark also has a well-developed system to forecast skills, as well as an information system that provides data on job opportunities for hundreds of occupations by region.

**Selecting efficient learners**

Some institutions and programs—particularly those teaching highly advanced material—may require advanced academic readiness and establish selective, merit-based admission criteria. Countries need an effective mechanism to identify, select, and promote talent and ability. Efficient learners with “merit” can be identified using the test scores of higher education entrance exams or high school exit exams, sometimes in combination with other criteria.

Entrance exams are a standardized, comparable way to evaluate students from different backgrounds, especially when used nationally. On the one hand, exams are a transparent and simple way to sort students across institutions and programs. In 2005, for example, the country of Georgia established a university entrance exam because its previous admission system— inherited from the Soviet era—was obscure, prone to corruption, and widely perceived as inequitable. Entrance exams also establish clear rules for the selection of students across institutions and majors, and they are the backbone of the increasingly popular centralized admission systems used in many countries (box 8.2). On the other hand, entrance exams can perpetuate the very inequities they seek to eliminate. Because students with more educated parents and from higher-income households enjoy access to higher-quality basic education, they score higher on university entrance exams and therefore appear to have more “merit” than others. Students are more likely to confuse an actual “aristocracy of privilege” with an imagined “aristocracy of talent.”

Unless all students develop foundational skills and receive excellent basic education, merit-based schemes can detract from—rather than promote—social mobility. Furthermore, entrance exams are not perfect measures of student preparation or the potential for advanced training. As a result, institutions may reject applicants who would perform well if they were admitted.

A more holistic approach to selection may be needed. In principle, “merit” could be defined in broader terms than just exam scores. For example, institutions could reserve a share of their classroom seats for students from disadvantaged minorities, who would also be chosen based on merit—as in Brazil. They may also choose to admit the top share of students from every high school—as in the Top Ten Percent Program in the US state of Texas and similar programs in California and Florida. All these variants, however, have their own trade-offs. More important, capacity at highly selective institutions is limited. The challenge is to build tertiary education systems that provide high-quality opportunities at all institutions, not only the most selective ones. In the United States, many institutions—not only top-ranked universities where merit-based admission is most prevalent—promote social mobility. Although countries may want to adopt merit-based admission to some higher education institutions, the emphasis should be on ensuring high-quality education at all institutions and educational levels in order to build a broad, deep talent pool.
Leverage digital technologies
Digital technologies—such as the internet, mobile phones, social media, and web-based information systems—have a large capacity to promote both social mobility and talent development. The internet, for example, allows individuals to find information, which makes them more productive; email allows for the exchange of ideas, which leads to knowledge diffusion; smartphones can be used for mobile banking, which promotes entrepreneurship; and data systems provide government with a wealth of information that can be used to efficiently target interventions.

In selecting students for higher education programs, merit-based selection requires standardized measures of merit such as test scores. Higher-income parents typically have the means to invest in tutoring services for their children, ensuring a critical advantage for them to improve their test scores. To level the playing field and give students from more disadvantaged backgrounds opportunities, countries can leverage digital technologies to deliver instructional materials to many more students online (box 8.3).

Expanding occupation choice and rewards
Climbing the economic and social ladder may not be possible when individuals cannot gain access to jobs or realize their entrepreneurial potential on the basis of merit. In many countries, attending an elite school is not sufficient to secure a top job because connections—not merit—determine recruitment (see chapter 5). Although combating
such discriminatory practices is a necessary first step, it is not sufficient because it does not address the inherent information asymmetry between job candidates and employers. Job candidates rely on social networks to learn about job openings and employers’ characteristics. Meanwhile, employers rely on these networks to ascertain workers’ skills and trustworthiness. This is particularly true in countries with a high degree of informality and limited information about labor markets.

To address these issues, countries need institutions that can serve as reliable, timely conduits of information. Online job portals—proliferating quickly across middle-income countries—are a cost-effective mechanism to communicate job openings to job-seekers. But information on job opportunities needs to be combined with credible certifications of skills. In South Africa, a job matching program provided candidates with information about job openings and a credible assessment of their own skills. Giving job-seekers this assessment to share with firms increased employment and earnings and enabled them to better align their beliefs about their job performance and their search strategies.

Although lack of information creates unrealistic expectations for many job-seekers about the type of work and wages they can find, some interventions can help. In Ethiopia, a job fair experiment that brought firms and job-seekers together allowed firms to advertise openings more widely and job-seekers to apply for more positions. It also improved employment outcomes for less-educated job-seekers. In South Africa, young job-seekers who live far from the city centers where jobs are located overestimated their employment prospects and underestimated actual commuting costs. By increasing their access and exposure to the broader labor market job-seekers were able to adjust their expectations and accept jobs closer to home.

Giving job-seekers access to “better” networks—those of more influential individuals—can also boost their opportunities. Mentoring improves outcomes mostly by teaching mentees about entry-level jobs and labor market dynamics.

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**Box 8.3 Improving students’ test scores by using online studying assistance from the Khan Academy**

In 2004, Sal Khan, a Bangladeshi American, began tutoring his cousin Nadia in mathematics using a phone and Yahoo Doodle. As Nadia improved her performance in mathematics, word of Khan’s service spread, and he began tutoring a handful of his cousins and family members. In 2006, lacking the time for one-on-one tutoring, he began recording videos and posting them on YouTube, offering them to everyone to watch at their own pace. In 2008, this initiative turned into the Khan Academy. It has since produced more than 8,000 video lessons on a wide range of academic subjects, including mathematics, sciences, literature, and computer science, as well as supplementary practice exercises and materials for educators. The learning materials, all provided free of charge, are available in many different languages. Today, they are a supplement to in-class learning, giving teachers more time to focus on individual students’ needs.

In July 2017, the Khan Academy became the official practice partner for the College Board’s Advanced Placement courses. Students who study for the college entrance exam, the SAT, for at least 20 hours via the Khan Academy increase their scores, on average, by 115 points (of a possible 1,600).

*Source: Khan Academy (website), Mountain View, CA, https://www.khanacademy.org/*
A mentoring program in Uganda that assisted vocational students during their school-to-work transitions increased their employment prospects three months after graduation, and their earnings were higher one year later.

