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PRODUCTIVITY GROWTH IN MEXICO

UNDERSTANDING MAIN DYNAMICS AND KEY DRIVERS

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Abbreviations and Acronyms

eCOVID	Survey on the Economic Impact Generated by COVID-19 on Enterprises
EIS	Enterprise Investment Scheme (United Kingdom)
ENAFIN	National Survey of Enterprise Financing
ENAPROCE	National Survey of Productivity and Competitiveness for Micro, Small, and Medium Enterprises
ENCRIGE	National Survey on Regulatory Quality and Government Impact on Enterprises
FDI	foreign direct investment
GDP	gross domestic product
GVC	global value chain
HHI	Herfindahl-Hirschman Index
ICIO	inter-country input-output table
ICT	information and communications technology
ILO	International Labour Organization
INEGI	National Institute of Statistics and Geography
IV	instrumental variable
LFP	labor force participation
M&E	monitoring and evaluation
MBA	Master of Business Administration
MOPS	Management and Organizational Practices Survey
MSMEs	micro, small, and medium-size enterprises
NAFTA	North American Free Trade Agreement
NAICS	North American Industry Classification System
OECD	Organisation for Economic Co-operation and Development
PPE	property, plant, and equipment
R&D	research and development
SEIS	Seed Enterprise Investment Scheme (United Kingdom)
SMEs	small and medium-size enterprises
TFP	total factor productivity
TFPQ	quantity-based total factor productivity
TFPR	revenue-based total factor productivity
UNCTAD	United Nations Conference on Trade and Development
UNESCO	United Nations Educational, Scientific and Cultural Organization
USMCA	United States-Mexico-Canada Agreement
WEF	World Economic Forum
WMS	World Management Survey
WTO	World Trade Organization

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Executive Summary

For three decades Mexico has been an economy in slow motion. Despite reforms, between 1990 and 2019, Mexico's economic growth averaged only 2.2 percent a year and gross domestic product (GDP) per capita relative to the United States declined from close to 30 percent to less than 20 percent. Growth has been driven by labor force growth from the demographic dividend, and to a lesser extent by capital investment. Yet this factor accumulation has been offset by negative productivity growth. In sum, GDP per worker (in constant US dollars calculated at purchasing power parity) increased at an annual rate of 0.1 percent between 1991 and 2020. This is well below the growth seen in other economies that started from broadly comparable income levels, such as the Republic of Korea (3.3 percent) and the Czech Republic (2 percent), or even OECD and Latin American averages of 1.1 and 0.8 percent, respectively.

The impact of the Covid-19 pandemic has compounded this productivity challenge. To jump-start growth in the wake of the pandemic, the Mexican government is pushing to ensure factor accumulation rebounds. The 2022 budget aims to reinvigorate public investment through major infrastructure projects, with a focus on the South. On the labor side, the government aims to build a national care system and to remove barriers to women joining the labor force.

To have significant and sustained growth impact, these measures should be complemented by other, structural reforms. For instance, expanding public investment calls for changes in the tax structure to increase revenues. Increasing female labor force participation would benefit from greater legal flexibility towards working hours and home-based work, as well as enshrining the principle of equal pay for equal work in Mexican labor law. But above all, Mexico needs reforms to shift onto a higher productivity path. Understanding the causes of Mexico's productivity weakness and the constraints to its growth, and therefore informing the design of these reforms, are the goals of this report.

The report undertakes, for the first time, a comprehensive firm-level analysis of the entire Mexican economy over 25 years, relying on the last six rounds of the Economic Census, which were conducted between 1994 and 2019 and surveyed more than 20 million businesses. It finds that Mexico's disappointing aggregate productivity masks large differences in productivity levels and growth across locations, sectors, and firms. A geographic productivity divide runs between the North-Center and South of Mexico, but large differences also persist between municipalities *within* regions. Fast-growing municipalities that have caught up to the Mexican productivity frontier, including in the South, while others have failed to grow at all. There is also a divide between modern firms, with access to finance and strong management, integrated into global value chains (GVCs), and more traditional firms characterized by limited access to finance and weak capabilities, unable to benefit from Mexico's regional and global integration. The report shows that Mexico's aggregate productivity is weakened by structural factors at industry and firm level — access to finance, lack of incentives to invest in technology, managerial capacities, and the business environment — that impede productive firms' access to resources. The rest of this summary gives a synopsis of the report's main findings and recommendations.

Promote Competition and Expand Access to Finance to Support Faster Productivity Growth

Access to finance is a crucial driver of Mexican firms' productivity growth. Total Factor Productivity (TFP) growth tends to be higher in firms with access to finance than in those without (controlling for other factors and for reverse causality – financing increasing

productivity). This problem is acute for younger firms, which are typically smaller and more financially constrained as they have not yet built reputations or enough assets to use as collateral for credit. Small firms in Mexico are 9 percent more likely to be unable to finance needed investment due to lack of access to finance. Once firms do access credit, markets seem to function better: more productive firms face lower interest rates. Access is the key constraint for the young and the small.

Other evidence confirms that credit constraints hamper Mexican productivity growth. Domestic credit to the private sector was only 39 percent of GDP in Mexico in 2020, versus 70 percent in Brazil, 124 percent in Chile, the Latin America and Caribbean average of 60 percent and the OECD average of 161 percent. Furthermore, the limited credit that is available does not flow towards the most productive firms, which are in fact less likely to have access to bank finance.

The report identifies several reasons for this counterintuitive situation. The first is concentration and limited competition in the banking system: three banks account for more than 50 percent of Mexico's total bank assets. Banks with greater market power focus on the most profitable market segments and charge higher interest rates, especially to small firms with limited collateral. This impact is more pronounced in the South, given its smaller firms and fewer bank branches (less competition). Several measures could thus help to foster competition and alleviate credit constraints:

- Reform policy and regulatory measures to reduce the cost of entry into the banking system.
- Facilitate the growth of payment system platforms (for example, CoDi), enabling pending FinTech law regulation and reducing rigidities in existing FinTech regulation.
- Expand financial systems to support young firms and startups through seed capital and venture capital markets, including scaling public support for the creation of financial networks and funds of funds and ensuring a supportive regulatory framework.

The report finds that collateral plays a critical role in determining access to finance. Lack of information and the related unwillingness of banks to lend to borrowers with uncertain likelihood of repayment are more pronounced in Mexico than in more advanced financial markets, and lenders therefore require greater collateral to mitigate payment risk. The report finds that in otherwise similar firms, a higher share of real estate assets (easily used as collateral) is associated with a lower likelihood of being financially constrained. Smaller firms, which have less collateral, face higher and more dispersed interest rates. Financing constraints are particularly relevant for firms that pursue technological innovation, as intangible investments are harder to collateralize. Existing guarantee programs (such as the *Nacional Financiera* programs) have proven successful at raising resources for a narrow group of businesses with longer credit histories, but these programs have not yet brought much help to younger firms or those without credit histories, nor have they increased investments in innovation. Some of these limitations could be mitigated as follows:

- Focus guarantee programs on more productive firms that are financially constrained, such as younger firms and new borrowers, who need time to build reputations and relationships, as well as firms pursuing innovative activities.
- Clarify rules on sunset clauses that limit the time by which firms graduate from guarantee programs, encouraging banks to improve risk management, the quality of information, and credit screening.
- Strengthen credit information bureaus and registries, to improve the allocation of finance towards more productive firms.
- Promote innovative forms of movable assets as collateral (for example, sales of receivables) alongside more expeditious enforcement procedures to increase collateral recovery rates.

Reduce Regulatory Barriers and Reform the Bankruptcy Regime to Foster Firms' Growth

Beyond credit markets, Mexico's economy exhibits a more general inability to allocate resources towards the most productive firms. The report finds persistently very high dispersion of revenue productivity between Mexican firms over 1993-2018. The most productive 10 percent of firms are 3.6 times more productive than the least productive 10 percent, versus ratios found in the literature of 1.9 in the United States, 2.4 in the United Kingdom, or 1.3 in Japan (Garone et al., 2020). These patterns suggest markets are not working efficiently.

More productive establishments face higher regulatory and tax burdens, which hinder the allocation of factors toward these firms. This is more worrisome

during recessions, which are exacerbated by this allocative inefficiency. The report estimates that, if resource allocation across firms in Mexico had followed a pattern similar to the United States during the 2008 global financial crisis, Mexican productivity would be 9 percent higher.

In line with previous findings in the literature, the report finds that new firm entrants into Mexican markets are, on average, marginally more productive than surviving firms: the entry of more productive firms therefore slightly increases aggregate productivity. However, many incumbent firms have quite low productivity, so the entry of only marginally more productive firms will have limited impact on the aggregate. Productivity growth in Mexico has been mainly driven by changes in the technical efficiency of operating firms. However, only a subset of these firms has shown productivity growth, and these firms have grown only while young; the productivity of the median firm in Mexico does not grow over its whole life cycle. This is because of various forms of market distortions in Mexico, which weaken incentives for investments in process efficiency and upgrading.

As a result of these dynamics, there are few large firms in Mexico, and they do not grow fast enough or create sufficient jobs. In 2019, 95 percent of establishments in Mexico had fewer than 10 employees, versus 61 percent in the US. Firms with five or fewer workers contribute 30 percent of employment in Mexico, versus 5 percent in the US. Large firms (more than 500 employees) account for only 25 percent of employment in Mexico, versus over 50 percent in the US. Market distortions in Mexico also affect larger establishments, which are typically formal, increasing regulatory barriers, tax burdens, managerial inefficiencies, and collateral constraints, thus hindering investment and growth.

The main constraints on efficient firm entry-and-exit dynamics in Mexico are stringent regulatory barriers and an outdated bankruptcy regime. Between 1993 and 2018, the report finds the unusual pattern of surviving operational firms losing more jobs than those destroyed by firms exiting markets. Market inefficiencies are contributing to the slow growth of firms' employment across the life cycle. Moreover, as in much of the rest of Latin America, informality, shown by existing research to be driven by the tax and social security systems, is an important driver of misallocation of factors across firms.

The urgency of policies to improve factor mobility and firm selection has been accentuated by the pandemic, which calls for large reallocation of resources toward surviving productive firms while letting unproductive firms exit markets:

- Simplify the bankruptcy regime through out-of-court mechanisms to enable the exit or restructuring of less efficient firms, including by
  - **(i)** guaranteeing protections for secured creditors during insolvency and reorganization proceedings;
  - **(ii)** improving the capacity of specialized courts to handle insolvency cases;
  - **(iii)** improving the capacity of and regulations governing insolvency practitioners (*síndicos de quiebra*)

- adopting guidelines to facilitate out-of-court workouts.
- To reduce the scope for corruption and cut transaction costs for operating firms, the excessive discretionary power given to inspectors can be limited in line with the *Ley de Fomento a la Confianza Ciudadana*, which allows businesses and citizens to register with the *Padrón Único de Confianza Ciudadana* and declare compliance with regulations. This would reduce government inspections of registered businesses to well-founded claims using a risk-based approach.
- Strengthen competition policy by reforming product market regulations (especially in service industries) and curbing concentration and market power in critical markets.
- Enhance the role of the Federal Economic Competition Commission to improve competition policy enforcement, especially in curbing cartel behavior.

Ineffective regulations continue to inhibit interstate trade, protect local oligopolies, and stifle local entrepreneurship in commerce, construction, manufacturing, agriculture, real estate, and tourism, to name a few key affected sectors. In 2018, the Markets and Competition Policy Assessment Tool identified over 2,400 state-level anti-competitive restrictions across Mexico's 32 subnational governments:

- Reduce regulatory barriers to enhance firm creation and growth at the subnational level, by:
  - **(i)** simplifying business permits, improving transparency and reducing the space for corruption by moving transactions to online platforms;

(ii) supporting the full implementation of SINAGER (*Sistema Nacional de Gobernanza Regulatoria*) to simplify existing unnecessary regulations.

Reducing long-standing rigidities in labor markets is another way to support the efficient reallocation of resources and encourage firm growth. For example, the Mexican Commission for the Minimum Wage has found that the "Youth Building the Future" program increases the probability of young people finding a job and that the income from the program has worked as safety net during the pandemic (CONASAMI, 2021). These reforms should be complemented by additional measures:

- An unemployment insurance program to work as an automatic stabilizer during downturns.
- Reform of employment law to allow reduced working hours for employees when crises hit, to preserve formal job matches and reduce risk aversion in hiring.
- Reforms to reduce the costs and time associated with labor disputes. The recent labor reform in Mexico has potential in this regard but its success will hinge on the details of implementation.

Liberalize Service Trade and Improve Logistics to Gain from Mexico's Participation in GVCs

Integration into GVCs has contributed to productivity growth in Mexico. Yet there is room to increase this integration and boost productivity in sectors and locations that have been largely excluded. The report finds that Mexican firms that integrate into GVCs are twice as productive as non-GVC integrated firms, controlling for other firm characteristics. Mexico's participation in advanced manufacturing and services GVCs has been driven by the country's low-cost labor supply, its large domestic market for manufactured goods, proximity to the US, and high foreign direct investment (FDI) inflows. But the economy has made little progress in technological upgrading and increasing local value added, which could broaden productivity gains across the economy. This is manifested in low use of domestic intermediate inputs, high concentration in manufacturing, and the exclusion of many domestic firms, sectors, and regions from GVCs entirely. The foreign value added embodied in Mexico's gross exports remains relatively high across all sectors. Indirect domestic intermediate inputs are only 25 percent of the country's total export value, compared with a foreign contribution of 36 percent. This is most marked in manufacturing, where domestic inputs represent 28 percent of export value compared with 47 percent for foreign inputs.

The report shows that anti-competitive regulation and de facto barriers to FDI in upstream services (such as transport or construction) inhibit competitiveness downstream, limiting integration into GVCs. Mexico should review vertical and horizontal constraints in key GVCs, such as electronics and aerospace, and reduce these constraints in partnership with the private sector:

- Emphasize innovation and skills upgrading. Sectors more integrated into GVCs invest more in R&D, which is positively correlated with labor productivity. Mexico trails other countries in R&D intensity, skilled labor, and quality of education. This calls for improving access to, and the quality of, education and stronger collaboration between industry and vocational training institutions.
- Liberalize services trade and increase technical standards. Mexico's transport and telecoms trade are more restrictive than comparator countries. Measures are needed to reduce non-tariff barriers and trade restrictions in transportation, logistics, and telecoms, and to lift barriers to competition in goods markets, with a focus on non-tariff barriers.

Improved connectivity could also strengthen the integration of firms in Mexico´s southern states into GVCs. For example, trade in parts and components is highly sensitive to logistics performance and uncertainty in transport times. But improved connectivity needs to be complemented by other reforms. The report finds limited impact on productivity of road construction in the South compared with the North-Center and Center, as the South lacks the dynamic nearby markets and complementary business environment of other regions. To tap the potential productivity of lagging states, infrastructure projects therefore need to be complemented by other reforms:

- Improving logistics performance in ports as main bottlenecks are linked to controls and administrative procedures which increase burdens and restrict transport activity. Mexico should develop an integrated logistic strategy for the main Mexican ports to increase the volume; and increase port efficiency by establishing a free area of border controls for coastal shipping, introduce a specific regime to

facilitate trans-shipment, expand opening hours of customs and inspection agencies; and simplify port gate operations. Better connectivity and logistics performance would not only facilitate GVC participation but would also link more domestic regions and suppliers to GVCs.

- Reducing the costs of doing business, particularly in southern states. Business costs in Mexico are among the highest across all the major categories: starting a business, construction permits, electricity, registering property, paying taxes, enforcing contracts, and insolvency. These costs cause foreign investors to prefer cheaper imported inputs to domestic inputs, reducing the domestic value added in Mexican exports. Reducing the costs of doing business would enhance domestic linkages to foreign investors and GVCs.

Promote Regional and Local Growth while Reducing Local Productivity Differences

It is well established that productivity differences between states in Mexico are higher than those observed in other OECD countries. The economic liberalization of the 1990s interrupted the ongoing convergence of income levels between Mexican states, which became an increasing dispersion. While some Mexican regions have taken advantage of the opportunities created by trade openness, poorer regions have done so less. Nuevo León has become as productive as Korea; Chiapas and Oaxaca remain about as productive as Honduras. Labor has flowed from less productive towards more productive states, which has increased income per worker at the expense of entrenching regional disparities.

The lack of success in international experience of regional development policies suggests that this is to some extent unavoidable. However, this report finds that the lack of convergence of labor productivity between Mexican states does not extend to *municipalities*. Between 1993 and 2019 Mexico's municipalities did in fact converge in productivity, in both manufacturing and services. This convergence was driven by low-productivity municipalities "catching up". Fast-growing municipalities do exist in poorer states, but these *states* do not converge with richer states owing to their smaller number of such faster-growing municipalities. And the weight of overall convergence driven by initially poorer, less productive municipalities helps explain low aggregate productivity growth at the national level.

The key drivers of municipal productivity growth are urbanization, skills, and access to markets. The report finds that urbanization—the concentration of economic activity—is a strong driver of local productivity in Mexico. Municipalities' density and scale significantly affect local productivity, with effects in line with those documented for advanced economies such as France, the UK, and the US. However, these productivity effects vary greatly within Mexico. In contrast to cities in the Center and North, Mexico´s southern cities have *not* benefitted from agglomeration. According to estimates in the report, doubling population density in the Center or North of Mexico increases local productivity by 3 percent; in the South this effect is absent. The impact of urban population growth on local productivity is also nearly three times larger in the North than in the South. These differences are driven by differences between complementary local policies and institutions: urban planning, public transport, policing, waste management, and the regulatory environment for businesses.

Mexico's urban policies should thus be reframed to recognize cities' central role in fostering growth. Better multi-jurisdictional coordination is needed to plan, finance, and execute investments with large positive externalities and economies of scale (including through the Fiscal Coordination Law), complemented by improved property taxes, more liquid land markets, and systems to encourage and monitor municipal development:

- Broader urban development plans beyond housing, to connect firms with households and promote productive, livable, and sustainable cities. Specifically, this could include incentivizing mixed land use zoning for peri-urban expansion and the renewal of dilapidated urban cores, and a multimodal approach to urban transportation.
- Leverage private-sector finance using financial instruments beyond housing subsidies, such as land-based financing capturing part of the increases in land values coming from public investment and urbanization. A key starting point is a well-functioning cadastral system at the city level.
- Strengthen coordination between neighboring Mexican cities to unlock agglomeration benefits. Coordination between municipal administrations within metropolises is incipient, but there are already good examples of multi-jurisdictional coordination (e.g., Monterrey).
- Increase municipal revenue generation. Beyond improvement of cadasters, this requires strengthening

the revenue potential of municipalities, for example, through property tax reform. This can be reinforced by revised federal transfers to support poorer municipalities.

The findings underline the importance of education and skills development, for example expanding universities, at the local level. The report finds strong links between the presence of universities and local labor productivity across all Mexican regions. Moreover, the productivity effects of access to international markets is found to be limited to skill-intensive services (which tend to be more tradable), whereas connectivity with nearby domestic markets is a stronger productivity driver for non-tradable services. Policy implications are:

- Improve local skills, in line with local labor market demands, to complement the urbanization and agglomeration process. Enhance public-private coordination at the local level to ensure that higher education institutions (vocational centers or universities) respond to market demand (e.g., following the successful example of the Aeronautical University in Querétaro).
- Improve cluster-policies – coordinating policies between industry, government and academia, stimulating innovation, strengthening human capital, facilitating access to finance and addressing congestion – to boost local productivity in line with the experience of several manufacturing industries in Mexico, especially in aerospace, automotive, and electronics. These policies strengthen input-output linkages through suppliers' development programs, with a focus on SMEs, as well as information exchanges on the demand for local inputs and skilled labor.

Foster Innovation, Technology, and Better Management Practices

Innovation policies are an engine of productivity growth. Yet the report finds that Mexico's innovation efforts are not at par with peer countries, with little change over the past decade. Mexico's R&D spending as a percentage of GDP is a third of the world median and half of Brazil's. Moreover, Mexico has shown a sharp decline in private R&D expenditure, which fell by around 35 percent between 2005 and 2018 (constant USD). Today, 60 percent of R&D expenditure in Mexico is financed by the government. Returns to R&D investment could be as high as 80 percent in non-G7 OECD countries (Goñi and Maloney, 2017).

Investment in information and communications technology (ICT) can generate productivity gains in Mexico, but only if complemented with the right incentives and organizational changes. ICT is key to the modernization of firms, and the Mexican government has supported this goal. However, the report finds that for ICT investments to generate productivity gains, they must be complemented by incentives for firms to invest in complementary organizational changes. As an illustration, the positive relationship between ICT adoption and sales per worker is limited to Mexican sectors that have experienced competitive pressure from Chinese imports. The report finds returns to ICT adoption over four times higher for firms faced with the highest levels of Chinese import penetration than for the average level, while returns to ICT adoption are zero in firms faced with the lowest levels of Chinese competition.

Reforms to boost competition and facilitate access to markets would improve the conditions for innovation, management reforms, and ICT adoption. Foreign direct investment also generates spillovers to management practices. Yet Mexico's policies to encourage innovation have been dispersed across multiple agencies. Better coordination between the Ministry of Economy and the National Council for Science and Technology, and between federal and state agencies, would enhance their impact. More evidence-based program evaluations could also improve program design.

- Benchmarking firms can provide information to encourage investment in management practices. Vouchers may be issued to subsidize the costs of an initial diagnostic.
- The US Manufacturing Extension Program could provide a model for the design, pilot, and scale-up of technology extension services, targeting improvements in management and organization.
- Building on experience of R&D tax credits and matching grants, as well as on international good practice, to introduce instruments that stimulate private R&D. A first step would be to run trials of new versions of existing programs and measure impact on R&D and innovation.
- Target specific managerial support instruments such as incubators and mentoring to innovative startup firms, which have more intangible assets and face higher risk. As firms mature, other instruments (e.g., vouchers) might become more appropriate.

Accelerate Digital Adoption to Promote a Productivity-Driven Recovery

The National Institute of Statistics and Geography (INEGI) estimates that between October 2020 and July 2021 more than 1.5 million businesses closed, and four in five firms that continued operating lost more than half their revenue. The related lockdown was a strong push factor for many firms to move into digital technology. Just between April and August 2020, the probability of a firm making online sales increased by nearly a third. INEGI also finds that digital technologies have mitigated the impact of the Covid crisis on employment and wages. However, smaller firms are less likely to adopt digital technology and gain these benefits. A 2019 survey by the National Alliance of Small Merchants found that 60 percent of surveyed firms did not know what a Quick Response (QR) code was; a similar share believed that electronic payments would not work for their business.

Despite the potential for government programs to promote technological catch-up, less than 9 percent of Mexican firms surveyed in this report had access to any kind of public support for digital technology during the early months of the COVID-19 crisis (compared with similar surveys elsewhere: Vietnam at 20 percent, Brazil at 30 percent, or Poland at 65 percent). Eliminating barriers and incentivizing digital adoption at the firm level could accelerate Mexico's post-Covid productivity rebound:

- Implement programs to promote the adoption of digital technologies among micro, small, and medium-size enterprises (MSMEs):
  - **(i)** expand information on available technologies;
  - **(ii)** strengthen capabilities for use of these technologies through vouchers or direct technical assistance;
  - **(iii)** lower barriers to access to digital technologies through leasing or subsidies during the initial adoption phase.
- Develop specific training and vocational programs to improve workers' skills for the adoption of digital technologies.
- Lower barriers to entry for suppliers of digital and FinTech solutions.
- Create a system to allow MSMEs to identify providers and assess services to deepen technology markets and reduce costs (e.g., digital payment systems, supply chains, and inventory control).
- Expand the quality and reliability of broadband services and infrastructure, and lower costs.

The Urgency of the Task

Reform is now more important than ever as the pandemic has exacerbated persistent structural challenges to productivity growth. The deep recession has created dark clouds on the horizon, disrupting supply and demand, impeding access to finance, damping the appetite for investment and innovation, and threatening long-term damage to human capital. Mexico's high share of informal, low-productivity firms has made it more vulnerable to these effects, compounding long-standing structural challenges, such as the phasing out of the demographic dividend as Mexico's population ages. But the pandemic has also shown new avenues to increase productivity, such as the acceleration of digital adoption, more focused infrastructure investments, and active labor-force support programs. These could offer a silver lining of opportunities for faster productivity growth in the coming years. One thing is clear: beyond investment in capital and labor, accelerating growth will require unleashing Mexico's undoubted – but hitherto untapped – productivity potential.

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Productivity Growth in Mexico: An Economy in Slow Motion[i]

CHAPTER 1

Introduction

Over the past three decades, Mexico's economic model has succeeded in maintaining stable macroeconomic fundamentals, increasing export competitiveness, promoting production diversification, and shifting the economy toward more complex industries (Padilla-Perez and Villarreal 2017; World Bank 2019).[1] This model, which started with the enactment of the Mexican Central bank in 1993 and the enter into force of the North American Free Trade Agreement as main landmarks, has also been very effective in improving macroeconomic stability and reducing inflation (World Bank 2019; OECD 2015). However, these achievements have not been enough to sustain robust economic growth. Gross domestic product (GDP) growth since 1990 has averaged only 2.2 percent a year and GDP per capita relative to the United States declined from close to 30 percent in 1990 to less than 20 percent in 2019.[2] The empirical evidence suggests that the main cause behind Mexico's lackluster economic growth has been declining productivity (López-Córdova and Rebolledo 2016). This report seeks to understand the reasons behind the poor productivity performance in Mexico, and to identify policies to revert the trend.

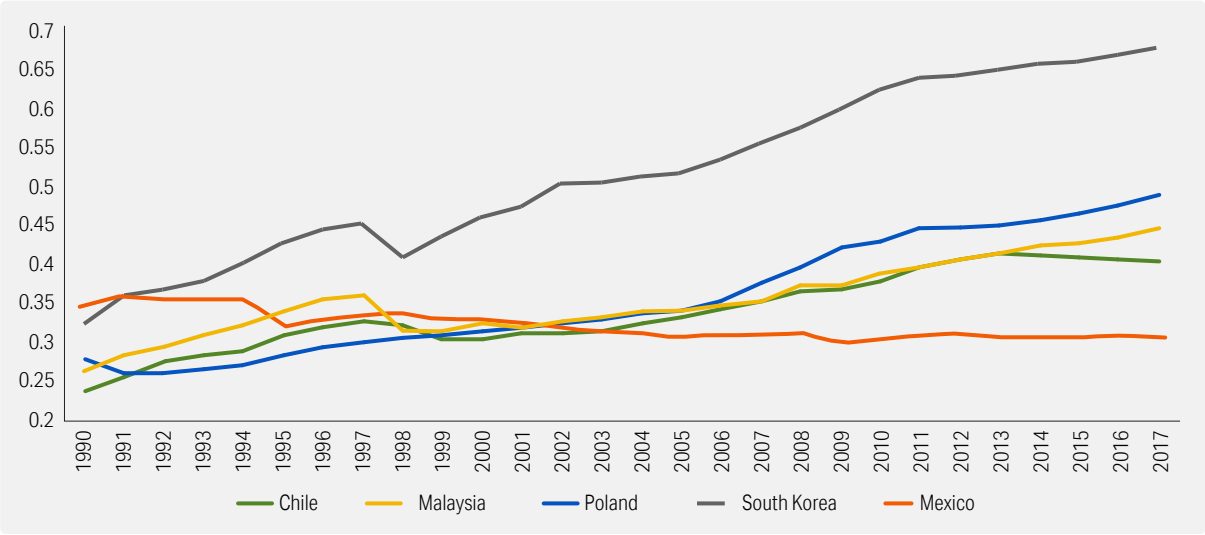
Poor aggregate productivity has been the main factor holding down long-term economic growth in Mexico. Since 1990, economic growth has been supported mainly by labor accumulation and to a lesser extent by capital accumulation. Labor accumulation has been significant (mostly in quantity, rather than quality) despite the constraints caused by migration, crime, violence, and in particular low female labor force participation (LFP). Capital accumulation has been characterized by low investment rates, particularly in public infrastructure, hampering economic growth and creating bottlenecks in sectors of the economy such as telecommunications and transportation. Thus, the gains achieved by Mexico's accumulation of production factors have been offset by negative growth in total factor productivity (TFP). Indeed, average labor productivity did not improve between 1990 and 2019.

There is a high degree of heterogeneity in productivity performance across states, sectors, and firms. Aggregate productivity trends in Mexico are shaped by structural factors that operate at the industry or firm level, which show considerable variation. Therefore, understanding Mexico's aggregate productivity requires analyzing the heterogeneity across regions, sectors, and firms (see chapter 2). The report finds that there are many informal enterprises, which have a limited aptitude for innovation and adoption of advanced technology and limited ability to integrate into global value chains (GVCs) (see chapter 4). The informal enterprises also tend to have ineffective management skills and practices (see chapter 5) and lack access to financial services (see chapter 6).

The next section of this chapter describes the aggregate trends and decomposes GDP growth into contributions from factor inputs and TFP. The chapter then describes sectoral and regional productivity trends and studies Mexico's low and uneven productivity growth path. The final section presents a first set of policy recommendations.

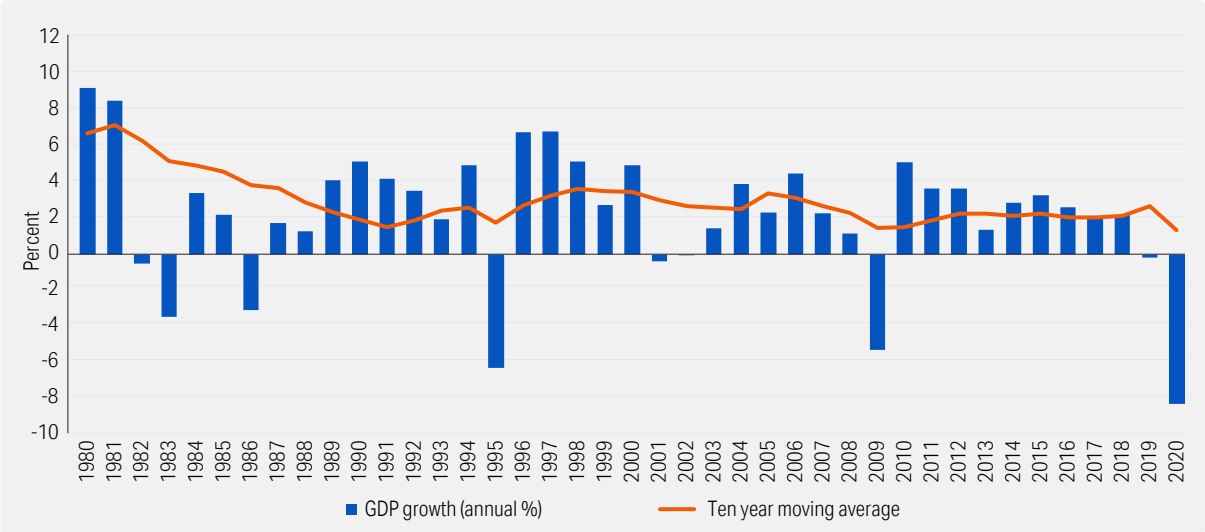
i This chapter was prepared by Eduardo Olaberria, Gabriel Zaourak, and Rafael Muñoz Moreno.

Figure 1.1 GDP per Capita Falling Relative to the United States



Source: Penn World Table 9.1.
Note: Gross domestic product (GDP) per capita is adjusted for purchasing power parity.

Figure 1.2 Mexico's Declining GDP Growth Trend



Source: World Development Indicators.

Aggregate Productivity Growth: The Story of an Economy in Slow Motion

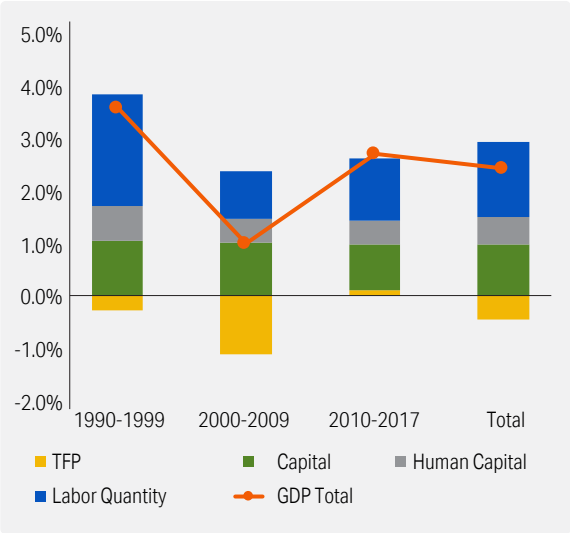
Mexico seems to be an economy in slow motion, compared with other emerging economies (figure 1.1). The GDP growth rate per decade declined from above 7 percent in the early 1980s to around 2 percent in the early 1990s and has remained around that level since then (figure 1.2). To understand the factors behind Mexico's modest economic growth, this section decomposes growth into contributions from factor inputs and TFP, as well as sectoral growth and reallocation. The exercise identifies low-productivity growth as the main character in the story of the Mexican economy.

Labor Accumulation (Adjusted by Education) Has Been the Engine of Growth

Labor accumulation has been the main driver of economic growth in Mexico (figure 1.3), contributing more to growth than in peer countries (figure 1.4).

Figure 1.3 Labor Is the Main Driver of GDP Growth in Mexico

(factor contribution to growth)



Source: Penn World Table 9.1.
Note: GDP = gross domestic product; TFP = total factor productivity.

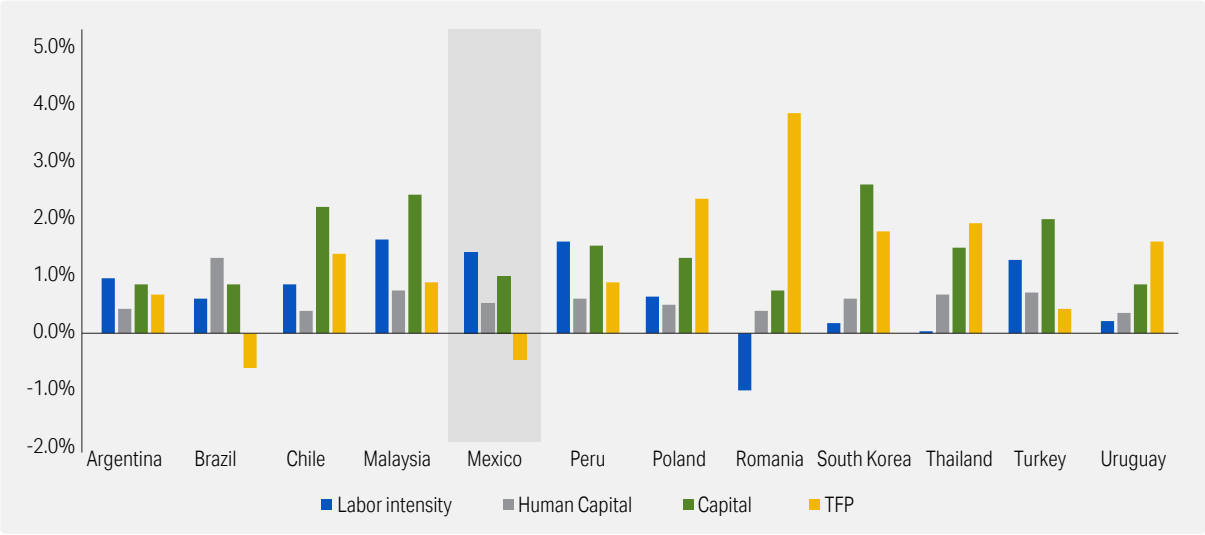
Labor represented 60 percent of all growth in Mexico over 1990–99, 30 percent over 2000–09, and 45 percent over 2010–17. Despite the declining role of Mexico's labor accumulation in contributing to growth—from 3.6 points during 1990–99 to 1.2 points during 2010–17—labor accumulation has played a greater role in growth in Mexico than in its regional comparators (Chile, Uruguay, Argentina, and Brazil) and peers (Poland, the Republic of Korea, Malaysia, and Peru).

Yet, Mexico's labor accumulation potential has been held in check by informality, migration, violence, and low female LFP. Insecurity and crime are rated among the top problems for conducting business in Mexico, contributing to misallocation of labor, while also impeding investment. Moreover, human capital is diverted away from its highest value use, as the labor force is unskilled and young. In the same vein, about 70 percent of those who migrate are motivated by work reasons rather than to reunite family or study (World Bank 2019).

In Mexico, human capital contributed the lowest share to economic growth, although it was in line with the country's peers.[3] Human capital accumulation's contribution to GDP growth was a similar proportion in Mexico as in countries like Chile, Poland, Korea, Malaysia, Peru, and Thailand. The quality of education seems to be insufficient, which is especially critical given the increasing importance of more complex sectors in the economy (World Bank 2019). Mexican students' performance on the Programme for International Student Assessment tests has improved, but it still falls behind its peers. The World Economic Forum's *Global Competitiveness Report* also highlights that in terms of skills, educational attainment in Mexico is low, and the curricula are still not up to date (Schwab 2019). As a result, lack of cognitive skills leads firms to report skill mismatches, which constrain employment and firm expansion and therefore economic growth (Bedoya et al. 2013). Among the employers consulted for the Enterprise Survey, 31 percent pointed to an inadequately educated workforce

Figure 1.4 Mexico Has Lower Productivity Growth Than Its Peers, 1990–2017

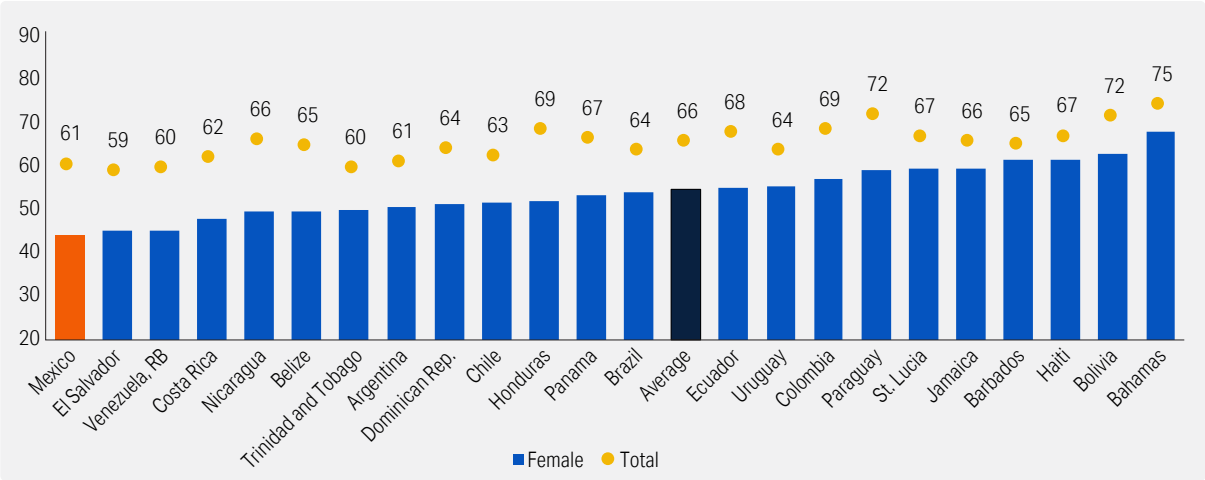
(average annual contribution to growth)



Source: Penn World Table 9.1.
Note: TFP = total factor productivity.

Figure 1.5 Low Labor Force Participation Is Mainly Explained by Low Female Labor Force Participation, 2019

(% of total and female populations, ages 15+, ILO modeled estimate)



Source: World Development Indicators from the ILO, ILOSTAT database. Data retrieved on March 1, 2020.
Note: ILO = International Labour Organization.

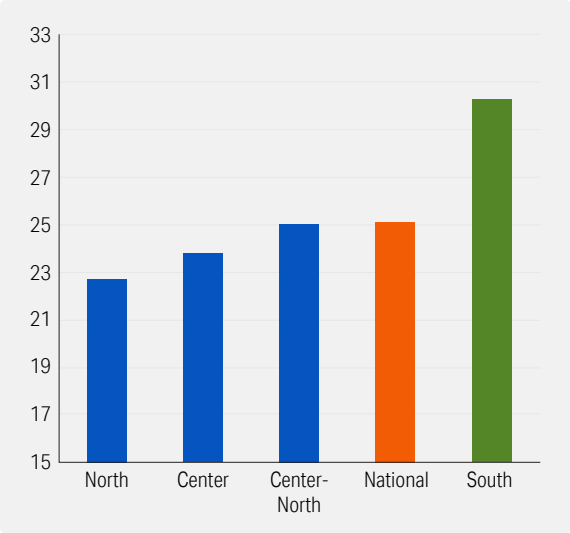
as a significant constraint, while also highlighting that only 68 percent of all production workers can be considered skilled, compared with 79 percent in the Organisation for Economic Co-operation and Development (OECD) countries (World Bank 2019).

Labor accumulation is also constrained by a very low rate of female LFP. Only 45 percent of Mexican women of working age are part of the workforce, well below the averages for the OECD and Latin America (figure 1.5). OECD countries, like Ireland and Spain, which started with roughly the same LFP rates as in Mexico in 1990, had LFP rates 8 percentage points higher than Mexico's by 2017 (Gehringer and Klasen 2015). In 1990, Mexico's female LFP rate was higher than that of several Latin American countries, such as Chile, Colombia, and Costa Rica. But in 2017, Colombia and Chile's female LFP rates were 12 and 6 percentage points, respectively, higher than Mexico's. Mexico's female LFP rate not only lags the country's peers, but also is below expectations given Mexico's level of development (World Bank 2019).

The loss associated with the gender gap in LFP for Mexico is around 25 percent of per capita income. If Mexican women had the same LFP as men, Mexico's GDP per capita would be around 25 percent larger (World Bank 2019; Cuberes and Teignier 2018). This is one of the largest losses among countries in the OECD (World Bank 2021). In particular, in the southern region of Mexico, GDP per capita would be 30.3 percent higher (figure 1.6), as Mexico's South is the region with the lowest female LFP.

Figure 1.6 Large Increase in GDP per Capita from Raising Labor Force Participation among Women, by Region in Mexico

(% increase)

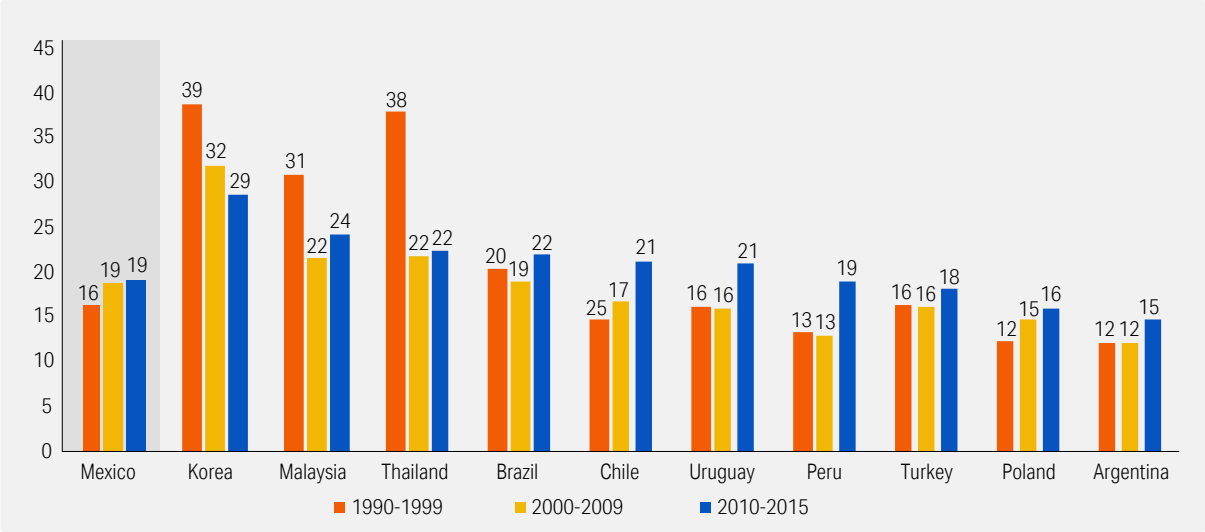


Source: Banxico 2021.
Note: Increase in gross domestic product (GDP) per capita generated by equalizing labor force participation and composition by gender.

Barriers to women's LFP come from both the demand and supply sides (World Bank 2021). On the demand side, economic activity and labor regulations are important barriers to the demand for women workers. Women's LFP is higher in urban areas and in areas where wages are higher. Legal barriers persist as the law does not explicitly prohibit potential employers from asking about a

Figure 1.7 Mexico's Low Investment Compared with Peers

(gross fixed capital formation, % of GDP)



Source: Data from the International Monetary Fund in purchasing power parity international dollars.

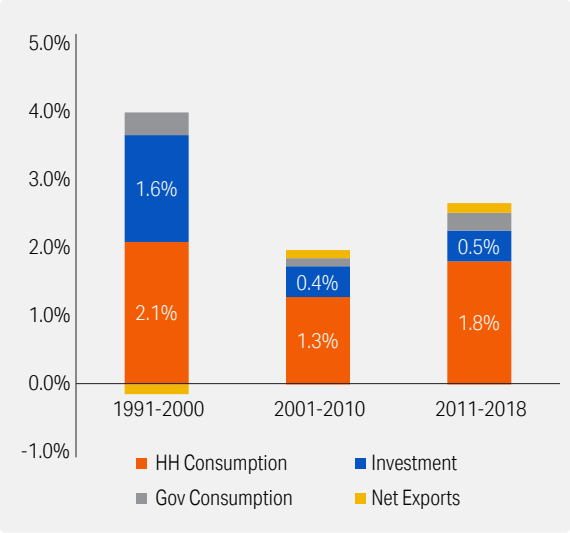
woman's family situation during the hiring process. On the supply side, individual characteristics and lack of access to productive inputs are obstacles to LFP. Yet, the main barrier is the need to provide care and the limited trust in childcare services. This is further reinforced by social and gender norms and low expectations for women building a career. The Ministry of Finance, along with UN-Women and other international actors are working towards the construction of a national care system.