**Nurturing scientific inquiry and enhancing research capabilities**

The process of nurturing innovation can start early. Identifying high-potential, high-performing students—advanced learners—in the early school grades and inculcating in them a mindset for scientific inquiry is crucial. In India, Atal Tinkering Labs, with the sponsorship of the government, sets up in schools physical laboratories that are equipped with scientific kits and apparatuses for use by students between the sixth and twelfth grades. The opportunity to “tinker” and learn by doing is intended to sow the seeds of a scientific mindset and an entrepreneurial spirit from an early age. Between 2016 and mid-2022, the program funded 9,600 spaces in 34 states and Union Territories.

Mechanisms to identify advanced learners are also important. Testing plays an important role. Instead of using a single absolute measure such as the student’s place in the national distribution of test scores, teachers can identify students with the greatest potential or the best performers in every classroom or school. In fact, they can do so repeatedly and not just in one high-stakes test, which leads to a larger, more equitable talent pool. Advanced learners can be offered opportunities—such as participating in advanced classes or attending selective schools—that match their interests and abilities without necessarily hurting other students’ outcomes.

Developed countries such as Finland, France, Japan, the Netherlands, Spain, the United Kingdom, and the United States provide special publicly backed programs for advanced learners. Developing countries such as Colombia and Mexico have followed suit. Programs vary in format. In the United States, many schools and school districts run a broad array of programs for advanced learners, whereas in Israel, the National Mentoring Program matches advanced learners in 10th and 11th grades with top professionals in students’ areas of interest to collaborate on a project of mutual interest. In a similar vein, exposing young children—particularly those from disadvantaged backgrounds—to inventors and scientists can widen this pipeline. In the United States, several private initiatives bring children together with inventors; in Spain, workshop initiatives bring children and scientists together.

Building and expanding high-quality universities that can train top talent and contribute to innovation requires an efficient system of public funding for research, as well as fluid university-industry connections to promote the exchange of knowledge. Public spending on research and development (R&D) is lower in middle-income countries—0.3 percent of the gross domestic product (GDP) of the median middle-income country—than in high-income countries—1.4 percent of GDP in the median high-income country. Thus it is more efficient for middle-income countries to focus their public funding on a few strategic areas of research such as STEM, health, and the energy transition, with funds allocated in a competitive fashion. For example, the Pakistan Science Foundation gives competitive research grants to scientists, engineers, technologists, innovators, academics, and entrepreneurs who need support to build on their initial research findings and develop new products, prototypes, and pilot-scale production in nanotechnology, material science, and artificial intelligence.

There are many examples of partnerships aimed at expanding countries’ research and educational capacities. In Argentina, the Instituto Balseiro is a highly selective public institution that trains undergraduate and graduate students in physics, nuclear engineering, and other STEM fields by means of a partnership between Cuyo National University and the National Atomic Energy Commission. Admitted students receive full scholarships and have access to state-of-the-art labs and highly personalized training, which allows them to pursue highly successful careers, both domestically and abroad. In Israel, several higher education institutions—such as the
Technion and the Weizmann Institute—have had a strong STEM orientation since their inception. In 2013, Israel’s eight universities produced more patents than the country’s firms, military labs, and private labs combined. Partnerships with world-class universities can serve as a strategy to develop a research base. The Egypt-Japan University of Science and Technology (E-JUST) offers graduate courses on electronics and communications, mechatronics and robotics, energy and environment, computer science, industrial science and manufacturing, chemicals and petrochemicals, and materials science. The Indonesian Biodiversity Research Center (IBRC) was created in 2010 by Udayana University, Diponegoro University, the State University of Papua, the University of California at Los Angeles, and the Smithsonian Institution to promote biodiversity research and build educational and scientific capacity in Indonesia.

Governments can also provide tax incentives to companies that collaborate with universities, such as a generous tax deduction, as in Sri Lanka. Establishing a regulatory framework for knowledge exchange is key, particularly in relation to the intellectual property produced by universities with public resources. Universities, in turn, typically establish technology transfer offices (TTOs) to promote university-based innovation and entrepreneurship. In 2003, the State University of Campinas (Unicamp) established Brazil’s first TTO, Inova; four years later, Unicamp was the second most frequent patent applicant in Brazil. Governments can also provide land and infrastructure close to universities to attract firms, usually in science and technology parks and incubators. The significant additional advantages of government support through universities include funding projects that are near the knowledge frontier, promoting the design of more industry-relevant education, fostering the development of an entrepreneurship ecosystem, facilitating workforce development, aiding in technology commercialization, and mitigating the risks of corruption through mechanisms such as peer review, whistleblower protection, and public disclosure of information. Furthermore, universities can enhance oversight and monitoring processes, adding robustness to the governance framework.

One outcome of university-industry collaboration is venture creation by university faculty, staff, students, and postdoctoral students, with private investors serving as venture capitalists. For example, the Tshimologong Digital Innovation Project in Johannesburg, South Africa, is a product of collaboration between the University of the Witwatersrand, the province of Gauteng, and firms such as IBM, Cisco, Microsoft, and Telkom. Tshimologong (“place of new beginnings”), located in an inner-city neighborhood of Johannesburg, is close to a major research university and urban infrastructure and is accessible not only to students from the university but also to disadvantaged youth who enjoy free training in computer programming, cybersecurity, and digital animation through the program’s Digital Skills Academy. The project has created more than 105 start-ups and seeks to inspire additional university-based incubators in Africa.

Universities can also partner with local companies to provide services. In Manizales, Colombia, for example, the Universidad Nacional de Colombia and Universidad Autónoma de Manizales are participating in a partnership, Innvestiga, to encourage innovation and productivity enhancement among local firms. It gathers scientists and engineers from these institutions and supports the needs of small and medium enterprises (SMEs) by generating solutions in materials science and processes and providing services such as research, prototyping, and lab tests.

The value added by firms

An economy that is functioning well allocates factors of production to the most productive firms. In developing countries, the reallocation of factors of production has been an important driver of productivity growth, accounting for about 25 percent of the growth in efficiency. The ability of middle-income countries to catch up will depend on how well they attract and adopt
leading technologies and facilitate reallocation of resources toward growing, productive firms and industries. Countries at lower levels of development have more opportunities for potentially productivity-enhancing reallocation as workers move from less valuable and less productive activities toward more productive ones (figure 8.2). Evidence from 21 European countries reveals that countries that experience the highest growth in terms of increases in GDP per capita are those with the highest job reallocation rates.