Investment Has Contributed Mildly to Economic Growth

Mexico's capital accumulation is insufficient to propel economic growth to the rates of peer countries. While the investment level is not acutely low relative to Latin America and the Caribbean (total investment has averaged about 19 percent of GDP since 1990), it is much lower than in rapidly growing emerging economies that are converging to higher income levels, for example: 29 percent in Korea and 24 percent in Malaysia (figure 1.7). Moreover, the rates of new public and private investment have only partially been able to offset the depreciation of the existing stock of capital. Capital's contribution to economic growth has been slightly declining during the past decades, at around 1 percentage point of GDP (figure 1.8), with private investment somewhat compensating the decline in public investment since 1990. Yet, investment has been lower than

Figure 1.8 Falling Investment Limits GDP Growth

(average annual contribution to growth, % of GDP)



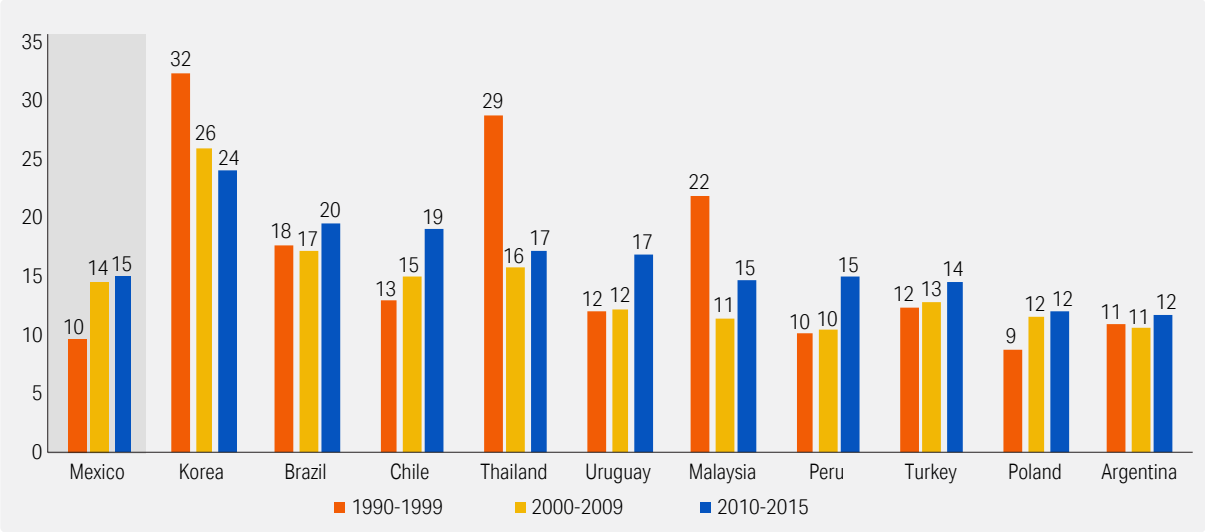
Source: Organisation for Economic Co-operation and Development.
Note: GDP = gross domestic product; HH = household.

in fast-growing economies, where capital represents a larger contribution to growth (figure 1.9).

Public investment, mainly in infrastructure, has not sufficed to avoid bottlenecks in sectors such as transport, water, electricity, and telecommunications. According to World Bank (2019), Mexico's transport infrastructure is aging, and the country's new infrastructure investment has trailed that of regional peers. At an average of

Figure 1.9 Private Investment Is Relatively Low

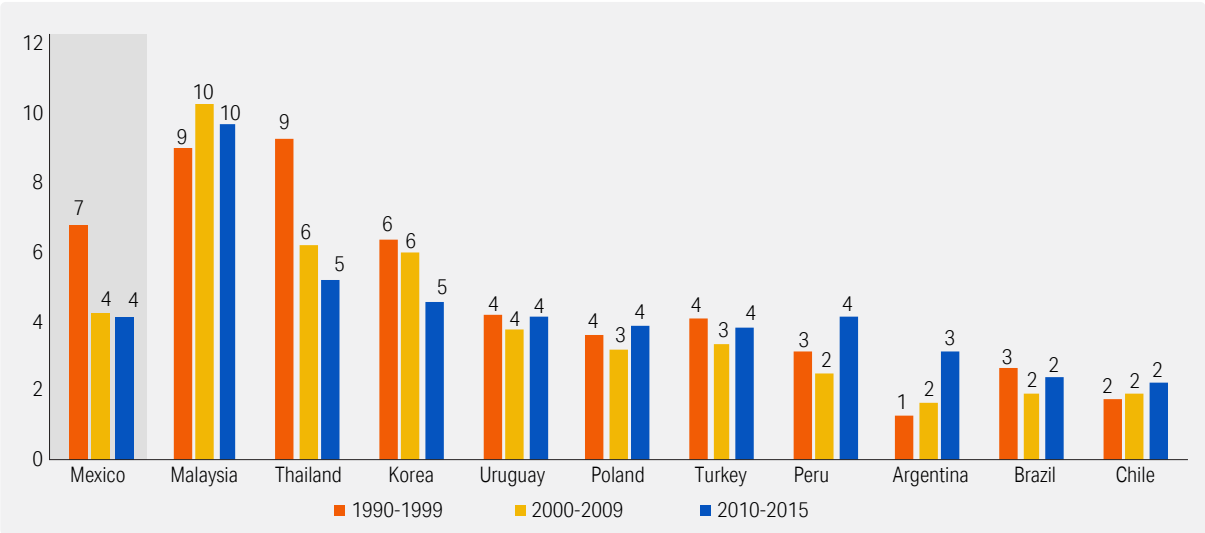
(private gross fixed capital formation, % of GDP)



Source: Data from the International Monetary Fund in purchasing power parity international dollars.

Figure 1.10 Public Investment Is Similar to Peers

(public gross fixed capital formation, % of GDP)



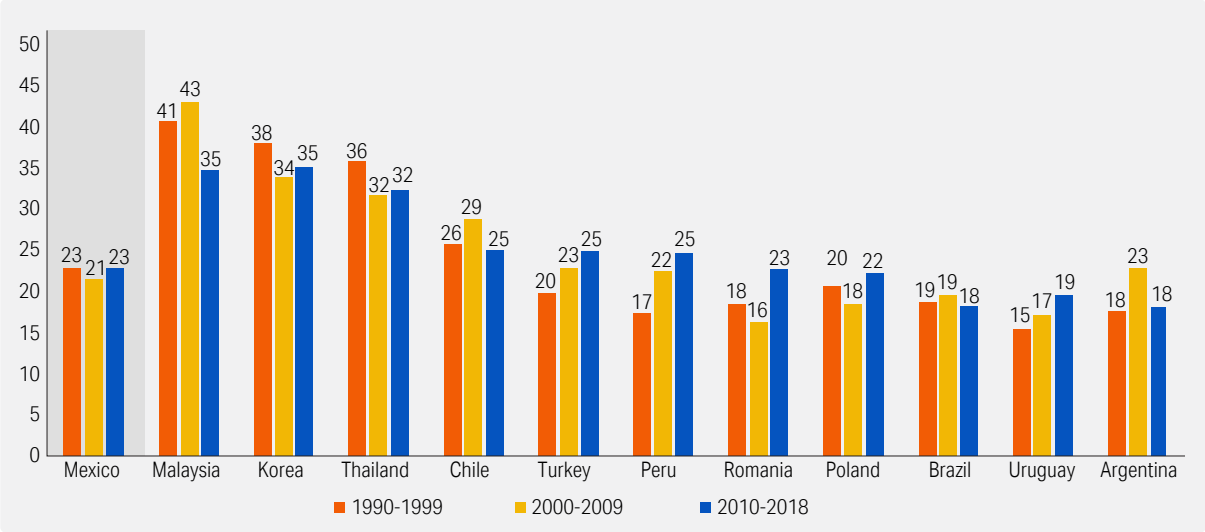
Source: Data from the International Monetary Fund in purchasing power parity international dollars.

1.4 percent of GDP over the past decade, infrastructure spending falls short compared with the fast-growing Latin American and emerging economies that spend more than 4 percent of GDP (figure 1.10). There are bottlenecks in transmission capacity and distribution of energy, as well as in the communications and water sectors. Investments in all these areas are paramount to diversify trade markets, support economic growth in general, and improve access to and quality of public services. Public-private joint projects have grown—for example, electricity and natural gas projects, as well as the *Red Compartida* project, which is meant to develop telecommunications infrastructure.[4]

Domestic savings have been below those in faster growing countries. On average, between 2010 and 2018, domestic savings were comparable to those of Mexico's regional peers but below those of Malaysia, Korea, Thailand, and Chile, which are closing the income gap with high-income economies (figure 1.11), limiting Mexico's capacity to finance its investment. Moreover, between 2007 and 2016, general government debt increased steadily, from about 29 to 49 percent of GDP, and fell only to around 45 percent in 2017–18.[5] Foreign direct investment (FDI) has not been enough to close the gap in private investment, despite the country's

Figure 1.11 Low Savings Hinders Investment

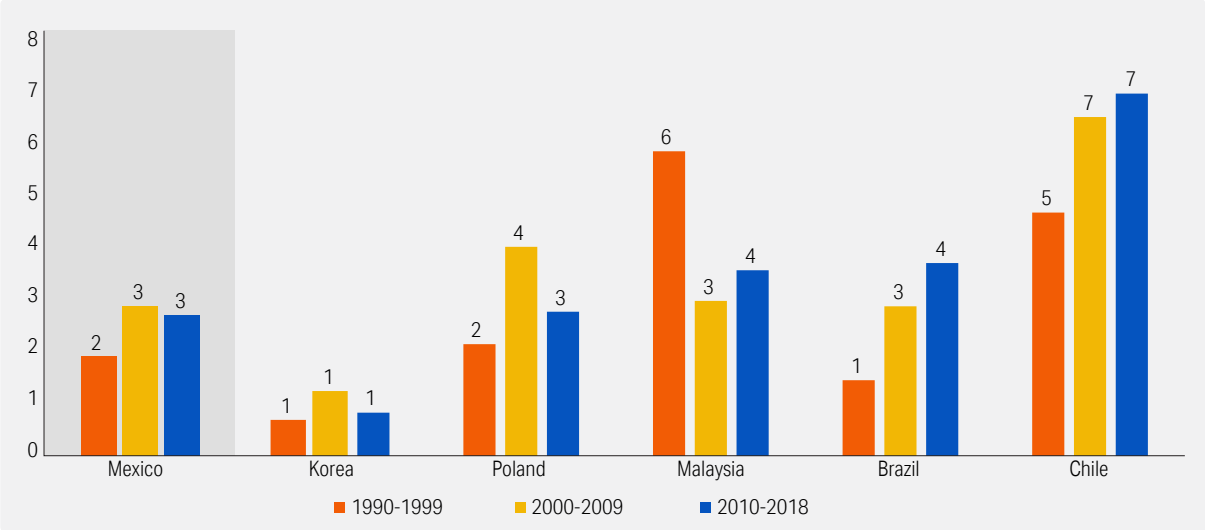
(average gross domestic savings, % of GDP)



Source: World Development Indicators.

Figure 1.12 FDI Can Be Bolstered

(average FDI net inflows, % of GDP)



Source: World Development Indicators.
Note: FDI = foreign direct investment; GDP = gross domestic product.

integration into regional value chains, particularly in the motor vehicle sector (World Bank 2019). Mexico's FDI falls behind that of most of its peers (figure 1.12), showing opportunities for increase, by taking advantage of its trade agreements and geographical position, among others.[6]

Financing Mexico's badly needed public investment will call for leveraging all financing sources, including more public financing. Mexico will need to create fiscal space to boost public investment by around 3 percent of GDP (World Bank 2019). Efficiency gains and fiscal savings can be identified across categories of spending, but growing spending needs for social security will constrain expenditure cuts. As Mexico still has a relatively low tax-to-GDP ratio, there are opportunities to bolster public revenues by adjusting the tax structure and reducing tax expenditures. A property tax reform can also raise the revenues of municipalities. Indeed, infrastructure development will call for joint federal and subnational government efforts as infrastructure investment varies widely across states. Subnational spending on

infrastructure can enhance regional development and help reduce territorial disparities.

Improving the planning, coordination, and prioritization of investments across the three levels of government and between the public and private sectors will be key to boost infrastructure. Historically, the lack of coordination has constrained strategic planning of investments (including public-private partnerships), contributing to suboptimal outcomes (World Bank 2019). Investment planning has improved significantly over the past years under the leadership of the Ministry of Finance but having a strategic plan that goes beyond administration periods would provide a more stable investment platform to design and liaise with the private sector. Strategic investments could be better set, including by providing clear links to economic growth and inclusion, building pipelines of development projects, and identifying private sector resources early. This would leverage private sector financing of infrastructure in Mexico while guarding against fiscal risks.

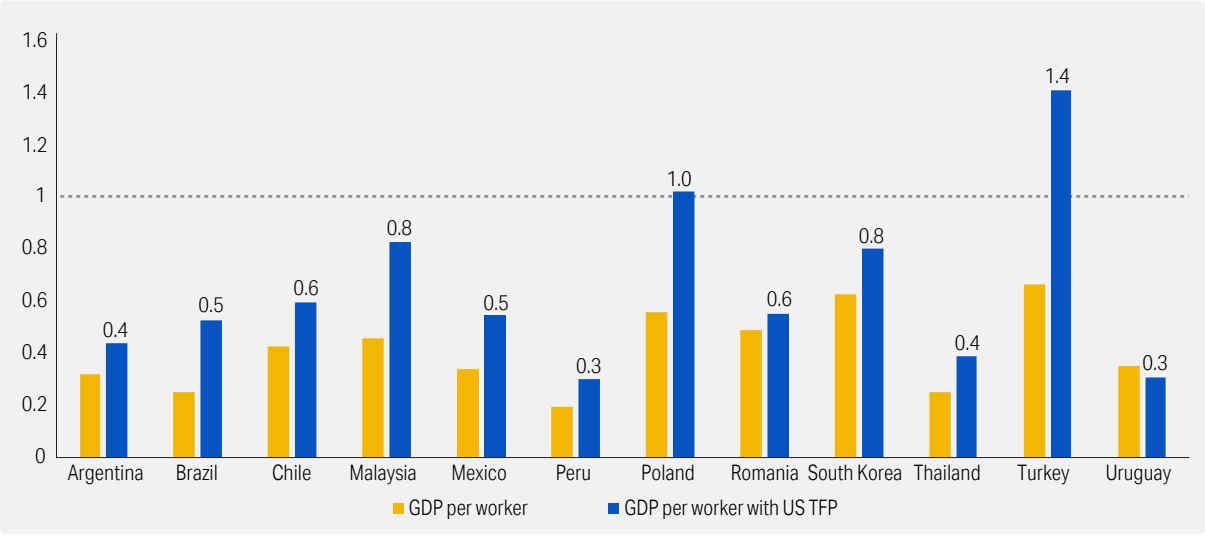
The private sector should also play an important role in improving investment in infrastructure. Public-private partnerships, in particular, have grown in importance since 1990, with half of the 296 projects undertaken as public-private partnerships in Mexico—amounting to US$83 billion—implemented since 2006. Once largely focused on toll roads, these investments have become more diverse. Since 2008, private investment across water, roads, energy, and telecommunications has accounted for one-third of total investment in these sectors on average. Since the energy reform in 2013 and 2014 and the telecommunications reform in 2013, electricity and natural gas projects have also become increasingly important. In 2017, financing of the *Red Compartida* project helped to develop backbone telecommunications infrastructure.

TFP Is the Main Factor Constraining Economic Growth in Mexico

TFP makes a low contribution to growth in Mexico. If Mexico had the same level of TFP as the United States, the GDP per capita gap between the two countries would be reduced by almost 30 percent (figure 1.13). In Mexico, the contribution of TFP to growth has been negative since 1990 (figure 1.3) and factor accumulation has not been enough to close the income gap with its main peers. Even when the U.S. level of productivity is assumed, income per worker in Mexico is lower than that of its peers (figure 1.13). Thus, the challenge of increasing income per capita is also a challenge of improving the efficiency at which the factors of production are combined.

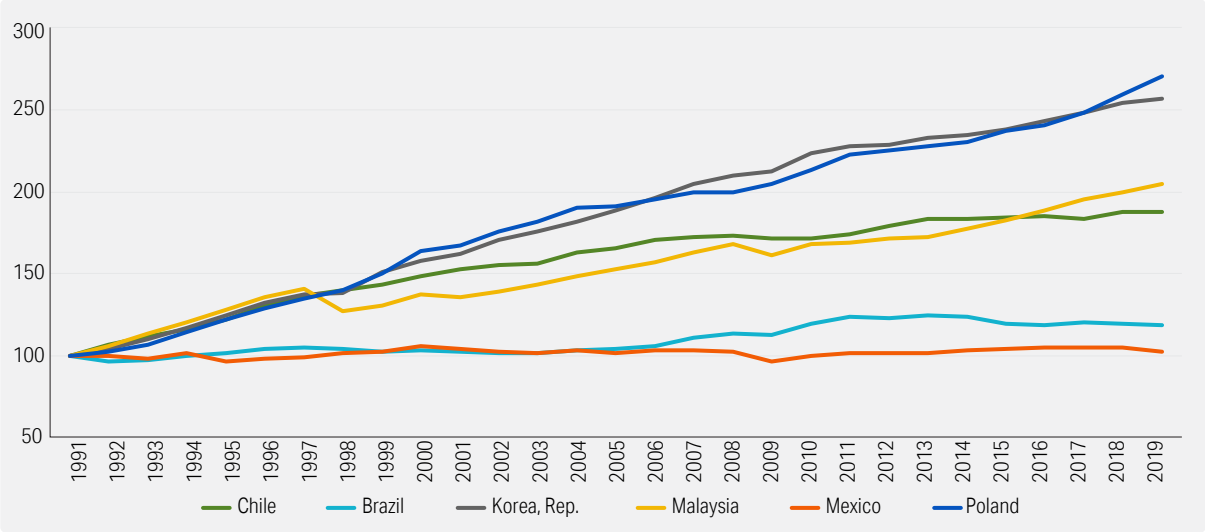
Labor productivity, measured as value added per worker, only accounts for half of the growth in income per capita, whereas demographics and employment explain the other half. The overall income per capita growth rate is low (only 1.31 percent) (figure 1.14), which is in

Figure 1.13 Factor Accumulation Has Not Sufficed to Close the Income Gap, 2017
(GDP per worker relative to the United States)



Source: Penn World Table 9.1.
Note: GDP = gross domestic product; TFP = total factor productivity.

Figure 1.14 Labor Productivity Has Been Stagnant in Mexico Since 1990
(growth in value added per worker, 1991 = 100)



Source: Calculations using data from the World Development Indicators.

line with the low growth rate of labor productivity (only 0.67 percent), which can be considered stagnant from a long-run perspective. Between 2000 and 2018, labor productivity increased by 50 percent in Mexico's aspirational peers and by more than 60 percent in its structural peers. In contrast, labor productivity did not change in Mexico, decreasing during 2000–09 and recovering during 2010–18 (figure 1.14).

Regional and Sectoral Productivity Growth: A Story of Forking Paths

The trend of aggregate productivity growth hides important heterogeneities across Mexican regions, sectors, and firms. This section shows that looking at more disaggregated data (at the regional and sectoral levels), the story becomes one of forking paths, with some regions and sectors growing fast and others remaining stagnant.

Productivity across States Is Diverging Instead of Converging

There is considerable dispersion of labor productivity across Mexican states (figure 1.15). Indeed, differences in regional GDP per capita and productivity are larger within Mexico than within any other OECD country. The dispersion between high- and low-productivity performers is substantial. States such as Nuevo León are as productive as Korea, while other states, such as Chiapas or Oaxaca, have productive capacities similar to Honduras.

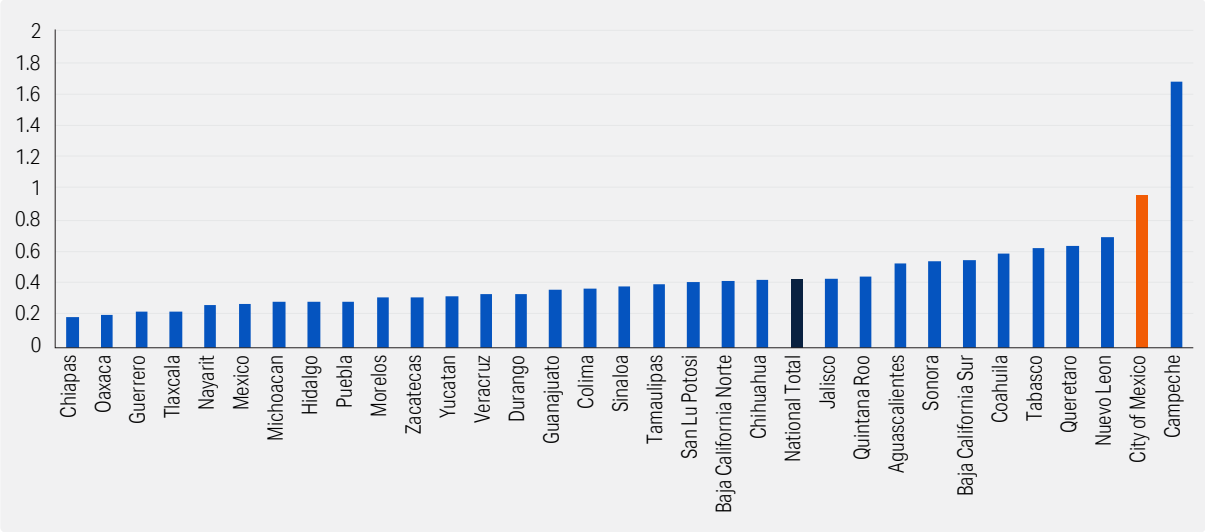
The lack of convergence across Mexican regions over the past three decades is a well-established phenomenon in the literature (Esquivel and Messmacher 2002). Research shows that the economic liberalization of the 1990s stopped the process of convergence among Mexican regions and increased dispersion (Chiquiar 2005; Rodríguez and Sánchez 2002). Research also shows that trade reforms negatively affected poor regions, as they were unable to take advantage of the new source of growth that international trade offered.

In recent years, the differences in productivity have been widening. Between 2005 and 2018, there was a positive correlation (albeit small) between initial productivity and its growth rate across states in Mexico, indicating no convergence and a small increase in productivity dispersion (figure 1.16). First, most low-productivity states are not growing fast enough. Second, high-productivity states keep increasing their levels of value added per worker (Mexico City). Yet, some states have managed to grow fast despite a low initial level of productivity (Guanajuato, Michoacán, Yucatan, and Guerrero).

Labor productivity growth across regions has been led by changes in Mexico City. Between 2005 and 2018, value added per worker grew 3.8 percent nationwide, in large part dominated by labor reallocation dynamics in Mexico City. Therefore, productivity growth was the

Figure 1.15 Labor Productivity Presents Substantial Dispersion across Regions, 2018

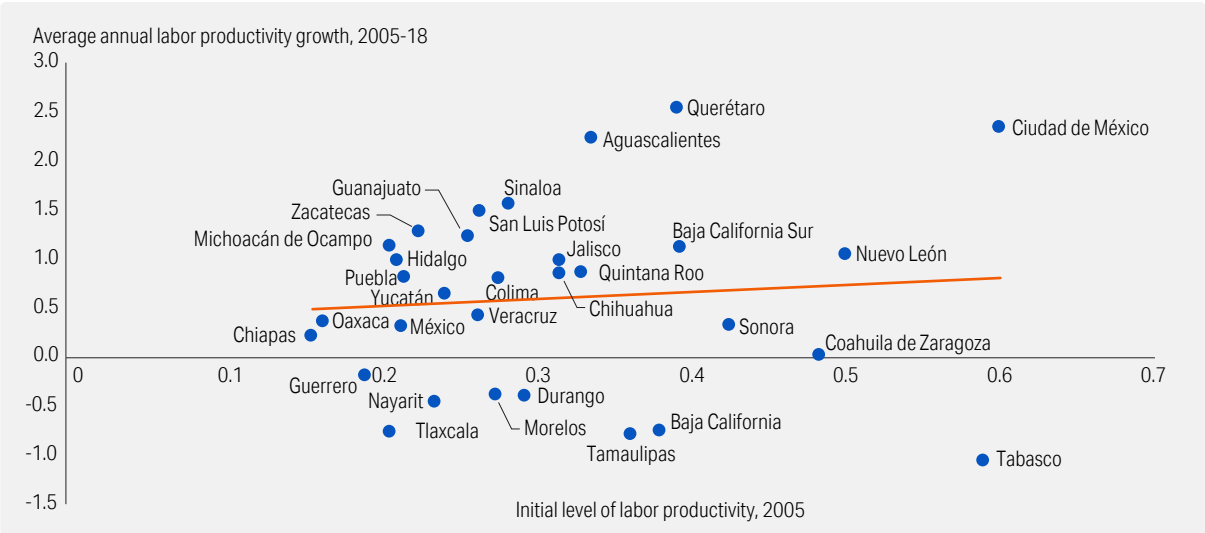
(value added per worker)



Sources: National Institute of Statistics and Geography; Organisation for Economic Co-operation and Development.

Figure 1.16 There Is No Sign of Convergence, 2005–18

(growth in average value added per worker, %)



Sources: National Institute of Statistics and Geography; Organisation for Economic Co-operation and Development.

result of within-region changes, contributing 5.6 percentage points (148 percent) to total growth. Mexico City has above average labor productivity (figure 1.15) and accounts for close to 10 percent of the country's total employment. However, between 2005 and 2018, Mexico City's share of total employment fell by 1.6 percentage points. Thus, the employment share in this high-productivity region has been falling, pushing overall labor productivity down. In sum, the (within) increase in labor productivity in Mexico City explains the behavior of overall value added per worker; however, this region has been reducing its share of total employment, limiting labor productivity growth. Conversely, in the rest of the country, reallocation of labor toward more productive regions has played a predominant role in driving income per worker in lieu of within-region productivity growth.

Productivity in Top 10 Percent of Industries Is Rising Faster Than in Remaining 90 Percent

Productivity dispersion is also increasing across industries and sectors. Although the TFP of the top

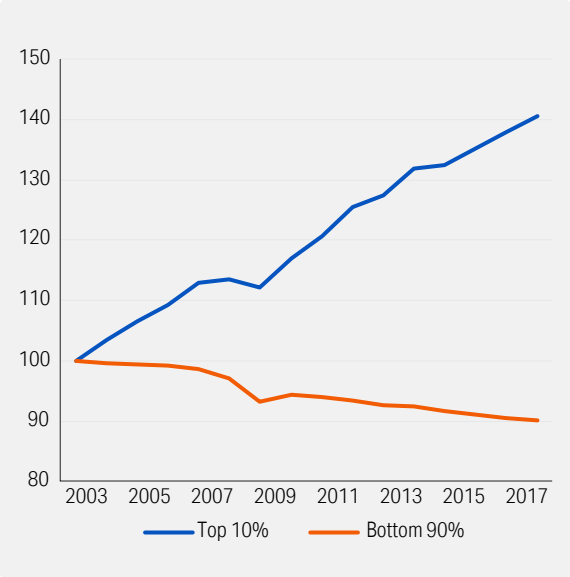
10 percent of industries has increased significantly over the past decade, there has been a long decline in the productivity of the remaining 90 percent of industries (figure 1.17). This is explained by the fact that Mexico's production base is comprised of two distinct groups of firms. On the one hand, there are firms producing cars, parts for the aerospace industry, electronics, and other sophisticated equipment that requires state-of-the-art technology for production. These firms are in the top 10 percent of firms in the country. On the other hand, other group of firms are characterized by subsistence agriculture or informal businesses (OECD, 2015). Similarly, while some sectors have seen high multifactor productivity growth over the past two decades, productivity in other sectors has declined sharply (figure 1.18).

Explaining Mexico's Low and Uneven Productivity Paths: The Stories Unite

This section studies the drivers of differences in productivities across regions, which in turn explain the low aggregate productivity growth in Mexico. The section also looks into how inter- and intra-industry structural change affects sluggish aggregate productivity growth in Mexico.

Figure 1.17 Striking Differences in TFP Growth between the Top 10% and Other Industries

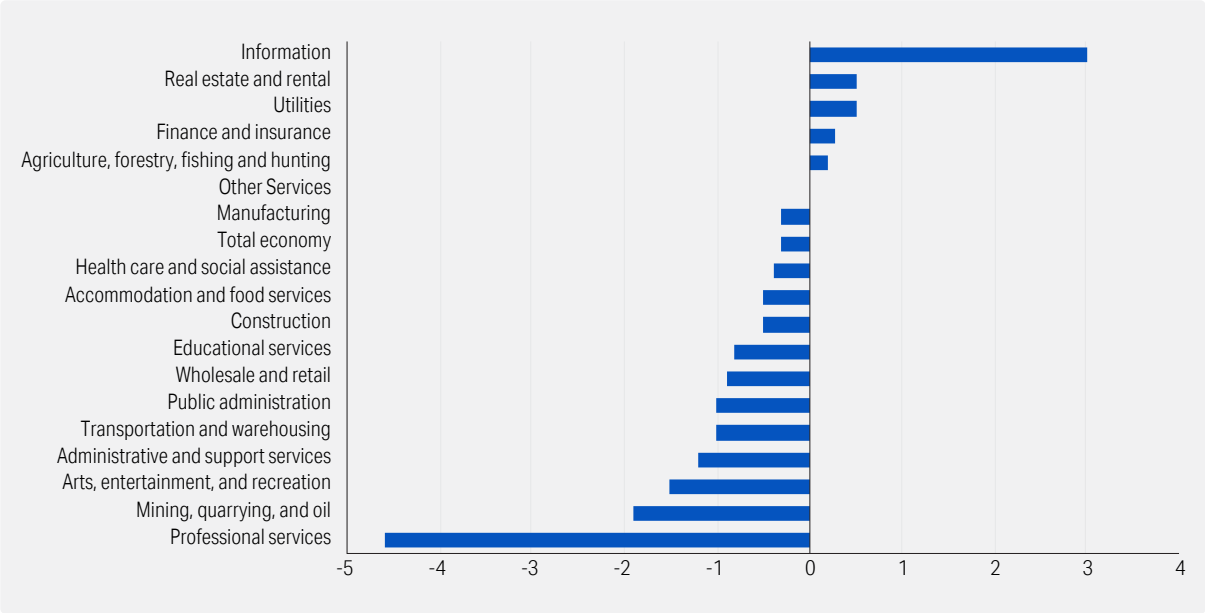
(3-digit NAICS; 2003 = 100)



Sources: National Institute of Statistics and Geography; Organisation for Economic Co-operation and Development.
Note: NAICS = North American Industry Classification System; TFP = total factor productivity.

Figure 1.18 Differences in Productivity across Sectors, 1991–2018

(productivity by sector, growth rate (%))



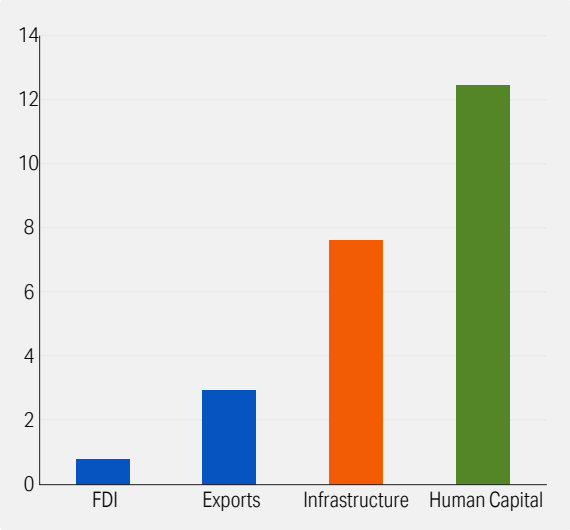
Source: National Institute of Statistics and Geography.

Differences in FDI and Factor Endowments Drive Productivity Differences across Regions

The literature offers several explanations for the lack of convergence across Mexican states, starting with geographical comparative advantage. An important trigger of the forking paths has been proximity to the United States, as regions that are closer to the United States have obtained most of the benefits of the economic model put in place starting in the 1990s (Chiquiar 2005). Proximity to the United States has attracted many global firms to produce in Mexico to export to the United States, raising the productivity of northern Mexican states. For instance, research by the Central Bank of Mexico shows that exports had a positive and statistically significant impact on labor productivity across states during 2005–18.[7] An increase of 1 percent in exports is associated with an increase of 2.93 percent in the state's labor productivity (figure 1.19). This could be attributed to some states taking advantage of economies of scale, a higher level of technological innovation, and greater productive efficiency on average.

Figure 1.19 Human Capital and Infrastructure Are the Main Determinants of Differences in Labor Productivity across Mexican States

(% increase in labor productivity due to a 1% increase in FDI, exports, infrastructure, or human capital)



Sources: Estimates from Banxico based on information from the National Institute of Statistics and Geography and the Ministry of Economy.
Note: FDI = foreign direct investment.

Regions that have attracted more FDI have had larger gains in labor productivity. Since 2005, Mexico has received, on average, US$28.7 billion in FDI a year, accounting for 3 percent of GDP and representing 12 percent of total investment (World Bank 2019). The largest shares of FDI went to Mexico City (19.0 percent), Nuevo León (8.8 percent), and Chihuahua (6.6 percent), contributing to increasing the gap in labor productivity across states. Estimations from a dynamic model based on data from Mexican states show that a 1 percent increase in FDI generates a 0.80 percent expansion in labor productivity in manufacturing (Rangel González and López Ornelas, 2021). This may be explained by the arrival of companies that have state-of-the-art technologies and efficient production systems integrated into GVCs (see chapter 4 for a discussion on how Mexico can integrate more regions and sectors into GVCs).

Research shows that the differences in labor productivity across Mexican states are also explained by differences in their infrastructure and human capital endowments (Banxico 2017). An important cause of Mexico's weak and uneven labor productivity growth is a deficient and unequal school system, which has failed to provide the quality of education required by the labor market (Lopez-Cordova and Rebolledo 2016).

In particular, increasing the endowment of human capital[8] by 1 percent can increase labor productivity in the manufacturing sector by more than 12 percent (figure 1.19). Similarly, infrastructure is also identified as an important determinant of differential productivity growth across states. An increase of 1 percent in the endowment of infrastructure[9] can increase labor productivity in the manufacturing sector by more than 7 percent.

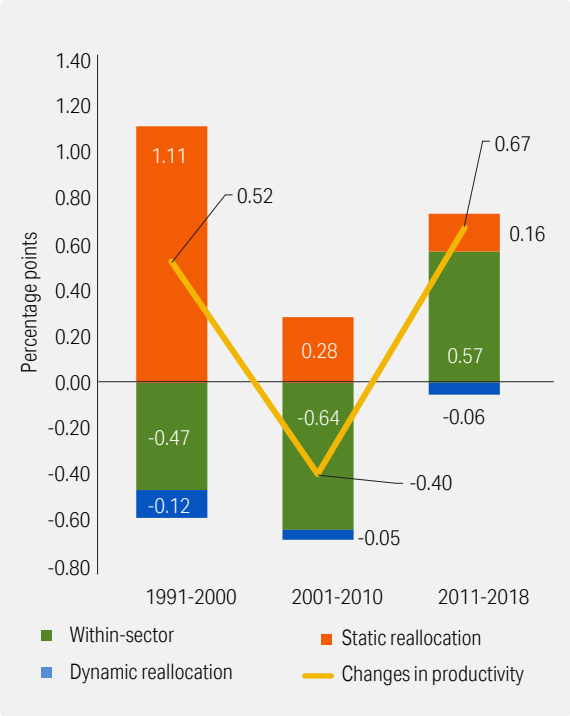
Another factor that explains the productivity differences across Mexican states is access to credit. Deeper financial systems provide instruments that facilitate the mobilization of resources toward the most productive uses, reducing transaction costs. Greater banking penetration can promote productivity growth by financing investment and new firms and favoring innovation, product development, and expansion of activities (Buera and Shin 2013). Access to credit varies a lot across Mexican states, contributing to productivity differentials across regions. The Central Bank of Mexico has estimated that if bank credit to companies in the southern region increased to the level in the central region, real GDP per worker would increase by 1.76 percent. Constraints to access to finance are further analyzed in chapter 5.

Labor Is Not Reallocating toward the Most Productive Sectors and Firms

Over the past three decades, Mexico has gone through an important process of structural change, which has been largely driven by trade openness and export-led growth (World Bank 2019). In effect, the production structure of the country has been significantly transformed. Exports of medium- and high-technology products increased from 33 to 69.9 percent of total exports during the same period. Mexico has also gone through a successful insertion into GVCs (see chapter 4). Indeed, controlling for capital intensity, country, sector, and time-specific drivers of labor productivity as well as other sources of endogeneity, a recent World Bank study finds a statistically significant effect of increases in GVC participation on labor productivity in Mexico (Constantinescu and Winkler 2020). Specifically, a 10 percent increase in the level of GVC-related trade is associated with a 1.6 percentage point increase in labor productivity in Mexico, and the impact of GVC trade on labor productivity is larger than that of non-GVC trade (see chapter 4 for more details).

Aggregate productivity growth during the past decade is mainly explained by productivity gains within sectors.[10] The evolution of overall labor productivity is determined by changes in sector-level (or within) productivity and changes stemming from labor reallocation across sectors.[11] Gains in value added per worker are expected if sectors increase their own (within) productivity, or workers move toward sectors with above-average productivity ("static reallocation") or high productivity growth ("dynamic reallocation"). Within-sector changes contributed negatively to productivity growth between 1991 and 2010 (figure 1.20), but they contributed positively, 0.57 percentage points, to labor productivity growth between 2011 and 2018. Yet, during the entire period, dynamic reallocation across sectors was negative, trailing overall gains in productivity. Despite negative labor productivity growth in industry and the close to zero growth in services, the shares of employment in these two sectors have remained stable (in industry) or even increased (in services), slowing potential growth of labor productivity. Static reallocation (or the movement of labor to above-average productivity sectors) contributed 1.1 percentage points to labor productivity growth, albeit it has been declining over time. Sectors with above-average productivity represent only a small fraction of total employment and have

Figure 1.20 There Have Not Been Dynamic Gains from Labor Reallocation



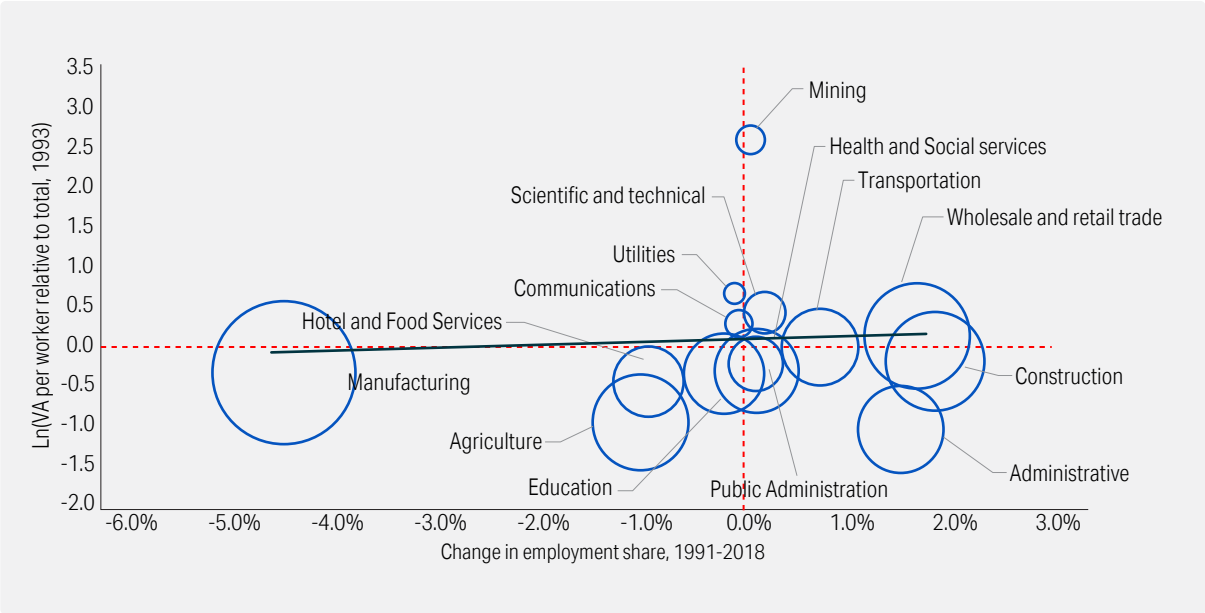
Sources: Calculations based on data from the National Institute of Statistics and Geography and the Organisation for Economic Co-operation and Development.

had limited employment gains. Small static reallocation gains stem from labor movements away from manufacturing and into services like wholesale, retail trade, and transportation, which show a higher although small productivity level (figure 1.21).

In sum, the structural change process in Mexico over the past three decades was characterized by a shift from the primary and secondary sectors toward the tertiary sector, which translated into limited productivity gains. This process of structural change brought substantial subsector reallocations, with increasing participation of commerce, telecommunications services, transport equipment, and electronics and exports moving toward more knowledge-intensive industries (see chapter 4). Yet, this process has not contributed to faster aggregate productivity growth because labor has moved from industries where productivity is growing faster toward those where productivity is growing at a slower pace or even contracting. Evidence suggests that the contribution of skilled workers to faster productivity growth has also been modest (Padilla-Perez and Villarreal 2017), as college-educated workers in Mexico have mainly contributed to productivity growth in manufacturing,

Figure 1.21 Labor Shifts from Manufacturing to Services Contributed to Limited Productivity Gains, 1991–2018

(change in employment share versus labor productivity, by sector)



Source: Calculations based on data from the Organisation for Economic Co-operation and Development.
Note: VA = value added.

which has been declining in terms of GDP contribution, with limited contributions to the most dynamic sectors in the service economy.

Resource Misallocation Is Largely Explained by High Informality Rates

Mexico's poor productivity performance has been in part a consequence of a differentiated productive system. On the one side, there are many informal enterprises, which have a limited capacity for innovation and adoption of advanced technology and limited ability to integrate into GVCs (see chapter 4). Informal enterprises also tend to be ineffective in their management skills and practices (see chapter 5) and lack access to financial services (see chapter 6). Due to these weaknesses, informal firms are very exposed and have been severely hit by crises such as the global financial crisis and the COVID-19 pandemic. The large share of informal firms curbs aggregate productivity growth because they are on average less productive and dynamic than formal ones. More than 90 percent of the firms in the manufacturing and service sectors rely partially or wholly on informal labor, and formal firms are on average 80 percent more productive than informal firms (OECD 2019). This is also observed at the regional level: states with lower labor productivity record higher informality rates, often associated with the prevalence of micro, small, and medium-size enterprises.

Policy Recommendations

This chapter has presented several stylized facts with relevant policy implications. First, slow economic growth has impeded Mexico from closing the income gap with respect to more advanced economies, and in doing so it has limited the reduction of poverty and inequality. Second, labor accumulation (quantity more than quality) and, to a lesser extent, capital accumulation have made positive contributions to economic growth. Third, slow economic growth is mainly explained by poor productivity gains. Fourth, poor productivity performance has been in part a consequence of a differentiated productive system and the inability of the economy to reallocate factors of production to the most productive regions, sectors, and firms. Fifth, this explains the large gaps in labor productivity across states, sectors, and firms.

Ensuring that labor accumulation continues to be an engine of economic growth will require policy reforms to boost female LFP and improve the quality of

education. Mexico's demographic dividend is fading, with the old-age dependency ratio set to increase from 9.8 in 2015 to 29.2 in 2050. Increasing labor accumulation will require greater female LFP, which remains very low compared with peer countries. To do so, Mexico could modify the law so that it would explicitly prohibit potential employers from asking about the family situation during the hiring process. It could also expand the flexibility of working hours and home offices and modify the Federal Labor Law to establish the principle of equal remuneration for equal work. Efforts will also be needed to increase the quality of skills that labor brings to the labor market given the growing relevance of high-complexity sectors in the economy (which tend to require more technical skills).

Mexico will need to invest more to increase economic growth. Since the 1990s, both private and public investment have been below the levels in rapidly growing emerging economies. Low public investment has resulted in infrastructure bottlenecks, for example in transport, water, electricity, and telecommunications (World Bank 2019). For the year 2022, the government decided to increase public investment by 14.3 percent in real terms relative to 2021. To create fiscal space to finance this increase in public investment, the administration is making efforts to enhance efficiency in spending. For example, in 2021, operating expenses other than personal services decreased 13.5 percent in real terms relative to 2018; and non-programmable expenditure decreased by 4 percent in real terms. These are steps in the right direction. However, significantly boosting much-needed public investment will require broad-based financing mechanisms. The federal government will need to create fiscal space for investment by adjusting the tax structure while reducing tax expenditures and public spending inefficiencies. Municipalities can improve urban investments by reforming the property tax to increase local revenues. Private sector participation will continue to remain key to promote investment in infrastructure, and it will be important to maintain stable policy and regulatory frameworks and a predictable investment pipeline.

Boosting productivity growth would have the largest impact in terms of reigniting economic growth in Mexico. Labor productivity has not increased in Mexico since 1990. Furthermore, productivity growth has been limited to selected top performers and thus translated into growing levels of disparities across regions, sectors, and firms. Firms in sectors and regions that lag suffer from insufficient scale economies, low investment, outdated technologies, and high informality. To boost productivity, Mexico can aim to tackle informality by reducing the costs of formalization for firms and workers (cutting the costs for hiring and firing and reducing the length of legal procedures in labor courts).

Explaining Mexico's aggregate productivity growth requires going beyond the averages and considering the heterogeneities across regions, sectors, and firms. Different findings emerge as Mexico's productivity conundrum is looked at from different perspectives. Chapter 2 looks into productivity analysis at the municipal level, showing that despite the lack of convergence at the state level, convergence is happening at the municipal level. The states with larger productivity gains are those with a higher share of fast-growing municipalities.

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Endnotes

1 These results followed a series of reforms that took place after the economic crisis of 1982–85, aiming to increase macroeconomic stability and open the economy to trade and foreign investment.

2 Early during this period, specifically in 1995, México had a fall in GDP of more than 6 per cent and the worst crises in its economy due to a current account imbalance.

3 Human capital is measured by the index developed in Penn World Table 9.1 and mainly considers the average years of education in each country.

4 Among others, critical areas for public sector investment include energy, health care, social protection, and water (World Bank 2019).

5 As of 2018, Mexico's general government net debt (as a percentage of GDP) was higher than that of Chile, Korea, Peru, Poland, Romania, and Turkey. But it was similar to or lower than that of some other Latin American countries, like Brazil and Uruguay.

6 Cuevas, Messmacher, and Wener (2005) find that the effect of the North American Free Trade Agreement (NAFTA) on FDI inflows into Mexico was larger than its effect on flows into the United States. According to their estimation, NAFTA stimulated flows into Mexico that were 60 percent higher than what they would have been without the agreement.

7 The research studies the determinants of labor productivity in the manufacturing sector during 2005–18, using state-level data to identify the effects of exports, FDI, human capital, and infrastructure on labor productivity. It employs an empirical methodology that controls for endogeneity issues using lags as instruments and for unobservables using fixed effects by state.

8 Endowment of human capital is proxied by the proportion of the employed population in manufacturing that has more than 11 years of schooling, constructed from microdata from the National Occupation and Employment Survey.

9 Endowment of infrastructure is proxied by telephone density by state.

10 Within-sector gains may stem from capital deepening, technological progress, or reductions of misallocations across plants, among others (McMillan and Rodrik 2011).

11 Labor productivity changes from labor reallocation or structural change can be further divided into static and dynamic reallocations. The static and dynamic reallocation components capture the changes in productivity stemming from labor movements from low-productivity sectors to high-productivity sectors (static reallocation) or high-growth sectors (dynamic reallocation). Thus, the static effect measures the country's ability to reallocate labor from low-productivity sectors to high-productivity ones, while the dynamic effect gauges the country's ability to reallocate labor toward sectors with high productivity growth.

PHOTO BY: ISABELLE SCHAEFER/WORLD BANK

Understanding Local Differences in Productivity[ii]

CHAPTER 2

Introduction

Mexico has implemented bold economic reforms since the mid-1980s, favoring market-based and export-oriented growth. Trade and investment liberalization are the hallmark of Mexico's new economic model, starting with the unilateral liberalization in 1985 and reinforced by the North American Free Trade Agreement (NAFTA) in 1994. The reforms have led to notable macroeconomic stability and remarkable trade performance, with Mexico standing out as the largest exporter in the Latin America region and contributing 40 percent of the region's annual exports prior to the COVID-19 crisis (WTO 2020). One of the main effects of these reforms has been a significant change in the economic geography (Alix-Garcia and Sellars 2020). The conventional wisdom is that Mexico is characterized by "divergence, big time"—large productivity disparities—and lack of convergence across regions and states despite (or because of) the profound impact of the reforms and NAFTA (Esquivel 1999; Esquivel and Messmacher 2002; Chiquiar 2005). Indeed, the reforms have not boosted Mexico's growth performance as expected, with slow productivity growth being the main concern. Yet, an aggregate picture of sluggish productivity growth can hide important differences at the subnational level. Poorer locations could continuously lag the richer ones, leading to slow growth at the national level. Alternatively, the poorer locations may be catching up, but the more productive locations may not be growing.

Economic theories offer different predictions on productivity convergence within Mexico after its important episodes of market-oriented reforms and liberalization. On the one hand, trade and foreign investment hold the prospect of technology diffusion from more advanced economies to Mexico. Free flows of productive factors, goods, and services within Mexico can spur knowledge diffusion and stimulate productivity convergence. On the other hand, the urban economics literature suggests that agglomeration forces and knowledge spillovers tend to reinforce the productivity advantages of existing economic centers, especially when a core-periphery production pattern exists as in Mexico. Unless policies and public investment address coordination failures among firms and households, new centers of growth may not emerge in the context of technology diffusion from abroad (Easterly, Fiess, and Lederman 2003).

Empirical results on economic convergence within Mexico since the reforms have been inconclusive. Relying on state-level aggregated data, several studies show that the unilateral liberalization in 1985 led to absolute divergence in state income per capita and labor productivity, and that this trend continued after NAFTA entered into force. The North and North-Center have taken advantage of the market opportunities offered by NAFTA, whereas the South has struggled (Aroca, Bosch, and Maloney 2005; Baylis, Garduño-Rivera, and Piras 2012; Chiquiar 2005; Fonseca et al. 2018; Rodrigez-Oreggia 2007). However, other studies suggest that there has been absolute convergence at the state level, especially when including longer time series prior to NAFTA (Cabral and Mollick 2012; Rodriguez-Gamez and Cabrera-Pereyra 2019). An emerging literature uses firm-level data to assess convergence at more disaggregated levels (2-digit sector-state), such as Castellanos-Sosa (2020), and across municipalities, such as Cabral et al. (2020). These studies focus on

ii The chapter was led by Leonardo Iacovone and Yue Li, with excellent research support from Luis Alejandro Aguilar Luna. The team appreciates the generous support by Harris Selod and Theophile Bougna on data and analysis related to connectivity. The team also thanks Fausto Andres Patino for insightful comments.

labor productivity instead of total factor productivity, as is done in this chapter, but also suggest that labor productivity convergence patterns changed after the global financial crisis (Castellano-Sosa 2020) and find evidence of municipal convergence, but also some very weak convergence between states (Cabral et al. 2020).

This chapter first takes a fresh look at the Mexico convergence debate, by using firm-level data from the six most recent rounds of the Economic Census, covering a period of 25 years from 1994 to 2019. The analysis departs from previous studies in two important ways. First, instead of income per capita or labor productivity, it focuses on place-level, revenue-based total factor productivity (TFPR), which is aggregated from firm-level estimation of TFPR.[12] This method has the advantage of identifying firm performance separately from the impact of factor accumulation. Second, the analysis aims for a granular understanding of growth patterns. In addition to state-level convergence, the convergence pattern across municipalities is assessed. This is done for all economic activities as well as for manufacturing and services separately.

The results reveal that there is weak or limited absolute convergence at the state level but strong absolute convergence when the analysis focuses on municipalities instead. The convergence is robust for manufacturing industries and service sectors. Further, the best performing municipalities do equally well in high- and low-income states. It is just that there are not many top performers in poorer states, and this is what explains the limited convergence at the state level. To understand the reasons for the disappointing overall performance at the country level, the chapter further shows that the municipalities at the productivity frontier have failed to grow. Indeed, most of the productivity gains are among low-productivity municipalities. As a result, Mexico's overall productivity growth lags that of other countries despite the encouraging absolute convergence at the municipality level.

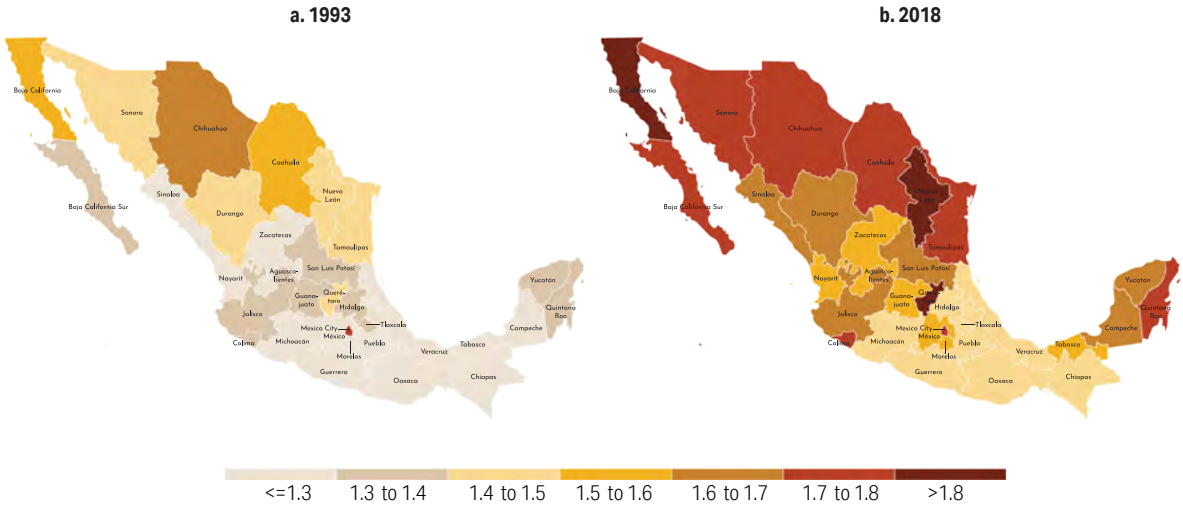
A closely related question is what drives local productivity differences. Analogous to the debate on convergence, studies on Mexico rely on state-level analysis and look at state-level differences. However, within a state, municipalities exhibit large heterogeneity in their initial conditions and abilities to implement federal or state-level policies. A growing consensus among academia and policy makers is that cities are important engines of growth. This consensus calls for a better understanding of the drivers of productivity at the local level. From an urban economics point of view, two fundamental reasons explain why some places are more productive than others (Combes and Gobillon 2015; Combes et al. 2010). First, firms (and workers) at a location may have characteristics that make them more productive. For example, the location may have attracted many especially well-managed firms that would be productive no matter where they were operating. Such differences in the composition of firms can be labeled the *firm premium*. The firm premium is associated with the process of "sorting," in which more productive firms tend to move to more productive places (Combes et al. 2008).

Second, more productive places may have qualities that make firms more productive beyond what would have been expected from their own characteristics, giving those places a productivity advantage over other places. These differences in underlying productivity advantages give rise to the *location premium*. Some place-specific characteristics are natural advantages, such as a favorable location and a pleasant climate. Other characteristics can be acquired or developed over time. For example, a world class airport in the vicinity of a city can vastly improve access to domestic and international markets. Another example is city size. A large city allows more learning and greater knowledge spillovers. And the size of a well-managed metropolitan area can increase without higher congestion costs.

This chapter focuses on the location premium and the characteristics that a place can develop and, hence, policy makers can influence. The chapter addresses the potential bias due to firm sorting by estimating a location productivity premium after accounting for the composition of firms. Using the location premium as the outcome indicator, the chapter assesses the importance of four broad types of municipality characteristics in determining local productivity: urbanization, access to markets, human capital externalities, and clustering.[13]

Leveraging the granularity of the location productivity premium measure, the sectoral and spatial heterogeneity in the roles played by different municipality characteristics is assessed. The analysis is conducted by sector for manufacturing and services separately and, within services, for skill-intensive and other services. Spatially, the analysis is conducted for Mexico and then replicated for each of the four main Mexican regions, namely, the North, North-Center, Center, and South.

Map 2.1 TFPR across States, 1993 and 2018



Source: Calculations based on INEGI 1994, 2019.
Note: Revenue-based total factor productivity (TFPR) is computed as the average across all firms in a state.

The results indeed reveal sectoral nuances in the impact of local (municipality) characteristics on the local productivity premium. For manufacturing, both urbanization—defined as the concentration of any economic activity—and clustering—the pooling of firms closely related through value chains—are robust determinants. The relative importance of access to international markets versus connectivity with domestic markets depends on the region, as it only matters for municipalities in the North and Center of Mexico. Universities increase productivity everywhere, indicating the importance of human capital externalities associated with highly skilled workers. For services, urbanization is an even more significant driver of local productivity. Conversely, clustering does not play a role. Access to international markets is an important determinant for skill-intensive services, whereas connectivity with domestic markets is a strong driver for other services. Both universities and middle-skill workers affect local productivity in the service sectors. However, the role played by universities and, hence, by the spillovers from highly skilled professionals and entrepreneurs, is more significant. The presence of higher education institutions is found to benefit skill-intensive services as well as other service sectors.

The analysis also finds notable spatial differences in the contributions made by the municipality characteristics. In the North, all four types of municipality characteristics—urbanization, access to markets, human capital externalities, and clustering—are robustly correlated with local productivity. In the North, the various agglomeration drivers appear to form a virtuous circle, supporting the dynamism of firms and municipalities in the region. In sharp contrast, in the South, urbanization and access to markets are weakly correlated with the local productivity of manufacturing industries. These results suggest that there is large, untapped potential to boost productivity in this lagging region, which could be realized through adequate complementary policies. Finally, universities and clustering are found to be robust determinants of local productivity across all four regions. Although the effectiveness of many clustering policies is under debate, studies have shown the effects of universities and clustering on local innovation and local productivity in more advanced economies. The results call for a better understanding of what has worked and how universities and clusters can be further leveraged to deliver innovation and push productivity catch-up in Mexico.

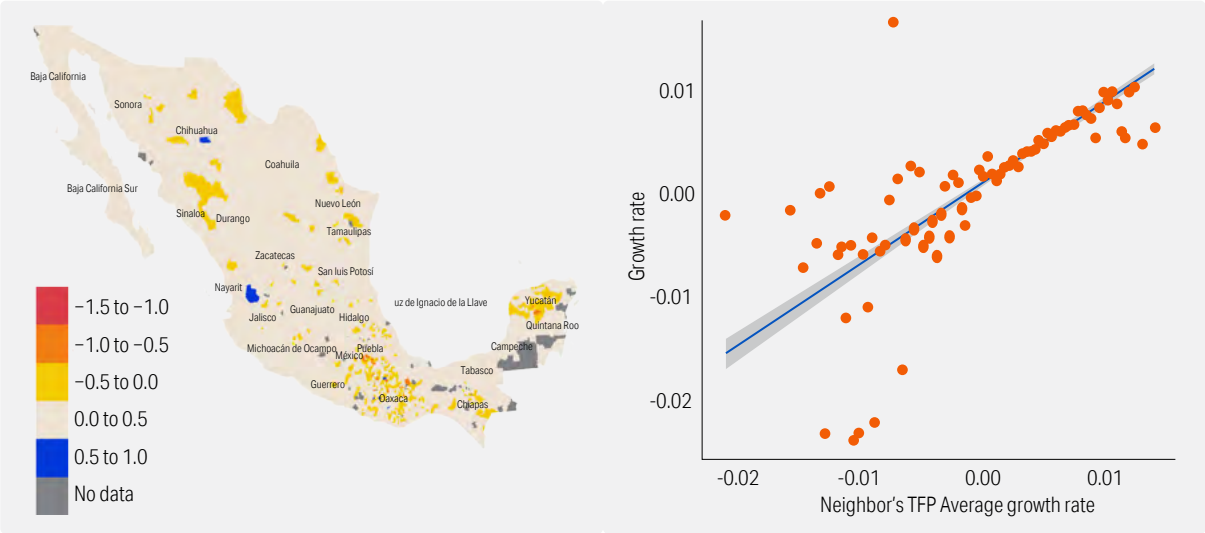
Large Heterogeneity within and across States

Before analyzing the convergence patterns, it is useful to understand the distribution of productivity across places in Mexico, using the six most recent rounds of the Economic Census (1994–2019).[14] Three stylized facts emerge from the analysis.

Figure 2.1 TFPR Growth Rates across Municipalities, 1993–2018

a. Distribution

b. Correlation between the growth rates of a municipality and its neighboring municipalities



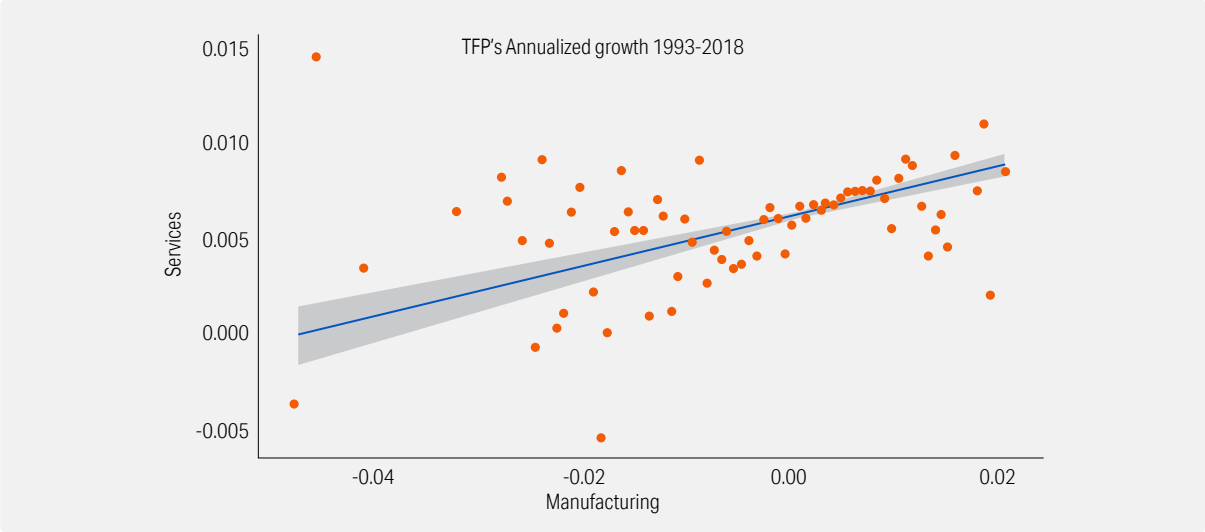
Source: Calculations based on INEGI 1994, 2019.
Note: Revenue-based total factor productivity (TFPR) is computed as the average across all firms in a municipality.

First, at the state level, the North-South divide persisted over the 25 years (map 2.1). Average TFPR increased in all states over the period, ranging from 9 percent in Puebla in the Center to 23 percent in Nuevo León in the North and Colima in the North-Center. However, the ratio between the average productivity of the states in the North region and that in the South region remained relatively constant. For example, an average firm in Chihuahua was 10 percent more productive than an average firm in Oaxaca in 1993 and 2018. An average firm in Nuevo León was 13 percent more productive than an average firm in Guerrero in 1993 and 18 percent more productive in 2018.

Second, within the same state, municipalities are heterogeneous and can register diverse productivity growth rates (figure 2.1, panel a). In Nuevo León, TFPR fell in 17 municipalities, although the state was a stellar growth performer over 1993–2018. The standard deviation of the municipality-level TFPR growth rate over the 25 years is as high as 0.59 in Mexico City and averages 0.27 across all states. Admittedly, there is also a clear pattern of clustering. The productivity growth rates of neighboring municipalities—contiguous municipalities—are positively correlated, with a statistically significant correlation coefficient of around 0.4 (figure 2.1, panel b). On average, municipalities benefit from the economic dynamism of their neighbors. Overall, the revealed heterogeneity within each state suggests the importance of looking at municipality-level convergence. And the clustering pattern calls for an assessment of the contribution made by access to markets, which can support a stronger demand for final products, a more affordable and diversified supply of inputs, and a greater supply of skilled workers. This in turn can boost the agglomeration effects.

Third, across municipalities, the productivity growth rates of manufacturing and services are weakly correlated (figure 2.2). For a relatively small local economy, manufacturing and services can be substitutes, competing for local factors, such as land and labor. The two sectors can also be complements, providing important inputs and generating spillovers to each other. In Mexico, geographically, manufacturing industries concentrate more along the border with the United States where they register higher TFPR than in the other regions. In contrast, services have grown in more populated and dense cities across the country and have gradually closed the TFPR gaps between the North and South. Most notably, at the municipality level, the TFPR growth rates between the manufacturing and service sectors are weakly correlated, with a correlation coefficient of 0.19. The weak correlation suggests weak complementary effects and potentially some substitution effects at the municipality level and different growth patterns. This finding calls for sector-specific analysis.

Figure 2.2 Correlation between Manufacturing and Services TFPR Growth Rates across Municipalities, 1993–2018



Source: Calculation based on INEGI 1994, 2019.
Note: Revenue-based total factor productivity (TFPR) is computed as the average across all firms in manufacturing industries (or service sectors) in a municipality.

Convergence, Big Time

At the global level, the first studies on convergence were part of the growth literature that emerged in the 1990s,[15] pioneered by Barro (1991). In this approach, an important distinction was made between absolute and conditional convergence. Absolute convergence analyses focus on whether countries (or regions) with a low initial income per capita grow faster than those with a high initial income per capita. Conditional convergence analyses control for other factors that could affect the speed of growth, in addition to the initial level of income per capita.

Studies have found that at the subnational level, regions that are sufficiently integrated with each other experienced both absolute and conditional convergence. Examples include state-level convergence in the United States during 1880–2000, prefecture-level convergence in Japan during 1930–90, and regional convergence in eight European countries during 1950–90 (Barro and Sala-i-Martin 1992; Barro et al. 1991; Sala-i-Martin 1996). Subsequent studies have confirmed this finding for other countries, such as Australia, Canada, Ireland, and Sweden.

The literature on economic convergence in Mexico has primarily focused on state-level analysis of income per capita or labor productivity. Some of the studies analyze state-level growth patterns starting from as early as the 1940s. More recent studies focus on the period starting right before the market-oriented reforms and trade liberalization in the 1980s. The dominant view based on these studies is that the unilateral liberalization in 1985 led to an absolute divergent pattern across states, and that the trend continued after NAFTA entered into force (Aroca, Bosch, and Maloney 2005; Baylis, Garduño-Rivera, and Piras 2012; Chiquiar 2005; Fonseca et al. 2018; Rodrigez-Oreggia 2007). A few studies suggest that there has been absolute convergence at the state level, especially when including longer time series prior to NAFTA and accounting for the earlier growth pattern (Cabral and Mollick 2012; Rodriguez-Gamez and Cabrera-Pereyra 2019).

Departing from previous studies, the analysis in this chapter presents two innovations. First, it focuses on TFPR as the measure of productivity. Second, it assesses convergence not only at the state level, but also at the municipality level. TFPR is first estimated at the plant level, following Ackerberg, Caves, and Frazer (2015), and then aggregated to the state or municipality level. Four different aggregated measures are considered to assess different moments of the firm distribution at the local level. These measures are the average across all firms, the median, the 25th percentile, and the 75th percentile. In the baseline analysis, 1993 is the initial year, the year before NAFTA entered into force. This starting point reduces the potential bias in local productivity introduced by the 1995 currency and banking crisis in Mexico, which may have differed across places nonrandomly.[16]

Weak State Convergence

The analysis finds evidence of limited or weak absolute productivity convergence across states since 1993. The deviation from the mean of state-level TFPR in 1993 and 2019 is virtually unchanged, meaning that states in which productivity was lagging in 1993 (relative to the mean) did not catch up faster than states in which productivity was higher than the mean (figure 2A.1).[17] An alternative way to assess convergence relies on evaluating the correlation between growth rates and the initial level of productivity (figure 2A.2). The results show that states with low average productivity in 1993 have grown at a slightly slower rate than those with high average productivity. This is confirmed by the regression results, which show that the correlation coefficient between the annualized growth rates of average TFPR and the initial values is positive and statistically significant.[18] Further, the results not only reveal absolute divergence of average productivity across states, but also show the lack of conditional convergence, after controlling for distance to the border with the United States and the share of indigenous population.[19]

The results also suggest that the 2008 global financial crisis may have influenced the convergence patterns. States with a low average TFPR in 2008 have grown faster than those with a high initial value over 2008–18.[20] This finding implies that after the crisis, the states that were more productive initially recovered less rapidly, likely because they were hit the hardest. The finding is consistent with Castellanos-Sosa (2020), who shows that the crisis enhanced convergence across states. However, the impact of the crisis on long-term convergence across states is yet to be seen.

Robust Municipality Convergence

In sharp contrast to the state-level results, the analysis reveals clear evidence of absolute productivity convergence across municipalities since 1993. The gap between low-productivity and average municipalities narrowed between 1993 and 2019. The difference between high-productivity and average municipalities also declined (figure 2A.3).

Low-productivity municipalities have grown significantly faster than high-productivity ones since 1993 (figure 2A.4). The annualized growth rates of average TFPR over 1993–2018 are significantly negatively correlated with the initial values. The relationship holds across all the aggregate TFPR measures. And the negative relationship between productivity growth and initial productivity becomes slightly stronger after controlling for distance to the border with the United States and the share of indigenous population.[21] The results point to a robust absolute and even stronger conditional convergence across municipalities.

The analysis finds evidence that the 2008 global financial crisis may have reduced convergence across municipalities, whereas it enhanced state-level convergence. In both the pre- and post-crisis periods, low-productivity municipalities grew faster than high-productivity ones. But the rate of convergence was slower in the post-crisis period.[22] This suggests that during the crisis, the hardest hit municipalities were those that were less productive but grew faster.

The finding of robust absolute municipality-level convergence is supported by the analysis of the spatial decomposition of productivity in chapter 3. That analysis shows that the within-municipality component contributed to productivity growth in a larger magnitude than the between-municipality component. The between-municipality component represents the reallocation of resources from lower to higher productivity municipalities, which may lead to divergence. The within-municipality component represents how changes in municipality characteristics, such as the technical efficiency of the municipality, affect productivity growth. The finding that the within-municipality component is more important implies that municipality growth (and convergence) has a larger effect on productivity than the shift of resources between municipalities.

The strong absolute convergence across municipalities holds for both the manufacturing and service sectors. Given that the geographic distributions of manufacturing and services differ, and their productivity growth rates are weakly correlated at the municipality level, the chapter further explores the convergence pattern for each sector separately.[23] The results reveal that municipality-level convergence is robust for manufacturing and services (figure 2A.5). For both sectors, municipality productivity in 1993 is significantly negatively correlated with the productivity growth rate over the following 25 years. Municipalities with low productivity in manufacturing industries grew faster. The same conclusion applies to municipalities with low productivity in services. And for both sectors, the conclusions are robust across all moments of the firm productivity distribution.

Convergence is not only statistically robust, but also relatively fast. Having found evidence of convergence at the municipality level, the key question to address is how large the convergence is in quantitative terms. Overall, about 20 years are needed for current disparities in average TFPR across municipalities to be halved (figure 2A.6). This compares rather well for instance with the same measure calculated for convergence in the European Union, where between 2000 and 2018, the half-life value was between 20 and nearly 60 years, depending on the period considered (Monfort 2020). The speed of convergence is slower for services, which take 30 years to halve the initial differences in productivity, while for manufacturing it is 20 years.

Why Do States Converge Weakly?

The finding that municipalities converge rather than diverge—relatively rapidly—is encouraging from a policy perspective, but also puzzling in the context of the conventional wisdom about geographic "divergence, big time" in Mexico. In other words, if municipalities converge, why is it that states do not?

To interpret these results, this section assesses how the distribution of fast-growing municipalities varies across states. Specifically, this is shown by calculating the share of fast-growing municipalities in each state, with "fast growing" defined as having an annual growth rate above the national median (Li, Rama, and Zhao 2018). All the states, including low-productivity ones in 1993, have at least one fast-growing municipality. But low-productivity states have few of these strong performers.

The section also considers the annual growth rate of the fastest-growing municipality in each state as a reference and assesses how it correlates with state-level growth. The findings show that there is no clear correlation between the growth rate of the state and the growth rate of its fastest-growing municipality (figure 2A.6, panel a). On average, all states have some star municipalities that grow on a par with peers in other states. But there is a positive correlation between the growth rate of the states and their shares of fast-growing municipalities (figure 2A.6, panel b). States with a higher share of fast-growing municipalities also tend to grow faster overall. Low-productivity states do not converge strongly because they do not have enough fast-growing municipalities.

A regression analysis corroborates this result: the state-level growth rate is significantly and positively correlated with the share of fast-growing municipalities, but it is not correlated with the speed of growth of the fastest-growing municipality (table 2A.1). The results are robust to changes in the definition of fast-growing municipalities, such as considering the 75th percentile in the distribution of growth rates across municipalities as the relevant threshold.

In conclusion, for state convergence, it is more important to have a solid team of converging municipalities than a lonely star municipality for convergence at a very fast rate.

Why Is Mexico Growing Slowly?

Another pertinent question is, if municipalities have converged rapidly, in both manufacturing and services, why is it that productivity performance at the national level during the past 25 years has been so disappointing?

The main hypothesis is that the convergence observed at the municipality level is driven by low-productivity municipalities catching up, while the growth of high-productivity municipalities has been unimpressive. In other words, municipalities that were below the productivity frontier have caught up, while those at the frontier have not expanded. As a result, productivity growth at the national level has remained disappointingly low.

The analysis finds that the performance of the municipalities on the productivity frontier declined relative to the 1993 level. To assess the performance of municipalities across the productivity distribution, six groups of municipalities were selected based on their average TFPR values in 1993.[24] The six groups represent different levels of the productivity distribution in 1993, and their productivity levels are traced over time. The results show that for the frontier municipalities, productivity fell sharply over the 25 years, to around 80 percent of the 1993 level. For the other two high-productivity groups, productivity declined or remained constant. In contrast, for the median and low-productivity groups, productivity grew significantly, by over 20 percent for the 25th and 10th percentile groups (figure 2A.7, panel a). To understand the dynamics behind these patterns, the analysis is replicated for each subperiod, where the productivity levels are set at the beginning of each

period and traced for the following five years. The result that municipalities with initially lower productivity grew faster is confirmed, but some nuances emerge. The periods during which the catchup seems to have been faster were post 1993 and post 2008, and 2013–18 and 2003–08 appear to have been characterized by growing divergence.

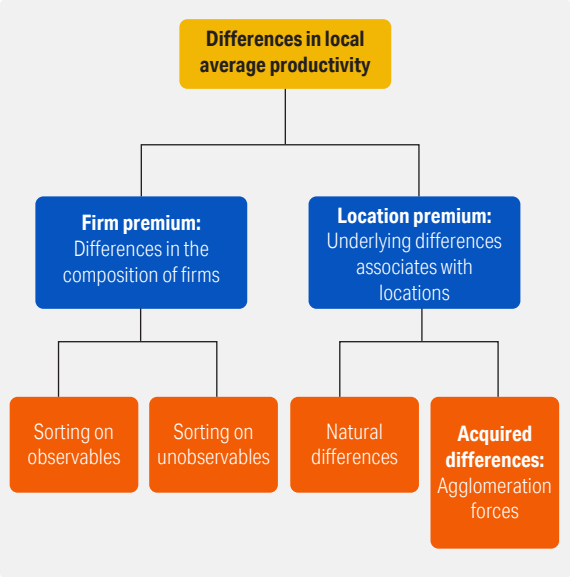
All the municipalities have been catching up with the frontier, but low-productivity groups have reduced their gaps faster than high-productivity groups (figure 2A.8). Nonetheless, it is discouraging to see that the gaps between high-productivity municipalities and the frontier have been almost constant since 1998. For the 75th percentile group, the gap remains at nearly 80 percent of the frontier municipalities' productivity. This result is in line with Iacovone and Crespi's (2010) firm-level results, which show that Mexican plants have caught up with national technological best practices much faster than with global ones.

To understand the relationship between the changes in the technological frontier in a geographic area and firm productivity growth, an analysis of catching up with the technology frontier is conducted. Iacovone and Crespi (2010) assess for an earlier period (1993–2000) the convergence of Mexican manufacturing firms with the domestic versus global frontier. Extending that study, this chapter focuses on three different frontiers, following the levels of spatial analysis, that is, national, state, and municipality.[25] The results suggest that firm productivity growth is driven by catching up with the national frontier and not the state-level or municipality frontier. At the same time, the results suggest the presence of important "spillover" effects due to the growth of the municipality frontier, pointing to the existence of localized spillovers from the growth of the local productivity frontier for firms in the same municipality. The finding that productivity growth is driven by catchup with the national frontier rather than with local frontiers (state and municipality level) points to the importance of the role of frontier firms at the national level toward which other firms converge through learning and imitation.

Drivers of Local Productivity

Based on urban economics, two fundamental reasons can explain why productivity varies across places (figure 2.3). The first reason, the *firm premium*, is determined

Figure 2.3 Two Fundamental Reasons Explain Why Productivity Varies across Places



Sources: Based on Combes and Gobillon 2015; Li and Rama 2015; Roberts et al. 2019.

by the composition of firms, entrepreneurs, and workers. It depends on firms' characteristics rather than the characteristics of their specific locations. This is normally driven by "sorting" as more capable entrepreneurs tend to locate in more productive places. These firms would be productive anywhere. The second reason, the *location premium*, which captures the underlying productivity advantages of a location, is driven by a specific location's characteristics (Combes and Gobillon 2015; Combes et al. 2010). Some place-specific characteristics may be due to natural advantages, such as a favorable climate, and cannot be changed. Other characteristics may be acquired or developed over time depending on policies and local investments. For example, a large city size allows more learning and greater knowledge spillovers, and the size of a well-managed metropolitan area can increase without higher congestion costs. Another example is access to major markets; a world class airport in the vicinity of a city can vastly improve access to domestic and international markets. This conceptual approach is summarized in figure 2A.9.

This chapter focuses on the drivers of the *location premium*, which can be acquired and depend on policies and investments. Over time, the right combination of public policies and investments can influence these characteristics ("acquired drivers") and improve the location premium of a place. Following Combes and Gobillon (2015), firm productivity at any point in time

can be expressed as a function of firm, sector, and place-specific characteristics. Within this framework, a three-step approach is applied to disentangle the impact of locations from the impact of firms and sectors and assess the impacts of four broad types of municipality characteristics on the location productivity premium: urbanization, access to markets, human capital externalities, and clustering.

Urbanization

Concentration of economic activities increases the productivity of firms and workers. Urban areas are more productive than rural areas, and this productivity advantage is larger for larger cities and denser places. Multiple mechanisms can explain these effects, which work through the labor, goods and services, and knowledge markets. These mechanisms are summarized as labor pooling, input sharing, and knowledge spillovers (Duranton 2015; Marshall, 1920; Rosenthal and Strange 2004). For example, in cities, a thicker labor market leads to better matches between the skills supplied and the tasks demanded by businesses. In a metropolis, the intense interaction among a large number of people and firms creates the conditions for knowledge transfers and spillovers. However, urban sprawl and greater density can also give rise to diseconomies of scale and congestion, as shown by Duranton (2016a, 2016b). The right mix of policies and investment can mitigate congestion and environmental and other externalities and therefore reduce the diseconomies of scale, as seen in London, New York, Paris, and other successful metropolises around the world.

For manufacturing industries, the analysis finds that both density and size are significantly positively correlated with the location productivity premium in Mexico (figure 2A.9). The correlation is robust after controlling for other variables that may also drive local productivity, which reduces the concern about omitted variables bias (table 2A.2, panel a). The magnitude is significant, as doubling a municipality's density is associated with a local productivity premium that is 1.5 percent larger. The size (or scale) effect is even larger: when a municipality's population doubles, the location productivity premium increases by 3 percent. These results are comparable to those for countries such as France, the United Kingdom, the United States, and other advanced economies, where doubling city density or size is associated with a local productivity premium between 2 and 10 percent (Duranton 2015).[26]

However, the results reveal vast differences between regions (table 2A.2, panel b). Urbanization's contribution to the local productivity premium is remarkably lower in the South of Mexico than in other regions. For example, doubling the population density of a city in the Center or North of Mexico is correlated with an increase of the local productivity premium by 3 percent, while it does not have any effect if the city is in the South. Similarly, the magnitude of the scale effect on the local productivity premium is nearly three times larger in the North than in the South. The lack of scale and density effects of cities is not uncommon in less developed countries in Sub-Saharan Africa and South Asia. These cities are often congested, characterized by high criminality, and limited public goods, and have areas that are disconnected as public transport is weak and inefficient. In this context, expanding population and density quickly leads to diseconomies of scale and congestion. The problem is that these types of cities tend to lack quality infrastructure, robust institutions, and complementary policies to support the economic dynamism of entrepreneurs and firms (Bird et al. 2018; Ellis and Roberts 2016; Lall, Henderson, and Venables 2017). Cities in the South of Mexico face similar challenges and are often characterized as distant, dispersed, and disconnected (Kim and Zangerling 2016). Therefore, improving the management of spatial growth in cities in the South of Mexico could lead to significant productivity gains and deliver the productivity promise of urbanization that this region has yet to experience.

Population density and size are also positively and significatively correlated with the location productivity premium for the service sectors, and the magnitude of this effect is larger than for manufacturing industries (figure 2A.10). The relationship remains robust when controlling for access to markets, human capital externalities, clustering, and other municipality characteristics (table 2A.3, panel a). When a municipality's density doubles, this is correlated with a local productivity premium of 2.6 percent. The magnitude of the scale effect is even larger. When a municipality's population doubles, the location productivity premium increases by 12 percent. These results are in line with the findings for the service sectors in the United States, where city productivity increases by 7-15 percent following the doubling of city size (Morikawa 2011).

For the service sectors, the regional analysis suggests that urbanization contributes more to the local productivity premium in the North and Center than in the rest

of the country (table 2A.3, panel a). The impact of local concentration of economic activities is larger in the North and North-Center than in the rest of the country. The difference is particularly considerable for the scale effect. These results reinforce the previous message that urbanization has not delivered as expected in the South of Mexico where congestion and negative externalities appear to outweigh the positive effects of agglomeration.

Access to Markets and Connectivity

Access to markets is a concept emphasized by the new economic geography literature. The ability to reach dynamic centers easily boosts the effects of agglomeration, as it supports a stronger demand for final products and a more affordable and diversified supply of inputs (Fujita, Krugman, and Venables 1999; Krugman and Venables 1995). Access to markets critically depends on connectivity. For example, highways and railways can cause relocation of firms and households and influence the size of the economy in the vicinity of a place. Growing evidence in the past few years has shown the importance of access to markets as a key driver of the productivity location premium (Baum-Snow 2007; Baum-Snow et al. 2017; Heblich, Redding, and Sturm 2018; Redding and Turner 2015).

In the case of Mexico, the government has made considerable efforts to improve road connectivity since the late 1980s. From 1993 to 2016, the length of multilane roads increased more than sevenfold. Previous studies have found that road infrastructure is positively correlated with the labor productivity of manufacturing industries, as well as local employment and specialization of manufacturing and services (Duran-Fernandez and Santos 2014a, 2014b; Blankespoor et al. 2017).

Consistent with the previous literature, the results reveal that more roads in a municipality and greater road efficiency are associated with a higher location productivity premium for manufacturing industries (figure 2A.11). The correlation remains statistically significant after controlling for urbanization, human capital externalities, clustering, and other important municipality characteristics (table 2A.4, panel a). This suggests that at the national level, improved connectivity increases manufacturing productivity independently of the other channels by providing greater access to markets as well as wider and cheaper access to intermediate inputs. Doubling the number of roads within the 10-kilometer radius of a municipality is correlated with an increase in the location productivity premium by 1.2-1.5 percent.

Meanwhile, there is notable variation across regions (table 2A.4, panel b). In the North-Center and Center, the impact of roads is stronger than the national average. In the North and South, improved connectivity and hence better access to domestic markets do not seem to matter. But the underlying reasons are likely different between the two regions. In the South, with few dynamic markets nearby and scarcity of complementary factors (for example, good local business environment), improved connectivity may do little. Additionally, coordination among the municipal administrations that form part of Mexican metropolises is still limited. The metropolitan area of Oaxaca is a case in point of fragmentation, which leads to a poor business environment. In the North, more than access to the domestic market, what matters is access to the U.S. market, especially since NAFTA. The analysis finds that halving the travel time to the U.S. border leads to an increase in the location productivity premium of over 2 percent in the North, which is a much larger impact than anywhere else (twice as large as the national average). At the opposite end of the spectrum, travel time to the U.S. border does not seem to play any role in terms of contributing to the location productivity premium for municipalities in the South. These results suggest that manufacturing industries in the South have not benefited much from access to this major international market.

Within services, the roles played by access to markets and connectivity vary across different types of services depending on their level of skill intensity (table 2A.5, panel a).[27] Skill-intensive services are more tradable. For these sectors, the demand by U.S. consumers and ties with U.S. businesses are more important than the demand from and business relationships with domestic markets. The analysis finds that for skill-intensive services, the location productivity premium grows by 2 percent when the travel time to the U.S. border is halved. And for skill-intensive services, the municipal road count or road efficiency has a significant impact. Conversely, non-skill-intensive service sectors tend to be non-tradable and oriented toward the domestic market. For these sectors, the travel time to the U.S. border or access to the U.S. market plays a more subdued role. Instead, connectivity to domestic markets is of high significance. For non-skill-intensive services, the location productivity premium increases by 1.4 percent when the availability of roads at the municipality level doubles.

The analysis by region offers more nuanced findings (table 2A.5, panel b). In summary, the results reveal that access to the U.S. market plays a critical role for skill-intensive sectors and service providers in the North and Center—the metropolitan area of Mexico City. At the same time, connectivity to domestic markets is an important driver of local productivity for non-skill-intensive services and service providers in the North-Center and South.

Notably, travel time to the U.S. border[28] does not seem to matter for municipalities in the South. Future research work is needed to identify the exact reasons. One potential explanation is that the region is too far from the U.S. border and the impact of travel time is nonlinear. The average travel time by road from a municipality in the South to the U.S. border is nearly four times longer than that from a municipality in the North. Marginal improvements in local roads may not make much of a difference in the location productivity premium in this case. Other types of transportation investment, such as high-speed railways and airports, may be required, especially when considering service sectors. In this regard, the current government administration is developing large investment projects to create interconnection points for multimodal transportation. One example is the Isthmus Project, that hopes to improve transportation connections and lower the final shipping cost. Another is the Maya Train, which hopes to improve rail connections between the south and the north of the country. But our results suggest that for these projects would benefit from complementary policies. For instance, we find that the lack of good business environment and conducive complementary policies (for example, urban management policies and public goods) explain why similar infrastructure investment can have different impacts in different regions.

Human Capital Externalities and Universities

The endogenous growth literature postulates that human capital is the ultimate driver of economic dynamism (Romer 1986). The literature on human capital externalities emphasizes that the concentration of highly educated and skilled workers stimulates transfers and spillovers of ideas and makes firms more productive than they would be otherwise. Existing research clearly indicates that higher human capital concentration has positive local productivity effects through externalities. For example, in the United States, the productivity of firms in cities that experience large increases in the share of highly educated population rises more than the productivity of similar firms in other cities (Moretti 2004a, 2004b; Shapiro 2006).

Universities have been viewed as a potential tool to boost local economic development by promoting human capital externalities. Empirical evidence has been supportive of the effectiveness of institutions of higher education. In the United States, land-grant colleges have been identified as the federal government's most successful place-making policy (Glaeser and Saiz 2004; Moretti 2004a). Institutions of higher education have also been shown to have significant effects on the formation of industrial clusters, local innovation, and local productivity in Germany, the United Kingdom, and Sweden. But the payoffs of universities can differ, depending on the characteristics of local industries and entrepreneurs (Ambramovsky and Simpson 2011; Andersson, Quigley, and Wilhelmson 2004; Dittmar and Meisenzahl 2020; Kantor and Whalley 2014).

The results confirm that the local presence of higher education institutions is positively correlated with the location productivity premium for manufacturing industries (table 2A.6, panel a). The relationship is robust after controlling for urbanization, connectivity, clustering, and other municipality characteristics. When the number of universities doubles, the location productivity premium grows by 1.2 percent. And differently from the previous drivers (urbanization and market access), the effects are strong across all four regions (table 2A.6, panel b).[29] Therefore, the existence of a robust productivity effect of universities is consistent with the idea of human capital externalities beyond firm-specific workers' skills. In other words, the social returns to concentration of highly skilled professionals and entrepreneurs are over and above the private returns to higher education.

Human capital externalities are not stronger in larger cities. Previous studies suggested that the effect of human capital externalities could be larger in bigger cities as externalities from agglomeration and human capital could complement each other, generating a virtuous circle. The results suggest that this is not the case in the context of Mexico, so even smaller urban centers benefit from the presence of higher education institutions.

The results also suggest that the impact of middle-skill workers as a source of human capital externalities is less strong (table 2A.6, panel a). The middle-skill workforce is measured as the share of the working-age population

with secondary education (box 2A.2). However, there are important regional variations. In the North-Center and South, the larger share of secondary educated working-age population is correlated with a higher level of the location productivity premium (table 2A.6, panel b).

For services, the results again support the importance of higher education institutions at the local level (table 2A.7, panel a). A robust positive association is found between the number of universities and the location productivity premium, after controlling for other local characteristics, including population size, connectivity, and clustering. Interestingly, the association is significant not only for skill-intensive sectors, but also for other service sectors. Across all the service sectors, doubling the number of universities in a municipality can lead to a 3.0-8.5 percent increase in the municipality-sector productivity premium. The positive impact of universities on non-skill-intensive services can arise from multiple channels. One channel is indirect through input-output linkages. The presence of universities in the local economy increases the productivity of skill-intensive services and manufacturing industries through knowledge spillovers. This change, in turn, can generate stronger demand for non-skill-intensive services as well as more affordable and higher quality supply of inputs to non-skill-intensive services. The other channel is direct via greater knowledge spillovers among entrepreneurs and managers, some of whom oversee firms in non-skill-intensive services.