Business dynamism is characterized by an up-or-out dynamic; entrants exit at disproportionately high rates, but those that survive grow quickly, on average. The most successful firms mature and grow larger, displacing less productive firms. Potentially high-productivity firms must decide whether to invest in the managerial and technical capabilities or the R&D required to raise efficiency and product quality. Distortions in the operating environment have a substantial impact on firms’ decisions. The benefits of reallocating resources through potentially high-productivity firms not only helps the firms themselves, but also boosts job and output growth and creates positive spillovers for other businesses along the value chain.

Policies in many middle-income countries, however, are not compatible with rewarding merit activities. Such policies thus need to be revisited and upgraded.

Moving away from coddling small firms or vilifying large firms

Subsidies to SMEs are widespread in middle-income countries. Governments may enact such subsidies hoping small firms will grow, creating more jobs and growth. Many subsidies seek to reduce small producers’ operating costs through special credit terms and tax exemptions. But the same distortions also reduce the incentives for a productive firm to expand, deterring it from scaling up production.

Many firms in middle-income countries remain small even when long-established; they simply do not aspire to grow. The abundance of small firms in middle-income countries does not solely mirror the challenges they face. Instead, it indicates a deficiency in competition, originating from larger firms that would have displaced them in the market if they had expanded. Blanket support for small firms can curtail the exit of unproductive small businesses, perpetuate smallness, crowd out other firms, and misallocate resources. In Sri Lanka and Viet Nam, the provision of targeted subsidized loans and financial assistance reduced total factor productivity (TFP)—a measure of the efficient allocation of resources. In Mexico, policies to support SMEs have been associated with talent misallocation and reduced labor productivity. A long-running program in Japan documents that SME support programs reduce incentives for SME growth, thereby reducing job creation.

Ideally, government support would help SMEs grow into larger, more productive companies that pay higher wages and adapt knowledge instead of perpetually supporting small firms. To help SMEs grow, support programs must identify firms with genuine constraints to expansion and productivity growth and alleviate specific constraints. Improved data and information, along with analytic capability, are necessary to identify firm-specific constraints.

And yet enforcement of tax codes often tends to lump firms together by size. Even where tax codes do not create explicit provisions based on firm size, middle-income countries may be creating a practical subsidy to SMEs through size-dependent tax enforcement: governments with weak tax collection capacity may concentrate enforcement on larger firms. In Türkiye, enterprises with 50 or more workers must comply with labor and safety laws that include establishing a health and safety board and hiring physicians and other health staff and setting up a health unit. In fact, between 1994 and 2014 more than 70 countries created special enforcement units for large taxpayers, in addition to the 18 countries that already had such units in 1994 (figure 8.3). This development is part of a growing trend of taxpayer segmentation, recommended by international institutions.
Figure 8.2 Countries at lower levels of development have more opportunities for potentially productivity-enhancing job reallocation


Note: Small firms with fewer than 20 employees are excluded to allow consistency across countries and sectors. The unit of analysis is the legal unit (firm). Entrants and exiters are excluded from the analysis. Data on gross domestic product (GDP) per capita are from National Accounts (dashboard), Organisation for Economic Co-operation and Development, Paris, https://www.oecd.org/sdd/na/; WDI (World Development Indicators) (Data Catalog), World Bank, Washington, DC, https://datacatalog.worldbank.org/search/dataset/0037712. GDP per capita growth is computed as the growth rate between 2010 and 2017 because the job reallocation rate is computed over 2010–17. Twenty-one European countries are included. The diagonal line indicates linear fitted values. For country abbreviations, see International Organization for Standardization (ISO), https://www.iso.org/obp/ui/#search.
Research has revealed that if firms were to comply with size-dependent tax policies, in 140 countries employment growth would drop by 25 percent. Conversely, removing size-dependent taxation would lead to TFP gains of about 1 percent, on average, and up to 2.3 percent for more distorted economies. For example, in Mexico eliminating distortions created by size-dependent taxation policies favoring small firms could boost output by 9 percent. In Chile, China, and India, reductions in distortions helped these economies close the gap between actual and potential productivity by 10 percent. Figure 8.4 illustrates the value of the actual level of manufacturing TFP in each country relative to the potential level if resources were allocated efficiently—that is, if the economy was on the production possibilities frontier. More important, reforms of size-dependent policies increase the return to skills and encourages technology adoption and productivity in the longer term.

**Figure 8.3** The number of countries creating special enforcement units for large taxpayers has increased

*Note:* The figure includes data collected by Bachas, Fattal Jaef, and Jensen (2019) for all 113 countries with more than 1 million inhabitants.

Letting go of unproductive firms

Letting inefficient firms and business models fail is a core principle of creative destruction. Literature on firm exit—stemming from seminal work by Hopenhayn (1992)—shows that the exit of less productive firms contributes substantially to raising aggregate productivity. In many countries, during periods of trade liberalization the exit of the least productive firms has boosted growth.

In middle-income countries, however, bureaucratic frictions prolong the survival of zombie firms—inefficient, debt-ridden companies that crowd out investment by productive firms. Reforms to bankruptcy laws can prevent unproductive incumbents from turning into zombie firms and should focus on enabling failed businesses to exit swiftly and predictably and on allowing viable businesses to restructure.

More generally, the shedding of outdated arrangements—enterprises, jobs, technologies, private contracts, policies, and public institutions—is essential for reallocation, innovation, and growth. Economic downturns sometimes create a much-needed opportunity for older, less productive firms to make way for newer, more productive ones. A key Schumpeterian insight is that the creation of new industries does not go forward without sweeping away past realities.

Modernizing organizational models to manage firms

As barriers to growth are removed and resources are better allocated toward firms that add value, firms will need to make some strategic decisions. Firm owners aspiring to expand must delegate managerial tasks to professionals. Delegation necessitates strong legal institutions to establish and enforce contracts between owners and managers. These contracts should give managers incentives to work hard and should hold them accountable for any wrongdoing. Such arrangements encourage firms to increase their investments in expansion. As productive firms expand, creative destruction eliminates unproductive
firms, driving up market compensation for managers within those expanding firms. The opportunity to earn more, in turn, encourages capable young individuals to invest in accumulating human capital to ensure a brighter future and enhances opportunities for everyone.

Capable professional managers can make sound decisions in their daily operations, think strategically, and manage human resources efficiently. In small firms, good management practices include keeping separate household and business accounts and monitoring inventories. In larger firms, they include rewarding good employees, setting production targets, deciding on product varieties, and monitoring performance. The impacts of better management are critical not only to individual firms but also to countries. Managerial quality accounts, on average, for about one-third of the gap in TFP between the country at the lead of the technology frontier, the United States, and other countries. In fact, Spain’s rapid growth from an economic backwater in Europe to a developed nation was backed by technology adoption and improving managerial capabilities (box 8.4).
Improving general education is the first step toward promoting managerial skills, as discussed earlier in this chapter. In emerging economies, firms with more educated owners tend to have better business practices, and more educated entrepreneurs start firms that are larger and grow faster.

A second step—which can provide benefits sooner—involves training and information interventions. Training can be provided in a formal classroom or by means of in-firm consulting. Classroom-based training is the most popular method among small firms. In-firm consulting yields high benefits to larger firms, such as in Colombia, India, and several other countries. Consultants diagnose management practices and provide recommendations accordingly. Positive effects can emerge within one year and tend to last for several years—although they sometimes disappear when the manager who adopted them leaves the firm. These interventions are highly effective, but they are also relatively costly. The costs can be reduced by providing group-based consulting.

Entrepreneurs in middle-income countries often rely on family and social networks to

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**Box 8.4 Catching up by opening up and modernizing firms: The Spanish growth miracle**

Spain grew rapidly between 1950 and 1980, becoming a high-income economy in the late 1970s. Over those three decades, its output per capita increased from 27 percent to 57 percent of that of the United States. How did Spain achieve rapid catch-up? Political stability, a necessary condition, helped. But economic policies remained unreformed, state-owned enterprises remained a significant part of the economy, and rent-seeking by incumbents remained rampant. Spain’s auto industry—which is one of the world’s largest car exporters, the country’s largest export sector, and one of the country’s largest employers—offers three notable lessons.

First, although the domestic market for cars remained protected, Spain opened up to foreign direct investment to attract large investment in a new plant by Ford. The authorities reduced the local content requirement but set a minimum size of production, established an export ratio, and capped the number of cars that Ford could sell domestically. Overall, incentives were aligned to learn from global technology and organizational structures. The venture was disciplined by the need to export in global markets.

Second, addressing complementary bottlenecks also helped. Ford was able to export its large production of cars because the port of Valencia operated smoothly. The port was capitalized enough to respond to the demands placed on it.

Third, technology adoption and a greater focus on management techniques proceeded rapidly, and efficiency gains quickly materialized, supported by a well-trained cadre of local professionals and entrepreneurs who were ready to adopt and adapt the new technology to the realities of Spain.

Eventually, the opening up of Spain’s economy helped speed up the “creative destruction” that is central to structural transformation.

Source: Based on Calvo-González (2021).

a. There are significant parallels with the operation of Korean chaebols as conduits for technology diffusion.

maintain business relationships and run their enterprises, but this practice hampers their ability to grow. Even for large publicly traded firms, how a firm is controlled can be traced back to the country’s legal origins.\textsuperscript{73} The share of family-controlled firms is highest in countries that have adhered to the French civil law system, followed by countries that have adopted the German civil law system and civil law countries in Scandinavia.\textsuperscript{74} Shareholder protection rights—provisions of corporate law that allow shareholders to take legal action against managers who abuse their position—are systematically linked to dispersed patterns of ownership, which can lead to better management. In the absence of solid shareholder protection, family control and management of a firm offer protection against abuse by management.\textsuperscript{75} However, in family firms with lower-quality governance, management quality is substantially lower.\textsuperscript{76}

Even among publicly listed corporations, family control is more likely in countries where organized labor is more powerful and collective dispute-resolution mechanisms are stronger. After all, it is easier to collude when corporate control is concentrated in the hands of families and organized labor.\textsuperscript{77} Management quality also varies with labor regulations and organization. In the United States, stronger union power weakens the ability of managers to use desirable performance incentives.\textsuperscript{78} Across countries, people management practices are weaker in those with more restrictive labor regulations. Revising laws and regulations related to corporate governance may be necessary to support entrepreneurship and good management.

\textbf{Connecting entrepreneurs with money, mentors, and markets}

Entrepreneurs in middle-income countries are the main protagonists of Schumpeterian growth through creative destruction, but these entrepreneurs are often disconnected from finance, as well as from networks of other entrepreneurs who can mentor them and help them access markets. Information asymmetries and lack of collateral hobble their potential. For this and other reasons, there is a paradox of low entrepreneurship amid great opportunity in emerging economies:

\textbf{Like any investor, an entrepreneur is fundamentally placing a bet, comparing an entrepreneurial project with an expected range of returns and risks against other alternatives, such as “safe” salaried work, which is the opportunity cost of entrepreneurship. This implies both a process of managing risk and a process of learning—about the investment, about running a firm, and about evaluating and managing risk.}\textsuperscript{79}

Approaches aimed at supporting entrepreneurship in developing countries are hampered by a “missing middle.” On the one hand, there has been a drive in development policy to focus on informal businesses or microentrepreneurs oriented toward survival.\textsuperscript{80} On the other hand, there has been a fascination with high-tech entrepreneurs in a handful of hot spots.\textsuperscript{81} What is missing is a clear-eyed assessment of the barriers facing growth-oriented entrepreneurs in middle-income countries—the protagonists of Schumpeterian growth. Three barriers are paramount: money, mentors, and markets.