The analysis further reveals that universities make a considerable contribution to the spatial distribution of productivity, regardless of the region (table 2A.7, panel b). For example, in the South, the municipality-sector productivity premium would grow by 3.0-8.5 percent should the number of universities double. The magnitude of change is the same as the national average and slightly higher than in the North.

The analysis also finds some evidence that the middle-skill workforce is a source of human capital externalities. Across all the service sectors, if the share of the secondary educated working-age population doubles, the municipality-sector productivity premium will grow by 0.3-0.4 percent. The impact is strongest in the South where the magnitude of the change in the productivity premium can reach 0.9 percent following the doubling of the share of the secondary educated workforce.

Specialization and Clustering

Clustering, or spatial concentration, of industries and related businesses is a well-established stylized fact. High-technology industries and innovation are even more spatially concentrated than general industries. From an urban economics point of view, the effects of local concentration of economic activities on local productivity may mainly take place within an industry, defined as localization effects. Analogous to urbanization effects, localization effects may arise from the typical Marshallian externalities, including labor pooling, input sharing, and knowledge spillovers, but the effects are more confined to a specific industry.

Conceptually, it is also useful to distinguish between specialization and clustering. Specialization refers to the simple concentration of any industry. However, certain industries may account for a larger share of the local economy, but they may not automatically reap the benefits of their concentration. By contrast, other industries may have a true tendency to cluster because they benefit from proximity as their Marshallian externalities may be more important. Specializing in the latter type of industries would be more likely to generate localization effects. For example, studies have shown the impact of clustering on local productivity, especially for high-technology industries. This can be explained by the importance of knowledge spillovers or the availability of a highly skilled workforce locally for these highly knowledge-intensive industries (Chatterji, Glaeser, and Kerr 2014; Combes and Gobillon 2015; Ellison and Glaeser 1997).

In Mexico, the automotive and auto parts, aerospace, and electronic devices industries have gained a global reputation and are concentrated in specific clusters. Automotive industries have established presence in all parts of the country, but the main clusters are located principally in the North and North-Center. Aerospace manufacturing is in Querétaro (Center) and Sonora, Chihuahua, Nuevo León, and Baja California (North). Electronics clusters are mainly established in the North, North-Center, and Center. These clusters may have boosted Mexico's global competitiveness and led to a more dynamic supply chain and more closely integrated industry value chains in the country (Contreras, Carrillo, and Alonso 2012; Gomis and Carrillo 2016).

Clustering (and not simple specialization) is an important driver of local productivity for manufacturing industries in Mexico (table 2A.8, panel a). A higher

cluster index is significantly positively correlated with the location productivity premium. The relationship remains robust after controlling for urbanization, access to markets, human capital externalities, and other municipality characteristics. However, no correlation between the simple specialization index and the productivity premium is found, confirming that localization effects are associated more with sectors with a stronger tendency to cluster.

The regional analysis further shows that clustering has played a significant role across all regions (table 2A.8, panel b). The correlation between the cluster index and the productivity premium is robust for all regions, including the South. However, the magnitude of the estimated coefficient on the cluster index is larger in the North, more than double the national average. The differences in the magnitudes of the impact indicate the importance of complementary factors, such as institutions and policies, which are not directly controlled for in the analysis. To assess the importance of the main clusters, the cluster index is interacted with dummies for the automotive, aerospace, and electronics industries. The results support the finding of a stronger impact of these three types of industry clusters on local productivity in the regions in which they operate.

By contrast, the analysis finds little evidence that specialization and clustering affect local productivity in the service sectors in Mexico. The clustering of certain skill-intensive industries may have influenced local productivity in the North; however, the effect cannot be identified separately from the effect of urbanization (box 2.1).

Policy Recommendations

Urbanization

The analysis has revealed that urbanization is a strong driver of local productivity in Mexico but not everywhere in the country, as there are untapped opportunities in the southern states. The results are highly consistent with the international literature and the growing consensus among academia and policy makers that cities are a key engine of economic growth. The results also suggest that cities in the South have not been as productive as expected given their level of urbanization, compared with cities in the Center and North of the country. A large, untapped potential exists in cities in southern Mexico and requires implementing policies that complement urbanization and improve the business environment.

Box 2.1 Challenges to Supporting the Emergence and Development of Clusters

Although clustering is very important for the local productivity premium, there is limited evidence of effective policies for creating clusters. Among the few policies with good evaluations are the local production systems in France. They support collaboration among groups of firms in the same industry and location, and they seek to boost cluster productivity. However, there is little evidence that the program has had a positive effect on employment growth or total factor productivity (Martin, Mayer, and Mayneris 2011). An exception is the Bavarian High-Tech Offensive in Germany, which targeted businesses in five technology sectors in Bavaria and had positive impacts on innovation activities (Falck, Heblich, and Kipar 2010).

More generally, across countries, cities that are specialized in a few activities coexist with more diversified cities. Firms in more specialized places can benefit from the proximity of closely related and highly specialized suppliers. However, more specialized places may be more exposed to exogenous shocks and risks as the fortunes of specific sectors rise or fall. High-technology industries are more concentrated because knowledge flows across a shorter spatial distance than labor pooling and input-output interactions. However, knowledge spillovers are stronger in large, more diversified cities. Most innovation takes place and most new firms are created in diversified cities (Chatterji, Glaeser, and Kerr 2014; Combes and Gobillon 2015; Duranton 2016a; Duranton and Puga 2000). So, although the results support the importance of clustering for the location productivity premium, especially for manufacturing industries, the question of the most appropriate policy interventions for successfully promoting clusters is still an open research agenda.

Mexico's overall urban policy framework has fallen short of recognizing the economic role of cities in promoting productivity growth and prosperity. Reframing urban policies through this angle helps to identify the bottlenecks in the urbanization process that slow productivity growth and points to four areas for reforms (Kim and Zangerling 2016).

First, in Mexico, most policy responses and instruments for urban development have been led by housing policies. However, cities are not just bedroom towns. Instead, policies and investments should promote smart urban growth and coordinate housing policies with broader urban development issues, such as land use decisions and infrastructure provision—to connect firms with households and promote productive, livable, and sustainable cities. In particular, incentivizing mixed land use zoning for peri-urban expansion and dilapidated urban cores could ameliorate the negative aspects of new developments in peri-urban areas. In addition, adopting a multimodal approach to urban transportation and promoting public transportation will be helpful. Encouraging mixed land use and improving urban transportation can bring firms and households closer, reduce home-to-work commuting trips, and mitigate traffic-related environmental problems.

Second, the economic potential and possible synergies of Mexican cities are left untapped in most cases because of the lack of coordination at the metropolitan and regional levels. Coordination among the municipal administrations that form part of Mexico's metropolises is still incipient, and there are few effective mechanisms for multijurisdictional and vertical coordination. For example, the metropolitan area of Monterrey (Nuevo León) enforces cycles of productivity growth and metropolitan coordination, whereas the metropolitan area of Oaxaca (Oaxaca) is stagnant and isolated without coordination. This difference in metropolitan-level coordination may be a reason why urbanization and connectivity have not worked in the South as well as in the North. Therefore, strengthening metropolitan and regional coordination can help to capitalize on contiguous or connected municipal economies and unlock the benefits of agglomeration.

Third, urban development in Mexico has relied heavily on housing subsidies. Other financing instruments are needed to leverage the contribution from the private sector and rely more on the financial market. Particularly, land-based financing can pay for upgrading urban infrastructure by capturing part of the increments in land values from public investment and the urbanization process. Supporting such financing with well-functioning cadastral systems for Mexican cities is an important action. Building more liquid and deeper land markets and systems that regularly monitor and update urban development plans is another critical action to support coordination between the public and private sectors.

Fourth, municipalities' revenue collection needs to be enhanced for cities to deliver critical productive and residential amenities. A property tax reform would strengthen the revenue-raising capacities of municipalities. To increase equity and support the lagging areas, a system of federal transfers to the most deprived municipalities can be designed, focusing on productivity-enhancing investments and not just social assistance programs.

Clustering

The results indicate that clusters play a significant role in boosting local productivity in Mexico but only for manufacturing industries. The chapter also showed that the impact is stronger for the aerospace, automobile, and electronics industries in the regions where they operate.

Clustering policies can be defined as public interventions that create a set of incentives to overcome coordination failures that hamper the development of some industries in specific localities, to foster the beneficial effects of economies of agglomeration within these industries. These policies can cover a variety of areas: developing and strengthening linkages and matching between firms, exchanging information, developing a shared diagnosis of problems affecting the sector, coordinating the actions of firms and organizations, identifying the essential public and collective inputs, and sometimes providing key commonly shared inputs to improve performance, such as the establishment of specific quality testing centers or vocational training centers (Maffioli, Pietrobelli, and Stucchi 2016).

The evidence on the effectiveness of clustering policies is limited despite that clustering policies have become an important component of the industrial policy toolkit. The rationale for clustering policies is to address

coordination failures that limit agglomeration economies. Although business clusters are often generated naturally and many connections already exist, they are often not sufficiently structured, and firms fail to exploit their full potential beyond the realization of market transactions because they do not internalize the typical Marshallian externalities.[30] Clustering policies have been implemented in more advanced economies for nearly two decades and increasingly in many developing countries over the past 10 years. Some general lessons can be drawn from these experiences.

First, clustering policies require high-quality governance mechanisms, participation, and coordination. Given their complexity, public and private actors need to be adequately trained prior to these interventions. Effective programs for supplier development should be established to strengthen input-output linkages and spillovers from clustering. There is also a need to facilitate information exchange among firms and reduce information asymmetries about demand for local inputs and skilled labor in local clusters. Finally, it is equally critical to invest in technical education through public-private partnerships that target specific demands for skilled workers from local clusters such as the aerospace, automotive, and electronics industries.

Second, successful clustering interventions require public-public coordination. Coordination with other programs and policies is necessary for a cluster to achieve greater impact. However, because their mode of intervention is innovative, clustering policies can be isolated and different from other policies. Therefore, it is necessary to find a balance between introducing policy innovations and achieving complementarity with other public policies. Additionally, a clustering development strategy should be consistent with the more general regional and municipality development strategy. Therefore, it is critical to develop capacity at the local level to coordinate and match the clustering development agenda with the larger local development agenda.

Third, clustering policies need to adapt to specific contexts, territories, history, and sectors. The selection of clustering needs to consider the competitiveness and development potential of the cluster and the local capacity to coordinate actions among private firms and with the public sector. And clusters go through different stages; therefore, the policies to support them should identify the changes and adapt to different phases of the development of clustering.

Evidence on policies to support clustering is still incipient and often anecdotical. Therefore, more evidence and rigorous evaluations are needed to draw lessons so that policy makers can adjust and design future clustering programs in an effective manner. Broadly, the implementation of programs to support clustering should be accompanied by appropriate monitoring and evaluation to ensure accountability and help policy makers learn how to increase program effectiveness and be able to discontinue interventions that appear not to generate the expected productivity gains.

Human Capital Externalities

The results suggest that investment in human capital is an important driver of productivity differences across municipalities, with higher education determining the performance of manufacturing industries and secondary and higher education driving differences in services. This finding is robust across all four regions.

Productivity gains from an increasingly highly skilled labor force can be further tapped because the demand for a more educated labor force has increased at a slower pace than supply (Levy 2018). It is important to understand the needs of businesses at the local level to focus efforts on their demand so that greater gains from human capital externalities can be realized.

Education policies are the responsibility of the federal government, but in coordination with state governments, they can help to integrate the productive sector with higher education institutions, to adapt study plans and develop specialized institutions that are focused on each region's specific demand for labor. Investment to expand higher education should be guided by emphasis on quality and labor market demand at the local level, building on examples such as the Aeronautical University in Querétaro.

Additionally, education policies and the education system should strive to balance efficiency and equity needs. It is imperative to refine fiscal federal relationships in the delivery of education services, simplify funding mechanisms, and increase transparency in the allocation of resources at the local level. It is also important to distribute resources equitably among schools, for example, by providing additional support to schools in municipalities with a higher share of students from lower socioeconomic backgrounds.

Conclusions

This chapter found that during the past 35 years, while convergence at the state level has been faltering, municipality-level convergence has been strong. There is hope that the less developed parts of the country will catch up, against the conventional wisdom of "divergence, big time" in Mexico. The finding that municipalities have converged while the state has not may appear puzzling at first sight. The analysis reconciled this potential contradiction by showing that what drives state growth is the share of fast-growing municipalities. The analysis found that everywhere in Mexico, in all states, there are some fast-growing municipalities; however, states in the South could not catch up because they had too few of them.

Convergence at the municipality level is driven by low-productivity municipalities catching up, while the growth of high-productivity municipalities has been disappointing. Mexico's disappointing productivity performance over the past 25 years is explained by the stagnation or decline of productivity in municipalities at the frontier.

To shed new light on the drivers of local productivity in Mexico, the chapter followed the urban economics literature and disentangled the impact of location from the impacts of firms and sectors, defined as the location productivity premium. It then focused on four broad types of municipality characteristics that can potentially generate agglomeration benefits and assessed how they affect the location premium. The four types of location characteristics are urbanization, access to markets, human capital externalities, and clustering.

The results reveal important sectoral nuances in the impact of these municipality characteristics. For manufacturing, both urbanization—defined as the concentration of all economic activities—and clustering—the pooling of firms within an industry that has a strong tendency to concentrate—are robust determinants. The relative importance of access to international markets versus connectivity with domestic markets depends on the region. Universities increase productivity everywhere, indicating the importance of human capital externalities associated with highly skilled workers. For services, urbanization is an even more significant driver of local productivity. Conversely, clustering does not play a role. Access to international markets is an important determinant for skill-intensive services because they are more tradable, whereas connectivity with domestic markets is a strong driver for other services, which tend to be non-tradable. Both universities and middle-skill workers affect local productivity in the service sectors. However, the role played by universities and, hence, by the spillovers from highly skilled professionals and entrepreneurs, is more significant.

The analysis also found notable spatial differences in the contributions of municipality characteristics to local productivity. In the North, all four types of municipality characteristics—urbanization, access to markets, human capital externalities, and clustering—are robustly correlated with the local productivity premium. Various agglomeration forces form a virtuous circle, supporting the dynamism of firms in the region. In sharp contrast, in the South, urbanization and access to markets are weakly correlated with the local productivity premium, especially for manufacturing industries. These results suggest that there is large, untapped potential to boost productivity in this region through improving urban development and connectivity and enhancing institutions and complementary policies. Finally, universities and clustering were found to be robust determinants of local productivity across all four regions. Although the effectiveness of many clustering policies is under debate, studies have shown the effects of universities and clustering on local innovation and local productivity in more advanced economies. The results call for a better understanding of what has worked and how universities and clusters can be further leveraged to deliver innovation and push the technology frontier in Mexico.

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Endnotes

12 The text refers to firms, plants, and establishments interchangeably, but the Mexican Economic Census collects data at the establishment (or plant) level and not at the firm level.

13 Among a long list of potential factors, the urban economics literature is used to select the characteristics that have been found to cause local productivity variations in different countries (Baum-Snow 2007; Baum-Snow et al. 2017; Combes and Gobillon 2015; Dittmar 2020; Duranton 2016a, 2016b; Ferreyra and Roberts 2018; Heblich, Redding, and Sturm 2018; Glaeser et al. 1995; Glaeser and Saiz 2004; Moretti 2004a, 2004b; Redding and Turner 2015; Shapiro 2006).

14 Namely, 1994, 1999, 2004, 2009, 2014, and 2019 are used for the analysis (INEGI 1994, 1999, 2004, 2009, 2014, 2019). Each Economic Census captures all nonfarm activities of the previous calendar year. The analysis focuses on manufacturing, commerce, and services (the analysis in this chapter excludes agriculture, mining, energy

15 These studies differed in the way convergence was defined, the unit of observation, and the statistical method.

16 One caveat of using the 1994 Economic Census is that it did not capture workers who were hired indirectly by a firm, but the subsequent Economic Censuses cover these workers.

17 The chapter refers to annex boxes, figures, and tables that are provided in online annex 2A.

18 At the conventional 5 percent level.

19 Results are available upon request.

20 See annex 2A.

21 See annex 2A.

22 See annex 2A.

23 Municipality-level TFPR aggregate measures are computed for the two broad sectors separately.

24 The 95th percentile (or the frontier municipalities), 90th percentile, 75th percentile, median, 25th percentile, and 10th percentile.

25 Taking the national technology frontier as an example, for a narrowly classified industry, the frontier is defined as the firms in the top 95th percentile of the productivity distribution across all firms in the sector in Mexico. The distance of a firm to the technology frontier is computed as the productivity gap between the firm and the productivity value of the technology frontier in the initial year. The growth rate of the technology frontier is the log difference between the productivity of the 95th percentile group in the initial year and that in the end year. In the analysis, a firm's productivity in the end year is regressed on its distances to the three technology frontiers and the growth rates of the frontiers in the same industry.

26 For example, in France, the location productivity premium increases by 3 percent when city density doubles (Combes et al. 2010).

27 Skill-intensive services include information, professional, scientific, finance, insurance, real estate, and management services.

28 The results are robust to using travel cost instead of distance to the U.S. border.

29 It is also important that the second step of the analysis controls for the share of white-collar workers in each firm (box 2A.1).

30 These externalities derive from three main aspects that are related to clustering: first, concentration and availability of higher quality and variety of inputs; second, concentration and availability of skilled workers; and third, knowledge flows and spillovers.

PHOTO BY: VG FOTO/SHUTTERSTOCK

Economywide Productivity Drivers and Job Dynamics[iii]

CHAPTER 3

Introduction

A growing strand of the economics literature explains cross-country differences in aggregate productivity due to resource misallocation across firms (Hsieh and Klenow 2009; Restuccia and Rogerson 2008, 2013; Bartelsman, Haltiwanger, and Scarpetta 2013, among others). This work finds that market distortions that inhibit the efficient allocation of resources seem to be more prevalent in developing economies, accounting for large losses in aggregate productivity relative to their more developed counterparts. In addition to generating static allocative inefficiencies, these market distortions constrain firm dynamics, resulting in lower firm growth and anemic job creation (Restuccia and Rogerson 2017; Hsieh and Klenow 2014; Bartelsman, Haltiwanger, and Scarpetta 2013; Gopinath et al. 2017, among others).

This chapter examines in depth factors that have contributed to Mexico's sluggish growth, by analyzing static and dynamic patterns in firm productivity and employment growth. Studies such as Hanson (2010) and Levy (2018) try to understand why Mexico has continued to lag developed countries, despite that it has liberalized trade, reduced public sector participation in production, increased human capital, and disciplined fiscal policy. The main culprits behind Mexico's poor performance seem to be regulatory frictions, firm-level constraints, and imperfect contract enforcement, which inhibit markets from efficiently allocating the factors of production across firms. These distortions appear to have negative static and dynamic implications for firms, which have resulted in poor aggregate economic performance in Mexico since the 1990s.

Using data from six consecutive Economic Censuses, the chapter first documents that the distribution of Mexican firms is characterized by few large firms.[31] Earlier literature on the distribution of firm size in developing countries focused on theories that suggest that there is a large missing middle, where markets are characterized by a large number of small firms that coexist with large firms. Institutional factors that hinder the expansion of small firms (De Soto 1989; Udry and Anagol 2006; de Mel, McKenzie, and Woodruff 2008; Kremer et al. 2013) as well as regulatory costs that incentivize firms to remain small (Harris and Torrado 1970; Rauch 1991; Banerjee and Duflo 2005, 2011; Levy 2008; Krueger 2013) are among the hypotheses that explain the "missing middle." However, recent empirical evidence for Mexico and other developing countries seems to contradict the "missing middle" hypothesis. For example, Hsieh and Olken (2014) explain that for Mexico, not only medium-size firms are missing, but also large firms. This chapter complements these findings by expanding the window of analysis to the past 25 years (1993–2018), documenting that self-employed and micro production units account for close to 95 percent of all firms in Mexico. More than a "missing middle," a "missing top" or a "missing large" is observed at the right end of the size distribution. This trend has been persistent since the early 1990s. Furthermore, not only the number of firms, but also employment is concentrated in small production units, especially compared with the distribution of firms and employment in the United States.

Along with these distributional characteristics, other patterns in the concentration of firms could be a result of relevant market distortions. This chapter documents that investment is much more concentrated across firms

iii The chapter was led by Leonardo Iacovone and Fausto Patiño Peña, with excellent research support from Luis Alejandro Aguilar Luna and Luis Sánchez Bayardo.

relative to employment. This suggests that there are large financial constraints and regulatory frictions that deter many firms from accessing credit to finance their capital requirements. Furthermore, the chapter shows that firms in services exhibit higher levels of concentration compared with manufacturing firms, as regulatory distortions appear to play a more prominent role in service industries. This finding for Mexico supports previous work carried out for Portugal by Dias et al. (2020) and for Mexico by Busso, Fazio, and Levy (2012), documenting higher misallocation in services relative to manufacturing. The findings suggest that in Mexico, credit constraints and product market regulations are important for explaining concentration and misallocation in the service markets.

The productivity distributions of firms in Mexico are characterized by patterns that are inconsistent with efficiently functioning markets. To study these distributional patterns, revenue-based total factor productivity (TFPR) is estimated using the methodology of Ackerberg, Caves, and Frazer (2015), which controls for endogeneity in the productivity estimates. The analysis of the distribution of TFPR shows that larger firms are associated with higher productivity, supporting previous findings for Mexico (Levy 2018; Saborowski and Misch 2019; Busso, Fazio, and Levy 2012).

Comparing the productivity distribution of surviving firms with that of exiting firms, there is little difference between them. Although surviving firms would be expected to have higher levels of productivity than exiting firms, the analysis conclusively finds that this is not the case. This suggests that the exit of firms in Mexico is "aggregate productivity reducing" instead of "aggregate productivity enhancing" through two channels. First, higher productivity firms are exiting the market while lower productivity firms are remaining. Second, as documented by Levy (2018), higher productivity firms are more capital and labor intensive, so their exit implies a larger misallocation of factors.

Distributional differences are also inexistent when incumbent firms are compared with entrants. In markets without distortions, the productivity of incumbents would be expected to be higher than that of entrants, given their experience in the market, as highlighted by Bartelsman and Doms (2000) and Foster, Haltiwanger, and Krizan (2001). The analysis finds evidence against this. And since most incumbents are low-productivity and there are no distributional differences between incumbents and entrants, it can be inferred that firm entry is mainly comprised of low-productivity establishments. Additionally, unproductive entrants absorb resources that could be better allocated toward more productive establishments, which implies that entry dynamics in Mexico are not "aggregate productivity enhancing."

The chapter finds evidence that there was persistent dispersion of revenue productivity between 1993 and 2018, suggesting that there is inefficient allocation of resources across firms in Mexico. The role of distortive market regulations is key in shaping these misallocation trends. More productive establishments face higher regulatory tax burdens as well as credit constraints that hinder the efficient allocation of factors toward these firms as well as inhibit their growth.

To complement the distributional analysis of firm-level productivity, changes in aggregate productivity are analyzed using a decomposition exercise developed by Melitz and Polanec (2015). This exercise allows decomposing growth in aggregate productivity between two censuses into four components: changes in the productivity of incumbent firms (within component), changes in the allocation of resources across incumbent firms (between component), the contribution of new entrants to productivity (entry component), and the contribution of exiting firms to productivity (exit component).

The findings show that the within and between components matter the most for driving aggregate productivity growth in Mexico. Further, these components are highly volatile. Comparing the results with those for the United States, there is a striking difference for the between component, which captures changes in allocative efficiency. In the United States, the between component is relatively constant and positive across the business cycle, which implies that during recessions, efficient markets can ameliorate the effects on aggregate productivity generated by negative shocks, through a reallocation of resources from less productive to more productive incumbent firms. This is not the case for Mexico, as the between component has contributed negatively to aggregate productivity growth during booms and busts. This is highly detrimental during recessions, as inefficient markets inhibit the efficient allocation of resources across incumbent firms, exacerbating the negative effects of crises. Moreover, the analysis finds that if the between component in Mexico had behaved like the between component in the United States during the 2008 global financial crisis, then aggregate productivity in Mexico would have decreased by 7.3 percent instead

of falling by 16.4 percent. Mexican productivity would have grown at a higher rate for all the five periods analyzed, if the between component had behaved like that in the United States.

Another dynamic decomposition exercise is carried out, which extends the Olley and Pakes (1996) specification to measure the changes in national aggregate productivity that arise from the spatial reallocation of resources. The findings show that spatial reallocation in Mexico has contributed very little to aggregate productivity growth. To study this, changes in national aggregate productivity are decomposed into changes in technical efficiency (within-firm component), changes in the allocative efficiency between firms within a municipality (between-firm component), changes in the allocative efficiency between municipalities within a state (between-municipality component), and changes in the allocative efficiency between states (between-state component). Hence, this exercise studies geographical structural transformation. The findings show that the main driver of changes in aggregate productivity is the technical efficiency component or within-firm component. The findings also show that the between-firm and between-municipality components are more important than the between-state component for changes in allocative efficiency. However, the contributions of these three components are small. This suggests that persistent market distortions that hinder resource reallocation across locations have inhibited factors from moving from less productive firms, municipalities, and states toward locations that are more productive over the past 25 years.

The chapter also studies firm dynamics in Mexico, documenting that most of the growth in productivity, value added, employment, and other firm variables occurs in the first few years of operation, and it stagnates over later stages of the life cycle. Dunne, Roberts, and Samuelson (1989); Davis, Haltiwanger, and Schuh (1996); and Cabral and Matta (2003) document that in advanced economies, new entering firms are small at first but expand considerably with age. This is not the case in Mexico, as this chapter shows that growth mostly occurs in the early years of operation, complementing other recent literature on firm dynamics in Mexico (Hsieh and Klenow 2014; Sabarowski and Misch 2019). These trends are consistent with the patterns of misallocation generated by regulatory distortions in Mexican factor markets. As highlighted by papers like Atkeson and Kehoe (2005); Foster, Haltiwanger, and Syverson (2013); Hsieh and Klenow (2014); and Akcigit, Alp, and Peters (2021), firm growth can be driven by firm-specific investments that improve the productivity of firms across time, such as expanding operations into foreign markets, improving managerial efficiency, or increasing operational capabilities. However, distortions in Mexico, such as imperfect contractual enforcement, may reduce the incentives for firms to innovate and improve their productivity over time. This results in lower firm growth across the life cycle. Indeed, if the life cycle growth of employment and productivity in Mexico were like that in the United States, then the value added over the average firm's life cycle would be five times higher at age 20.

The chapter also investigates how firm dynamics contribute to the creation and destruction of jobs, and the results show that the entrance and exit of young firms account for most of the job flows in Mexico. Studies such as Haltiwanger, Jarmin, and Miranda (2013); Decker et al. (2014); and Haltiwanger et al. (2016) document the importance of young firms in accounting for most of the job flows and employment reallocation in the United States. Their work complements that of Dunne, Roberts, and Samuelson (1989); Davis and Haltiwanger (1990, 1992); Foster, Haltiwanger, and Krizan (2001); and Becker et al. (2006), who find that employment reallocation is accompanied by output growth and capital reallocation. This chapter's findings for Mexico mostly resemble those of Haltiwanger et al. (2016). That is, the chapter first shows that jobs created by entrant firms and destroyed by exiting firms (the extensive margin) are more important for job flows relative to jobs created/destroyed by existing firms (the intensive margin). Second, in Mexico, younger firms contribute the most to job creation (through entrants) and job destruction (younger firms exit at a higher rate).

The trends in job flows in Mexico highlight the notion that there are large distortive barriers that have increased misallocation. In particular, the analysis finds that between 1993 and 2018, the contribution of operational firms to job destruction increased relative to that of exiting firms, implying that increasing market inefficiencies are contributing to the slow growth of firm employment across the life cycle. Moreover, the analysis finds that this is more prevalent for service firms, which again suggests that misallocation is greater for service industries relative to manufacturing industries. The results also show that firm age is more important than firm size for job creation. That is, younger firms grow faster than older firms, even when the analysis controls

for size differences. By contrast, although smaller firms grow faster than larger firms, once the analysis controls for age, there is no difference in employment growth across firm size groups. This suggests that employment growth can be increased by promoting the expansion of younger, more innovative firms.

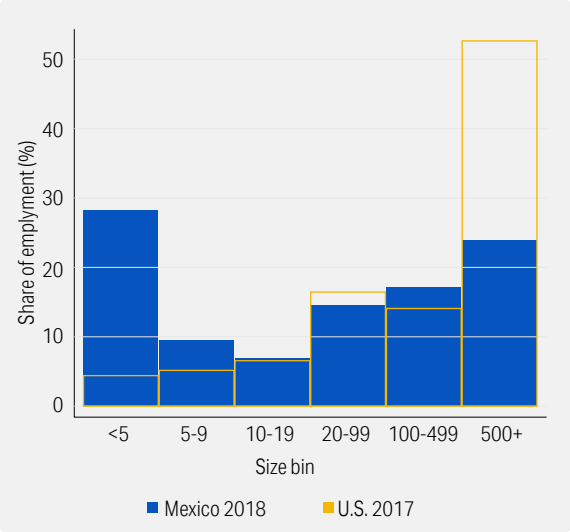
Firm Size Distribution

Contrary to previous literature, which characterized the distribution of firm size in developing countries as bimodal, with very few medium-size firms, the analysis finds that in Mexico there are relatively few large firms and their contribution to economic aggregates, such as employment, is small relative to developed countries (figure 3.1). Firms with five or fewer workers contribute nearly 30 percent of employment in Mexico, but they contribute only 5 percent of employment in the United States. By contrast, large firms, with more than 500 employees, account for over 50 percent of employment in the United States and only 25 percent in Mexico. The contribution of medium-size firms (10 to 99 workers) to total employment is close to 20 percent in both countries.

Hsieh and Klenow (2014); Hsieh and Olken (2014); Saborowski and Misch (2019); and Akcigit, Alp, and Peters (2021) argue that the absence of large firms in Mexico and other developing countries may be a result of high regulatory costs, constraints in access to capital, and imperfect contract enforcement, which do not allow medium-size firms to expand or larger ones to continue growing.[32] Hsieh and Olken (2014) present suggestive evidence supporting this hypothesis by showing that larger firms have higher average products of capital relative to smaller firms, which implies that larger firms face higher marginal costs than smaller firms, resulting in slower growth for larger firms. They also find that the constraints faced by medium-size and large firms vary considerably across establishments, which implies that barriers are not a result of one specific regulatory obstacle (such as higher corporate tax rates for larger firms). Hence, policies should be targeted at relaxing these differential constraints for larger firms, instead of targeting growth policies at small firms, which can generate counterproductive incentives for establishments to remain small.

These findings are in line with those of Saborowski and Misch (2019), who document that an important determinant of growth for Mexican firms is access to finance. Chapter 6 of this report shows that larger firms have greater access to finance compared with small firms. However, credit constraints still play a crucial role for larger establishments. These constraints inhibit the continued growth and expansion of firms, keeping medium-size establishments from becoming large. For example, Saborowski and Misch find that if they are not constrained in access to capital, formal firms with multiple establishments grow at similar magnitudes compared with firms in the United States.

Figure 3.1 Distribution of Employment, by Firm Size: Mexico versus the United States



Source: World Bank.

Levy (2018) documents that formal firms in Mexico are on average six times as large as informal firms. Therefore, targeting policies at larger firms can help formal establishments expand, so that resources can shift from less productive informal production units toward more productive formal businesses. Akcigit, Alp, and Peters (2021) suggest that a key factor for firm growth is managerial inefficiencies that arise from imperfect contract enforcement. They argue that in developing countries, the incentives for firms to expand depend on the managerial delegation environment. Due to imperfect contract enforcement, firms in emerging economies prefer to hire family members rather than outside managers to carry out managerial tasks. This, in turn, stunts the growth of firms, as outside managers have higher managerial skills. Akcigit, Alp, and Peters find that these managerial inefficiencies resulting from weak rule of law account for the large concentration of small firms in India, as well as a significant fraction of the income per capita difference between India and the United States.

This report's section on management practices as drivers of firm performance and the misallocation problem in Mexico, in chapter 6, explains that the lack of contract enforcement is one of three main drivers of misallocation in Mexico, along with crime and corruption.

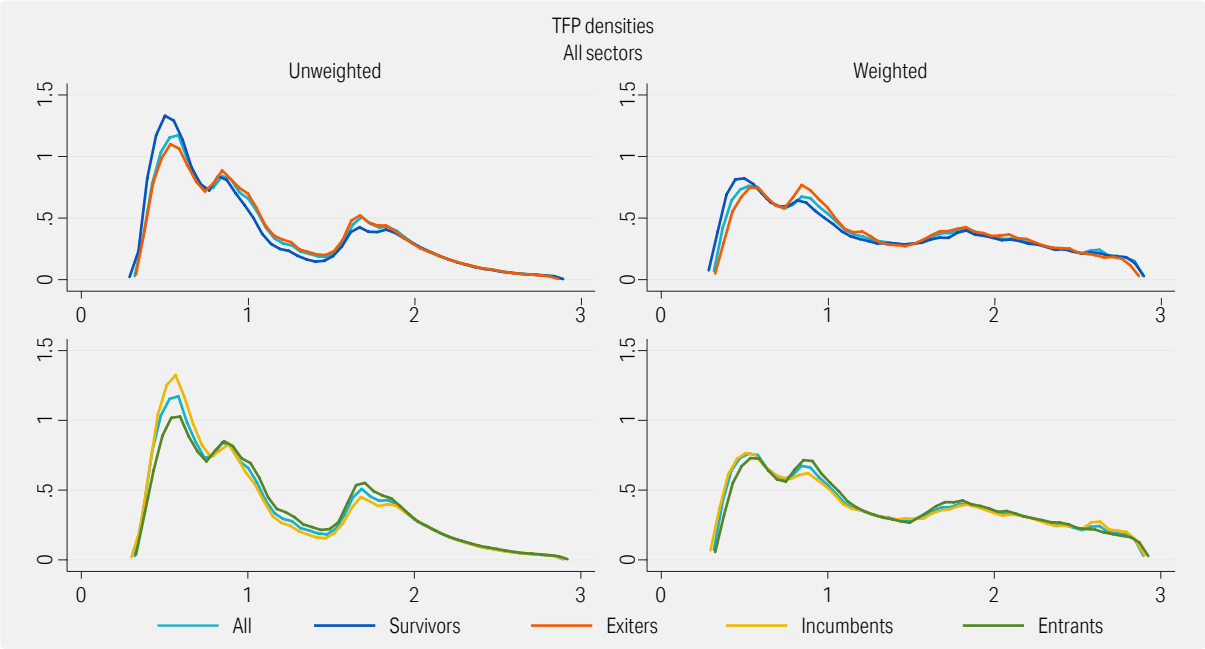
The distribution of firm size in Mexico is unimodal and concentrated mainly in micro firms (between two and 10 employees) and self-employed production units (figure 3A.1, panel a).[33],[34] Between 1993 and 2018, the distribution of firms remained relatively unchanged, as close to 96 percent of establishments employed 10 or fewer workers. Furthermore, enterprises comprised of one worker, that is, the self-employed, accounted for between 34 and 47 percent of total firms. This concentration of small production units reflects the large informal sector in the Mexican economy, which accounts for a large portion of economic activity. Firms with more than 50 employees (medium-size and large firms) accounted for less than 1 percent of the total number of establishments throughout the period analyzed. Furthermore, large enterprises only contributed 0.21 percent of the total number of establishments in 2018.

Between 1993 and 2018, the share of large enterprises increased in terms of employment, value added, and investment (figure 3A.1, panels b to d). The increase in the employment share of large firms (9 percentage points higher) was accompanied by a reduction in the employment shares of the other firm size groups of about 2 percentage points each. However, large firms still account for a smaller share of employment compared with establishments with 10 or fewer workers (micro firms plus self-employment). This suggests that although allocative efficiencies may have improved, as large firms are generally more productive than small firms, there are still persistent distortions in the Mexican economy that inhibit large firms from hiring even more workers (figure 3.1). The contributions of large firms to value added and investment have also increased over time and are much larger than their contribution to employment (figure 3A.1).

The shift in employment, value added, and investment toward larger firms over time could be the result of higher market concentration among the most productive firms, which would yield efficiency gains, or market distortions, which would result in efficiency losses. Using the Herfindahl-Hirschman Index (HHI) of concentration, and assuming that larger firms are more productive, a higher concentration among larger firms may have resulted in efficiency gains (figure 3A.1).[35],[36] Yet, some concentration could also be attributed to frictions, especially in the service sector, as employment is much less concentrated than investment, which may imply that firms are more constrained in accessing capital relative to hiring labor (figure 3A.2). The concentration of investment is much higher in services than manufacturing, which is mainly explained by the high level of investment in tradable services (figure 3A.3). Furthermore, after controlling for observables such as sector, location, size, and age, establishments with lower productivity are associated with higher access to credit, highlighting that credit constraints not only result in higher concentration, but also inefficient resource allocation.

Two hypotheses may explain the higher concentration of investment in service industries. On the one hand, chapter 6 in this report finds that collateral is a key determinant of access to finance, since firms with higher collateral, measured as the ratio of assets to sales, are associated with higher access to credit. Collateral would be a form of insurance for lenders due to lack of enforceability of loan contracts and imperfect information on the profitability of the business from the lenders' perspective. Service firms typically use less real estate and other forms of fixed assets for production compared with manufacturing, which explains why access to credit may be more constrained in the service sector. On the other hand, the service sector in Mexico is characterized by high product regulations, which result in lower competition, especially for services like energy and transport. According to the Organisation for Economic Co-operation and Development (OECD), the environment for firms in these services is less competition friendly compared with the United States and the OECD average, based on the OECD's Product Market Regulation index (see OECD 2018 PMR database). This pattern is most striking for the natural gas and rail transport industries (Vitale et al. 2020). Thus, although some market concentration could be attributed to more efficient firms capturing larger resources, regulatory aspects that inhibit competition and constrain access to credit are also likely to play an important role in explaining the concentration patterns within service industries in the context of Mexico. Furthermore, the 2020 OECD Services Trade Restrictiveness Index (STRI) of Mexico is slightly above the average of the other countries in the STRI sample. This is due to restrictions that apply on key strategic services sectors such as logistics customs brokerage, broadcasting and road freight transport services.

Figure 3.2 Distributions of Revenue Productivity, by Type of Firm



Source: World Bank.
Note: Weighted kernel distributions are weighted by firms' total workers to control for firm size. TFP = total factor productivity.

Productivity Distribution and Market Selection

This section analyzes the distribution of firm productivity in Mexico, controlling for firm activity status, such as exiting versus surviving firms and entrant versus incumbent firms, as well as sectors.[37],[38]For the whole sample as well as by firm activity status, the kernel distributions of revenue productivity are skewed to the right (figure 3.2). The unweighted distributions are somewhat bimodal (figure 3.2), while for the weighted distributions (figure 3.2), the right hump dissipates. These results imply that there are systematic differences in productivity between firms of different sizes, as medium-size and large firms, in terms of revenue, are more productive than their smaller counterparts.

The productivity differences driven by firm size are mainly a characteristic of establishments that operate in trade and services, as the unweighted distributions of firms in services present a large right hump, while the unweighted distributions of manufacturing firms do not (figure 3A.4). The previous section showed that the service sector is more concentrated than the manufacturing sector. If the concentration patterns arise because of inefficient regulations, they can affect the productivity of many service firms. That is, the double-humped, unweighted densities may be a sign of regulatory distortions that hinder increases in technical efficiency for a large portion of service firms. Hsieh and Klenow (2014) conjecture that productivity in Mexico is lower than that in the United States because market distortions remove incentives to make productivity-enhancing investments. Hence, the bimodal productivity distribution in services potentially highlights inefficient market regulations that result in high concentration among smaller firms.

In the absence of market frictions, it would be expected that systematically surviving firms should be more productive than their exiting counterparts. However, the distributions of surviving and exiting firms in Mexico are almost identical. Hence, market distortions are impeding low-productivity firms from exiting while driving high-productivity firms out of the market. Furthermore, it would be expected that without market frictions, incumbent firms would have higher productivity than firm entrants, due to incumbent firms' previous experience in the market, as documented by Bartelsman and Doms (2000) and Foster, Haltiwanger, and Krizan (2001). However, the analysis finds that the distribution of entrants is quite similar to the distribution of incumbents.

Even after controlling for location and activity, surviving firms are less productive than exiting firms and entrants are more productive than incumbents (figure 3A.5). On average, surviving firms are 2.5 percent less productive than exiting firms, and entrants are 1.0 percent more productive than incumbents. These findings imply that firm productivity distributions in Mexico are not consistent with well-functioning markets.

Market distortions that make surviving firms less productive than exiting firms affect aggregate productivity through two channels. First, they keep low-productivity firms participating in the market, while high-productivity firms are forced to exit the market, thus reducing aggregate productivity. These results are supported by the findings of Levy (2018). Second, there are allocative inefficiencies associated with the patterns of exit. Levy (2018) reports that high-productivity formal firms have a higher propensity to exit than high-productivity informal establishments. In contrast, low-productivity formal firms have a lower propensity to exit than low-productivity informal firms. In terms of resources, these two trends are costly, since formal production units tend to be more labor and capital intensive relative to informal firms. Hence, there seems to be "aggregate productivity reducing" exit of firms instead of "aggregate productivity enhancing" exit in Mexico. As highlighted by Hsieh and Klenow (2014) and Akcigit, Alp, and Peters (2021), the market distortions that can lead to this inefficient exit of firms include contractual frictions in hiring nonfamily managers and labor, higher tax enforcement for large formal firms, and access to credit, among others. This is tied to the finding in the previous section that highlights the distortive role that regulations may play in Mexican markets.

Although entrant firms are more productive relative to their incumbent counterparts (figure 3A.5), firm entry is not necessarily "aggregate productivity enhancing" in Mexico. First, the productivity distributions of entrants are very similar to those of incumbents, which implies that entrants do not differ in productivity relative to those already operating in the market. Second, incumbent firms already have lower incentives to adopt productivity-enhancing innovations, as high-productivity firms have a higher propensity to exit compared with low-productivity firms. Last, Levy (2018) finds that low-productivity informal entrants capture large amounts of resources. Hence, aggregate productivity does not necessarily increase through the entry of firms.

There is persistent misallocation of resources in Mexico, as the gaps in TFPR between the top 1st, 5th, 10th, and 25th percentiles and the bottom 1st, 5th, 10th, and 25th percentiles remained relatively constant between 1993 and 2018, increasing during the financial crisis, but then returning to pre-crisis levels (figure 3A.6).[39] Among the reasons associated with the persistent dispersion in TFPR are the exit of higher productivity firms and non-exit of low-productivity establishments, which reduce aggregate TFPR through lower levels of firm-level productivity as well as an inefficient allocation of resources across surviving firms. This is coupled with resource allocation inefficiencies generated by the entry of low-productivity establishments that disproportionally capture resources. Last, larger establishments, which are typically formal, face disproportionate regulatory barriers, like higher tax burdens, managerial inefficiencies, or collateral constraints, which inhibit their growth. This implies that these firms are most likely using suboptimal levels of labor and capital.

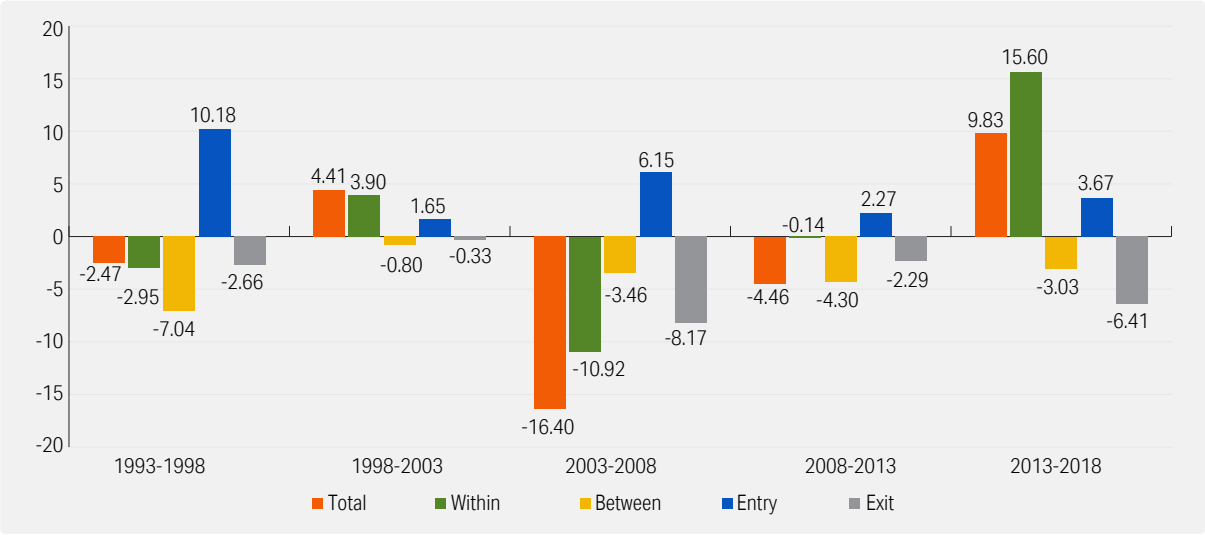
Productivity Decomposition

This section carries out two productivity growth decomposition exercises. The first exercise analyzes Mexican productivity growth using the dynamic productivity decomposition proposed by Melitz and Polanec (2015). This exercise allows determining the degree to which the intensive (surviving firms) and extensive (entrant and exiting firms) margins contribute to productivity changes, providing novel insights for policy implications. Box 3A.1 explains the Melitz-Polanec decomposition in further detail using the Mexican Economic Censuses.