\textbf{Money}. Lack of targeted finance is a fundamental reason why many opportunities in middle-income countries do not lead to more growth-oriented entrepreneurship. Improving access to finance is not only about extending credit; it is also about backing a money-making idea implemented by capable founders and managers. But it is difficult to gauge these dimensions. For example, a study of a large business plan competition in Nigeria found that even after an initial screening, expert judges, machine learning models, and economic models had very low abilities to predict which firms would grow the fastest over the next three years.\textsuperscript{82} Female founders of firms face particular biases and obstacles. In general, project evaluators place a lower value on the competence or leadership potential of women
than of men, and investors inquire more about risks when dealing with female founders than with men.\textsuperscript{83}

Information asymmetries and lack of collateral are especially constraining for entrepreneurs with new ideas, regardless of whether those ideas are imitative or innovative. Equity markets can be instrumental in supporting innovative activities, especially in private firms, which typically face larger financing gaps than publicly listed firms.\textsuperscript{84} However, private markets for equity financing lack depth and access in emerging economies (figure 8.5). Private equity markets also make it easier for entrepreneurs to cash in on their investments and move on to a new project, should they choose to do so. Often, entrepreneurial ventures do not perform as planned, but the costs of exiting are very high, and the entrepreneur is held responsible for the entire downside risk of a failed endeavor, leading to reputational and financial downfalls.\textsuperscript{85} This is a great disincentive to risk-taking.

*Mentors.* Although money is important, entrepreneurial success is not all about the money. Most entrepreneurs need to be connected with networks of entrepreneurs—those at their stage as well as successful ones—to fully assess whether they and their ideas are fit for entrepreneurship. Data reveal that start-ups collaborating with seasoned venture capitalists tend to exhibit superior performance.\textsuperscript{86} Accelerator programs are a relatively recent addition to the variety of programs that direct knowledge, social, and financial capital to promising people and ideas.\textsuperscript{87} They provide training and technical assistance, along with mentorship and networking support, and offer certification, thereby reducing information asymmetries between entrepreneurs and investors.\textsuperscript{88}

Y Combinator, launched in 2005, is widely regarded as the first accelerator program.\textsuperscript{89} Its website stated: “You can’t make people something they’re not, but the right conditions can bring out the best in them. And since most people have way more potential than they realize, they’re often surprised by what they’re capable of.”\textsuperscript{90} A highly competitive process allows founders to join a three-month program of capability assessment and upgrading in which their ideas are pitched to investors. After the program’s inception, 5,000 US-based start-ups accelerated between 2005 and 2015 raised nearly US$20 billion in venture capital.\textsuperscript{91}

Accelerators have made their way into emerging markets, helping entrepreneurs access early-stage investment. But beyond investments, accelerators are “schools for entrepreneurs” that give competitively selected participants opportunities to build their capabilities—including through business training, networking, and mentoring—and sometimes supply funding.\textsuperscript{92}

Researchers associated with the Global Accelerator Learning Initiative (GALI) compiled information on 2,455 ventures that applied to 43 accelerator programs between 2013 and 2015, about half in high-income countries and half in emerging markets.\textsuperscript{93} After one year, participating ventures report higher revenue and employee growth, as well as higher equity and debt investment growth, compared with ventures rejected from the application pool. Surprisingly, the major gains for accelerated ventures in emerging markets are in leveraging debt, not equity. Furthermore, emerging market entrepreneurs rarely indicate that connections made during a program help grow their networks. They also tend to place more emphasis on business skill development. However, program managers in emerging markets report difficulties in recruiting mentors and advisers.\textsuperscript{94}

*Markets.* In middle-income countries, creative destruction is amplified by better connections between opportunity and entrepreneurship. Governments can help create and sustain contestable markets by weakening the forces of preservation, and they can work with investors and growth-oriented entrepreneurs to nurture infusion and innovation.
Figure 8.5 In emerging market and developing economies, few companies are funded through venture capital or private equity

a. Venture capital

b. Private equity

Source: Didier and Chelva 2023.

Note: The figure displays the number of companies funded through venture capital (panel a) and private equity (panel b) investments from deals concluded during 2018–19. Economies are classified according to the World Bank’s income classification as of June 2020 (Serajuddin and Hamadeh 2020). For country abbreviations, see International Organization for Standardization (ISO), https://www.iso.org/obp/ui/#search. EMDEs = emerging market and developing economies; GDP = gross domestic product.
Reducing an economy’s greenhouse gas emissions

In middle-income countries, emissions drive the impact of development on global climate change. Policy debates in middle- and high-income countries should be concerned primarily with decoupling GDP growth from emissions growth in all ways feasible. One important consideration is arrangements that lock middle-income countries into particular types of production, such as long-term investments in coal and other fossil fuels. To the extent that so-called lock-in effects are preventing progress toward actually meeting global environmental goals, all efforts should be directed toward reducing the path dependence from the specific energy source, while better protecting natural resources, including forests (box 8.5).

Policies and technologies to mitigate carbon emissions will vary among middle- and high-income countries, depending on their economic structures, resource endowments, and institutional and technical capabilities. A good starting point is fiscal policies. These can be surgically sharp if designed with care. The discussion that follows first examines economywide fiscal policies, then turns to sectoral policies, and finally explores the options for scaling up renewable technologies.

Economywide fiscal policies

Regarding energy, the ultimate impact of growth on global greenhouse gas emissions will depend on the carbon intensity of GDP, reflecting both GDP’s energy mix and energy intensity. Fiscal policies can influence both dimensions.

Carbon pricing is an essential policy for mitigating emissions, while helping to raise public revenue in an efficient and less distortive way than the alternatives. It signals to markets the social cost of emitting GHGs, creating financial incentives to abate emissions, reduce fossil fuel consumption, and innovate low-carbon products and processes. Some economists believe that carbon taxation is the most efficient instrument for reducing emissions in a growth-friendly way. On January 16, 2019, 43 of the world’s most prominent economists, including 27 Nobel Laureates, issued a statement published in the Wall Street Journal (2019) arguing that a carbon tax in the

Box 8.5 Productivity growth can slow deforestation in Brazil

Brazil’s Amazon region provides the world with immense ecosystem services. Estimates peg the services to be worth, at a minimum, US$317 billion a year, US$210 billion of which is accounted for by carbon dioxide (storage) alone. Deforestation is among Brazil’s leading sources of greenhouse gas emissions and a major threat to biodiversity. In fact, ecosystem collapse in the Amazon stemming from deforestation and climate change ranks among the most catastrophic tipping points for the planet. In response, Brazil has made much progress in protecting the Amazon, improving forest and land governance by means of, for example, the Action Plan for the Prevention and Control of Deforestation in the Legal Amazon, first launched in 2004 and most recently reinvigorated in 2023.

And yet Brazil’s growth model also matters for the Amazon. The fact that it remains anchored in factor accumulation and land accumulation is synonymous with agricultural frontier expansion and deforestation. To overcome the middle-income trap Brazil will have to raise productivity—and growing through productivity rather than factor expansion would also slow deforestation. Indeed, there is a strong relationship between Brazilian productivity and the change in forest cover in the country’s Amazon (figure B8.5.1).

(Box continues next page)
United States “offers the most cost-effective lever to reduce carbon emissions at the scale and speed that [are] necessary.” Others have proposed a strategic combination of temporary research subsidies and carbon taxes that could steer technological advancements toward more environmentally sustainable solutions.96

Direct carbon pricing instruments include carbon pricing signals sent through carbon taxes and emissions trading systems (ETSs). According to the World Bank’s State and Trends of Carbon Pricing 2023 report, these schemes currently cover a relatively limited portion of global carbon emissions, but the greater a program’s scope, the more effective it can be.97 The report points out that the number of countries that have adopted direct carbon pricing schemes through ETSs or carbon taxes is limited.98 Perhaps more important, so is the coverage of such programs. With the introduction of the ETS in China in 2021, the share of global carbon dioxide (CO₂) emissions from fossil fuels covered by direct carbon pricing schemes rose to about 31 percent (amounting to about one-quarter of global GHG emissions). Along with their coverage, average carbon prices have been rising over the last few years. The carbon price in the European Union (EU)
through the EU ETS rose sharply from 2019 to 2021. Nevertheless, the carbon prices prevailing in most jurisdictions and their estimated global average remain quite modest.

Because the overall carbon price signal is not confined to direct carbon pricing, the concept of the total carbon price (TCP) has been introduced—a metric intended to assess the price signal resulting from a combination of direct and indirect carbon pricing instruments, including energy excise taxes and fuel subsidies. Illustrative TCP calculations carried out using the best available global data sets relying on annual data for 142 countries covering the last 30 years find that indirect carbon pricing instruments play a much more prominent role in sending price signals on carbon emissions. Among indirect carbon pricing instruments, an analysis of illustrative TCP calculations finds that energy taxes, in particular, send the strongest price signal. These taxes cover a significant share of global emissions and send much higher carbon price signals than their direct counterparts. By contrast, energy subsidies send strong signals in the opposite direction, undermining the positive signals sent from direct and indirect instruments, as illustrated in figure 8.6.

Removing inefficient fossil fuel subsidies is an integral part of the policy mix to reduce carbon emissions. This market distortion discourages the adoption of clean energy because regulated prices or taxes favor fossil fuels. After a noticeable dip in 2020 stemming from the COVID-19 pandemic, global fossil fuel subsidies for 2022 doubled from the previous year to an all-time high of US$1 trillion, as indicated by preliminary estimates. According to a global tracking effort, at least 60 countries increased (or even reintroduced) general fuel price subsidies (as opposed to targeted compensation), and at least 98 countries announced energy-related measures, including subsidies for fuel, electricity, transport, and electric vehicles, as well as price controls for fuel.

**Figure 8.6** Indirect carbon pricing such as energy taxes is the strongest price signal

![Figure 8.6](image_url)

*Source: Agnolucci, Gencer, and Heine 2024.*

*Note: The figure presents illustrative calculations for the global aggregate total carbon price using the best available global data. The figure covers 142 countries. ETSs = emissions trading systems; tCO$_2$ = metric tons of carbon dioxide; VAT = value added tax.*
Well-designed taxes can be a starting point to incentivize citizens and businesses to make cleaner choices, thereby reducing climate damage and air pollution. Taxes also raise much-needed revenue, which can be used to fund vital government services and support vulnerable groups in adjusting to higher energy prices, including by introducing or strengthening social safety nets.

Policy makers, however, face strong resistance from industrial and residential consumers to removing subsidies and raising the social cost of carbon. Often, resistance comes from interest groups representing specific sectors concerned about bearing the brunt of the economic and job losses associated with the loss of those rents. Indeed, the literature simulating the impact of removing subsidies finds that reductions in GDP and welfare will occur in countries in the short term. In China, models indicate the GDP could decline by up to 3.8 percent. In the Islamic Republic of Iran, GDP could decrease by 2.2 percent and welfare by 5.2 percent, and the non-energy price index could increase by 26 percent. However, those short-term effects are reversed in the long term, leading to a substantial increase in GDP and welfare, particularly when subsidy reforms are accompanied by complementary policies such as cash transfers and other productive activities (including electrification, public transport, and investment in education and health).

Complementary sectoral policies

Countries such as Germany and Spain have used feed-in tariffs (FiTs) to support the deployment of new clean energy technologies, but as technologies mature, competitive bidding through auctions in middle-income countries (including Brazil, India, and South Africa) have been more cost-efficient in procuring renewable capacity (for example, by achieving lower prices per unit of electricity, as assigned in the power purchase agreements). FiTs guarantee a fixed price for the electricity produced by renewable energy sources. However, they may result in overpayment to producers if the cost of renewable energy technologies falls over time. Auctions create a competitive market for renewable energy and allow policy makers to manage the quantity and the quality of renewable energy projects by setting the volume, technology, and the criteria for the bids. Auctions can also foster innovation and diversification of renewable energy sources by creating different categories or segments for the bids. Auctions have led to low utility-scale prices for solar photovoltaics (PV) in middle-income countries (figure 8.7).

Technology adoption and deployment are aided by scale. In Europe, the companies most diversified in renewables are the largest firms—they have a lower risk because of their size advantage. Those companies able to obtain the cheapest capital to replace energy from the Russian Federation by means of additional renewable generation are those already most invested in renewables.

Raw materials are a significant element of the cost structure of many technologies, and any disruption in supply can increase the cost of capital. For lithium-ion batteries, technology advancement and economies of scale have reduced overall costs by 90 percent over the last decade. However, if both lithium and nickel prices were to double at the same time, it would offset all the anticipated cost reductions associated with a doubling of battery production capacity. For electricity networks, copper and aluminum currently represent about 20 percent of total grid investment costs. Higher prices arising from a tight supply could constrain the level of grid investment.