The second exercise consists of a spatial productivity growth decomposition. This decomposition provides insight into how changes in national aggregate productivity are driven by changes in technical efficiency (within-firm component), changes in allocative efficiency between firms within a municipality (between-firm component), changes in allocative efficiency between municipalities within a state (between-municipality component), and changes in allocative efficiency between states (between-state component). The decomposition studies geographical structural transformation through the reallocation of resources between and within locations.

Both exercises extend the Olley and Pakes (1996) productivity decomposition, which analyzes how the allocation of resources across firms affects aggregate

Figure 3.3 Dynamic Decomposition of Total Factor Productivity



Source: World Bank.

Note: The figure shows the weighted average of the dynamic decompositions of total factor productivity at the industry level, using the North American Industry Classification System 6-digit level of disaggregation. The industry weights correspond to the industry's value-added share in total value added for each period.

productivity. Online annex 3A provides details on the Olley-Pakes decomposition.

Dynamic Productivity Decomposition

Box 3A.1, describes the dynamic productivity decomposition approach developed by Melitz and Polanec (2015), which decomposes aggregate total factor productivity (TFP) changes into two intensive margin components (the within-firm component and the between-firm component for incumbent firms) and two extensive margin components (the entry component and the exit component). In Mexico, the two components of the intensive margin were the main drivers of changes in aggregate productivity between 1993 and 2018 (figure 3.3).[40] Even more striking, during the great recession (2003–08) and its subsequent recovery (2008–13), both intensive margin components contributed largely to the reduction in aggregate productivity. The between-firm component also fell between 1993 and 2003 and between 2013 and 2018, suggesting that over the 25-year period analyzed, resources were consistently reallocated from more productive establishments to less productive establishments. This result supports the previous finding that frictions present in Mexican markets have induced persistent misallocation. The importance of the intensive margin in explaining changes in productivity is robust to different measures of productivity (figure 3A.7) and also when studying productivity changes at the sectoral level (figure 3A.8).

Changes in aggregate productivity in Mexico are more volatile than those in the United States, which shows Mexico's vulnerability to external shocks, such as the financial crisis.[41] Similar to the United States, in Mexico, the within-firm component is highly volatile and procyclical. For example, the within-firm component fell in 1998 and 2008, coinciding with the Mexican peso crisis and the global financial crisis. Unlike in the United States, the between-firm component in Mexico is more volatile and throughout the period it contributed in a negative manner to productivity growth. In Mexico, the constant reallocation of resources across firms is productivity reducing, regardless of booms or busts. For example, in the period that coincided with the financial crisis, the between-firm component in Mexico fell, while in the United States it grew. Hence, during the crisis, efficient markets in the United States reallocated resources from less productive firms to more productive firms, that is, a cleansing effect. By contrast, in Mexico, market distortions resulted in lower productivity firms accounting for larger shares of factor inputs. This could be explained by more rigid labor regulations or credit constraints that disproportionally affected firms that depended more on external finance and had limited access to credit, as highlighted in chapter 6 of this report. Furthermore, during the recovery from the crisis (2008–13), the between-firm

component was the main driver of the aggregate reduction in productivity in Mexico. This indicates that market distortions in Mexico inhibited aggregate productivity from recovering as in the United States in the post-crisis period.

In line with the results above, the exit component contributed negatively to changes in productivity during the five periods analyzed, and the magnitude of its contribution was volatile. This highlights the presence of market distortions, which not only negatively affect productivity, through the inefficient reallocation of factors (between-firm component), but also by inadequate exit trends (exit component).

The entry component has contributed positively to changes in productivity over time, but its contribution decreased over the 25 years. Between 1993 and 1998, there was a large increase in the entry component that was offset by large productivity losses from the intensive margin components, resulting in overall falling productivity. During the financial recession, the entry component was the only component that contributed to productivity growth. In the two periods after the crisis, the entry component still made a positive contribution to changes in aggregate productivity, but the magnitude was much smaller. In line with previous findings, entrants are, on average, marginally more productive than surviving firms (figure 3A.5). Hence, the entry of more productive firms may increase aggregate productivity. However, many incumbent firms have low productivity, so the entry of marginally more productive firms does not necessarily imply that high-productivity firms are entering. Instead, it can be inferred that market frictions inhibit incumbents from improving their technical efficiency while they operate in the market, as suggested by Saborowski and Misch (2019) and Hsieh and Klenow (2014). Moreover, the entry of unproductive firms and persistent market frictions may have worsened over the 25 years, explaining the reduction in the magnitude of the entry component.

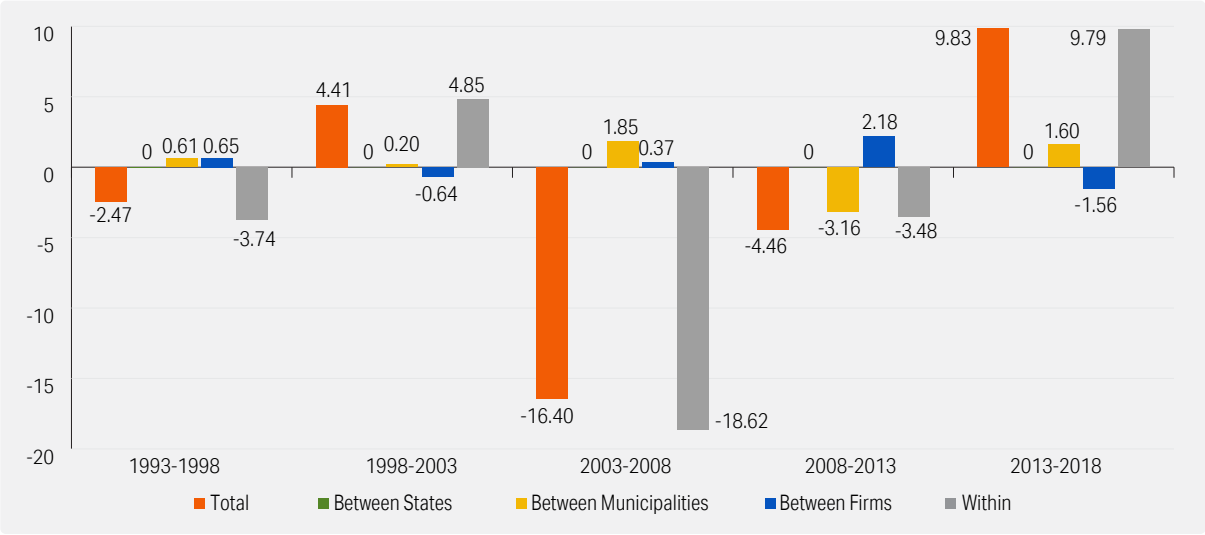
If the between-firm component behaved like the between-firm component of the United States, Mexican productivity would have grown between 1993 and 2018.[42] The stability of the between-firm component in the United States indicates that factor markets perform relatively efficiently in allocating resources across firms. Between 1993 and 2018, Mexican aggregate productivity fell by 9.1 percent. However, if the between-firm component had changed like that in the United States, the productivity of Mexican firms would have been 34.5 percent higher in 2018 relative to 1993 (figure 3A.9). The reduction in aggregate productivity over this 25-year period was driven by a large productivity loss during the global financial crisis (16.4 percent reduction between 2003 and 2008). If reallocation in Mexico had been as efficient as in the United States during this crisis, aggregate productivity would have decreased by half the magnitude (-7.3 percent). This shows that during this recession, well-functioning factor markets could have mitigated the negative external shock by shifting resources from lower productivity firms to higher productivity firms, offsetting, to an extent, the fall in technical efficiency (within-firm component) during this period.

Spatial Productivity Growth Decomposition

A spatial decomposition of productivity expands the Olley-Pakes approach to quantify the role that firm location plays in allocative efficiency. In particular, this exercise decomposes aggregate productivity changes in terms of changes in technical efficiency as well as changes in allocative efficiency between states, within states, and within municipalities. The spatial productivity decomposition is analogous to analyzing the reallocation of resources within and between broader sectors, which indicates structural transformation. Analyzing the reallocation of resources between and within locations studies geographical structural transformation. Box 3A.2 provides further details on this spatial decomposition.

For the spatial decomposition, the main component that has driven changes in national aggregate productivity during all five periods is the within-firm component, which measures the technical efficiency of firms (figures 3.3 and 3.4). Reallocation of resources across locations had minor effects on changes in productivity in Mexico, suggesting the presence of market distortions that inhibited a productivity-enhancing geographical shift in resources. The contributions of the geographical allocative efficiency components were also volatile, reflecting persistent market frictions. In every five-year period, the contribution of the between-firm component was in the opposite direction compared with the overall change in productivity. For example, during the recovery from the recession, Mexico experienced a reduction in productivity, while the between-firm component grew, reflecting a better reallocation of resources

Figure 3.4 Spatial Productivity Growth Decomposition



Source: World Bank.

across firms within municipalities. This was reversed during the following period. The between-municipality component made limited contributions to changes in aggregate productivity. Last, the between-state component had negligible effects on the changes in national aggregate productivity, suggesting that structural differences between Mexican states persisted over the 25 years. Therefore, reallocation of resources across states did not increase productivity between 1993 and 2018, suggesting that "catchup" policies have not been able to close the gap between the northern and southern states (figure 3.4). Controlling for sector, there are few differences in the decomposition results (figure 3A.10).

A well-documented fact for Mexico is that the northern states experienced different growth patterns than those of the southern states following the economic crises in the 1980s and 1990s as well as the trade liberalization that started in the early 1990s (OECD 2012; Rodriguez-Oreggia 2005). According to Rodriguez-Oreggia (2005), a possible explanation for the growth of the northern states after the trade liberalization is that there was a better allocation of human capital in production. Previous to the liberalization of trade, high human capital was absorbed by the public sector, where its productivity was lower relative to the private sector, as explained by Griliches (1997). After trade liberalization with the United States, firms in the industrialized northern states absorbed the higher productivity human capital, which boosted firm productivity and resulted in the divergence between regions. As a report from the OECD (2012) finds, most policies to close the gap between the northern and southern states have been compensatory instead of productivity enhancing. Instead of upgrading infrastructure, building human capital, and improving the business environment for entrepreneurship and innovation, policies have focused on transfers from the federal government to the states and municipalities, with limited impact in improving market performance in the southern states. This has been accompanied by decentralization of the federal government, which granted more power to the states and municipalities for policy making.

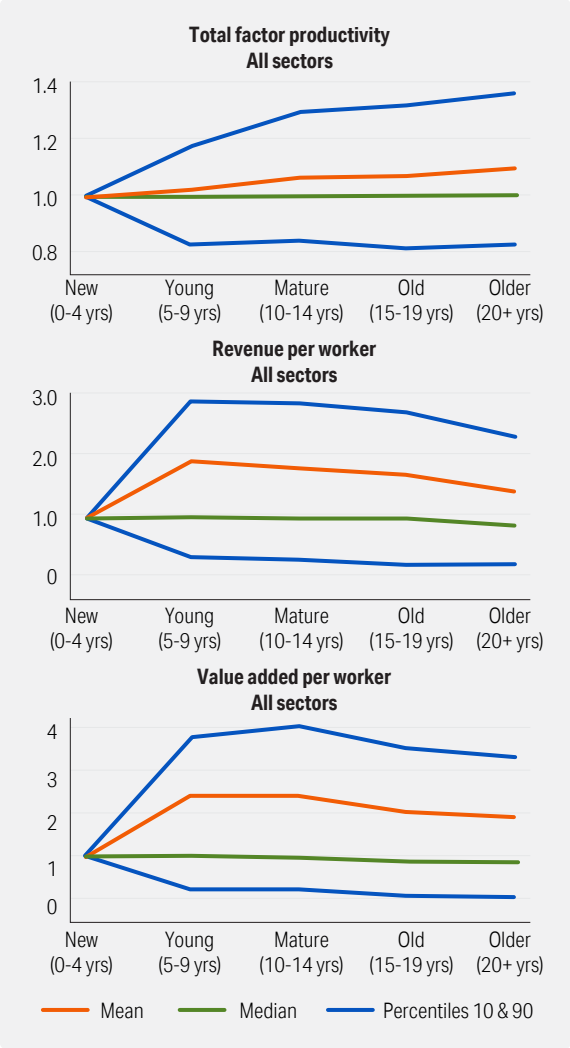
The findings that reallocation of resources within states and municipalities has had little effect in creating productivity growth in Mexico (figure 3.4) complement those documented by Misch and Saborowski (2018), in that market distortions within Mexican states and municipalities inhibit the productivity-enhancing reallocation of factors across locations. They document that misallocation within states is highly correlated with state income per capita. Furthermore, they find that eliminating resource misallocation within states would lead to large gains in aggregate productivity. Aggregate productivity would have been 2.5 times larger if resources were allocated efficiently. Hence, eliminating market distortions within states and municipalities could bring about a geographical structural transformation in which reallocation across locations contributes positively to productivity growth. Misch and Saborowski (2018) explain that policies that improve physical and transportation infrastructure in less developed states in Mexico can potentially increase the

mobility of labor and capital and the efficiency of the allocation of resources. However, the findings in chapter 2 of this report suggest that infrastructure alone may not be enough. This chapter finds that infrastructure has a larger productivity impact in the northern and central states, relative to the least developed southern states. This suggests that there are high complementarities between factors, such as institutions, contract enforcement, and access to skills and finance, among others, which can boost the effects of infrastructure for productivity gains.

Life Cycle of Mexican Plants

This section studies the life cycle trends in the productivity of Mexican firms using three measures of productivity: TFPR, revenue per worker, and value added per worker (figure 3.5). The findings show that the average firm's productivity growth slows after 10 years of operation. Focusing on TFPR, the average firm, defined as having average TFPR growth across its life cycle, has little TFPR growth during its first 20 years, with most of its growth occurring as it transitions from young (five to nine years) to mature (10 to 14 years). The median firm's TFPR presents no growth over its life cycle, while the 90th percentile firm's TFPR grows 40 percent throughout its life cycle, having its strongest growth in the first 14 years of operation. By contrast, the 10th percentile firm's TFPR decreases by 20 percent over 20 years of operation, and the decrease is largest in the first nine years of production. Using alternative measures of productivity, the growth of the average firm is higher than that of the median firm (figure 3.5).

Figure 3.5 Life Cycle Trends of Productivity Measures



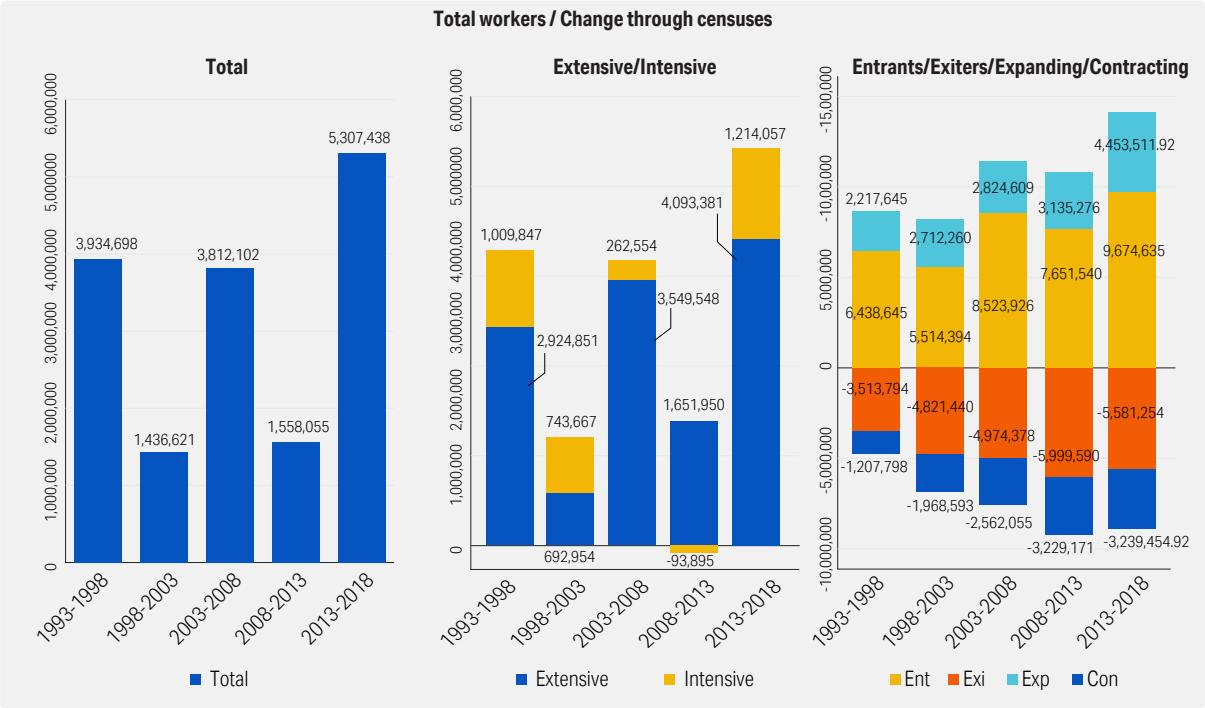
Source: World Bank.

These results confirm other findings in the literature on productivity in Mexico. Hsieh and Klenow (2014) document that the productivity growth of the average Mexican firm occurs early in the life cycle and stagnates after the 10th year of operation, unlike in the United States where the average firm experiences continued productivity growth throughout its life cycle. Saborowski and Misch (2019) find heterogeneous life cycle dynamics in Mexican firms, with a small set of Mexican firms—characterized by being formal, having multiple establishments, and having access to credit—growing like their U.S. counterparts. The life cycle productivity patterns of firms in Mexico are affected by market distortions that generate overall dynamic misallocation. Hsieh and Klenow (2014) find that market distortions in Mexico harm the growth of establishments by providing fewer incentives to invest in process efficiency, quality, and expansion of their products to foreign markets.

Misch and Saborowski (2019) also find that manufacturing firms that have multiple establishments tend to grow at higher rates than their counterparts in the service sector. This finding complements the previous discussion on inefficient regulations or market frictions (that is, collateral constraints) that affect the manufacturing and service sectors differently, resulting in higher market concentration in service industries as well as differences in the productivity distributions between these sectors.

The value added of the average Mexican firm grew almost three times across its 20-year lifespan, while its

Figure 3.6 Decomposition of Job Flows



Source: World Bank.

revenue more than doubled (figure 3A.11). In a similar exercise for the case of Colombia, Eslava and Haltiwanger (2018) find that the average Colombian firm grows at a faster rate than the average Mexican firm in value added and revenue.[43] Using a rich data set, they further evaluate the drivers of value-added growth as stemming from fundamentals, such as physical productivity or demand shocks, and from market distortions. Given the data constraints (that is, lack of data on firm prices), our analysis for Mexico confounds the effects of fundamentals and distortions into one, as physical productivity cannot be distinguished from revenue productivity. However, some inferences can be extrapolated based on the results and findings. Eslava and Haltiwanger (2018) find that almost 80 percent of the variance in life cycle output growth is explained by physical productivity. They also find that distortions contribute around 10 percent negatively to variation in life cycle output growth, which implies that market inefficiencies potentially hinder the growth of value added across firms.

The findings above suggest that Mexican firms grow at slower rates than their counterparts in other countries (such as the United States and Colombia). If Mexican firms' employment and TFP had grown at rates similar to U.S. growth, then by age 20 Mexican firms would have been five times larger.[44] The results show that the trend of value added for the *Mexican benchmark* firm stagnates early in the life cycle as a result of slow TFP growth and slow labor growth that deteriorates after age 15 in the average Mexican firm's life cycle. And if labor for the average Mexican firm had grown like in the United States, its value added would have been 115 percent higher by age 20. Furthermore, changes in technical efficiency are important drivers of firm growth, and if TFP for the average Mexican firm had grown like that in the United States, its value added would have been five times higher by age 20 (figure 3A.12). This finding complements the findings of Hsieh and Klenow (2014), who explain that the slow life cycle growth of firms in Mexico is partially driven by the inability of firms to invest in intangible capital that improves their technical efficiency.

Job Creation and Destruction

This section studies job flows in Mexico, analyzing changes in employment between two consecutive Economic Censuses to complement the results of the previous sections, which showed that there are potential regulatory distortions that generate allocative inefficiencies, which have hindered aggregate productivity growth as well as firm growth. Employment grew in

Mexico during each of the five-year windows considered (1993–2018) (figure 3.6). There was limited job creation between 2008 and 2013 (1.6 million jobs) due to slow employment recovery after the global financial crisis, but employment creation accelerated again between 2013 and 2018 (5.3 million jobs).

Overall, the extensive margin (jobs created by new firms minus jobs destroyed by exiting firms) created jobs across all the Economic Censuses and more jobs relative to the intensive margin (net job creation by surviving firms), except during 1998–2003.[45] In addition to playing a less significant role in net job creation, the intensive margin contributed negatively to job flows in the aftermath of the Great Recession (2008–13), highlighting that Mexico, similar to other countries, exhibited a slow recovery in terms of employment (figure 3.6, panel b).

Most job creation in Mexico was generated by new job vacancies posted by entrants (figure 3.6, panel c), representing around 71 percent of new jobs during the period analyzed. Incumbent firms in turn contributed much less to job creation in Mexico (around 29 percent of new jobs), in line with the life cycle dynamics of firm employment (figure 3A.11). As explained by Hsieh and Klenow (2014), slower life cycle growth of firms results in a larger flow of entrants into the market, since incumbents are not much more competitive than entrants. Hence, new firms account for a higher share of job creation and there is also a larger share of small enterprises (micro and self-employed) operating in the economy, as new firms are typically small (figure 3A.1, panel b). Similar to the findings for the whole sample, the extensive margin is more important for job flows in both manufacturing and trade and services (figure 3A.13).

The total number of jobs created between 2013 and 2018 was 1.6 times higher than the number of jobs created between 1993 and 1998. The total number of jobs destroyed during 2013–18 was 1.9 times as large as the number destroyed during 1993–98. Between 2013 and 2018, 8.8 million jobs were eliminated, of which exiting firms during the period accounted for 63 percent while the rest was explained by employment contraction by surviving firms. Compared with 1993, the contribution of exiting firms to job destruction fell by 11 percentage points, while the contribution of employment contraction increased by the same magnitude. This is explained by the slow life cycle firm growth and increasing resource misallocation in Mexico between 1993 and 2018. These distortions act as barriers to firm growth and operating firms are decreasing their use of labor, resulting in a higher contribution on the intensive margin to job destruction and slow growth of firm employment across the life cycle.

Younger firms matter more for job flows than older firms (figure 3A.14). First, most of the job creation is carried out by firms that have been in operation for fewer than four years, reinforcing the point that employment creation in Mexico is dominated by new entrants (figure 3.6). Second, firms that have been in operation between five and nine years not only create more employment relative to older cohorts, but also destroy more jobs compared with older firms, by exiting the market. In addition, job destruction generated by exiting firms far exceeds the net job creation of continuing firms (figure 3A.15). This is consistent with the findings of Haltiwanger et al. (2016) for the United States, where net job creation by incumbents is positive but smaller than the employment destruction by exiting firms across different age groups. Haltiwanger et al. (2016) also show that in the United States, firms in older age cohorts contribute less and less to job flows. However, in Mexico, firms in older cohorts contribute less to net job creation relative to their U.S. counterparts and more to job destruction compared with older U.S. firms. This aligns with the slower life cycle growth of employment in Mexican firms. Controlling for sectors, the same patterns are observed as in the whole sample. That is, entrants dominate the creation of jobs, younger firms contribute more to job flows, and net creation by continuers is much smaller than job destruction from exiting firms.

Indeed, conditional on surviving the first four years of operation, younger firms are more important for job flows compared with mature firms (figure 3A.15). In Mexico, younger firms have a higher exit rate than older firms, which results in high employment destruction arising from firm exit. Between 1993 and 2018, 55 percent of young Mexican enterprises exited the market before age five, a rate that is even higher than that of the United States, where the exit rate was slightly over 50 percent (Haltiwanger et al. 2016). In Mexico, among non-exiting firms, net employment creation is positive, offsetting by a small magnitude the job destruction that arises from exiting firms. Once firms survive more than four years of operation, they contribute more to job destruction than job creation, which is consistent with the dynamics of firms in the United States, as documented

by Haltiwanger et al. (2016). Employment changes very little for firms that that have been in operation for 10 years or more, and younger, non-exiting firms expand more than older ones in Mexico (figure 3A.11). Controlling for sectors does not change the results, as job destruction of exiting firms is much higher than the positive net job creation of continuing firms, and younger firms account for the majority of job flows.[46]

Figure 3A.16, panels a, b, and c, shows that job creation is driven by small entering firms with fewer than 10 employees. That is, entrant firms with fewer than 10 workers contributed 60 percent of the job creation rate of all entrants in Mexico. This finding is consistent with Haltiwanger et al. (2016), who find that the job creation rates for small entrant firms in the United States were the highest (21 percent for firms with fewer than 5 workers, 9 percent for firms with 5-9 workers, and 5 percent or less for firms with 10 or more workers). Controlling for sector, there are slight differences between firms in the manufacturing sector and those in trade and services (figure 3A.16, panels b and c). The pattern of job creation by entrants in the whole sample was driven by the pattern of firms in trade and services, where the contribution of entrant firms with fewer than 10 employees to the job creation rate of entrants was about 70 percent, compared with only a 10 percent contribution of larger entrants. For manufacturing, the contribution of entrant firms with fewer than 10 workers to the job creation rate of entrants was around 40 percent, while for large firms the contribution was 25 percent. These patterns reinforce two of the previous findings. First, smaller firms are more predominant in Mexico relative to the United States. These smaller firms tend to be informal and have lower productivity. Hence, job creation by small firms in Mexico is associated with "aggregate productivity-reducing" entry of firms, as more employment is allocated to small, unproductive establishments. In part, this explains the persistent aggregate productivity differences between the two countries. Second, regulatory distortions seem to be more prevalent in services relative to manufacturing in Mexico, incentivizing a larger entry of low-productivity firms into services as well as inhibiting firm growth within this sector. As a result, small firms contribute to more job creation in services than in manufacturing.

Micro entrant firms (fewer than 10 workers) account for a larger share of the total revenues of firms with fewer than 10 workers (figure 3A.16, panels d, e, and f). Larger firm size groups have lower shares of revenue creation and, like for job creation, this pattern is driven by firms in trade and services. Contrary to the whole sample, large manufacturing firms have higher rates of revenue creation, accounting for larger shares of revenue within their size class compared with smaller manufacturing enterprises. This again shows that frictions are more distortionary in services relative to manufacturing. Consistent with Levy (2018), larger firms tend to be formal and more productive. Hence, in manufacturing, revenue seems to be generated by the firms that are most productive. By contrast, in services, most of the revenue is generated by smaller production units, which are associated with lower productivity levels.

Younger firms have the highest employment growth rates, even when controlling for size (figure 3A.17). This pattern is for the whole sample as well as by sector. Age explains high employment growth rates more than size does. Without age controls, changes in employment are almost negligible across firm size (the blue lines in figure 3A.18, panels a, b, and c). When controlling for age within each size group, smaller firms exhibit negative net changes in employment, while the net change in employment for large firms is close to 0 percent. This suggests that differences in age are important drivers of changes in employment within firm size groups. In particular, among small firms, certain age groups with positive net changes offset the negative changes in the other age groups. Focusing only on surviving firms (figure 3A.18, panels d, e, and f), smaller firms exhibit larger net growth. However, accounting for differences in age, smaller firms have negative net growth. Hence, age groups within smaller firms are important in explaining the patterns of job creation and destruction. These patterns are consistent when firms in manufacturing and trade and services are evaluated separately. The trends highlight the importance of the correct policy focus, as policies that target small firms to create employment may not be the most effective, as small, older firms grow at slow rates. By contrast, targeting young, innovative firms can boost their growth potential, generating more job vacancies. Furthermore, chapter 6 in this report shows that there is more misallocation among younger firms. Targeting policies at younger establishments can potentially reduce this misallocation by allowing the more productive young firms to capture larger levels of employment.

Policy Recommendations

Focus on Medium-Size and Large Rather Than Micro Firms

Similar to previous findings in the literature (Hsieh and Olken 2014; Saborowski and Misch 2019), this chapter has documented that the firm size distribution in Mexico is concentrated mainly in micro firms (two to 10 employees) and self-employed production units. Medium-size and large firms (more than 50 employees) make up only 1 percent of all the firms in Mexico. Furthermore, the share of employment of large firms in Mexico is much smaller than the share captured by large firms in the United States. The absence of large firms could be the result of high regulatory costs (that is, higher corporate tax rates) and financial constraints that do not allow large, productive firms to expand. Policies should be designed to alleviate regulatory constraints for the growth of medium-size and large firms instead of targeting growth policies for micro establishments. Policies directed at micro firms can be inefficient for two reasons. On the one hand, small firms are generally less productive. On the other hand, these targeted policies may provide incentives for firms to remain small. Constructing a more business-friendly environment for spurring the growth of medium-size and large firms through lower regulatory costs and lower credit constraints would allow medium-size firms to transition into large establishments and large firms to expand even more. In this manner, these firms, which are on average more productive, will absorb larger quantities of resources, which is "aggregate productivity enhancing."

Target Younger Establishments

The evaluation of employment growth by firm age and size found that younger firms tend to grow at faster rates than older firms, even when the analysis controlled for firm size. By contrast, although smaller firms grow faster than larger firms, this difference in growth rates across firm sizes dissipates when the analysis controls for firm age. This is because many small firms are young. Hence, to foster job creation, firm policies should be targeted at younger, more innovative firms instead of smaller firms. In addition, as is explained in chapter 6 in this report, misallocation is larger among younger firms. Thus, targeting policies at younger establishments can potentially reduce this misallocation by allowing the more productive young firms to capture larger quantities of employment, given their higher employment growth rates.

Ease Credit and Regulatory Constraints

Investment in Mexico is highly concentrated among firms, especially in the service industries. The findings suggest that there are high regulatory costs that exclude many firms from accessing credit. Bank concentration is high, even compared with other emerging markets. The three largest banks hold more than 50% of total bank assets (OECD, 2019). This is due to relatively low competition and high barriers to entry and risk of collusion and low availability and quality of information to consumers (COFECE, 2014). Indeed, enhancing competition in the financial sector has been highlighted as a top priority of the Federal Economic Competition Commission (COFECE, 2018). Earlier studies, such as Gelos and Werner (2002), documented that collateral constraints are important for credit access in Mexico. Newer findings by Sabarowski and Misch (2019) highlight that access to credit is essential for firm growth. Hence, high firm growth seems to be an option only for firms with collateral. Relaxing credit constraints for firms as well as providing firms a wider set of financing instruments can be essential for their growth. This is especially important for firms in the service sector, where real estate and other forms of fixed asset collateral are less intrinsic to production compared with manufacturing firms. And, as documented by Vitale et al. (2020), service industries in Mexico are constrained by high product regulations, which result in lower competition and higher market concentration. Improving access to credit for firms in the service sector as well as reducing product regulation are key policies that can yield more efficient market competition in service industries.

The presence of distortive frictions in the Mexican economy not only results in static misallocation, but also has negative implications for firm life cycle performance. The chapter found that firm life cycle growth in productivity, value added, employment, and other variables generally occurs at the beginning of the life cycle. In later stages, growth of these economic variables stagnates in Mexico. This is contrary to the findings for developed economies, where firm growth continues throughout firms' lives. Compared with Colombia (Eslava and Haltiwanger 2018), firm growth in Mexico is also smaller. Therefore, market distortions could be playing a more detrimental role in Mexico. As explained by Hsieh and Klenow (2014), the main mechanism through which market imperfections affect life cycle growth is by disincentivizing firms from investing

in productivity-enhancing activities, such as improving process efficiency, raising quality, and expanding their products to foreign markets. Alleviating barriers to firm growth, especially for larger establishments, such as by lowering tax burdens and reducing collateral constraints, can provide the missing incentives for technology-enhancing investments. This in turn can facilitate firm growth, resulting in more medium-size firms expanding into large firms across their life cycle. As empirical evidence from Saborowski and Misch (2019) shows, larger formal firms grow more when their credit constraints are relaxed. Hence, policies directed at large establishments that facilitate access to credit and encourage formality (lower tax and regulatory burdens) can facilitate growth over the life cycle of Mexican firms.

Alleviate Distortions in the Allocation of Resources

The entry and exit of firms are "aggregate productivity reducing" instead of "aggregate productivity enhancing." The results show that the productivity distribution of surviving firms is not significantly different from the distribution of exiting firms. If markets functioned efficiently, it would be expected that surviving firms would have higher productivity than exiting firms. Similarly, the productivity distributions of incumbents and entrants are very similar. Again, it would be expected that, due to their market experience, incumbents would have higher productivity than entrants. These patterns are a result of market inefficiencies that negatively affect aggregate productivity through two channels. On the one hand, higher productivity establishments are exiting the market while lower productivity firms are entering. On the other hand, the exit of higher productivity firms and entry of lower productivity firms is costly in terms of the allocation of resources, as factors are shifting from more productive to less productive units. Regulatory distortions that could be driving these results include contractual frictions in labor markets, higher tax enforcement for larger and more productive firms, and access to credit, among others. Alleviating these distortions should be at the top of the policy agenda, especially because misallocation seems to have increased in Mexico over the past two decades. Also, long term concessions granted by government and based on exclusivity rights in the provision of some services, like railroads and ports, impose higher costs on cargo and affect industry location and efficiency.

Prioritize Policies That Facilitate Factor Mobility and Reallocation toward More Productive Firms

Persistent misallocation is apparent in the evaluation of the drivers of Mexico's aggregate productivity growth. The chapter found that the two main sources of productivity changes in Mexico are changes in the technical efficiency of surviving firms and changes in allocative efficiency across surviving firms. The contributions of the entry and exit of firms are much less significant because of their magnitudes. The changes in allocative efficiency among survivors are negative and highly volatile, compared with allocative efficiency changes in the United States. The pattern in Mexico can be detrimental, especially during economic recessions. During economic busts, such as the global financial crisis, the contribution of changes in allocative efficiency to aggregate productivity growth in the United States is positive and the same magnitude as during economic booms. This suggests that whenever the economy is facing negative exogenous shocks (for example, the global financial crisis and more recently COVID-19), well-functioning factor markets can ameliorate the shock by shifting resources from lower productivity firms to higher productivity firms and act as "shock-absorbers." This is not the case for Mexico. During the global financial crisis, the allocative efficiency component fell, exacerbating the negative effects of the recession. Regulations that generate rigidities in the factor markets (for example, rigid labor markets) and constrain firms' access to credit inhibit factors from being allocated efficiently during busts, resulting in external crises having more detrimental effects on productivity. Policies should be designed to facilitate factor mobility from less productive to more productive firms, especially more so during recessions. This is a priority in the context of the current COVID-19 crisis, to promote an inclusive and sustainable recovery.

Improve Contract Enforceability

In Mexico, imperfect contract enforcement reduces firm growth (Levy, 2018). When the institutions in charge of contract enforcement are weak, the input supply and customer base of banks and firms are reduced to only those that can be trusted. Hence, weak contract enforceability inhibits firms from having more access to financing and investment sources. On the one

hand, bank loans become more dependent on collateral. Hence, many firms face credit constraints that limit their growth. On the other hand, access to shareholder funds is reduced, as investors are less willing to invest their wealth in firms given that property rights may not be fully enforced. This is particularly harmful for larger firms that most likely require more resources to scale up their production activities. Levy finds that there is large variation in contract enforceability across states. In states where enforceability is low, firms are generally smaller. Misch and Saborowski (2018) find that two additional important "rule-of-law" factors are associated with higher resource misallocation and lower firm growth in Mexico: corruption and crime. They document that a higher level of corruption induces a larger misallocation of resources for industries in which government procurement is prevalent. This shows that government procurement regulations provide incentives for corruption between public officials and goods/services providers (that is, bribes). Also, crime is relevant for resource misallocation. Higher crime rates impose extra costs on firms, reflecting spatial misallocation of resources (they inhibit the mobility of factors across firms and municipalities).

Improve the Business Environment for More Productive Firms

The findings on job dynamics show that the main driver of job creation and destruction is the entry and exit of firms, compared with expansion and contraction by surviving establishments. This pattern is consistent with Haltiwanger's (2016) findings for the United States. However, a deeper evaluation of the patterns of job flows showed that contraction of operating firms became the main source of job destruction in Mexico between 1993 and 2018. Moreover, this trend was more pronounced for firms in the service sector. This highlights some of the previous inferences. First, market frictions increased over the 25-year period, resulting in larger barriers to operating for surviving firms. Second, market imperfections are more prevalent in service industries, which hinders firm operation and expansion in this sector. As a result, smaller, unproductive firms in services account for most of the revenue generation. Consequently, policies should try to improve the business environment for surviving firms, particularly for larger establishments that are generally more productive. The imperfections in the service industries also imply that there is lower performance among larger firms in this sector. Hence, product market regulations should be reduced, and policies should be designed to facilitate credit instruments for more productive establishments.

Policies should go beyond "compensatory" objectives and aim at improving the business environment and key complementary factors for the growth of firms. The rigidity of factor mobility is highlighted by the finding that market frictions are relevant for the allocation of factors within municipalities and states. Labor and capital market regulations can inhibit the most efficient firms from capturing resources within municipalities and more productive municipalities from absorbing higher amounts of resources within states. The findings suggest that regional policies may have hindered productivity growth instead of enhancing it. To close the gap between the least developed regions and more developed regions, policies have been compensatory instead of productivity enhancing. As a result, Misch and Saborowski (2018) find that the least developed regions also have the highest market distortions. Hence, policies based on federal transfers to the least developed states have not alleviated the root of the problem, which lies in the market distortions that affect allocative efficiency. Going forward, policies in lower performance states should focus on upgrading infrastructure (and access to markets), building human capital, and improving the business environment for entrepreneurship and innovation.

Conclusions

This chapter studied the static and dynamic patterns of firm productivity and employment in Mexico, to understand the potential reasons why Mexico's economic performance has been poor over the past two decades. Similar to other contributions in the literature, the chapter found that the main culprits in Mexico are regulatory frictions that inhibit markets from performing efficiently. These market distortions yield static and dynamic misallocations that reduce allocative efficiency as well as firm life cycle growth.

First, the chapter documented that the firm size distribution in Mexico is systematically different from that in the United States, as the number of small firms (self-employed and microenterprises) in Mexico is much larger and these small production units account for larger shares of employment. As highlighted by Levy

(2018), small firms in Mexico are mainly informal and have lower productivity.

Second, the chapter evaluated the concentration of investment and employment among Mexican firms and found that concentration is much higher for the former relative to the latter. This signals that there are potential market distortions, such as collateral constraints, which inhibit access to credit for most firms. Moreover, this pattern is more pronounced for service industries, which are associated with larger product market regulations and credit constraints.

Third, the chapter studied the distributions of revenue productivity in Mexico, comparing surviving firms with exiting firms and incumbent firms with entering firms. The findings show that the revenue productivity distributions are not systematically different from one another. This implies that exit and entry of firms in Mexico are "aggregate productivity reducing" instead of "aggregate productivity enhancing."

Fourth, the chapter evaluated aggregate productivity growth through two dynamic decomposition exercises. The first exercise showed that aggregate productivity growth is driven by changes in the intensive margin instead of the extensive margin. That is, changes in aggregate productivity result mainly from growth in the technical efficiency of firms and changes in the allocation of resources across firms. The analysis found that changes in allocative efficiency have contributed negatively to productivity growth and are much more volatile across the business cycle in Mexico compared with the United States. This implies that persistent frictions in Mexico inhibit factor markets from efficiently reallocating factors during recessions and expansions. The second decomposition exercise found that market distortions hinder the mobility of factors toward more productive firms within municipalities and toward more productive municipalities within states.

Fifth, the chapter analyzed the life cycle trends of firms in Mexico and found that firm productivity, value added, employment, and other variables generally grow rapidly in the earlier years but then stagnate in later stages of the firm life cycle. This shows that the persistent and growing misallocation in Mexico has pervasive effects on firm dynamics. Market distortions do not provide firms incentives to generate productive investments that can lead to firm growth and expansion. The chapter also studied the flow of firm employment in Mexico and found that job creation and destruction are mainly driven by the entry and exit of firms. This finding is similar to the situation in the United States. However, firms in operation in Mexico contributed more to job destruction in 2018 relative to 1993, especially in services. This again highlights that persistent market frictions have inhibited the expansion of firms and constrained their life cycle growth. Last, the findings show that firm age is more important for job creation than firm size, as younger firms exhibit higher employment growth rates relative to their older counterparts.

Table 3.1 Summary of Policy Recommendations

Policy	Term	Costs	Benefits	Other considerations
Constraints to growth of medium-size and large firms				
Tax regulation	Medium	Low	High	• Focus on alleviating the differential tax burdens that affect larger firms.
Credit/collateral constraints	Medium	Medium	High	• Focus on improving credit contract enforceability to rely less on collateral.
Competition and product market regulations	Medium	Medium	High	• Promote competition by reducing product regulations (especially in the service sector) and by leveling the playing field in factor markets.
Reallocation of factors				
Labor regulation	Medium	Low	Medium	• Make labor regulations more flexible by reducing firing costs and improving social pension systems.
Recession relief (COVID-19) policies	Short	Low	High	• Facilitate the mobility of factors (labor and capital) in recessions by reducing labor and corporate regulations that affect firm operations during crises.
Subsidized loans for young firms	Short	Medium	High	• Promote job creation and innovation by targeting young, high-growth firms.
Business environment and complementary factors				
Infrastructure and access to markets	Medium	High	High	• Improve infrastructure, especially in less developed states (southern states) to enhance firms' technical efficiency and improve spatial allocative efficiency.
Contract enforcement	Medium	Medium	High	• Strengthen regulations and institutions in charge of ensuring contract enforcement.
Corruption/crime	Short/medium	Medium	Medium	• Eliminate incentives for corruption, especially within industries that are more prone to public procurement. • Reduce crime in states/ municipalities with high crime levels.
Trade and access to foreign markets	Medium	Medium	High	• Provide tax incentives and support programs for high-growth firms that want to integrate into foreign markets/value chains.
Entrepreneurship and innovation	Medium	High	Medium	• Target research and development tax credits for young firms in sectors with high potential growth, in terms of productivity and employment.

Sources: Compilation based on Scur et al. 2021; Bloom, Van Reenen, and Williams 2019; McKenzie et al. 2020.v

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Endnotes

31 The chapter uses firm-level data from the last six Economic Censuses (1994, 1999, 2004, 2009, 2014, and 2019). Online annex 3A provides more information on this data set. The panel was constructed using the algorithm designed by Busso et al., (2018).

32 Hsieh and Olken (2014) use microdata on formal and informal manufacturing firms to document that the distribution of firm size in India, Indonesia, and Mexico is not bimodal. They find that large firms are missing more than medium-size firms.

33 We classify firms into five size categories: (1) large firms employ more than 250 workers, (2) medium-size firms employ 51 to 250 workers, (3) small firms employ 11 to 50 employees, (4) micro firms employ two to 10 workers, and (5) self-employment in a business with only one worker, the owner.

34 The chapter refers to annex boxes, figures, and a table that are provided in online annex 3A.

35 The HHI of concentration is measured as: $HHI = \sum_{i=1}^{N} s_i^2 * 10{,}000,$ where S_i is the market share of firm i. Markets in which the HHI is between 0 and 1,500 are not concentrated; markets in which the HHI is between 1,500 and 2,500 are moderately concentrated; and markets in which the HHI is greater than 2,500 are highly concentrated.

36 The HHI may not be a good measure of market concentration when firms do not compete in quantities or there is vertical differentiation. In these cases, a higher HHI may reflect that larger firms have conducted quality upgrading over time, instead of firms' market power. Given the lack of information on firm prices in the Economic Census, the market concentration analysis may be constrained by this caveat.

37 See online annex 3A for details on the productivity estimation.

38 Exiting firms are not present in the Economic Census at time $t+1$, but they are present at t, while surviving firms are present at both t and $t + 1$. Entrants are not present in the Economic Census at time $t - 1$, but they are present at t, while incumbents are present at both $t - 1$ and t.

39 The data do not allow calculating quantity-based total factor productivity (TFPQ); therefore, these calculations could potentially be affected by markups. Box 3A.4, analyzes the correlation between TFPQ and TFPR for the manufacturing sector, using information based on the Manufacturing Survey, which allows comparison of these calculations.

40 Aggregate productivity growth is calculated as the weighted average of industry productivity growth, where industries are defined using the North American Industry Classification System 6-digit level of disaggregation. The industry weights correspond to the industry's share in total value added for each period. Hence, the aggregate productivity growth decompositions of TFP are also weighted averages of the industry-level growth decompositions. The approach follows Batelsman, Haltiwanger, and Scarpetta (2013), to control for industry effects within the productivity growth decompositions.

41 Haltiwanger et al. (2016) decompose changes in productivity in the United States between 1996 and 2013. They find that, on average, the within-firm component contributed to productivity changes of around 0.8 percent each year, while the between-firm component contributed 1.0 percent each year. Moreover, they analyze these components for three separate time intervals and find that between 1996 and 2006, the within-firm component contributed 1.6 percent to productivity growth each year. However, during the crisis period of 2007–10, the within-firm component contributed -0.2 percent to annual changes in productivity, and during 2011–13, its contribution was negligible. These findings show the procyclicality of the within-firm component in the United States. By contrast, the between-firm component remained relatively stable over the three time periods, contributing between 1.0 and 1.1 percent to productivity growth each year.

42 Using the decomposition estimates from Haltiwanger et al. (2016), the analysis assumes that the between-firm component would have increased by 1.0 percent every year for the two periods before the financial crisis, by 1.1 percent every year during the financial crisis period, and by 0.9 percent every year during the two periods after the financial crisis. The exercise assumes that the within-firm component as well as the extensive margin components changed as estimated in the data.

43 Eslava and Haltiwanger (2018) only consider manufacturing plants that belong to firms that own at least one plant with 10 employees or more. Hence, part of the difference in growth patterns for Colombia relative to Mexico is because they are excluding many micro and self-employed production units as well as service sector establishments.

44 To estimate the counterfactual trends, the analysis uses life cycle growth estimates from Hsieh and Klenow (2014) for U.S. firms and complements them with the life cycle estimates for Mexican establishments. Using these estimates, the life cycle trends of value added are calculated under different scenarios, by assuming a standard Cobb-Douglas production technology. The first scenario corresponds to the series labeled Mexico benchmark in figure 3A.12. This series plots the life cycle trend of value added for a firm whose labor, capital, and TFP grew at the same rate as the average firm in Mexico across its life cycle. The counterfactual series labeled Δ Labor Like US corresponds to the life cycle value added trend of a firm whose capital and TFP grew like that of the average firm in Mexico, while labor grew like that of the average firm in the United States. Last, the counterfactual series labeled Δ Labor and Δ TFP Like US corresponds to the life cycle value-added trend of a firm whose capital grew like that of the average firm in Mexico, while labor and TFP varied like that of the average firm in the United States.

45 Box 3A.5 provides details on the decomposition of job flows in Mexico.

46 Continuing firms are firms that survive to the next Economic Census.

PHOTO BY: CASSIELMX/SHUTTERSTOCK

Raising Productivity through Participation in Global Value Chains[iv]

CHAPTER 4

Introduction

This chapter explores the link between integration into global value chains (GVCs) and productivity growth in Mexico. The previous chapters have shown that Mexico's low level of aggregate productivity growth since 1995 hides important heterogeneities. At the same time, Mexico's integration into GVCs has increased considerably, but the process has been incomplete and asymmetrical (Constantinescu and Winkler 2020). This chapter studies how Mexico's process of GVC integration has contributed to the productivity divergence observed across Mexican firms, sectors, and states and presents policies to broaden and upgrade GVC participation to include more sectors and firms, with the hope of boosting their productivity and raising the country's potential growth.

The chapter begins by mapping Mexico's GVC participation, showing that it is unbalanced: it is highly concentrated in a few sectors, too dependent on the United States, and regionally unequal. Mexico has high backward and low forward GVC participation, with backward participation serving as a strong and reliable engine for its export growth.[47] But the country's GVC-related exports are centered on the United States, despite the growing role of China as a source of imported inputs. In part as a result of reliance on the United States, GVCs in Mexico are spatially concentrated in the northeastern part of the country, leaving many regions, domestic firms, and workers disconnected, especially in the west and south. And the economy shows very low reliance on domestic upstream sectors across all broad export sectors, in contrast to its extensive backward GVC participation. Mexico's manufacturing sector relies little on domestic goods inputs, but also on domestic services inputs.

The chapter provides evidence that GVC integration has contributed to higher productivity growth in Mexico, but because of the country's position in GVCs, the benefits have not spread throughout the economy. The economic literature shows that GVC participation contributes to higher productivity, better jobs, and lower poverty (World Bank 2020). GVCs can raise efficiency in the production system (Grossman and Rossi-Hansberg 2008; Baldwin 2012); they also provide opportunities to diversify exports and create opportunities for technology transfer and knowledge spillover (Pietrobelli and Rabellotti 2011). However, productivity gains from GVC participation can vary depending on the position in the chains (World Bank 2020). Using Mexican firm-level data from the Economic Census and data on GVC participation across sectors, the chapter finds positive and significant effects of GVC participation on productivity at the firm, sectoral, and state levels. Yet, while backward GVC participation has been beneficial for productivity, value added, and employment, the low forward GVC participation reflects scope for further upgrading by engaging in higher value-added activities (through integration of new tasks and sectors) and by expanding linkages to domestic firms and regions. The results suggest that policies designed to promote participation in GVCs can raise aggregate productivity and potential growth in Mexico.

The Mexican economy can integrate more tasks, sectors, domestic firms, and regions to increase its productivity and enhance the country's growth rate. The last contribution of the chapter is to assess which policies can

iv The chapter was prepared by Deborah Winkler (Senior Consultant), Cristina Constantinescu (Economist), Luis Alejandro Aguilar Luna (Consultant), and Eduardo Olaberria (Senior Economist).

foster upgrading through GVC participation in Mexico, at the national and subnational levels, including innovation and skills upgrading, services trade liberalization and higher technical standards, logistics performance and infrastructure, and the quality of institutions. Understanding the drivers of GVC participation provides insights on the current bottlenecks and can offer policy guidance on how to foster further productivity growth and upgrading. Although Mexico's GVC participation is in part determined by fundamentals, including the country's or region's endowments, market size, geography, and quality of institutions, policies can make a big difference (World Bank 2020).

Upgrading Mexico's GVC participation becomes even more relevant in the aftermath of the current COVID-19 crisis and the adoption of the new United States–Mexico–Canada Agreement (USMCA). The COVID-19 pandemic exposed the risks of supply chain disruptions. The pandemic could also accelerate some of the recent trends in terms of technology adoption and use of new data (Goldberg 2020). This could have implications for Mexico's GVC participation and prospects for economic upgrading in some sectors, for instance in the automotive and electronics sectors, where the global stock of robots is highest and can further accelerate automation post-COVID-19. The USMCA may reshape Mexico's role in North American value chains due to the introduction of minimum wage requirements and the required increase in the regional value content.

The first section in the chapter maps Mexico's GVC participation. The second section reviews the link between GVC participation and upgrading and productivity growth in Mexico. The third section assesses the determinants of GVC participation globally and across Mexican regions, and the fourth section identifies Mexico's policy priorities to foster upgrading.

Mapping Mexico's GVC Participation

High Backward and Low Forward GVC Participation

Mexico is deeply engaged in GVCs primarily through backward participation, which has served as a strong and reliable engine for its export growth. GVC participation is proxied by backward and forward GVC participation, which measure the portion of international trade linkages embodied in gross exports of goods and services that cross at least two country borders (see box 4.1).[48] Mexico's intensity of GVC participation in its gross exports increased from 35 percent in 1995 to about 43 percent in 2015 (figure 4.1). Yet, Mexico's GVC participation is asymmetrical and strongly driven by backward GVC participation. While the foreign value added embodied in the country's exports (backward GVC participation) increased from 28 percent in 1995 to more than 36 percent in 2015, the value added embodied in the exports of its direct trading partners (forward GVC participation) remained almost unchanged at around 7 percent over the same period.

Mexico's high backward and low forward GVC participation in its exports also stands out by international comparison. The country's backward participation intensity is among the highest in the world—on par with several Eastern European and East Asian countries or very small countries like Luxembourg and Malta (figure 4.2). By contrast, Mexico's forward participation intensity is the second lowest globally behind Malta, implying a strong reliance on exports of final or intermediate goods and services that are directly consumed in Mexico's trading partners. Interestingly, China shows much lower backward GVC participation than Mexico of only 18 percent, i.e. the portion of domestic value added embodied in its exports is much higher, while China's forward GVC participation is larger at 14.5 percent.

High Concentration in Complex Manufacturing GVCs

Mexico is one of the world's largest exporters, driven by the rise of manufacturing exports following the country's accession to the North American Free Trade Agreement (NAFTA). In the past three decades, Mexico's exports of goods and services have expanded 10 times in value terms and five times in volume terms. As a result, Mexico became the country with the 16th largest share of exports in global trade by 2018. Mexico's trends in exports reflect the dynamism in manufacturing that followed the country' accession to NAFTA in the 1990s (figure 4A.1).[49]

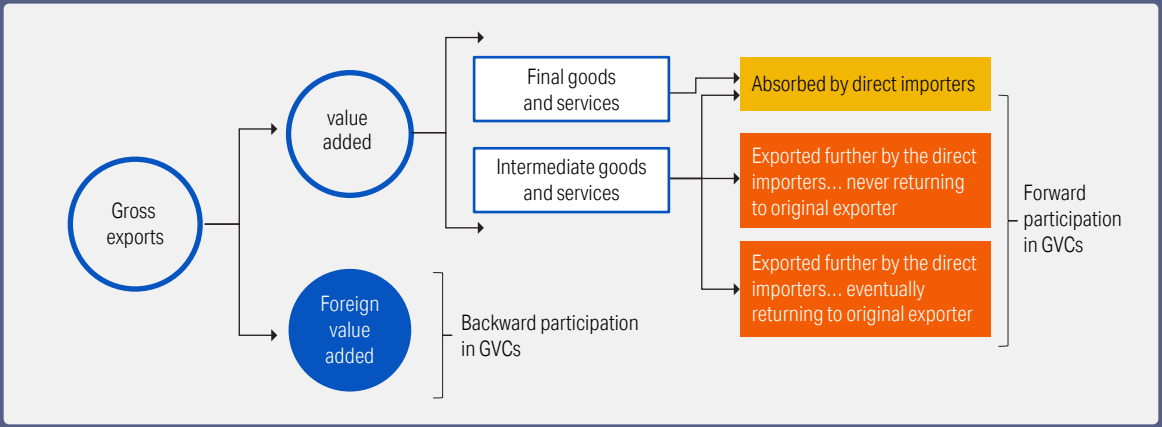
Export shares increased strongly in transport equipment, electrical and electronic apparatuses, and machinery, but declined in extractives, reflecting Mexico's specialization in more complex value chains. Mexico's export basket is heavily focused on transport equipment, electrical and electronic apparatuses, and

Box 4.1 GVC Participation Indicators Derived Using Intercountry Input-Output Data

To examine the signs of global value chain (GVC) participation, the chapter relies on two international linkage measures, namely backward and forward participation in GVCs. Both measures are components of gross exports (figure B4.1.1). *Backward participation* captures the foreign value added embodied in a country's or sector's gross exports. *Forward participation captures* the domestic value added embodied in a country's or sector's gross exports that the direct partners use in their own exports.[a] When expressed as a share of gross exports, the two metrics give the *intensity of backward and forward participation in GVCs*, respectively.

While international linkage measures are an important sign of GVC participation in international trade, they fall short of capturing overall GVC-related trade, which also includes exports of final and intermediate goods absorbed by the direct partner but produced or sold in a GVC context.

Figure B4.1.1 Gross Export Decomposition, by Origin of Value Added and Location of Absorption

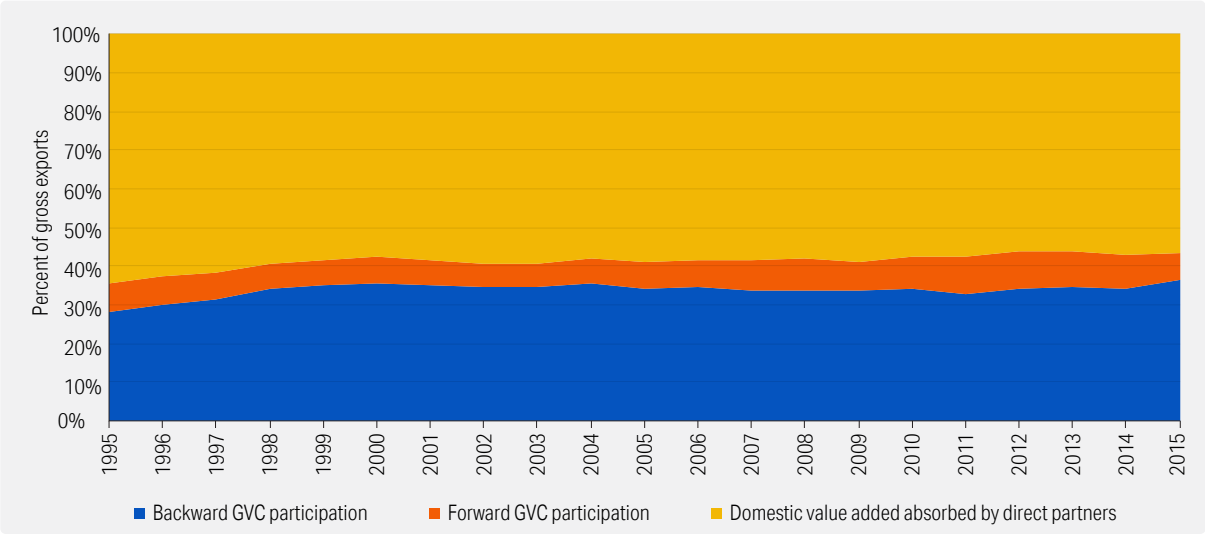


The backward and forward indicators used in this chapter were obtained from the World Development Report 2020 database. They were derived by Borin and Mancini (2019) based on the 2018 version of the Organisation for Economic Co-operation and Development's (OECD's) intercountry input-output tables (ICIOs). ICIOs, whether produced by the OECD or other agencies, combine data from multiple countries' national input-output tables with bilateral trade flows among those countries, using a set of simplifying assumptions. As a result, ICIOs convey information about the origin and destination of sectoral transactions across countries.

a. Forward participation has also been defined as the domestic value added of a country or from a specific sector that is embodied in all (not just a country's direct) trading partners' exports, but this measure suffers from a double-counting problem and can thus exceed 100 percent (Hummels et al. 2001).

machinery (figure 4.3, panel a). As of 2018, motor vehicles accounted for a third of Mexico's goods exports, while electrical equipment, electronic apparatuses, and other machinery jointly accounted for another third. Motor vehicles already played an important role in Mexico's exports in 1990, and the export share of electrical equipment, electronic apparatuses, and other machinery expanded stongly in the years following Mexico's accession to NAFTA. The export share of motor vehicles further expanded after the Great Recession of 2008, and medical equipment and office equipment have gained in importance in recent years. The composition of Mexico's import basket confirms its heavy concentration on manufacturing, which seems to support GVC production in these export sectors. The top import sectors include motor vehicles, radio and

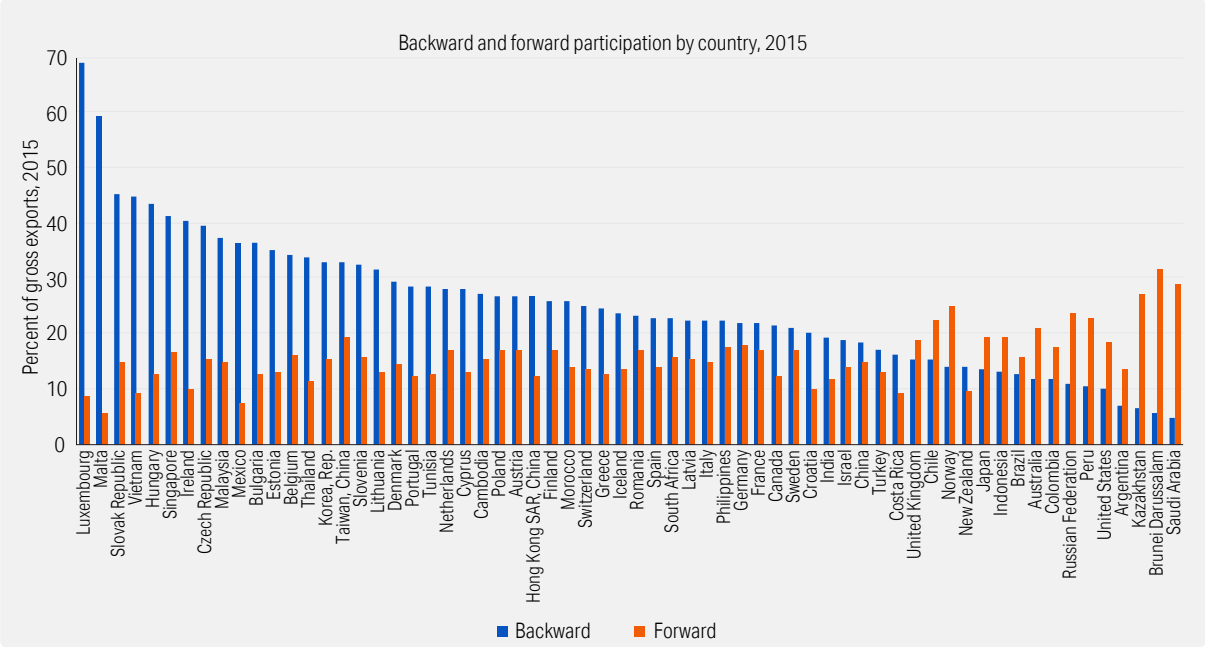
Figure 4.1 GVC Intensity in Mexico's Exports Is Driven by Backward GVC Participation



Sources: Based on data from World Bank 2020, based on Borin and Mancini 2019 and OECD TiVA 2016 and 2018 editions.

Note: Backward participation is captured by the foreign value added embodied in a country's gross exports. Forward participation is defined as the portion of a country's gross exports that is embodied in direct trading partners' exports.

Figure 4.2 Mexico Shows High Backward but Low Forward GVC Participation



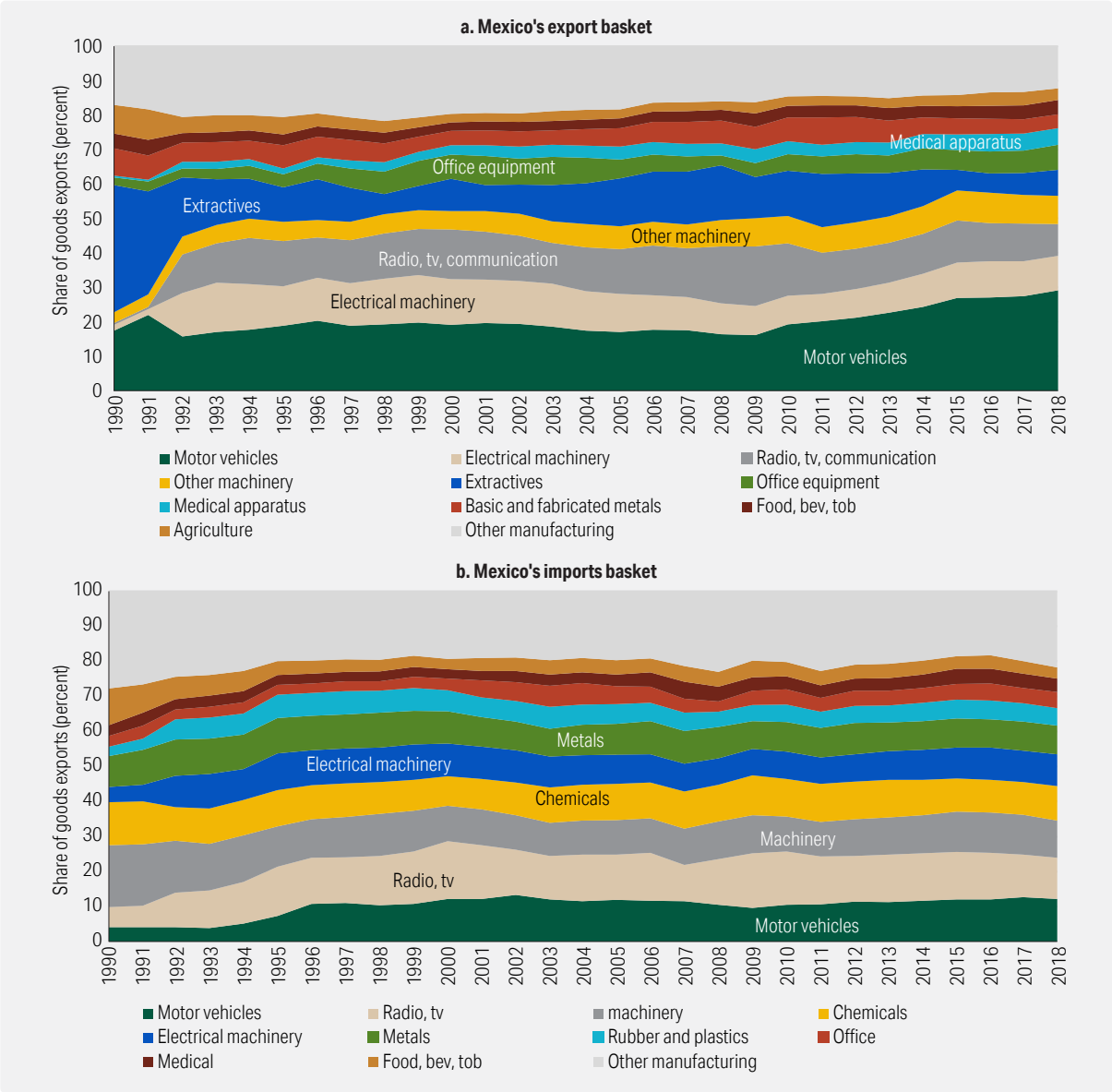
Sources: Based on data from World Bank 2020, based on Borin and Mancini 2019 and OECD TiVA 2016 and 2018 editions.

Note: Backward participation is captured by the foreign value added embodied in a country's gross exports. Forward participation is defined as the portion of a country's gross exports that is embodied in direct partners' exports.

television, machinery, chemicals, electrical machinery, and metals, which now represent around 60 percent of Mexico's goods imports, up from 50 percent in 1990 (figure 4.3, panel b).

Mexico's largest export and import sectors are the most integrated into GVCs, driven by backward GVC participation. The largest GVC participation intensity in Mexico is found in electronics, chemicals, electrical equipment, motor vehicles, machinery, and metals. Their GVC participation is primarily via backward linkages, as is also the case for Mexico's aggregate exports, although chemicals and metals show a higher share of forward GVC participation, due to their resource intensity.

Figure 4.3: Mexico's exports and imports are heavily focused on manufacturing sectors



Source: Own computations. *Data:* UN Comtrade

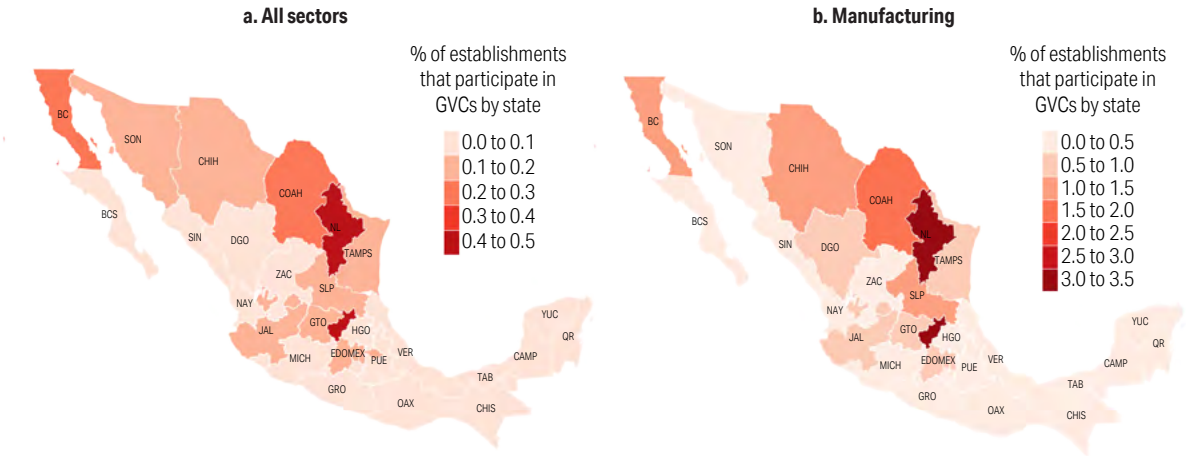
The portion of GVC linkages in exports is substantially smaller in most other sectors, in particular services, extractives, and other manufacturing (figure 4A.2).

Strong Dependence on the United States

Mexico's GVC-related exports are still centered on the United States, although China's role as a source of imported inputs has grown. The diversification of Mexico's export destinations remains limited, as the U.S. share of Mexico's goods exports has hovered at around 80 percent since the 1990s. Exports to Latin America and the Caribbean represent less than 10 percent (figure 4A.3, panel a). Similarly, the United States is still the most important partner for Mexican intermediate imports (figure 4A.3, panel b), although its share fell from around 70 percent in the early 2000s to about 60 percent in 2018, reflecting mostly the rise of China.

The important role of the United States and China in Mexico's trade is confirmed using GVC participation measures at the bilateral level. The United States and China account for almost 60 percent of all foreign value added embodied in Mexico's gross exports (backward GVC participation). On the selling side, Mexico's

Map 4.1 GVCs Are Spatially Concentrated in Mexico's Northeast



Source: Based on data from the Economic Census 2019.
Note: GVC participants are establishments that simultaneously import and export. GVC = global value chain.

domestic value added embodied in U.S. gross exports accounts for 41 percent of the total domestic value added produced in Mexico that is reexported by its trading partners (OECD 2018).

Mexico's high backward and limited forward participation intensity could also reflect its specific role in NAFTA and its close ties with the U.S. market. First, Mexico's backward GVC participation intensity has remained relatively stable over time, which is consistent with the country's long-term positioning in GVCs. Second, Mexico's limited forward GVC participation intensity reflects its specialization in downstream production that is exported to final consumers in NAFTA member countries.

Spatial Concentration of GVC Participation across Mexican States

In part because of Mexico's focus on the United States, GVCs in Mexico are spatially concentrated in the northeastern part of the country. GVC firms tend to be located closer to the U.S.-Mexican border and in the center of Mexico, leaving many regions, domestic firms, and workers disconnected, especially in the west and south (map 4.1). The percentage of GVC establishments by state is highest in Nuevo Leon and Queretaro, ranging from 3 to 3.5 percent of all establishments in manufacturing. The presence of manufacturing establishments participating in GVCs is also high in Coahuila, followed by Chihuahua, Baja California, and San Luis Potosi (map 4.1, panel a). This spatial concentration of GVC activity could be a driver of Mexico's relatively low domestic sourcing intensity, as inputs can more easily be imported from the United States.

Limited Reliance of Exports on Domestic Inputs

Mexico shows very low reliance on domestic upstream sectors across all broad export sectors, which contrasts with its extensive backward GVC participation. Upstream sectors (indirect domestic) only contribute 25 percent of the country's total export value, as opposed to the 36 percent foreign contribution (figure 4A.4). The discrepancy is even higher in the manufacturing export sector, where domestic inputs represent 28 percent of the export value compared with 47 percent for foreign inputs. China lies on the other end of the spectrum, where the contribution of domestic inputs is almost three times as much that of foreign inputs (Kee and Tang 2016). Although greater reliance of manufacturing exports on domestic inputs is common in natural resource–intensive countries like Brazil, Argentina, Peru, South Africa, and Chile, other peer countries, such as Turkey and Poland, also depend more strongly on domestic inputs. Mexico's low share of domestic inputs in services, agriculture, and mining points to more systemic challenges to linkage development.

Mexico's manufacturing sector not only relies little on domestic goods inputs, but also on domestic services inputs. Mexican manufacturing exports rely strongly on services inputs, representing around 37 percent of the total manufacturing export value in 2015 (figure 4A.5, panel a). But while services represent a similar share in Poland or Turkey, Mexico's manufacturing exports depend more strongly on imported services inputs (20 percent) than on domestic services inputs (18 percent). Only Thailand and Malaysia show lower domestic shares of services inputs. Relative to total services inputs used in manufacturing exports, Mexico's share of domestic inputs is the second lowest (figure 4A.5, panel b).

Link between GVC Participation and Productivity Growth in Mexico

The positive links between GVC participation, productivity, and upgrading are apparent at multiple levels. GVC participation, especially in manufacturing, magnifies the traditional gains from trade (World Bank 2020). Previous research has found a positive link between GVC participation and productivity or upgrading more generally across countries and country-sectors (Kummritz 2017; Constantinescu, Mattoo, and Ruta 2019; Stolzenburg, Taglioni, and Winkler 2019; World Bank 2020). This analysis also finds evidence of a positive link across Mexico's firms, regions, and subsectors. Although this chapter focuses on labor productivity, it includes value added and employment as measures of economic and social upgrading.

GVC participation can foster upgrading through various channels. One major channel is technology transfer or knowledge spillovers from foreign suppliers to domestic firms that produce a more differentiated variety of inputs and higher quality foreign services (Bas and Strauss-Kahn 2014). GVCs can also raise incentives to innovate and adopt foreign technologies, as local firms face pressure to match international standards (Pietrobelli and Rabellotti 2011). Reliance on foreign research and development (R&D) knowledge and technology can also boost local firms' own innovation activity and raise aggregate productivity (Nishioka and Ripoll 2012).

Growth in GVC Participation Is Associated with Upgrading across Countries

The cross-country evidence presented in this chapter shows a positive correlation between growth in GVC participation and upgrading in manufacturing. Countries that are more integrated into GVCs typically see higher growth in the labor productivity of their manufacturing sectors. They also see gains in manufacturing value added and employment (figure 4A.6). Over the past decade, Mexico's annual average growth in these indicators has been below that of peers such as China, Malaysia, and Thailand and slightly below the cross-country predictions, as shown by bivariate regression lines.[50]

Upgrading from advanced manufacturing and services to innovative GVC activities goes hand in hand with an increased emphasis on forward GVC participation (see figure 4A.7). Moving to advanced manufacturing and services GVCs and especially innovative activities typically increases forward participation. This is because countries engage in activities that contribute more domestic value added both upstream (for example, R&D or design) and downstream of final assembly (for example, aftersales services) (World Bank 2020). However, Mexico's low forward participation suggests that it specializes mostly in producing goods (or services) for final consumption in its partner countries, in particular the United States. More engagement in higher value-added tasks that are reexported by the United States and other partner countries rather than consumed there will result in increased forward GVC participation.

At the same time, upgrading to more sophisticated GVC activities is associated with reduced backward GVC participation. Countries such as Mexico that specialize in advanced manufacturing and services are highly reliant on imported inputs for exports. Backward participation is slightly lower for the countries in the innovative group because their activities are less dependent on imported relative to domestic inputs (figure 4A.7).

Mexico Has Not Fully Absorbed the Value-Added Gains from Forward GVC Participation Compared with Other Countries

Mexico has been capturing the value-added gains from backward GVC participation in manufacturing. A cross-country-sector regression analysis finds that the positive link between backward GVC participation and value added in manufacturing is only significant for countries participating in advanced manufacturing and services or innovative GVCs (figure 4A.8).[51]

Interestingly, the link in Mexico alone is much stronger. Thus, this result differs from the previous findings on labor productivity (see figure 4A.6), where Mexico did not outperform other countries in the sample.

However, while the gains from forward GVC participation are larger, Mexico has not fully absorbed those gains yet. The value-added gains from forward GVC participation are larger than those from backward GVC partipation in a large sample of countries and manufacturing sectors (figure 4A.8). Forward GVC participation in manufacturing shows a much stronger correlation with domestic value added than backward participation for countries specialized in advanced manufacturing and services or innovative GVCs. The larger coefficient of determination (R-squared) between the growth in GVC participation and labor productivity or value added in manufacturing for forward participation confirms this point (figure 4A.6). However, Mexico's gains from forward GVC participation in manufacturing are smaller than for the average country specializing in advanced manufacturing and services or innovtive GVC activities (figure 4A.8). Similarly, Mexico's larger gap to the predicted regression line for forward GVC participation (figure 4A.6) suggests the presence of untapped potential.

Positive Link between Backward GVC Participation and Productivity in Manufacturing

Within Mexican manufacturing sectors, backward GVC participation and labor productivity show a positive link over time. Prima facie evidence suggests that for most manufacturing sectors in Mexico, backward GVC participation and labor participation are positively associated (figure 4A.9). There is a positive relationship in most manufacturing subsectors with the exception of wood, apparel, and computers/electronics. The positive association is strongest in food and beverages, electrical equipment, and other non-metallic sectors and also strong in machinery, motor vehicles, chemicals, and rubber.

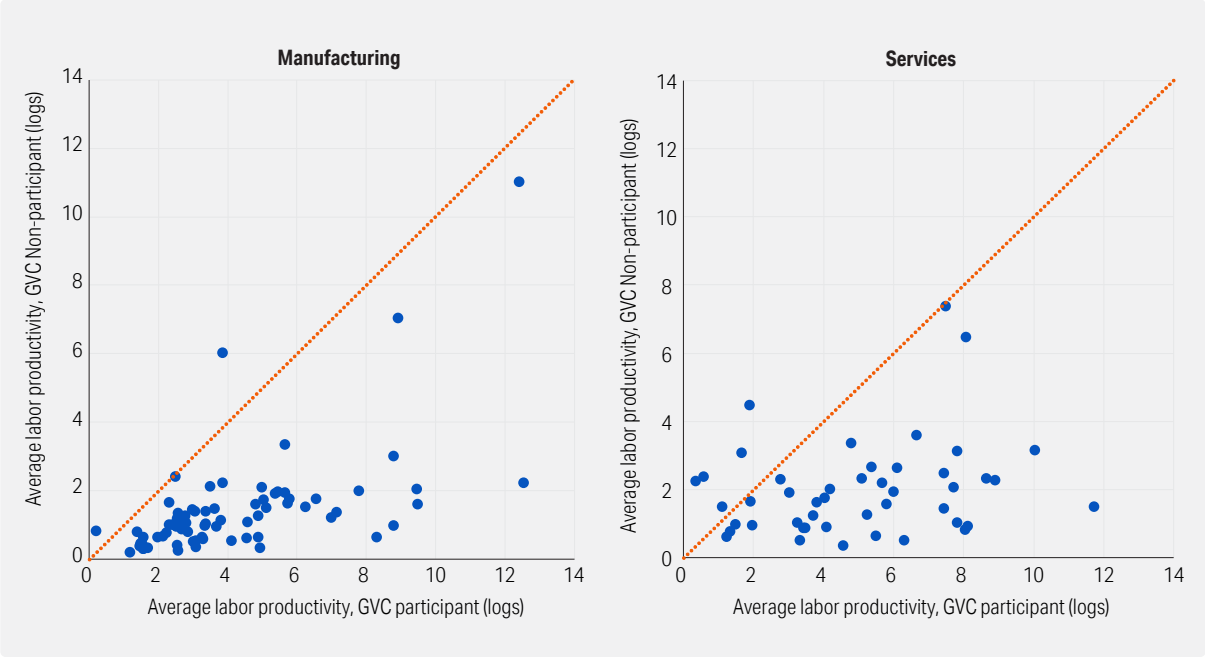
Evidence of gains from GVC engagement for the average country, in general, and Mexico, in particular, also comes from empirical country-sector estimations that find a causal relationship between GVC participation and labor productivity. As relates to backward GVC participation, Constantinescu, Mattoo, and Ruta (2019) obtain that a 10 percent increase in the foreign value added embodied in sectoral gross exports is associated with an increase of at least 1.4 percentage points in labor productivity. The extension of this analysis shows that this same effect applies to Mexico (table 4A.2.1). As relates to forward participation, Kummritz (2017) finds that a 10 percent increase a country's domestic value added that is embodied in the gross exports of other countries in the world leads to 3.3 percent higher productivity. Both studies control for capital intensity, country, sector, and time-specific drivers of labor productivity and use instrumental variable estimation to control for endogeneity and other potential biases.

GVC Participation Is Positively Related to Productivity for Mexican Firms

Evidence from the latest Economic Census confirms that Mexican firms participating in GVCs have higher levels of productivity than nonparticipating firms. The analysis covers more than 4.7 million establishments in Mexico in manufacturing and business services.[52] For 2019, it finds a clear productivity premium among establishments that both export and import, relative to those that do not (where the latter could also include establishments that only export or only import). GVC participants are around 100 percent more productive than non-GVC participants, controlling for an establishment's capital stock per worker, state, and sector (Table 4A.1).[53] The productivity premium falls for establishments that only import inputs compared with those that generally import, but the difference is only marginally smaller.

The productivity premium of GVC-participating establishments also translates into higher average productivity across disaggregated sectors for both manufacturing and services. Almost all manufacturing sectors at the 4-digit North American Industry Classification System level show a higher average labor productivity among establishments participating in GVCs relative to nonparticipants, as shown by their location below the 45-degree line (figure 4.4, left panel). The only exceptions are animal food manufacturing (3111) and other furniture-related product manufacturing (3379). Similar results can be found for service sectors (figure 4.4, right panel), although nonparticipants are on average more productive in six service sectors, in particular management of companies and enterprises (5511). A positive relationship is found for employment (figure 4A.10), suggesting that GVC participation at the establishment level is associated with higher job creation across both manufacturing and service sectors.

Figure 4.4 GVC-Participating Establishments Show Higher Labor Productivity Than Nonparticipating Establishments across the Manufacturing and Service Sectors

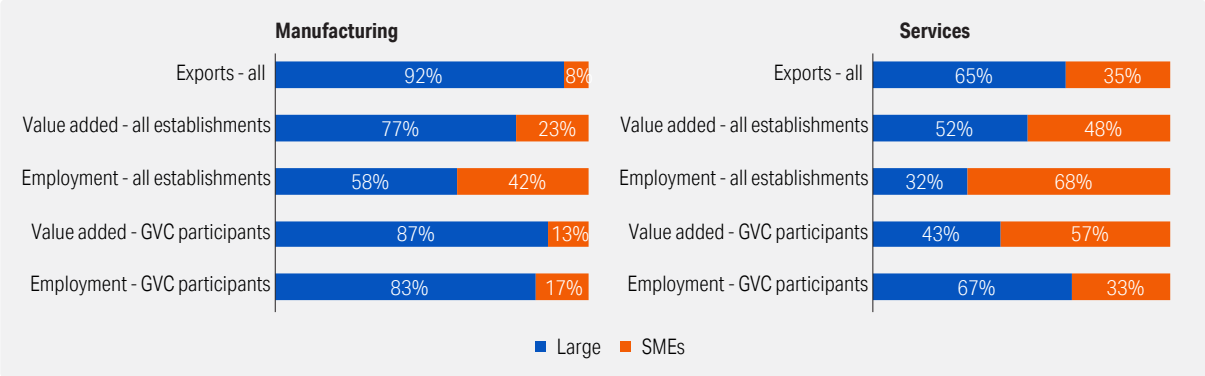


Source: Computations based on data from the Economic Census 2019.

Note: The scatterplots show average labor productivity (value added per worker in natural logarithms) across GVC participants and nonparticipants, respectively, by 4-digit North American Industry Classification System sector for manufacturing and services separately. The blue 45-degree line indicates equal productivity among participants and nonparticipants in GVCs in a sector. GVC = global value chain; GVC participant = establishment that exports and imports.

Small and medium-sized enterprises (SMEs) contribute less to exports, but matter for value added and especially job creation in Mexico. While their share in exports reaches 35 percent in services, it is only 8 percent in manufacturing, suggesting large potential for GVC integration among manufacturing SMEs. The contribution of SMEs to value added and job creation is larger, especially among services establishments (figure 4.5, panel a and b). The importance of firm size in manufacturing trade is not only evident for exports, but also for value added and job creation among GVC participants where less than 20 percent are accounted for by SMEs. While the value added and job contribution of SMEs is generally higher among services GVC participants, participation appears to be driven by high value-added and capital-intensive establishments, as implied by their higher contribution to value-added and lower contribution to employment relative to all services establishments.

Figure 4.5 SMEs play a smaller role in exports, but matter for value added and job creation



Source: Computations based on data from the Economic Census 2019.

Note: GVC = global value chain; GVC participant = establishment that exports and imports ; SME = small and medium-sized enterprise.

States with a Higher Percentage of Firms Participating in GVCs Show Higher Upgrading

The productivity premium for firms participating in GVCs translates into higher overall labor productivity across Mexican states. States with a higher percentage of establishments participaing in GVCs show higher aggregate labor productivity in both the manufacturing and service sectors (figure 4A.11), reflecting their productivity premium over non-GVC establishments. The premium at the state level is substantially higher for establishments in the service sector, that is, states with a higher percentage of GVC firms in service sectors tend to be more productive overall (table 4A.2, column (3)). Taking into account the magnitude of economic activity of GVC establishments, based on their shares of employment and output in a state, suggests that Mexican states in which GVC participants have a larger weight in the state's total employment and output show significantly higher labor productivity (table 4A.2, columns 4 and 7). However, this positive role is not confirmed for establishments in the service sector (table 4A.2, columns 6 and 9).

Mexican regions with a larger presence of GVC firms also benefit in terms of job creation and poverty reduction. Job creation in Mexico is more strongly linked to GVC expansion rather than firms merely engaged in exporting or importing (figure 4A.12). In addition, in municipalities in Mexico, the growing presence of GVC firms is more strongly linked to poverty reduction than the presence of firms that export only or import only (World Bank 2020).

Opportunities for GVC Upgrading to Boost Productivity

Given the benefits of GVC integration for employment and productivity growth, a key goal of Mexican policy makers should be to integrate more firms, sectors, and regions into GVCs. This section identifies the determinants of GVC participation based on a cross-country analysis, drawing on the framework developed in World Bank (2020). Mexico's characteristics in these fundamentals relative to comparator countries explain its type of engagement in manufacturing GVCs. The section complements this analysis with a subnational analysis that identifies how different states fare within Mexico on the fundamental drivers of GVC participation.

Factor Endowments: Availability of Low-Skilled Labor Enhanced Mexico's GVC Participation, but Upgrading Would Require More Skills

Stronger endowments of low-skilled labor enhance backward participation in labor-intensive manufacturing GVCs, including in Mexico, while greater skills matter more strongly for complex GVCs (Fernandes, Kee, and Winkler 2021). The abundant supply of low-cost labor in lower-income countries is often an entry point for participation in the labor-intensive manufacturing segments of GVCs, as suggested by the low annual labor costs for countries specialized in limited manufacturing GVCs of less than US$12,000 over 2006–15 (figure 4A.13, left axis). Mexico's average labor cost per worker was less than US$10,000 over this period and thus in line with countries participating in limited manufacturing GVCs. Only Thailand showed lower average labor cost per worker, while labor costs were highest in Poland and Turkey among the peer countries.

But upgrading skills and labor productivity becomes necessary for integration into more complex GVCs, as reflected in increasing labor costs along the GVC taxonomy groups, especially amid the adoption of the new USMCA. Signed at the end of 2018, the USMCA is in large part similar to NAFTA and likely to preserve Mexico's strong trade and GVC ties with the United States and Canada. Yet, two new measures impacting the manufacturing sector may disrupt Mexico's role in intraregional value chains in the short run. First, the introduction of a minimum wage of US$16 per hour in the production of 40 to 45 percent of vehicles could increase unit labor costs and require efforts to increase labor productivity. Second, sector-specific increases in the percentage of regional value content used in manufactured products traded under the USMCA regime may further increase unit labor costs when imported inputs need to be replaced by regional inputs.

The importance of skills as a driver of increased GVC activity is evident across Mexican states. Mexico already carries out tasks that require more skills compared with those specific to limited manufacturing industries. The majority of Mexican states with relatively higher shares of medium/high skill levels also show higher GVC participation rates (figure 4A.14). A similar correlation can be observed between GVC participation and the share of tertiary educated population by region (table 4A.3).

Higher Backward and Lower Forward GVC Participation Is Consistent with Market Size

Domestic market size determines a country's type of GVC participation, with Mexico's large market for manufactured goods being at odds with its high backward and low forward GVC participation. Countries with larger markets have a larger industrial capacity and could be less likely to use imported inputs in their exports, reducing backward GVC participation, while they are also characterized by larger forward GVC participation (Fernandes, Kee, and Winkler 2021). This finding is in line with the increase in market size across GVC taxonomy groups (figure 4A.15, right side). While Mexico shows the largest market for manufactured goods across the sample, even in line with countries specializing in innovative GVC tasks, its backward GVC participation is much higher and forward participation much lower, reflecting its limited capacity to produce inputs domestically that are used in its own or its partners' export production. A region's market size, as proxied by its gross domestic product (GDP), is also positively associated with GVC participation across Mexican regions (table 4A.3).

Proximity to the United States Has Fostered GVC Participation, but Not in Remote States

Longer geographical distances to the major GVC hubs—China, Germany, and the United States—have a strong negative impact on both backward and forward GVC participation (Fernandes, Kee, and Winkler 2021). Remote location can affect GVC participation, as economies that are closer to GVC hubs are more likely to be part of manufacturing GVCs, while countries facing longer distances tend to specialize in commodities (figure 4A.15, left side). Countries specializing in advanced manufacturing and services or innovative GVCs, by contrast, show a lower geographical distance to the GVC hubs.

However, strong regional value chain integration can offset larger geographical distances to other GVC hubs. Mexico, Malaysia, and Thailand show a larger average geographical distance to China, Germany, and the United States, respectively, than Poland and Turkey. However, Mexico, Malaysia, and Thailand benefit from short geographical distances to regional value chain hubs. Mexico's dependence on the United States has been documented earlier in this chapter; Malaysia and Thailand are more strongly integrated into East Asian value chains.

Mexico's integration into the North American value chains should not mask the fact that within Mexico geography strongly matters. Mexican states that are closer to the United States tend to have higher GVC participation indexes in manufacturing sectors (figure 4A.16). Notable examples of such states are Nuevo León, Coahuila de Zaragoza, and Baja California. By contrast, remote states, such as Campeche, Quintana Roo, Yucatán, Oaxaca, and Guerero, have significantly lower shares of GVC firms.