The most efficient way to scale up the deployment of low-carbon energy is to respect merit order: the sequence followed by grid operators selling power to the market. The starting point is set by the cheapest offer (made by the power station with the lowest running costs), which determines the wholesale market prices. Any provider that can offer renewable energy at zero marginal cost—that is, with insignificant operating costs—should have priority in meeting demand. When the merit order functions as designed, it shifts prices along the supply curve, which energy economists accordingly call the “merit order curve.”

The design and enforcement of effective regulations are vital in ensuring that the merit order is respected. Clear, transparent rules on
interconnection will be needed to ensure entry by low-carbon energy providers and respect of the merit order. Allegations of abuse of dominance are common in wholesale electricity markets, which are more susceptible to the exercise of market power. This abuse includes both physical withholding (not offering available capacity to the market that could be profitably produced at the market price) and economic withholding (offering available capacity at a price that does not reflect its marginal cost—including the opportunity cost). Both cases of withholding make the merit order curve steeper and shifts its intersection with the demand curve, resulting in a higher price. Customers are then worse off while producers benefit.

Worldwide, promising regulatory initiatives are under way. In the European Union, regulators began investigating 109 cases of abuse of wholesale energy market integrity and transparency in 2021. Box 8.6 describes successful cases in detecting abuse of dominance in the Bulgarian and German wholesale markets. In Mexico, the Federal Economic Competition Commission (COFECE) issued a public report in 2021 about improving the regulation of Clean Energy Certificates, an instrument that provides incentives for generating electricity using clean technologies under the framework of the Electricity Industry Law and the Energy Transition Law.

In Colombia, the Superintendence of Industry and Commerce (SIC) developed an advocacy initiative in the energy sector in 2019 encouraging competitive bidding through renewable energy auctions. For example, SIC recommended arranging subsequent rounds of auctions (tenders), instead of a single tender, to enable the participation of companies that were still preparing to enter the market and would only be able to provide renewable energy sources after the initial date indicated in the first auction model.

Figure 8.7 In some middle-income countries, the prices of renewable energy through competitive auctions have reached record lows


Note: The emirates of Abu Dhabi and Dubai are shown separately. kWh = kilowatt-hour; PPA = power purchase agreement.
**Box 8.6 Correcting abuses of dominance in electricity markets**

Liberalizing and opening up a sector that historically has been governed by the state and state-controlled actors are challenges that go far beyond updating the regulatory framework, as witnessed in Germany and Bulgaria.

**Bulgaria.** In 2019, the Bulgarian Commission for Protection of Competition (BCPC) fined the National Electricity Company EAD (NEK) for abuse of dominance. NEK is part of Bulgarian Energy Holding, which owns 80 percent of all hydropower plants in Bulgaria. It is historically the last-resort supplier and the coordinator of special balancing energy groups.a BCPC found that NEK abused its dominant position in the balancing market of electricity producers from renewable energy sources at preferential prices in two ways.b First, it unilaterally altered the forecasted hourly electricity production schedules submitted by renewable energy producers. NEK submitted a different schedule, usually unilaterally providing for less production (that is, without informing the respective producer). These changes made it practically impossible for the renewable producers to meet the amounts set by NEK. Second, the BCPC found that unilaterally the renewable energy supply producers were financially burdened by the artificially increased imbalances.c

**Germany.** In May 2021, the German Federal Network Agency (Bundesnetzagentur) imposed fines of €200,000 on Energi Danmark A/S and €175,000 on Optimax Energy GmbH for manipulation of the wholesale electricity market. The penalties were the outcomes of investigations opened in September 2020 after significant imbalances were observed in the system in June 2019. The Bundesnetzagentur’s analysis of trading activities indicated market manipulation involved sales of electricity that was not available. The companies placed offers to sell electricity on the intraday market shortly before the electricity was due to be supplied without intending to supply it. Their incentive to do so stemmed from the difference between the unusually high intraday price and the lower expected imbalance price in the balancing market.d The practice distorted market signals at a time when transmission system operators had to make full use of balancing energy and take other measures to ensure the stability of the German system. The practice not only allowed the companies to realize unjustified profits but also threatened system stability.e

Source: Mateina and Grunova 2020.
a. A balancing group is a group of participants on the free market, both consumers and producers which optimize their electricity costs by netting their counter hourly deviations (imbalances) and reducing the overall deviation between the projected and reported electricity consumption. A special balancing group includes only participants of the regulated market.
c. Mateina and Grunova (2020).
d. Balancing services are reactive short-term means of leveling out frequency deviations in the power grid. These services (sometimes also called control reserve) are one of many ancillary services that system operators must provide for a secure power supply.
e. See Bundesnetzagentur (2021).
In many middle-income countries, policies need to be revisited and upgraded to reward merit activities. But this will require a change in mindset. Policy makers should think in terms of adding value (merit): economic, social, and environmental. That requires changes in policies to enhance value added across the economy through the efficient resource utilization of talent, capital, and energy. All these efforts will help middle-income countries escape the middle-income trap.