Quality of Institutions: Mexico Managed to Attract Foreign Direct Investment and Increase Backward GVC Participation Despite Its Lower Political Stability

Institutional quality matters for a country's type of GVC participation. It also plays an important role in foreign direct investment (FDI), which often acts as a catalyst for GVC entry. Upgrading along the GVC taxonomy was thus associated with higher political stability and FDI inflows over 2006–15 (figure 4A.17). In addition, the type of FDI differs along GVC taxonomy groups, with resource-seeking FDI being more important for countries specializing in commodities, while efficiency-seeking FDI becomes more relevant for countries participating in limited manufacturing GVCs. Asset-seeking FDI matters more strongly for countries engaging in innovative GVC tasks.

Mexico managed to attract high FDI inflows despite lagging in political stability[54] behind the average country in advanced manufacturing and services GVCs. Average political stability in Mexico was behind Poland and Malaysia over 2006–15 but higher than in Thailand and Turkey (figure 4A.17, right axis). Nonetheless, Mexico attracted the largest FDI inflows among the comparator countries over the same period, which was likely driven by efficiency-seeking FDI and characterized by high backward GVC participation.

The positive association between FDI and GVC participation in Mexico can be confirmed across Mexico's states and sectors. Mexican states that absorb more FDI tend to be more deeply integrated into GVCs (figure 4A.18). Average FDI inflows across Mexican states over 2015–19 were positively linked to their share of GVC participants in manufacturing. The bivariate correlation of about 40 percent rises to 70 percent when excluding Mexico City. At the sector level, the positive association

between FDI and GVC participation in Mexico can be confirmed, which in turn is linked to higher labor productivity. Cumulated FDI flows between 1995 and 2015 across sectors were positively correlated with both backward GVC participation and labor productivity (figure 4A.19, panel a).

Policy Recommendations

Mexico exhibits many favorable conditions, but also faces several bottlenecks in its type of GVC participation. The previous analysis suggests that Mexico's participation in advanced manufacturing and services GVCs has been driven by its availability of low-cost labor, large market for manufactured goods, close proximity to the United States, and large FDI inflows. This is despite the fact that Mexico shows a lower level of political stability relative to comparator countries. However, the analysis also pointed out Mexico's little progress in economic upgrading (including in productivity growth), which was also manifested in low forward GVC participation, high sectoral concentration in manufacturing, and lack of inclusion of many domestic firms, sectors, and regions in GVCs.

Choosing the right policies can shape each of the fundamental determinants and foster upgrading and productivity through GVC participation in Mexico, including through increased forward participation. Fostering GVC upgrading and productivity will require an emphasis on skills upgrading and innovation to shape factor endowments. Overcoming the remoteness of lagging regions by improving connectivity can promote GVC participation, because trade in parts and components is highly sensitive to logistics performance and uncertainty in bilateral international—but also domestic—transport times. Optimizing the use of trade policy tools can further expand effective market size and promote participation in GVCs. Improving institutional quality, including through engaging in deep trade agreements, enforcing legal and regulatory frameworks, implementing harmonized customs procedures, and setting rules on intellectual property rights, can increase GVC participation (World Bank 2020).

Mexican states vary in their GVC participation intensity, and this variation is associated with fundamental factors such as labor endowment, market size, geography, and the quality of institutions (table 4A.3). The impact of each of these factors on GVC participation can be influenced by policy measures that are implemented at the national and subnational levels. The following subsections discuss in more detail some of the most important policy priorities.

Emphasize Innovation and Skills Upgrading

Innovation and skills upgrading can shape Mexico's skill endowments and foster GVC upgrading. Across Mexico's sectors, the analysis finds a positive association between expenditure on R&D and GVC participation as well as labor productivity. Sectors that are more integrated into GVCs invest more in R&D, which, in turn, is positively correlated with labor productivity (figure 4A.20). A cross-country econometric analysis covering 50 countries and 23 sectors over 2005–15 finds that lower unit labor costs and higher expenditures on R&D as a percentage of GDP increase the gains in value added from forward GVC participation (Constantinescu and Winkler 2020). Unit labor costs do not necessarily equal low wages; rather, they can reflect high labor productivity, which, in turn, can be fostered by skills development.

However, Mexico trails other countries in R&D intensity, highly-skilled labor force, and quality of education. While Mexico's unit labor costs are on par with other countries, controlling for population, income per capita, and taxonomy group shows a significantly lower R&D intensity (figure 4A.21). However, the country does not differ significantly in terms of payments and spending on intellectual property. In addition, engaging in R&D and using foreign technology require the necessary worker skills, but Mexico shows a significantly lower share of high-skilled workers compared with the other countries in the sample (figure 4A.21). Mexico's share of high-skilled workers in 2017 was 19 percent, compared with 38 percent in Poland, 26 percent in Malaysia, and 20 percent in Turkey. Only Thailand, among the four peers, shows a lower share of 14 percent (International Labour Organization's Labor Force Statistics). Similarly, the quality of education in Mexico significantly lags the rest of the country sample (by more than one standard deviation), controlling for income, population, and taxonomy group (figure 4A.21). While labor market flexibility also matters for GVC upgrading through forward participation (figure 4A.21), Mexico does not differ from the other countries.

Although regional value requirements and higher minimum wages as part of the USMCA could lead to

disruptions in the short run, these requirements may foster Mexico's upgrading to more sophisticated production processes in the long run. On the one hand, it would be expected that the large increase in the minimum wage requirement (from an average of US$3.5 to US$16 per hour) would significantly reduce the benefits from low-cost assembling processes and speed up the upgrading toward higher value-added functions carried out in Mexico and more sophisticated processes used in export production. On the other hand, higher regional value shares could incentivize lead firms to source from Mexican suppliers. These opportunities of GVC upgrading critically depend on the quality of the workforce, the competitiveness of local suppliers, and engagement in innovation.

Liberalize Services Trade More Widely and Increase Technical Standards

Liberal trade policy matters for GVC upgrading, including in Mexico, as it enlarges effective market size (World Bank 2020). Mexico shows a more liberal trade policy than the other countries, measured by import tariffs and the overall Services Trade Restrictiveness Index, even when controlling for GDP per capita, country size, and taxonomy group (figure 4A.22). Mexico has applied one of the lowest tariff rates on manufactured products among its comparator countries over the past decade, moving between 1 and 4 percent (Constantinescu and Winkler 2020). Mexico's low Services Trade Restrictiveness Index matters given the country's stong reliance on foreign services inputs. Mexico has also signed more preferential trade agreement provisions and has more preferential trade area partners than the rest of the country sample (figure 4A.22).

However, Mexico's restrictiveness in selected service sectors is higher and its technical standards are lower. Compared with other countries, Mexico's transport and telecommunication services trade is more restrictive (figure 4A.22). Furthermore, while a higher percentage of imports affected by sanitary and phytosanitary standards is associated with lower gains, a higher percentage of imports affected by technical barriers to trade is linked to higher value-added gains. The latter finding seems to reflect technical standards applied to imports, rather than true "barriers." Indeed, 39 percent of imports are affected by technical barriers to trade in Mexico, compared with 57 percent in Malaysia and 92 percent in Poland, implying that there is room to improve technical standards in Mexico (Constantinescu and Winkler 2020).

Improve Logistics Performance and the Density of Infrastructure

To foster GVC upgrading, improving connectivity and the density of infrastructure are important policy priorities that would mediate disadvantages in geographical distance. Promoting connectivity and improving the quality of infrastructure touch on several dimensions: securing the flow and lowering the costs of inputs and outputs, increasing speed, and reducing uncertainty. Therefore, better connectivity and infrastructure can not only faciliate GVC participation, but also could help link more domestic regions and suppliers to GVCs.

Exporting firms in Mexico show an average distance to ports and airports that is more than 10 times as high relative to importing firms, which points to underinvestment in remote regions. According to the Logistics Performance Index 2018, the average distance of exports to ports and airports in Mexico is 3,500 kilometers, reflecting the country's large size and putting exporting firms at a major disadvantage compared with those in the comparator countries. If domestic inputs have to travel similar distances as the average exports, GVC firms are better off relying on imported inputs, which only have an average distance of 300 kilometers from the port/airport (figure 4A.23). In particular, it is crucial to ensure that good infrastructure not only benefits firms in export processing zones or those close to the U.S. border, but also extends to more remote areas behind the border. Indeed, Mexican states that are more integrated into GVCs tend to have denser railway networks (table 4A.3).

Mexico also has room to improve its logistics performance. Mexico showed the lowest international logistics performance among its comparator countries (figure 4A.24, left panel). A closer look at different aspects of logistics performance (figure 4A.24, right panel) reveals weaknesses in all major areas, in particular the quality of trade and transport infrastructure (infrastructure) and the competence and quality of logistics services—trucking, forwarding, and customs brokerage (logistics quality).

Mexico's cost to import following documentary compliance is significantly higher than in other countries.

The results from an econometric model for 50 countries and 23 sectors suggest a positive role for lower costs to import in increasing the positive relationship between forward GVC participation and domestic value added (Constantinescu and Winkler 2020). The cost to import a container following documentary compliance is US$100 in Mexico, compared with less than US$60 in Malaysia, Turkey, and Thailand and US$0 in Poland. Mexico also shows one of the highest import times spent complying with documents (18 days) and at the border (44 days), compared with only 1 and 0 days in Poland or 2 and 7 days in Turkey, respectively. Mexico's high reliance on imported inputs for export production despite its higher import costs and times could reflect even larger disadvantages behind the border that make it worth paying the import "premium." Mexico performs slightly better on the cost and time to export.

Several infrastructure projects are currently underway that promise to improve connectivity and therefore the development of international and domestic GVC linkages. They include the Interoceanic Corridor Project which will connect the Atlantic and Pacific oceans between the states of Oaxaca and Veracruz; the Isthmus Project of Tehuantepec which will compete with the Panama Canal as a Atlantic-Pacific economic and transit zone; and the Mayan Train which will connect the states of Yucatan, Quintana Roo, Campeche, Chiapas, and Tabasco.

Strengthen the Quality of Institutions

A business-friendly environment and the quality of institutions matter for FDI attraction and GVC participation globally and across Mexican states. The ability of individuals and firms to move their resources in and out of specific activities both internally and across the country's borders, as captured by investment freedom, matters for GVC upgrading, where Mexico has outperformed other countries (Constantinescu and Winkler 2020). The business environment and quality of institutions are also key enablers of FDI and GVCs at the subnational level. Integrated Mexican states show relatively shorter times to start a business and obtain construction permits and a higher quality of judicial processes (table 4A.3).

However, Mexico still has room to improve on certain business-related policy areas, including protecting minority investors and contract enforcement. Among the different Doing Business indicators, protection of minority investors shows the second lowest score in Mexico (figure 4A.25, left panel), where it is behind Malaysia, Poland, Thailand, and Turkey (figure 4A.25, right panel). A closer look at the sub-indicators of the Doing Business investor protection indicator reveals weaknesses across most areas, in particular in corporate transparency and ease of shareholder lawsuits. Another area related to GVC participation and FDI is Mexico's relatively weak contract enforcement (figure 4A.25, left panel). To build linkages to domestic companies, foreign investors need to have confidence that they are protected and that the local contract enforcement mechanisms in the country function. A closer look at the subcomponents of the Doing Business contract enforcement indicator shows that the costs in Mexico are among the highest, while the quality of judicial processes is among the lowest.

The costs in Mexico are among the highest across all the major categories—starting a business, construction permits, electricity, registering property, paying taxes, enforcing contracts, and resolving insolvency. High costs of doing business may incentivize foreign investors to prefer cheaper imported inputs to domestic inputs (Constantinescu and Winkler 2020). Improving the quality of institutions could therefore not only lower the cost of doing business, but also help develop linkages to domestic suppliers and regions, so that businesses would benefit more widely from GVC participation.

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Endnotes

47 Backward participation captures the foreign value added embodied in gross exports, while forward participation captures the domestic value added embodied in gross exports that the direct trade partners use in their own exports (see box 4.1 for more details on these measures).

48 Backward and forward international linkages are associated with GVCs because they reflect the back-and-forth movement of intermediates among GVC firms located in different countries and specialized in specific stages rather than the entire process of the production of goods (UNCTAD 2013).

49 The chapter refers to annex figures and tables that are provided in online annex 4A.

50 There is marked variation at the sector level. For example, in motor vehicles and electrical equipment, Mexico's labor productivity is higher than predicted, while in computers and electronics, it is significantly lower.

51 See section 4A.1, in annex 4A, for the econometric model, drawing on Stolzenburg, Taglioni, and Winkler (2019).

52 The analysis excludes agriculture, forestry, fishing, and hunting; mining, quarrying, and oil and gas extraction; utilities; and construction.

53 Evidence for Vietnam reveals a similar productivity gap between participants and nonparticipants in GVCs, while it reaches almost 80 percent for Ethiopia and 40 percent for a large set of developing countries (World Bank 2020).

54 Based on the Political Stability Index from the World Governance Indicators.

PHOTO BY: ANTONIO OJEDA/SHUTTERSTOCK

Financial Constraints and Misallocation[v]

CHAPTER 5

Introduction

Access to finance, both short-term and long-term finance, is crucial for firm growth. Access to short-term finance plays a key role in expanding scale by allowing firms to leverage and cover the costs of working capital. Access to long-term finance, in turn, is crucial for capital investment, information and communications technology investment, research and development (R&D), and innovation, which build firm capacity to grow in the long term. Furthermore, depending on the firms' characteristics and the level of financial market development, access to finance can help firms to weather demand shocks such as during the Great Recession or the recent COVID-19 crisis (box 5.1), by alleviating short-term cash flow constraints. Overall, the literature suggests that financial development is a key driver of firms' growth and performance (Rajan and Zingales 1998).

In a context where firms have different levels of productivity, what matters is not only overall access to credit, but also how credit is allocated across firms. As Moll (2014) points out, in a country with well-functioning financial markets, more productive firms are more likely to obtain credit; therefore, improving capital allocation can lead directly to increased average productivity. However, credit markets are imperfect due to asymmetric information, and especially in countries with a lower level of financial development, credit allocation can become a factor that leads to misallocation of resources and lower the overall productivity in the economy. As Haltiwanger, Jarmin, and Miranda (2013) argue, credit market imperfections are especially important because they prevent the flow of credit toward more dynamic and high-potential businesses (typically younger ones). As chapter 3 of this study explains, the theoretical and empirical evidence has proved that misallocation leads to significant reductions in total factor productivity (TFP) (see Hsieh and Klenow (2009) for evidence on India and China).

In this sense, lack of access to finance can affect an economy's long-term TFP growth directly, by lowering firms' investments, and indirectly, by generating misallocation. An imperfect financial system, which does not allow firms to access finance to expand their scale, invest in more modern machinery, or pursue innovation, directly reduces the potential of firms to grow. That is, it directly affects TFP by limiting the "within-firm" component of productivity growth. Furthermore, a financial system that does not function well may not allocate resources toward the most productive firms, leading to capital misallocation and indirectly reducing overall productivity by limiting the "between-firm" component of productivity growth.

This chapter first provides an overview of financial access for firms in Mexico and how financial resources are allocated across heterogeneous firms. On the one hand, smaller firms exhibit lower access to financing and face both higher average interest rates and higher dispersion. Overall, smaller firms and young and medium-size firms tend to be more financially constrained. On the other hand, foreign-owned firms and exporters tend to be less financially constrained, which could be associated with greater access to international financial markets. Surprisingly, firms that pursue innovation tend to face more credit constraints. Still, this result is consistent with previous evidence for other countries that R&D tends to be financially constrained, especially in the case of small firms (Hall 2010). Firms that

v The chapter was led by Leonardo Iacovone and Mariana Pereira-López, with excellent research support from Luis Alejandro Aguilar Luna. The team appreciates the generous comments and suggestions by Tatiana Didier.

Box 5.1 Financial Frictions and COVID-19

The COVID-19 crisis has affected firms through various direct and indirect channels, starting with the lockdown measures, the demand shocks on durable goods, as well as indirect effects from suppressed demand in other sectors and supply shocks on firms due to the availability of inputs, especially in the case of imported inputs.

In contexts of crisis, access to finance plays a major role as financial shocks have at least two potential effects: (1) related to the structural characteristics of the firm in the presence of a credit crunch (long term), and (2) related to financial needs in terms of working capital (short term). Some firms may even experience both effects at the same time.

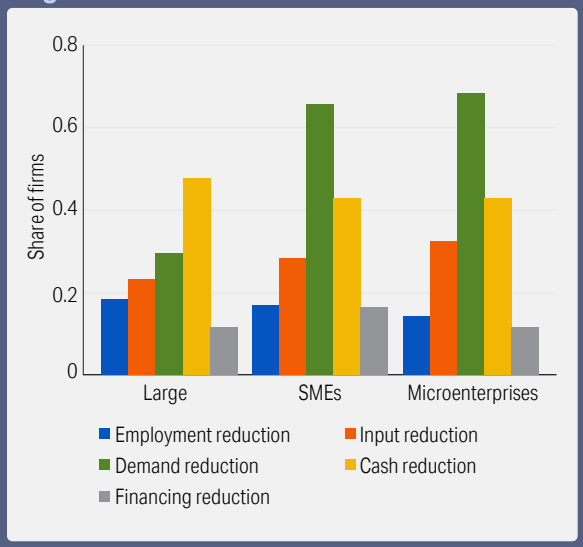
On the first (long-term) effect, in the case of Mexico, where credit was already scarce, firms with structural characteristics that yielded a low probability of receiving credit, but that still had access as reported in the Economic Census, are probably suffering from credit constraints as a result of a credit crunch and a subsequent credit rationing.

On the second (short-term) effect, as firms still need to cover their fixed costs, they face liquidity constraints, especially in the case of small and medium-size enterprises (SMEs), which have suffered significant financial distress over the past year (Apedo-Amah et al. 2020; Bartik et al. 2020).

The COVID-19 crisis differs substantially from the Great Recession. The 2007–09 crisis was a financial crisis, which by definition disproportionally hurt firms that depended more on external finance, with few collateralizable assets and limited access to trade credit. In contrast, the credit crunch from the COVID-19 crisis is a second-order effect, a consequence of other demand, supply, indirect, and uncertainty shocks.

According to the 2014 Economic Census in Mexico, financially vulnerable firms account for 4 percent of employment and 1.7 percent of the national wage bill, and most of the firms in this group are vulnerable in the short term.

Figure B5.1.1 Share of Firms That Faced Negative Shocks



Source: Calculations using data from the first wave of the Survey on the Economic Impact Generated by COVID-19 on Enterprises, National Institute of Statistics and Geography.

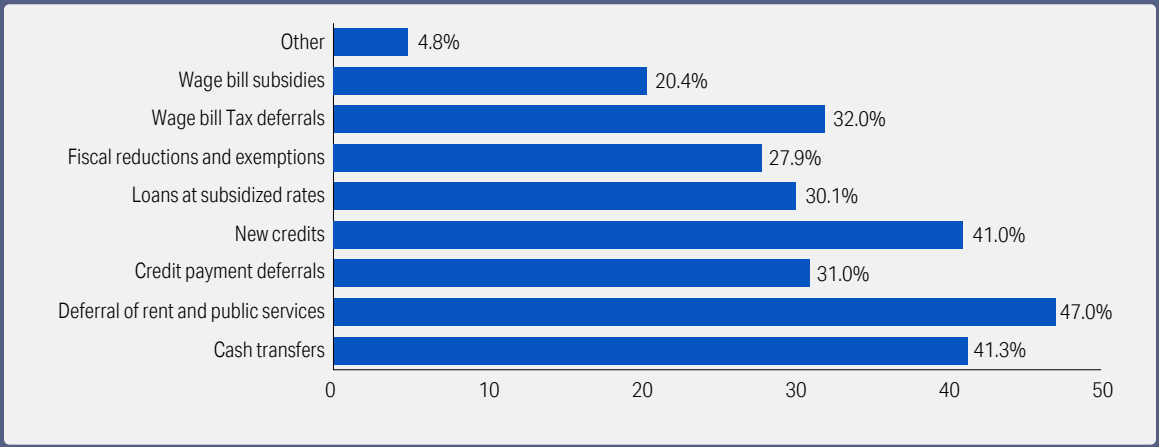
The first wave of the Survey on the Economic Impact Generated by COVID-19 on Enterprises (ECOVID-IE 2020) is used to investigate the short-term impacts of the crisis on firm financing. More than 40 percent of the firms in each size category reported having reductions in liquidity. Furthermore, almost 20 percent of the SMEs experienced reduced access to financing, while a slightly lower proportion of large firms and microenterprises experienced this kind of reduction (figure B5.1.1).

Among the firms that participated in the ECOVID-IE 2020, 92 percent reported not having received any kind of support, and only 7 percent had support from the government. The main government support mechanism

for firms in Mexico was 25,000 pesos of credits, payable over a three-year period, which was basically aimed at microenterprises.

As reported by firms, at least 40 percent would require new credits, a similar proportion would need cash transfers, and around 30 percent would need credit payment deferrals and loans at subsidized rates (figure B5.1.2).

Figure B5.1.2 Type of Support Needed (% of firms)



Source: Calculations using data from the first wave of the Survey on the Economic Impact Generated by COVID-19 on Enterprises, National Institute of Statistics and Geography.

innovate are not riskier; they tend to be less likely to default. They are more profitable and have a higher level of tangibility, measured as assets over sales. However, their share of collateralizable assets tends to be lower, which in addition to the distinctive characteristics of innovation investment, could be a factor causing their financial constraints.

Second, the chapter explores the heterogeneity among firms according to their characteristics. The findings indicate that for the same level of productivity, younger firms tend to be more financially constrained and exhibit greater misallocation. This could be explained by the fact that these types of firms have not yet had time to build a reputation or the required network that would allow them to overcome the credit restrictions derived from existing information asymmetries.

Third, the chapter analyzes the dynamics of the relationship between financial access and performance, by accounting for the potential endogeneity of financial access. The findings show that better financial access is associated with larger increases in TFP, especially in the case of younger firms. Moreover, access to finance is positively correlated with larger firms and a higher intensity of churning. As explained by Peters (2020), higher churning intensity can mitigate misallocation problems. However, most of the effects due to churning come from entry and not from exit, which would be desirable if financing went to the most productive firms.

Finally, the chapter analyzes the relationship between establishment-level productivity and access to finance. It finds strong evidence of misallocation as higher productivity is associated with lower access to finance. However, it is encouraging that among firms that do receive credit, interest rates are lower for the more productive firms, suggesting that the problem is more at the "extensive" margin of access to finance rather than at the "intensive" margin. The analysis of the different sources of misallocation indicates that financial misallocation is driven mainly by banks and family and friends, and not by equity financing.

The results show that one of Mexico's key allocative efficiency problems derives from the inefficient allocation of banking finance toward less productive firms. Whited and Zhao (2021) find similar financial misallocation problems in China, pointing to a widespread problem across developing countries. Previous studies for Mexico identify a set of business environment conditions, such as a high level of concentration in the banking sector, as well as poor contract enforcement, as potential causes of financial misallocation (Levy 2018; Busso, Levy, and Torres 2019).

How Much Access to Finance Do Mexican Firms Have?

Mexico falls well behind other countries in terms of the overall level of private credit as a share of gross domestic product (GDP) (figure 5A.1, panel a).[55] Taking the United States as the frontier, Mexico's level of private credit represents one-fifth the level observed in the United States and one-fourth the average level in Organisation for Economic Co-operation and Development countries. These figures point to the fact that initially, credit tends to be relatively scarce in Mexico, as pointed out by Levy (2018). Mexico has a much lower level of financial development (credit/GDP) than countries with a similar level of GDP per capita (figure 5A.1, panel b).

According to López (2017), in a counterfactual exercise, if Mexico's credit-to-GDP ratio were similar to that of Chile, Mexico would be able to increase TFP by around 9 percent. This would represent around 20 percent of the observed gap against the frontier (the United States, as calculated by Caselli (2005)).

On average, around 22 percent of firms with more than five employees in Mexico have access to finance (National Survey of Enterprise Financing 2018). Microenterprises mainly drive down this average as these are the most prevalent type of firms in Mexico[56] and only 14 percent of them have access to finance. By contrast, figure 5.1, panel a, shows that around 40 percent of medium-size and large firms have access to finance.

The main source of credit for firms of all sizes is banks, followed by suppliers (figure 5.1, panel b). However, banks account for a slightly lower share of total credit for microenterprises, which obtain an important proportion of their finance from suppliers or family and friends. This may be a reflection that these firms might have to rely on alternative sources, rather than traditional finance, as they find it difficult to access loans from banks.

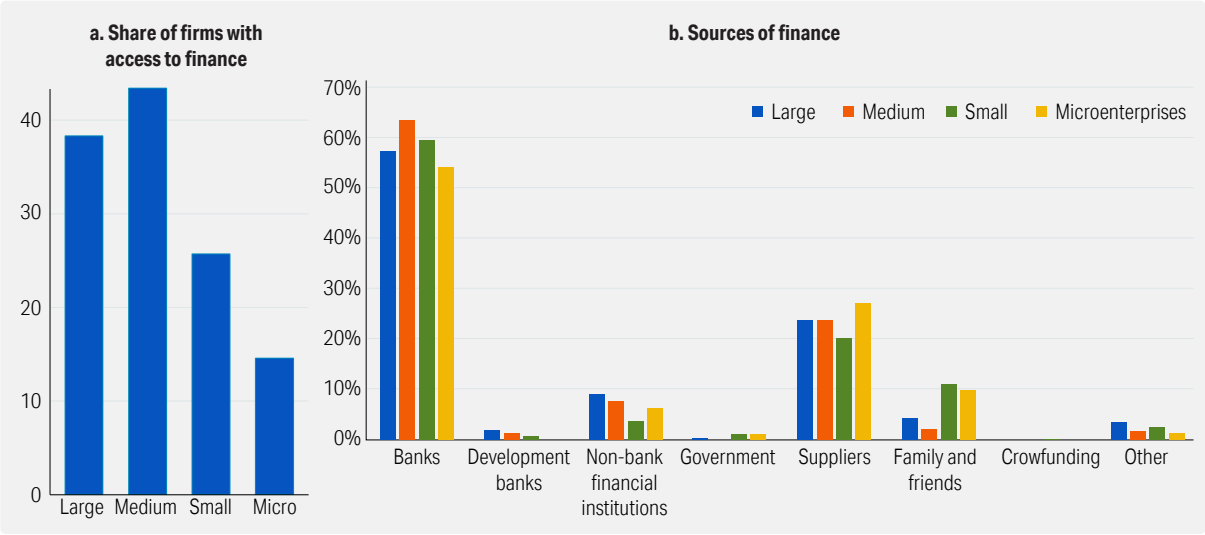
In addition to the heterogeneity by firm size observed in access to finance, credit conditions vary according to firm size (figure 5A.2). Small firms and microenterprises face higher average interest rates compared with those faced by larger firms. Moreover, there is large variation among smaller firms in access to finance from banks and other financial institutions as dispersion tends to be higher for small firms and microenterprises. Compared with other financing sources, credit from suppliers has a much lower average interest rate. Suppliers are an important source of short-term credit for financially constrained firms, as suppliers can more easily overcome the risks associated with information asymmetries and moral hazard, thanks to their long-term and well-established relationships with their clients (Love 2011).

This section confirms that firms face important financial constraints and there is significant unsatisfied demand for credit. According to the National Survey on Productivity and Competitiveness of Micro, Small, and Medium Enterprises (ENAPROCE), in 2017, 26 percent of small and medium-size enterprises (SMEs) and large firms reported needing to invest but being unable to do so due to financial constraints. This untapped demand for finance is larger for smaller firms as only 16 percent of large firms reported having this problem. Smaller firms tend to be more constrained. A small firm has a 9 percent higher probability of being in a situation where it needs to invest but cannot because of lack of access to finance. A similar problem emerges for younger firms, but this result is driven mainly by the fact that younger firms tend to be smaller (see figure 5A.3). Beyond smaller firms, another group of firms that appear to be especially constrained are medium-size startups.[57]

Exporters and foreign-owned firms tend to have fewer binding constraints to access to finance. As shown in table 5A.2, foreign-owned firms are 13 percent less likely to find themselves in a situation of needing to invest but being unable to do so for lack of finance. Exporters are similar but only 2 percent less likely to be financially constrained. These results can be easily explained by the fact that foreign-owned firms have higher liquidity due to their operations in other countries. Additionally, they have access to foreign financial markets, which increases their alternatives for financial access. On exporters, the literature[58] points out that typically exporting firms are required to incur significant costs to enter export markets and therefore must already have enough liquidity to be able to export. Thus, they have already solved the problem of constraints to access to finance (Chaney 2016). Furthermore, the relationships of exporting firms with other firms abroad provide additional potential sources of financing that reduce their probability of being financially constrained.

An unexpected result is that firms that innovate and have a higher level of technological capabilities tend

Figure 5.1 Access to Finance in Mexico



Source: Calculations using data from the National Survey of Enterprise Financing 2018.
Note: The survey only includes firms with more than five employees. Therefore, microenterprises are defined as having between six and 10 employees. Panel b was constructed using the total the number of credits (when firms chose more than one option for credits in 2018).

to be more financially constrained. When financial markets are not sufficiently developed, innovative and more technology-intensive sectors might exhibit higher financial constraints as traditional financial institutions may be unable to assess the risks for these firms. This could be driven by the fact that financing innovative and more technologically sophisticated firms is harder for banks as they cannot assess these risks properly (or have few incentives to invest in developing capabilities to assess these risks). Indeed, according to the results for firms in Mexico, firms that pursue innovation are not riskier; instead, when they obtain credit, they have a lower probability of default. They are also more profitable and tend to have higher tangibility, which is measured by total assets over sales. However, firms that innovate tend to have fewer collateralizable assets compared with firms that do not innovate. Therefore, it appears that innovative firms are not riskier, but as banks are not able to assess the risk, they might require a higher share of collateralizable assets, which these firms do not have. This result suggests that it may be important to think of specific types of financial products for more technologically sophisticated firms and those that are likely to innovate.

An additional and interesting result that is further explored in chapter 6 is management's role in firm-level capability, which can potentially mitigate the constraints that firms with higher technological capabilities face. As shown in table 5A.2, firms that have high technological capabilities and are well managed tend to be less financially constrained. Firms that apply all the structured management practices (management score of one) could almost offset the access to finance "penalty" associated with being technologically sophisticated (as measured by the technological capability score).

Is There a Problem with Collateral?

Collateral plays a critical role in determining access to finance in financial markets that are not well developed. When financial markets are not well developed, problems like moral hazard and adverse selection become more pronounced and, therefore, lenders require collateral to mitigate their risks. Furthermore, in industries that hold higher shares of tangible assets, a higher level of growth and lower volatility are observed (Iacovone et al. 2019; Braun 2005; Raddatz 2006; Manova 2013; and Hur, Raj, and Riyanto 2006). How much of a problem is collateral in Mexico?

Collateral appears to be more of a problem among medium-size and larger firms. For these firms, indebtedness, followed by collateral, appear to be the main reasons limiting access to finance. For micro and small

firms, bad credit history and lack of credit history are the main reasons for not being able to access credit (figure 5A.4).

Similarly, collateral appears to be an important problem for older firms and firms with higher levels of indebtedness or bad credit histories. The main reasons preventing younger firms from obtaining credit are the lack of credit history and evidence of revenues, as well as the lack of a guarantor—all reasons that matter more than collateral.

Firms that have more tangible assets tend to be less likely to be financially constrained. Firms that have a higher share of real estate assets, which can be easily used as collateral, have a lower probability of being financially constrained even after the analysis controls for different firm-level characteristics, such as size, age, sector, and location (table 5A.4).

Under the hypothesis of lack of collateral as a crucial reason behind the lack of credit, constrained firms might have incentives to use any credit they can obtain to purchase collateralizable assets that could eventually lead them to obtain more credit. Figure 5A.5 exhibits the main ways in which firms use credit. As shown in panel a, regardless of size, the main use of credit is to purchase inputs. Smaller firms, which tend to be more financially constrained, do not show a higher proportion of purchases of real estate. A higher proportion of large firms use their credit for real estate, purchasing machinery, and expansion activities. Young firms exhibit a higher proportion of real estate purchases than older firms (panel b).

Further, the results in table 5A.5 show that firms that were financially constrained in the initial period appear to have a lower share of collateralizable assets (real estate) three years later. The opposite situation occurs among firms that had access to finance in the earlier period (2014)—they increase their share of investment in real estate assets (collateral assets). They also exhibit a higher level of tangibility, measured as assets over revenues, in the final period. The findings show that even after controlling for various firm characteristics, including financial constraints, access to credit leads to greater investment in real estate assets. However, in general, real estate, which could later be used as collateral, does not appear to be the preferred use of credit, although the share of real estate increases slightly with access to credit.

Is a Higher Level of Access to Financing Correlated with Improved Performance over Time?

This section analyzes the role of financing in performance, using two complementary approaches that rely on two different data sets. First, employing the ENAPROCE panel for 2014–17, the section analyzes how access to finance leads to improved performance in the future (measured by TFP).[59] As Figure 5.2 and table 5A.6 show, firms with access to finance in 2014 increased their capital and improved their labor productivity and TFP between 2014 and 2017. This is true for both the extensive and intensive margins regardless of which measure of access to finance is used.[60] It is important to stress that in a world where firms operate optimally and there are no market failures, increasing access to finance should not lead to improvement in TFP as firms should already be in equilibrium. However, in a world where firms are financially constrained and unable to operate optimally because of these constraints, expanding access to finance can lead to increasing TFP. Therefore, finding that expanding access to finance leads to higher TFP is a sign of the presence of financial constraints.

A further sign that financial constraints exist and are binding is that the effect of access to finance on future TFP is higher for younger firms (table 5A.7). The result that access to capital may have higher returns for certain firms is consistent with McKenzie and Woodruff's (2008) finding of sizable returns to access to capital for micro firms.

Taking a much longer time horizon, the impact of access to finance is assessed over 10 years (2009–19), relying on Mexico's Economic Census data. Using a panel that relies on data from three Economic Censuses, this section analyzes the impact of expanding local access to finance, or local financial development, measured by the number of automated teller machines or bank branches per 10,000 inhabitants at the municipal level. The section adopts a difference-in-differences strategy based on the assumption that firms in different sectors have different levels of reliance on finance, so the impact of financial development should be stronger for firms in sectors that rely more heavily on finance (Rajan and Zingales 1998; Rioja, Rios-Avila, and Valev 2017).[61]

The findings show that financial development at the municipal level leads to higher turnover. Figure 5A.6 and table 5A.8 present the results of assessing the impact of financial development on business dynamism, measured as turnover (the sum of the entry and exit rates). The findings show that expanding access to finance increases local business dynamism. This is an important result because, as suggested by Peters (2020), increases in churning intensity are typically associated with reductions in misallocation. However, the results are mainly driven by higher entry, as shown in table 5A.9.

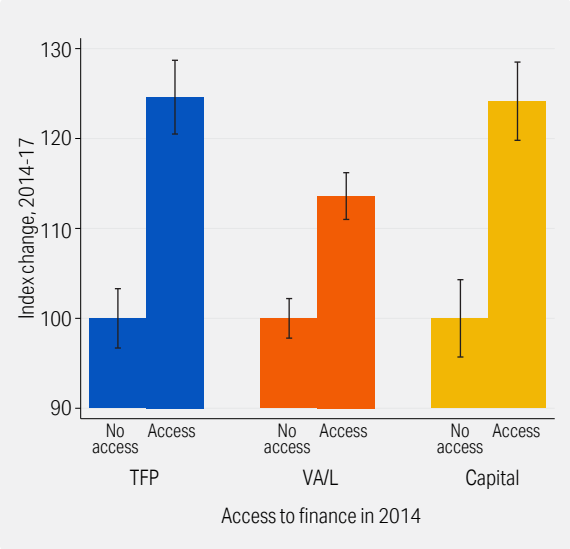
Local financial development leads to larger business size and higher productivity levels. To extend the analysis beyond the manufacturing sector, an alternative measure of dependency on finance is built using data from ENAPROCE.[62] Once again, the key identifying assumption, following Rajan and Zingales (1998), is that financial development disproportionally impacts firms in sectors that are more dependent on finance. As shown in the first two columns in table 5A.10, exposure to financial access, measured by the interaction of financial dependence and local financial development, is associated with larger establishment size.[63] This is important as it means that access to finance leads to firms' growth. Similarly, the results in the last two columns in table 5A.10 show that exposure to greater financial access leads to higher TFP, which is again a strong sign that firms in Mexico tend to be financially constrained.

In conclusion, the results suggest that access to finance is a crucial driver of firms' growth in Mexico, and that firms face significant financial constraints, which limit their potential to grow.

Is There Heterogeneity in Investment Patterns According to the Different Types of Sources of Finance?

This section analyzes whether investment patterns are affected by the sources of finance to which firms have access. Brown, Fazzari, and Petersen (2009) show that for U.S. firms, R&D is financed mainly by cash flow and stock issues, and that these effects are particularly high for young firms but not for mature ones. Building on their analysis, this section assesses whether these results hold in the case of Mexico. As shown in table 5A.11, in Mexico, R&D; investment in property, plant, and equipment; and innovation expenditures are all positively associated with having financing from banks.

Figure 5.2 Growth and Access to Finance



Source: Calculations using data from the National Survey of Enterprise Financing 2015 and 2018.
Note: The calculations control for the initial value of each variable analyzed, initial profitability, size, and age. The results are the same as those in column (1) in table 5A.6. The "No access" columns are normalized to 100. TFP = total factor productivity; VA/L = value added per worker.

The patterns of investments depending on sources of finance differ sharply between young and older firms in Mexico. First, in contrast with the findings of Brown, Fazzari, and Petersen (2009), Mexican firms that receive finance from equity tend to have lower innovation expenditure and a lower probability of innovating, compared with those that obtain financing from banks and family and friends. However, this surprising result is entirely driven by older firms. As shown in the first column in table 5A.12, young firms tend to use more equity and less credit from banks to finance expenditure in R&D. Additionally, young firms use more financing from family and friends to purchase property, plant, and equipment and less financing from banks for this activity. Second, these results are driven by smaller firms, among which greater access to equity finance is correlated with less R&D, while banking finance is correlated with more R&D (table 5A.13). These results suggest that the findings that equity finance leads to less R&D while banking finance is correlated with more R&D could also be driven by some misallocation of finance.

Access to Finance and Misallocation

In a world where financial markets work efficiently and competitively, financing would flow directly to the most productive firms, improving capital allocation and, therefore, increasing average TFP (Moll 2014). However, due to information asymmetries, risk of moral hazard, adverse selection, and lack of competition, financial markets tend to be imperfect. These market failures lead to higher search costs for financing and, therefore, as Hanson (2010) points out, may impede the flow of credit to profitable and productive business ventures, especially in the case of smaller-scale ones.

The results suggest the existence of financial misallocation in Mexico as access to finance and productivity are negatively correlated (figure 5.3, panel a). Comparing firms within a sector (at 6 digits), location (municipality), and similar size, firms that are more productive tend to have a lower probability of having access to finance.[64],[65] This is a sign that financial resources could be misallocated, as firms that are less productive are more likely to have access to finance, and vice versa, more productive firms are less likely to have access to finance. These results are robust to the use of different proxies for measuring access to finance (figure 5.3, panel b).[66]

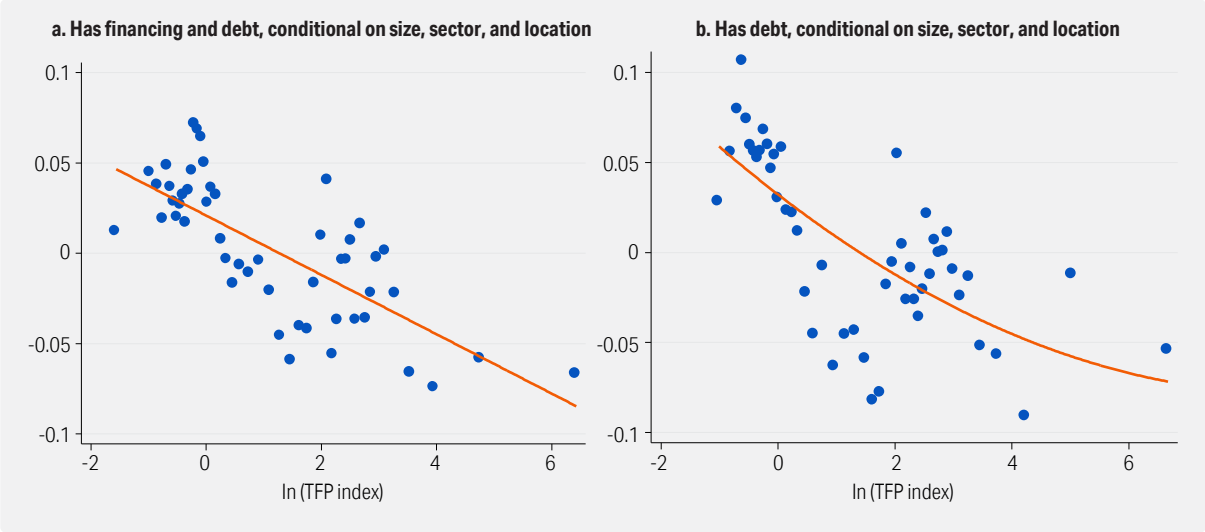
The results suggest that the imperfect functioning of financial markets could be a key driver of misallocation in Mexico. Levy (2018) also finds the existence of significant misallocation of resources in Mexico and suggests that it is driven by a business environment in which after-tax profitability is distorted by labor, social insurance, and tax provisions. The results in this chapter complement his findings, suggesting that another crucial driver of misallocation could be the financial markets. At the same time, the results are consistent with those of studies that suggest that contract enforcement could be another driver of misallocation in Mexico, as these imperfections could lead commercial banks to limit their supply of credit to a small set of "well-known" firms, not necessarily the most productive firms (Busso, Levy, and Torres 2019; Hanson 2010). More generally, the results are consistent with those of López (2017), who finds that the negative effects of credit misallocation on overall productivity in Mexico are substantial.[67] The results in this chapter are also consistent with those of Whited and Zhao (2021) for the case of China, which suggest that the problem of imperfect financial markets leading to financial misallocation could be a widespread issue in developing countries and emerging markets.

The result that access to finance is negatively correlated with productivity is robust to controls for many firm characteristics. To assess the robustness of the result that financial resources may be misallocated, the analysis adopts a regression framework that can control for many firm-level characteristics. Table 5A.14 shows that even after controlling for a large number of firm characteristics, such as age, profitability, and tangibility,[68] the negative relationship between TFP and access to finance is still significant and robust. Considering that the access to finance variable may include firms that would not accept or do not need credit, these variables are included as additional controls in column 6 in table 5A.14, and the result of the negative correlation between productivity and access to finance remains unchanged.

However, the results show that more profitable firms tend to have greater access to finance. In table 5A.14, columns (7) to (14), there is a positive relationship between profitability and financial access, after controlling for various firm-level characteristics, including TFP. This is consistent with the idea that financial institutions focus on profitability as it may be easier to observe.[69]

Beyond profitability, another aspect that is associated with greater access to finance is tangibility, or the existence of collateralizable assets, which is a further sign of imperfect financial markets driven by informational problems. Consistent with an environment where information and contract enforcement problems are pervasive, the analysis finds that collateral plays a key role in allowing firms to access finance in Mexico. In table 5A.14, columns (11) to (14) show that a higher level of tangibility, measured by the ratio of assets over sales, is associated with a higher probability of access to finance. This result is consistent with a large literature suggesting that in less developed financial markets, collateral becomes crucial as industries that tend to have more tangible assets grow relatively faster, exhibit lower volatility, and export more (Iacovone et al. 2019; Braun 2005; Raddatz 2006; Manova 2013; Hur, Raj, and Riyanto 2006). This is explained by the fact that a higher level of collateral may be required in contexts where there is a higher risk of adverse selection and moral hazard.

Figure 5.3 Firms with Financing and Debt, Conditional on Size, Sector, and Location, versus Productivity



Source: Calculations using data from the National Survey on Productivity and Competitiveness of Micro, Small, and Medium Enterprises 2015 and 2018, National Institute of Statistics and Geography.

Note: Values are weighted using survey weights. The turning point for debt is at ln(TFP index) = 8.6. Less than 1 percent of the firms in the sample have TFP above the turning point. TFP = total factor productivity.

Too much debt could be another barrier to accessing finance, but this is a problem for very few firms in Mexico. Is it the case that access to finance could be constrained by indebtedness above a certain level? To answer this question, the analysis uses the correlation between access to finance and indebtedness, controlling for firm-level characteristics (sector, size, and location). As shown in figure 5A.7, there is indeed an inverted U-shaped relationship. The likelihood of accessing finance increases up to a certain level; beyond that level, firms with higher levels of debt become less likely to have access to finance. Is this a problem in the context of Mexico? This turning point appears to be not very binding as less than 1 percent of the firms have such a high level of debt. This result suggests that for the majority of firms, the level of indebtedness does not appear to be a binding constraint preventing access to credit.

Once they manage to gain access to finance, more productive firms face lower interest rates. This is encouraging and suggestive that the main issue with access to finance is at the extensive margin, with financial institutions unable (or uninterested) in identifying productive firms to serve. This finding is consistent with a situation where the key market failures are driven by lack of information and capacity (or incentives) to screen new clients (figure 5A.8 and table 5A.15).

Just expanding access to finance may not lead to increased aggregate TFP in Mexico. As Levy (2018) argues, merely expanding credit under conditions of misallocation would not necessarily lead to increased productivity if financial resources were not being channeled to the most productive firms. Average productivity could even decrease due to a perverse reallocation of market shares toward less productive firms. In this context, tackling the problem of misallocation is crucial for firms to be able to realize the benefits of policies aimed at expanding access to finance in Mexico.