Notes
3. China is an exception. By 1990, China and India were similar in terms of their gross domestic product (GDP) per capita, upper-secondary completion rate, and tertiary enrollment rate. Today, China surpasses India in all three indicators. A comprehensive study of educational upgrading in Brazil, China, India, and Indonesia starting with the 1950 cohorts finds that, although China followed a strategy of progressive universalism, India did not (Schady, Isaacs, and Parra 2024).
5. As the focus on basic education declined, so did its budget share. But because the country was growing, the absolute amount of resources spent on basic education did not decline.
6. Angrist et al. (2023); World Bank (2018).
7. Angrist et al. (2020). This comparison includes only those reforms that have been rigorously evaluated.
8. These findings are also consistent with the “Smart Buys” recommendations of the GEEAP (2023). In addition, Angrist et al. (2023) conduct a cost-benefit analysis for two interventions—structured pedagogy and teaching at the right level—and find that, if applied to 90 percent of the nearly 470 million students in low-income and lower-middle-income countries, they would cost on average US$18 per student and yield US$65 in benefits for every dollar spent. Overall, they would increase spending by a mere 6 percent and yet raise learning by 120 percent. See also Dixit and Gill (2024).
9. Dinarte-Díaz et al. (2023); Ferreyra et al. (2021).
11. La Hora (2022).
12. In the United States, the co-op model was first implemented at the University of Cincinnati and Northeastern University. Today, additional institutions include Georgia Tech, Purdue, and Drexel.
14. China’s number of science and engineering (S&E) graduates grew from 225 per million population in 2000 to 1,057 in 2014, and the number of PhD S&E graduates increased from 5.6 per million population in 2000 to 23 in 2014. The source of these figures is WDR 2024 team calculations based on World Bank (2020).
15. For example, Kitchen, Sonnert, and Sadler (2018) find that in the United States the National Science Foundation’s STEM Talent Expansion Program increased high school students’ interest in a STEM career. In addition, Kitchen, Sonnert, and Sadler (2020) show that campus visits, including meetings with STEM professors, significantly increased the likelihood of college students expressing STEM career aspirations. Mentoring and information interventions are among the most effective ways to boost the interest of female students in STEM (Muñoz-Boudet et al. 2017).
17. In their review of job training programs, Carranza and McKenzie (2023) note the importance of design issues, given that the returns to most TVET programs are modest. They highlight the success of Colombia’s Jóvenes en Acción program and of others led by nongovernmental organizations. The scalability and general equilibrium effects of these programs remain to be seen.
18. Material on Finland is drawn from Nieminen and Kaukonen (2001). Information on Denmark is from Cedefop (2023), Peters et al. (2010), and the sources cited therein.
19. See, for example, Gorgodze and Chakhaia (2021).
22. Chetty et al. (2020).
24. Abebe et al. (2021); Alfonsi, Namubiru, and Spaziani (2022); Bandiera et al. (2022); Groh et al. (2015); Kelley, Ksoll, and Magruder (2023).
27. Chetty et al. (2022a, 2022b).
31. Card and Giuliano (2016) documented large achievement gains for students who are tracked in separate “gifted/high achiever” classrooms. Benefits were overwhelmingly concentrated among minority participants without negative spillovers to the students who were left behind. Van Reenen (2021) reviews other evidence for the United States.
32. Rutigliano and Quarshie (2021); Tirri and Kuusisto (2013).
33. For a full discussion on advanced learners in the United States, see Thomas B. Fordham Institute (2023).
34. Zorman, Rachmel, and Bashan (2016).
35. See Baeza (2020) for Spain and Invention Programs (portal), Kid Museum, Bethesda, MD; https://kid-museum.org/invention-programs/ and NIH (2022) for the United States.
36. WDR 2024 team calculations based on OECD (2021). Data are available for eight middle-income countries and 30 high-income countries.
40. Bond et al. (2012).
41. Shetty et al. (2014).
42. The deduction is 300 percent. The company reduces taxable income by three times the amount of R&D expenditure (Mendes 2015).
43. Brazil, China, Malaysia, the Philippines, and South Africa, as well as other member countries of the Organisation for Economic Co-operation and Development (OECD), have followed the United States in allowing a university, research institute, small firm, or nonprofit institution to claim ownership of an invention funded with public resources. For evidence on the effectiveness of providing scientists with greater ownership of innovations, see Hvide and Jones (2018) for Norway and Lach and Schankerman (2008) for the United States following the Bayh-Dole Act.
44. For example, see Bueno (2009).
45. Garcia and Crawley (2024).
46. Garcia and Crawley (2024).
50. Eslava and Haltiwanger (2020); Hsieh and Olken (2014).
52. Brazil, China, Malaysia, the Philippines, and South Africa, as well as other member countries of the Organisation for Economic Co-operation and Development (OECD), have followed the United States in allowing a university, research institute, small firm, or nonprofit institution to claim ownership of an invention funded with public resources. For evidence on the effectiveness of providing scientists with greater ownership of innovations, see Hvide and Jones (2018) for Norway and Lach and Schankerman (2008) for the United States following the Bayh-Dole Act.
53. Aivazian and Santor (2008); Vu and Tran (2021).
54. López and Torres (2020).
55. Tsuruta (2020).
56. Bachas, Fattal Jaef, and Jensen (2019); see discussion in chapter 4.
57. Akcigit et al. (2023).
60. López and Torres (2020).
62. Didier and Cusolito (2024).
64. Schumpeter (1942).
65. McKenzie et al. (2023); Scur et al. (2021).
70. McKenzie et al. (2023).
71. Back, Parboteeah, and Nam (2014); Bloom et al. (2013, 2020); Bruhn, Karlan, and Schoar (2018); Giorcelli (2019); Higuchi, Nam, and Sonobe (2015); Karlan, Knight, and Udry (2015).
73. Glaeser and Shleifer (2002); La Porta et al. (1998).
74. Aminadav and Papaioannou (2020); La Porta et al. (1999).
75. La Porta et al. (1997, 1999).
76. Scur et al. (2021).
78. Bloom et al. (2019).
82. McKenzie and Sansone (2019).
83. Miller et al. (2023).
84. Didier and Cusolito (2024).
86. Akcigit et al. (2022).
87. Lall, Chen, and Roberts (2020).
88. Kim and Wagan (2014); Plummer, Allison, and Connely (2016). For more on the highly successful accelerator program of Y Combinator, widely regarded as the first, see Hathaway (2016).
89. Hathaway (2016).
90. See https://www.ycombinator.com/about.
91. Hathaway (2016).
92. Gonzalez-Urbe and Hmaddi (2022).
94. Roberts et al. (2017).
95. Stern (2022).
96. See Acemoglu et al. (2012, 2016).
97. World Bank (2023b).
98. World Bank (2023b).
99. Agnolucci et al. (2023); Agnolucci, Gencer, and Heine (2024). TCP components labeled as “energy taxes” and “energy subsidies” are based on “net” computed values, as proxies for actual values of energy taxes and subsidies, due to data limitations. Energy taxes and subsidies are estimated based on the “price gap” between retail prices and supply costs for a particular energy carrier, used in a specific sector in a jurisdiction in a given year. The net energy taxes and subsidies are then aggregated across sectors, fuels, and countries to yield a global value, as illustrated in figure 8.6. More details on this methodology are discussed in Agnolucci, Gencer, and Heine (2024).
100. Agnolucci, Gencer, and Heine (2024).
102. Gentilini et al. (2022).
103. Lin and Li (2012).

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La Hora. 2022. "Hay una desconexión entre lo que las empresas necesitan y lo que se está formando en el