Heterogeneity in Misallocation?

Financial misallocation is driven mainly by two sources of finance: banks and family and friends. Digging further into the financial misallocation problem, this section analyzes whether the TFP–financial access relationship varies according to the credit source. Figure 5A.9 shows that the negative correlation between access to finance and productivity, conditional on firm characteristics (size, sector, and location), is clearly driven mainly by banks and family and friends. However, in the case of equity, the relationship between likelihood of access to finance and productivity is mildly positive. To assess the magnitude and statistical robustness of these results, table 5A.16 presents the results of a regression

that analyzes this relationship. The findings indicate that there is a negative relationship between access to finance and TFP, which is significant only for banks or family and friends; for equity, the relationship is positive or null. These results suggest that what seems to be driving the misallocation of finance is the specific characteristics of the sources of finance. In particular, the results for banks, which are the most important source of finance in Mexico, are consistent with Levy's (2018) conclusion that the level of competition in the banking sector, along with the distortions impacting the profitability of firms, is a key culprit of misallocation as it generates a bias in access to credit toward a small group of well-known firms.

Young firms appear to be disproportionally more affected by lack of access to finance. When discussing heterogeneity in access to finance, a specific focus should be on younger firms, which, as shown in chapter 3, play a crucial role in Mexico in terms of their contributions to jobs and productivity growth. In general, these firms are expected to be more financially constrained as they have often not yet built a reputation or network that could help them to obtain external credit from financial institutions. Figure 5A.10 analyzes the relationship between TFP and access to finance, focusing on startups (young firms), that is, firms that have been in operation for fewer than three years. The findings show that there are important differences between young and other firms. For the same level of TFP, young firms have a lower probability of having access to finance. However, in terms of misallocation, the pattern observed for small firms does not appear different from that for other firms.

Distinguishing across different types of sources of finance, young firms not only appear to be more constrained, but also experience a deeper level of misallocation. The next step breaks down this relationship between access to finance and productivity for younger firms (versus the rest), separating the different sources of financing. It finds that when focusing on financing from banks (figure 5A.10, panel b), younger firms experience not only lower access for the same level of productivity, but also more misallocation. Something similar occurs for funds from family and friends. However, in terms of equity, once again, a positive relationship is observed (which would indicate no misallocation), and the patterns of young and other firms are very similar. Furthermore, for highly productive firms, access is similar between startups and older firms. Table 5A.17 confirms these results in a regression framework. Younger firms have lower access to finance; however, among younger firms, it does not appear that those with lower productivity have significantly lower access to finance. Large firms have greater access to finance regardless of the source, and there is some evidence of misallocation among them.

Policy Recommendations[70]

Implement Guarantee Funds Focused on Young Firms

The main reason young firms tend to be financially constrained is that they have not been in the market long enough to build a reputation or relationships. Programs that expand access to finance in Mexico have tended to focus on firms with a longer credit history, which reduces risks for financial institutions but, at the same time, does not reduce financial constraints for startups and young firms. Furthermore, it is important to have strong monitoring under these programs as well as clear rules in terms of graduation from the program so that resources are indeed channeled to young firms that suffer from information problems. (See box 5.2 for international experiences in supporting young firms.)

Improve the Design of Guarantee Funds to Expand Access to Finance, Especially for New Clients and Innovative Firms

The design and eligibility characteristics of most of the credit programs that have been implemented with government support lead banks to provide credit to a narrow group of firms, and this may have disincentivized banks from improving their risk management systems. Establishing clear rules for guarantee programs in terms of graduation and time-bound constraints could provide the incentives for implementing better quality control and risk management practices and expand access for new clients.

Additionally, it is important to set up support for innovative activities. As is shown in chapter 6, innovation is one of the levers or characteristics associated with increases in productivity. However, as shown in this chapter, firms that pursue innovation tend to be financially constrained. This could be due to the risks associated with innovative activities. Therefore,

Box 5.2 International Experience: Innovative Mechanisms to Support Young Firms

An international example of innovative mechanisms to overcome the risks associated with investing in small and young enterprises and the resulting financial constraints these firms face is the case of the Seed Enterprise Investment Scheme (SEIS) and Enterprise Investment Scheme (EIS) in the United Kingdom (table B5.2.1).

Under these two programs, investors who purchase new shares of qualifying companies obtain generous tax breaks. The SEIS offers 50 percent tax relief per tax year to early-stage small companies, which significantly reduces the risk for investors as firms can even carry back the tax incentive. The programs further reduce the investors' risk by providing substantial loss relief via tax liabilities if the startup or young company fails.

Table B5.2.1 Eligibility for and Benefits of the Programs

SEIS		EIS	
Company eligibility	**Investors' benefits**	**Company eligibility**	**Investors' benefits**
• Not necessarily a UK company but permanently based in the UK. • If eligible, can offer £150,000 in SEIS shares to investors. • Under £200,000 in gross assets pre-money. • No more than 25 employees. • Have been trading for two years. • Must not be a member of a partnership with another company.	• 50% tax relief per tax year on investments up to £100,000, which can be carried back. • Loss relief of "at-risk" capital via tax liability (according to income tax, for example, 45%). • Capital gains tax exemption upon holding shares for three years or more.	• Not necessarily a UK company but permanently based in the UK. • Easier to qualify than SEIS. • If eligible, can offer £2,000,000 in EIS shares to investors. • Under £15 million in gross assets pre-money. • No more than 250 employees. • Must not be a member of a partnership with another company.	• 30% tax relief per tax year on investments up to £1,000,000 a year, which can be carried back. • Loss relief of "at-risk" capital via tax liability. (according to income tax for example, 45%). • Capital gains tax exemption upon holding shares for three years or more.

Sources: Peterson 2018; Global Shares 2021; SeedTribe ("SEIS/EIS Tax Break," https://www.seedtribe.com/seis-eis-tax-breaks).

The design of these programs also deals with the incentives to invest, obtain tax relief, and sell shares by providing a capital gains tax exemption if the investor holds the shares for three years. Finally, the qualifying rules are clear, and there is a Venture Capital Relief Office within Her Majesty's Revenue and Customs office that monitors the programs' operations.

These tax breaks have been instrumental in supporting the growth of startups in the United Kingdom. Since the start of the EIS in 1994, the program has supported around 33,000 firms providing US24 billion. The SEIS program, which targets younger and smaller firms, has provided US1.4 billion to 13,800 companies since its launch in 2012. These programs have successfully allowed these firms, which are young and perceived as riskier, to have access to equity funding.

through guarantee funds, the government can generate incentives for sharing these risks. The aim should be more at financing investment than at financing working capital as an innovative investment could have higher long-term returns in terms of productivity, as long as firms are initially financially constrained.

Improve Credit Information and the Credit Registry

Guarantee fund programs should be complemented with improvements in the credit registry. This is the more straightforward mechanism to solve information problems. In general, for the case of Mexico, the credit

bureau has focused more on households and people, providing little information about firms. In this sense, it is important to encourage the participation of data providers to merge information from different data sources, ensure data quality, and construct a comprehensive commercial credit report. Under this scheme, firms should have a unique identification number and should be monitored and scored.

Implement More Innovative Types of Collateral

Smaller firms tend to be excluded from financial access as immovable assets (mainly real estate) are required as collateral. Furthermore, difficulties in terms of enforcement procedures lead to high origination costs and delays in recovering this type of guarantee. Although some advances in terms of types of collateral have been observed in recent years in Mexico, it is still necessary to promote the use of movable assets (which small firms do tend to have) as collateral. Moreover, more innovative schemes based on good quality information could be implemented, such as accepting future cash flows, inventories, or sales as collateral.

Improve Enforcement Procedures

Lack of enforcement generates a series of delays in contract resolution and collateral execution, which calls for better enforcement capacity and faster judicial procedures. Improvements in enforcement can help guarantee support for SMEs that are currently financially constrained and without access to credit. Secondary markets for these credits could help improve the enforceability of these kinds of contracts.

Promote Programs Aimed at Developing Equity Finance

Misallocation is not observed in the case of equity. Seed capital funds and venture capital are alternative sources of financing (alternatives to banks and other financial institutions) that allow pursuing investment and high-growth projects. And although angel investments are scarce, they can push entrepreneurship. Incubator and accelerator programs could be integrated with this policy as this kind of program tends to have better information on the different characteristics of the firms to be financed.

Conclusions

This chapter provided an overview of the characteristics of Mexico's financial market, focusing on heterogeneity in terms of the financial constraints that firms with different characteristics face.

The analysis of overall financial market conditions confirmed that firms in Mexico face less developed financial markets and are constrained in their access to credit. It is clear that credit in Mexico is scarce, as the level of credit over GDP in the economy is much lower not only in comparison with the country's northern neighbor, but also with other countries at a similar level of development. Additionally, the requirements and conditions for access to finance are highly heterogeneous. Smaller and younger firms tend to be more financially constrained and face higher average and more dispersed interest rates.

Delving into the characteristics of financially constrained firms, the chapter found that foreign-owned firms and exporters are less financially constrained. This could be explained by their potential access to foreign financial markets, stronger relationships with their suppliers, or the fact that exporters need to cover a set of sunk costs to be able to export, so these kinds of firms might already have enough financial resources.

The chapter found that firms that pursue innovation and those with higher technological capabilities appear to be more financially constrained. As is explained further in chapter 6, firms in Mexico do not tend to innovate, and these efforts require sizable investments to succeed. In this sense, lack of financial access can further deter this type of investment. A complementary factor that might at least partially mitigate these constraints for firms with higher technological capabilities is management.

Relying on two different methodologies and an alternative data set, the chapter analyzed whether expansion of access to credit is correlated with higher productivity. In a situation where firms have no financial constraints, expanding access to credit should only be reflected in an expansion of the firm's scale and not productivity. The results are consistent and robust in pointing out that expanding access to credit is correlated with higher firm-level productivity. Some of the results can be interpreted in a causal manner, pointing toward the

importance of addressing access to credit in Mexico as a key obstacle to productivity growth. This is especially the case for younger firms, which tend to be more financially constrained.

The chapter found that credit plays a key role in driving firms' growth and leading to more entrepreneurial dynamism. Financial access is positively correlated with firm size, that is, expanding access to finance at the local level appears to lead to firm growth. Additionally, the expansion of access to credit at the local level is associated with higher entrepreneurial dynamism as measured by higher churning rates and in particular higher entry of firms.

The chapter also provided evidence pointing to the existence of significant misallocation of financial resources, driven by two specific sources of credit: banks and family and friends. The analysis found that credit is not flowing toward the most productive firms due to information asymmetries as well as risks of adverse selection and moral hazard. This is driven by credit provided by banks or family and friends and not by equity markets. This misallocation appears to disproportionally affect younger firms. However, an encouraging result is that conditional on having access to finance, more productive firms face better credit conditions as indicated by lower interest rates.

The results point toward three main conclusions. First, the growth of Mexican firms is constrained by access to finance. Second, expanding access to finance in Mexico is a key priority for productivity growth. Third, an expansion of the supply of finance would not be sufficient given the existing misallocation in Mexico. In addition to an expansion of the supply of finance, what is required is improvement in the functioning of financial markets to address the root cause leading to credit misallocation, in particular with respect to banking institutions.

Table 5.1 Summary of Policy Recommendations

Policy	Term	Costs	Benefits	Other considerations
• Implement guarantee funds focused on young firms	Medium	Medium	High	• Focus on high-growth young firms. • Strong monitoring is crucial. • Time-bound incentives.
• Generate incentives for better risk management by banks	Short	Low	High	• By placing eligibility restrictions on government guarantee funds and focusing on young firms, generate incentives for banks to improve their risk management and the quality of information used and to have better screening processes.
• Improve credit information and credit registry	Medium	High	High	• Increase the scope of the credit registry to include more information about firms. • Improve the quality of the information. • Combine information from different data sources.
• Implement more innovative types of collateral	Medium	Low	High	• Focus on movable assets as new forms of collateral, which are easier for micro, small, and medium-size enterprises to obtain. • Include intangibles like future sales, inventories, and future cash flows.
• Implement improvements in enforcement procedures	Medium	Medium	Medium	• Reduce time for judicial procedures. • Promote secondary markets for debt.
• Implement guarantee funds focused on innovative firms and subsidized loans for innovation	Medium	Medium	High	• Shared risks on innovation projects. • Focus on credit for investment more than for working capital.
• Promote programs aimed at developing equity finance	Short	Medium	High	• Promote venture capital and seed capital as financing mechanisms for startups. Promote shared risks and implementation through incubators and accelerators and ensure better information.

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Endnotes

55 The chapter refers to annex figures and tables that are provided in online annex 5A.

56 In Mexico, 95 percent of the establishments have fewer than 10 employees. Among firms with more than five employees (the ones included in the National Survey of Enterprise Financing 2018), around 50 percent have fewer than 10 employees. Considering all firms in Mexico, including those with fewer than five employees, only 12 percent of the establishments have access to finance (Economic Census 2019).

57 Table 5A.3 presents the differences in the characteristics of highly productive firms (top 10 percent) that have no access to finance and are financially constrained, compared with similar firms with low productivity (bottom 10 percent) with access to finance. The results indicate that highly productive firms with no access tend to be smaller and slightly younger and have a slightly higher level of profitability.

58 Several theoretical and empirical studies focus on the importance of sunk costs in penetrating foreign markets. As discussed by Becker and Greenberg (2003), these costs are large and difficult to finance for several reasons, including the time lag between investment and revenue collection, limited collateral, and the difficulty of predicting and verifying revenues from abroad.

59 The TFP measure constructed for the ENAPROCE survey is a Törnqvist index, following Aw et al. (2001).

60 There are two measures, a flow measure of access to finance equal to loans received during the last two years over sales, and a stock measure of access to finance equal to the value of debt over sales.

61 This analysis is restricted to the manufacturing sector as Rajan and Zingales (1998) do not include services and commerce.

62 To make use of the entire universe of the Economic Census data, beyond the manufacturing census, a measure of "dependency on finance" at the sectoral level (4-digit North American Industry Classification System (NAICS)) is built using data from ENAPROCE. The specifications estimated are as follows:

$$y_{ijt} \in \left\{ Employment, Investment, \frac{sales}{workers}, \frac{Value\ added}{workers}, TFP \right\} (i)$$

where:

$$log\ (y_{ijt}) = \beta\ (Finance\ Development_{it} * Finance\ Dependence_j) + \lambda_i + \epsilon_{it}$$

- λi refers to location, municipality, or state fixed effects.
- Finance Development is a municipality-level measure computed as bank deposit balance per capita. The bank deposit balance within each municipality is taken from the National Banking and Securities Commission, and total population is taken from the Population Censuses conducted by the National Institute of Statistics and Geography.
- Finance Dependence is an industry-level measure at the NAICS 4-digit level and is not time varying, computed using data from ENAPROCE. Median values were taken from four measures: financing from banks over investment or assets and all financing over investment or assets.

63 These results are robust to the inclusion of firm fixed effects.

64 Firms are compared conditional on their sector of activity (at the most disaggregated level, 6-digit North American Industry Classification System), size, and location, which may be important drivers of access to finance that should not be confused with misallocation.

65 Access to finance = 1 for firms that have any level of access to finance. Similarly, having debt = 1. In figure 5.3, the y-axes are the estimated residuals, conditioning for size, sector, and location of the dummy variable of access to finance or having debt.

66 A robustness check uses as a proxy having debt instead of having received finance in the previous two years.

67 López (2017) suggests that around one-fourth of the observed gap in TFP between Mexico and the United States is driven by credit misallocation.

68 Tangibility is measured by the ratio of assets over sales, while profitability is profits over sales.

69 As the focus is on pre-tax profitability, this result is not inconsistent with Levy's (2018) hypothesis that after-tax profitability is distorted due to regulations and tax provisions.

70 Table 5.1 summarizes these policy recommendations, their terms, costs, and benefits.

PHOTO BY: LUXBOX/SHUTTERSTOCK

Innovation, Technology, and Management as Drivers of Productivity[vi]

CHAPTER 6

Introduction

Over the past 10 years, the focus of academic debate to understand the drivers of productivity growth has shifted from misallocation of resources toward within-firm drivers (that is, firm capabilities). The shift occurred in light of the results of recent studies suggesting that reallocation may not play such an important role relative to within-plant improvements in explaining overall productivity growth (Collard-Wexler and De Loecker 2015; Restuccia 2016; Sivadasan 2009; Bollard, Klenow, and Sharma 2013). This shift of attention is consistent with the results of Brown et al. (2016), who decompose firm-level productivity growth for manufacturing companies in Colombia, Mexico, Uruguay, Chile, and the United States. They find that firm-level growth (the "within" component) represents around two-thirds of total productivity growth. As shown in chapter 3 of this report, a decomposition of total factor productivity for Mexican establishments indicates that the within-firm component accounts for more than two-thirds of productivity growth. These results highlight the importance of better understanding the drivers of within-firm productivity growth, namely, a set of drivers that influence firm-level capabilities: innovation, technology, management, and organization.

As Syverson (2011) explains, productivity drivers can be considered as a set of factors or "levers" that are capable of boosting firm-level performance and have the characteristic of being determined by firm-level decisions. Among these drivers, he highlights three that are addressed in this chapter: innovation, management practices or managerial talent, and information and communications technology (ICT).

This chapter provides an overview of Mexico's characteristics in terms of innovation capabilities and how Mexico compares with other countries. Regardless of the measure used, Mexico exhibits substantial lags in its innovation efforts. This problem is not only a static one when comparing with similar countries, but also a dynamic one as these indicators have remained practically unchanged over the past decade. An important consideration here is that like other developing countries, the kind of innovation that is pursued by Mexican firms is not at the frontier but consists of adapting technologies and innovations developed elsewhere, which allows firms to move closer toward the technology frontier.

Given the importance of external financing to pursue both direct and complementary long-term investments to innovate, the chapter analyzes the relationship between access to finance and innovation and shows that firms with access to finance have a higher probability of pursuing innovation. Further, it shows that other firm characteristics, which are typically positively correlated with access to finance, such as higher profitability and tangibility, are also positively associated with innovation. In contrast, firms that have defaulted in the past tend to have a lower probability of innovating, probably because their higher risk makes them less likely to access finance.

The chapter analyzes the role of management practices as drivers of innovation. The importance of management

vi The chapter was led by Leonardo Iacovone and Mariana Pereira-López, with excellent research support from Luis Alejandro Aguilar Luna. The team appreciates the comments and suggestions by Bill Maloney, Nick Bloom, John Van Reenen, and Tatiana Didier.

has emerged over the past 10-15 years as one of the main findings in empirical studies assessing the drivers of productivity and growth (Bloom et al. 2013; Bloom, Sadun, and Van Reenen 2016; Cirera and Maloney 2017; Bloom et al. 2019; Scur et al. 2021). Using the first large-scale representative survey of management practices in Mexico, the chapter analyzes whether better management leads to firms pursuing innovation and improving their technological capabilities. Appropriately instrumenting for management, the analysis finds that the adoption of structured management practices is indeed associated with innovation. The returns to management in terms of technological capabilities increase across the distribution of this innovation indicator. Therefore, management becomes more important for firms that are more innovative. Additionally, the findings indicate that managerial capabilities are crucial for reaping the benefits of investments in research and development (R&D) and materializing them into innovations.

Given the critical role of management in Mexico's context as a key driver of innovation and productivity, the chapter analyzes Mexican firms' characteristics and drivers of managerial practices, with a special emphasis on external incentives and the issue of misallocation. The analysis establishes that the levels of management and organization in Mexico are well behind the levels observed among U.S. firms. Moreover, there is a much larger spread in terms of managerial practices in Mexico than in the United States, suggesting a higher level of misallocation. This result is reinforced by the fact that as management improves, compared with firms in the United States, firms in Mexico tend to benefit less (they tend to grow at a lower rate) from this improvement. This is especially observed among firms in the service sector, again suggesting that misallocation and lack of incentives due to distortions in the business environment may be driving lower investments in good organization and managerial practices.

Looking deeper into the potential drivers of misallocation, the chapter finds that institutional weaknesses, such as contract enforcement problems, violence, and particularly corruption, are the key contributing factors to misallocation. Instead, connection with the U.S. market (for manufacturing) and the size of the local market (for services) tend to mitigate misallocation and lead to greater investment in good managerial practices. The findings indicate that for manufacturing firms, being closer to the U.S. market and having closer ties with it through exports improve management and organization. By contrast, for services, what matters is the size of the local market where these firms typically compete. Consistent with studies in other countries, foreign-owned firms are better performers in terms of the quality of management, while family-owned and run firms exhibit the worst practices across all ownership types (Bloom and Van Reenen 2010; Bloom, Sadun, and Van Reenen 2015, 2016; Lemos and Scur 2019; Bandiera et al. 2015). Providing training for the employees is associated with better managerial capabilities, in line with the results of randomized controlled trials on the effects of management practices (see Bloom et al. 2013).

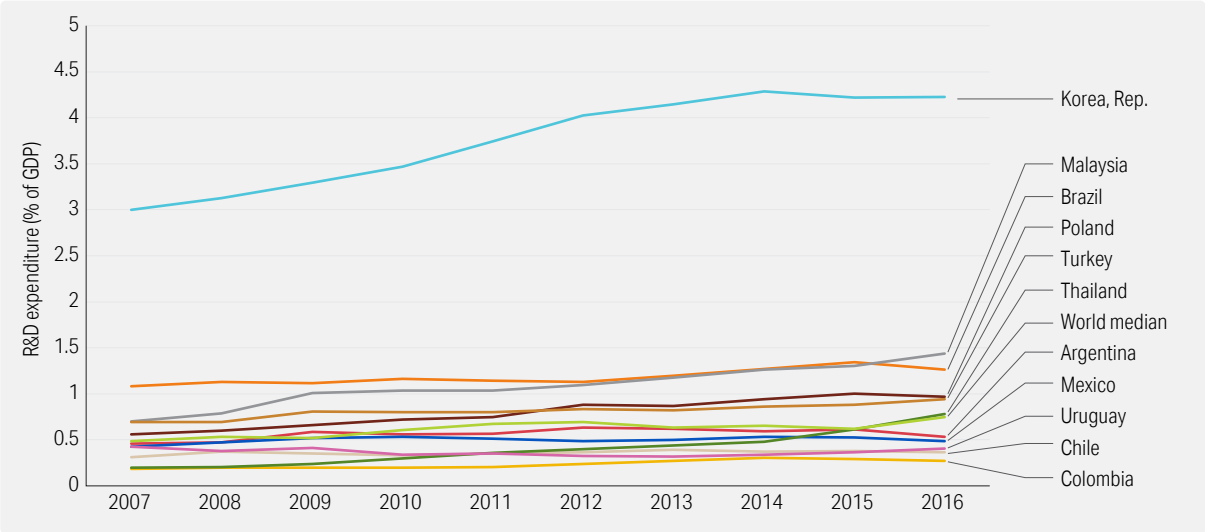
Finally, the chapter focuses on ICT adoption, which is a key driver of within-firm productivity driven by firm-level decisions. Analyzing the adoption of ICT in the context of Mexico, the chapter finds that only firms that face higher competition (proxied by the level of Chinese import penetration) exhibit positive returns to adopting these technologies. The results suggest that this is due to the complementary investments that are needed for effectively using ICT, such as organizational changes and innovation, as firms are more likely to make these complementary investments when facing significant competitive pressures.

Mexico's Innovation Performance: Countrywide Benchmark Analysis

According to the literature on firm productivity, one of the factors boosting productivity and competitiveness is innovation. Yet, most developing countries exhibit low levels of investment in innovation, which represents a paradox, considering the high expected potential returns of these investments (Cirera and Maloney 2017).

Although the measurement of innovation represents a challenge, most studies have relied on innovation inputs as indicators of this type of activity. One of these inputs is expenditure on R&D as a percentage of gross domestic product (GDP), where Mexico is well behind, as the world median is 53 percent higher, and R&D in Brazil is more than double that in Mexico (figure 6.1). Furthermore, this share has remained practically unchanged over the past 10 years, and the gap against other countries, like Poland and Malaysia, which had a slightly higher initial level, has dramatically widened. Compared with Brazil (which already had a much higher level in 2007), which also exhibits a relatively flat trend, the difference in R&D expenditure over GDP has increased.

Figure 6.1 R&D Expenditure: Mexico versus Comparison Countries, 2007–16 (% of GDP)



Source: Calculations using data from UNESCO Institute for Statistics.
Note: GDP = gross domestic product; R&D = research and development.

Mexico exhibited a sharp decline in private R&D expenditure over the past decade (figure 6A.1).[71] In this scenario, the majority of R&D investment is public, as 60 percent of total R&D expenditure in Mexico is financed by the government (according to Alvarado et al. 2018).

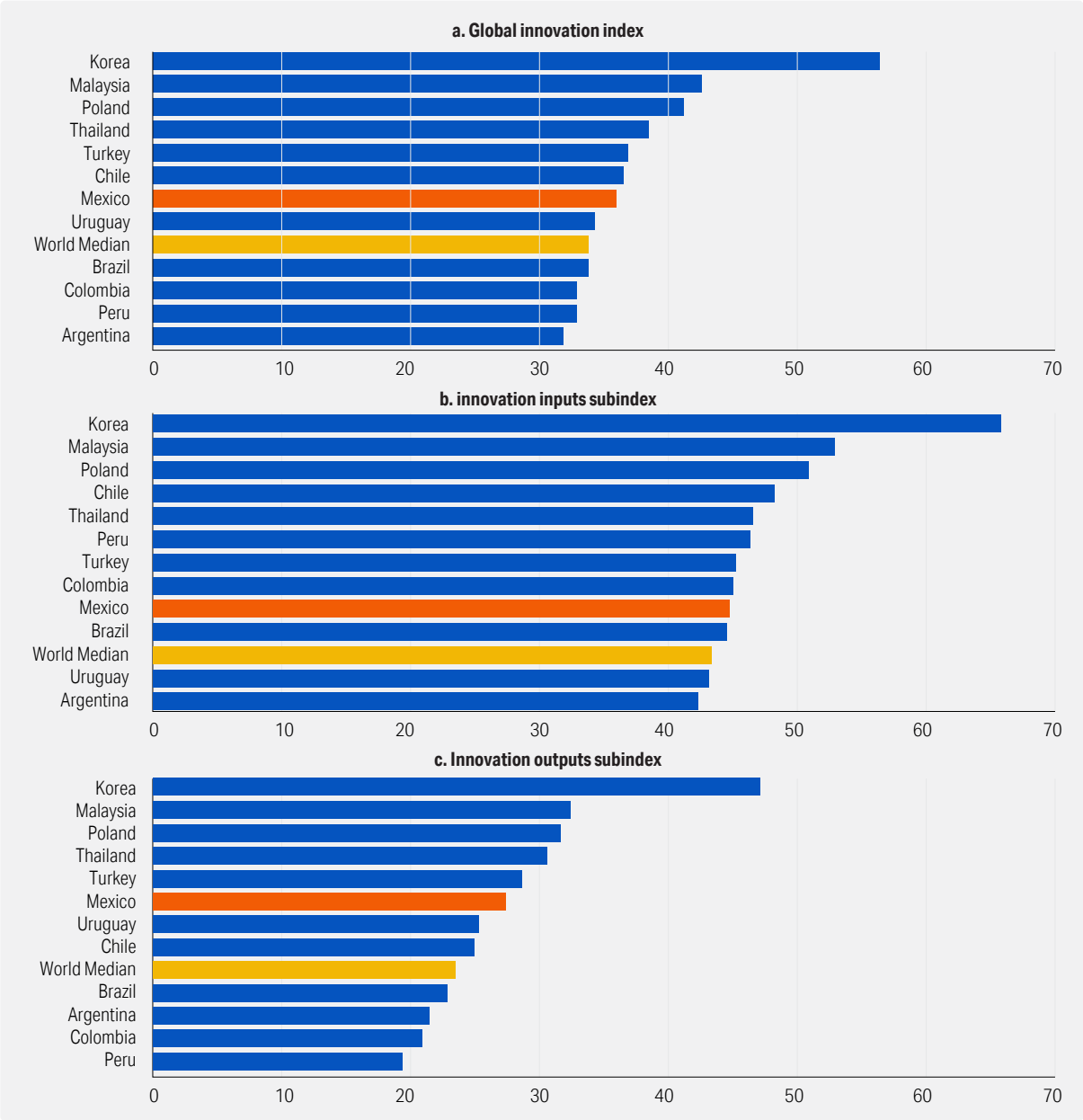
In terms of the number of engineers as a proportion of the labor force and the number of researchers involved in R&D per capita (widely used as proxies for human capital and training to pursue and absorb innovation), Mexico exhibits substantial lags against comparator countries. Although Mexico is among the top 10 countries in absolute number of engineers (UNESCO Institute for Statistics 2015), in relative terms Mexico only surpasses Latin American countries, except Chile (figure 6A.2, panel a). Mexico not only has a very low number of R&D researchers, ahead of only Colombia, but even more concerning, this did not change between 2007 and 2014 (figure 6A.2, panel b). This indicates that over the past 10-15 years, efforts to enhance innovation capabilities in Mexico have been very limited. Investing in R&D and engineering capacities to accumulate innovation capabilities in a country like Mexico is not just essential to promote frontier or radical innovation, but even more to support absorptive capabilities, which are key for catching up (Cirera and Maloney 2017; Cirera and Muzi 2020; Crespi, Tacsir, and Vargas 2014; Cohen and Levinthal 1989).

Using input and output innovation indicators such as the Global Innovation Index 2019, Mexico is above the world median. It performs better than all the countries in Latin America except Chile but behind East Asian developing countries (figure 6.2). Instead, in the case of innovation inputs, although Mexico is above the median, it is surpassed by Peru and Colombia, and East Asian developing countries perform better in the overall score and the input and output subindexes.

Using basic measures of innovation, such as ISO 9001 certificates, which are mainly related to quality management systems, Mexico's innovation performance is relatively poor. Although Mexico is ranked 21st among countries with this kind of certificate, the number of certificates per capita is relatively low compared with other countries with similar GDP per capita (figure 6A.3).

These results suggest that Mexico has significant opportunities to catch up technologically and increase its investments (especially private ones) in innovation to support convergence following a path charted by East Asian countries. Additional good news on opportunities for Mexico is provided by the analysis performed by Goñi and Maloney (2017). They show that returns to innovation follow an inverted U-shaped pattern across development levels as two counteracting forces are at play. On the one side, the potential gains from catch-up increase with distance from the frontier. On the other side, complementary factors decrease and, below a certain level of development, investment in innovation has decreasing returns. Given its current level of development, Mexico lies close to the peak of this inverted U-shape and returns to innovation investments have the potential to be relatively high (figure 6A.4).

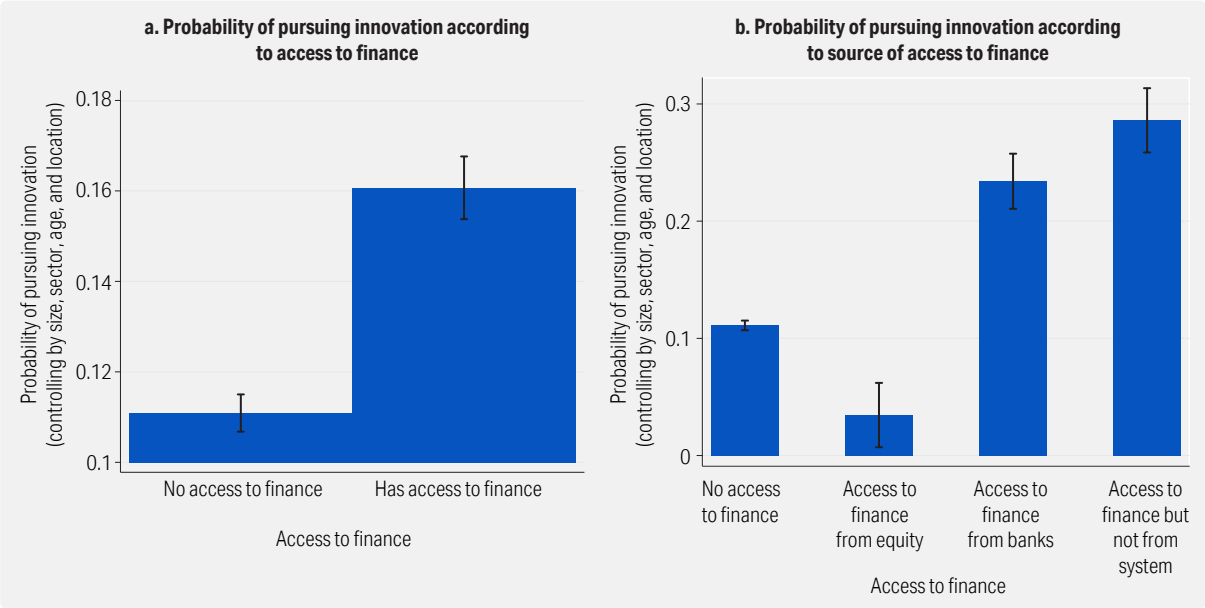
Figure 6.2 Global Innovation Index 2019: Mexico versus Comparison Countries



Sources: Calculations using data from Cornell University; INSEAD; WIPO 2019.

However, opportunities are not likely to translate into a strategy to invest and promote innovation because of an important political economy challenge. As shown by Maloney and Valencia Caicedo (2017),[72] innovation capabilities (proxied, for instance, by the number of engineers) tend to have long-run impacts on the level of development in the future. From a policy perspective, this creates a political economy challenge as incentives for policy makers to invest today are limited when returns are far in the future and they are unable to reap significant electoral gains from these investments in the short run. This is especially the case in contexts where institutions experience frequent leadership changes, and it is particularly difficult to ensure long-term, predictable financial and institutional commitment. Political commitment and broad-based support across the national political spectrum will be needed to build a successful national innovation system that comprises research universities linked with a dynamic private sector, ensure financial support for innovative ventures, and build the national capacity to design strategies and monitor, evaluate, and sustain that effort (Cirera and Maloney 2017).

Figure 6.3 Innovation and Financing



Source: Calculations using data from the National Survey on Productivity and Competitiveness of Micro, Small, and Medium Enterprises 2015 and 2018.

Innovation and Access to Finance

To innovate, firms need to pursue both direct investment in R&D and technologies and other complementary factors such as human capital and improvements in organizational capabilities. For some of these long-term investments, firms require external financing. Previous evidence suggests that financial constraints indeed can hold back innovation (Bloom, Van Reenen, and Williams 2019; Hall and Lerner 2010). Therefore, it is essential to analyze whether in Mexico having more finance increases the likelihood to pursue more innovation.

The analysis shows that firms with access to finance have almost a five percentage point higher probability of innovating,[73] which is particularly high considering that only approximately 12 percent of the firms innovate (figure 6.3). Firms with access to equity have a lower probability of pursuing innovation against firms with no financing. However, firms with access to finance from banks and those that obtain credit from nonformal sources have 12 and 17 percentage points, respectively, higher probability of pursuing innovation. Still, as shown in chapter 5, there are some differences in the use of these sources to pursue innovation according to firm age and size.

More profitable firms and also those with various characteristics proxying access to finance tend to have a higher probability of pursuing innovation and better technological capabilities. In the case of firms that had credit during the past two years, having defaulted is associated with a lower probability of pursuing innovation and worse technological capabilities (table 6A.2). Having a higher level of tangibility (assets/sales) is positively correlated with innovation, after controlling for other firm-level characteristics.

Management Practices as Drivers of Innovation

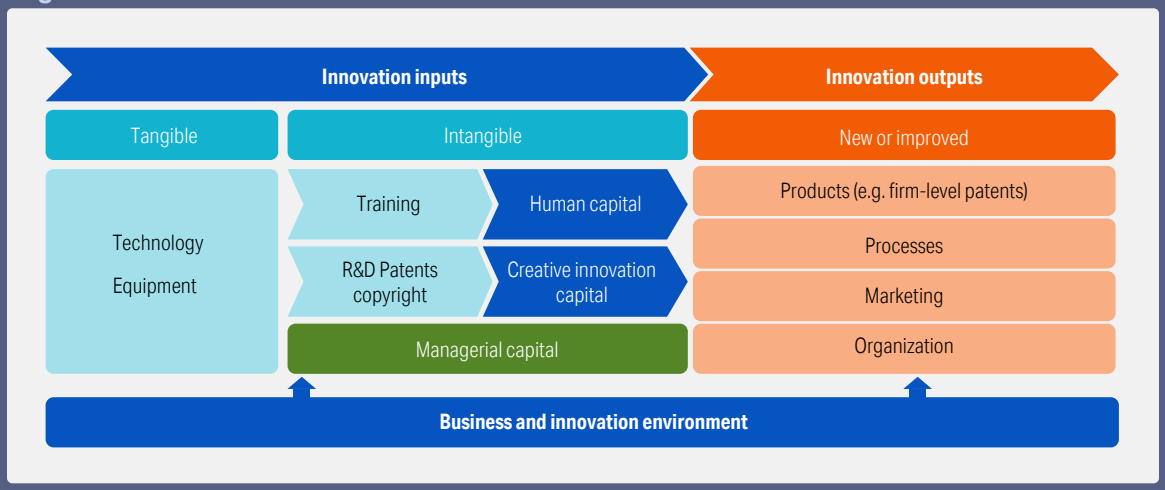
Although there is ample evidence that innovation generates high productivity returns, the proportion of firms that innovate and invest in R&D is relatively low in many developing countries, leading to what Cirera and Maloney (2017) call the "innovation paradox." Innovation activity is complex and to be relevant, it requires a set of complementary investments such as human capital (training), equipment and machinery, investment in R&D, and managerial capital (box 6.1 and figure B6.1.1). As Cirera and Maloney (2017) argue when analyzing the different inputs of innovation, even controlling for R&D, management is a key driver of innovation and, consequently, firm-level productivity. They conclude that the lack of good managerial and organizational capabilities could explain the low returns to innovation observed in the context of many developing countries.

Box 6.1 Challenges in Measuring Innovation

The measurement of innovation entails a series of challenges. First, it is difficult to find comparable and precise definitions of innovation. The different definitions further lead to measurement differences. According to the *Oslo Manual*, innovation can be defined as the "implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations" (OECD/Eurostat 2019).

To understand the different measures of innovation, their advantages, and their shortcomings requires understanding the whole process of innovating. The innovation process has tangible (technology and equipment) and intangible (human capital, research and development (R&D), and management capital) inputs, which under a positive innovation environment will lead to innovation outputs such as the ones described in the definition from the *Oslo Manual*: innovation in products, processes, marketing, and organization (figure B6.1.1).

Figure B6.1.1 The Innovation Process



Sources: Compiled from information from Cirera and Muzi 2016; Cirera and Maloney 2017.

The literature has relied on quantitative measures of innovation by using inputs (R&D expenditure) or outputs (number of patents). However, some surveys ask directly whether the firm has had product, process, marketing, or organizational innovation. Most of the instruments that attempt to measure innovation qualitatively following the *Oslo Manual* guidelines face the problem of differentiating "significant" innovations from marginal innovations. As Hall (2011) points out, no innovation is like another. The self-reported, closed-ended nature of most of the surveys entails the problem that frontier innovation cannot be distinguished from marginal innovation, and firms report innovations that should not be regarded as so in most cases. Furthermore, social desirability might affect the results of these kinds of questions.

In Mexico, management practices are significantly and positively correlated with R&D expenditures, mainly among manufacturing firms (figure 6A.5). For service sector firms, by contrast, the relationship is less linear, and only the firms with the highest level of management practices (top deciles) exhibit a significantly higher level of R&D. Focusing on patents as an output measure of innovation, the share of services and manufacturing firms with patents monotonically increases with management practices. While this finding does not show causality, it indicates how management is tightly correlated with the inputs and outputs of innovation.

Data from the 2015 National Survey on Productivity and Competitiveness of Micro, Small, and Medium Enterprises (ENAPROCE) were used to analyze the role

of management practices in the process of innovation of manufacturing firms. Two proxies were constructed for innovation. The first one is related to whether the firm spends on innovation. Here innovation is defined as a process, product, or organizational innovation. As Cirera and Muzi (2020) argue, most of the surveys on innovation rely on questions asking directly whether the firm innovated during a specific period of time, so the use of this measure allows for mitigating potential social desirability. However, this method might miss innovations that do not incur expenditures. The second proxy is a score for technological capabilities, aiming to measure innovation efforts in a more objective manner. This score, which is based on the Survey on Research and Technological Development and following the *Oslo Manual*, is built on a set of questions assessing whether the firm buys technology, adapts it, modifies it, or even generates technology of its own or sells it to other firms.[74]

The management measure is based on Bloom et al. (2019) and consists of a set of 16 questions that assess the quality of managerial practices and organization along three dimensions: (1) using data and key performance indicators to inform decisions, (2) linking key performance indicators to target setting, and (3) providing incentives for workers. (See box 6.2 for further information on measurement of management practices.)

The share of firms that pursue innovation increases with the level of the managerial practices score. Similarly, management is highly correlated with the technological capabilities index (figure 6A.6, panel b). These correlations do not indicate whether good managerial practices lead to more innovation or vice versa, or whether there could also be some third factor driving both. Further analysis instruments the management score. The instrumental variable for managerial capabilities is generated as the interaction between a measure of sectoral complexity and a measure of the regional distribution of Master of Business Administration (MBA) graduates. Improving management practices from the 10th to the 90th percentile leads to an increase of at least 19 percentage points in the probability of pursuing innovation (table 6A.3).[75] A similar increase is associated with a rise of 0.13 in the technological capabilities index, representing 62 percent relative to Mexico's average level of technological capabilities. A deeper dive into which types of management practices are more important for innovation reveals that incentives and data-driven monitoring are key to increasing the probability of innovating and the technological capabilities score (table 6A.4). Further analysis investigates whether the relationship between management and technological capabilities is the same across all firms, or if it is heterogeneous. To assess this question, the effects of management across the distribution of technological capabilities is analyzed using a quantile regression approach. The results show that the coefficients are increasing with the level of technological capabilities (figure 6A.8). This suggests that good managerial practices are especially important for improving the technological capabilities of firms with medium-high levels of technological capabilities (above the median).

An additional and intriguing result is that management not only matters directly for technological capabilities, but also indirectly. Assessment of the relationship between R&D expenditures and innovation reveals that the two are positively correlated only when firms are better managed. In other words, management appears to be a key complementary factor that drives the returns to R&D investments. That is, only well-managed firms can turn investments in R&D into innovations that improve companies' performance (table 6A.5).

How Are Mexican Firms Managed?

The concept of managerial talent has been posed as a factor affecting productivity for a long time in economics, starting with Walker (1887). As explained by Bloom et al. (2019), Adam Smith's discussion of the organization of work in a pin factory could be considered an antecedent. However, measurement difficulties and lack of reliable and comparable data for measuring managerial practices prevented economists from focusing on the impact of managerial talent on firm productivity. However, during the past decade, there has been a resurgence of interest in management practices due to the availability of large-scale microdata that rely on novel measures of managerial practices (Roberts 2018).

Analyzing managerial practices among Mexican firms relative to U.S. firms, this study finds that while, on average, firms in the United States apply around 60 percent of the most structured practices, Mexico only implements around 40 percent. Furthermore, the best

Box 6.2 Measuring Management Practices

World Management Survey

The World Management Survey (WMS) is the first cross-country database aimed at measuring the quality of management practices. The evaluation methodology was developed by Bloom and Van Reenen (2007) with the aid of an international consulting firm, with the primary objective of providing a comparable measure of management practices. This interview-based instrument consists of 18 basic practices, which are graded by the interviewer (specially trained graduate students) on a 1-5 scale, where 1 is the worst practice and 5 is the best. The instrument is targeted at managers who are senior enough to give an overview of management in the establishment but not that senior to be detached from the actual operations. Interviews are conducted by phone.

To obtain accurate responses, the WMS uses a double-blind approach, where the interviewer does not have further information on the financial performance of the firm, and the interviewed manager has no information on the scoring process. The open-ended nature of the instrument, where managers provide examples and details about their actual practices, contributes to this double-blind methodology (Scur et al. 2021).

The WMS has run several waves, starting in 2004. Currently, the sample comprises 11,383 manufacturing firms across 34 countries.

U.S. Management and Organizational Practices Survey

Despite the information advantages of running interview-based surveys with open-ended questions, such as the WMS, their high costs represent a restriction for conducting large-scale representative surveys. In 2010, the U.S. Census Bureau implemented the Management and Organizational Practices Survey (MOPS) as a supplement to the Annual Survey of Manufactures. This was the first large-scale management survey. The instrument was based on a tool developed by the European Bank for Reconstruction and Development and the World Bank, called the Management, Organisation and Innovation Survey, which, although it used face-to-face interviews, consisted mostly of closed-ended questions.

The U.S. MOPS had several rounds of cognitive testing to ensure that the questions reflected the management practices of the establishments. The instrument comprises a total of 36 items (16 on management practices, 13 on organization, and seven on background characteristics). The management score is constructed by assigning a value of one to the most structured practice, a value of zero to the worst practice, and fractions to all the practices in between (depending on the number of options for each question). The final score is calculated as an unweighted average of all 16 management questions. The U.S. MOPS had a second wave in 2015, and a third wave was expected for 2020, but due to the COVID-19 pandemic, it is on hold.

This instrument has been adapted and used in countries such as Australia, Canada, China, Denmark, Finland, Germany, Japan, the Netherlands, Pakistan, the United Kingdom, the Russian Federation, and Croatia. In the case of Latin America, Mexico was the first country to implement it in 2015, and recently Colombia and Uruguay have applied it.

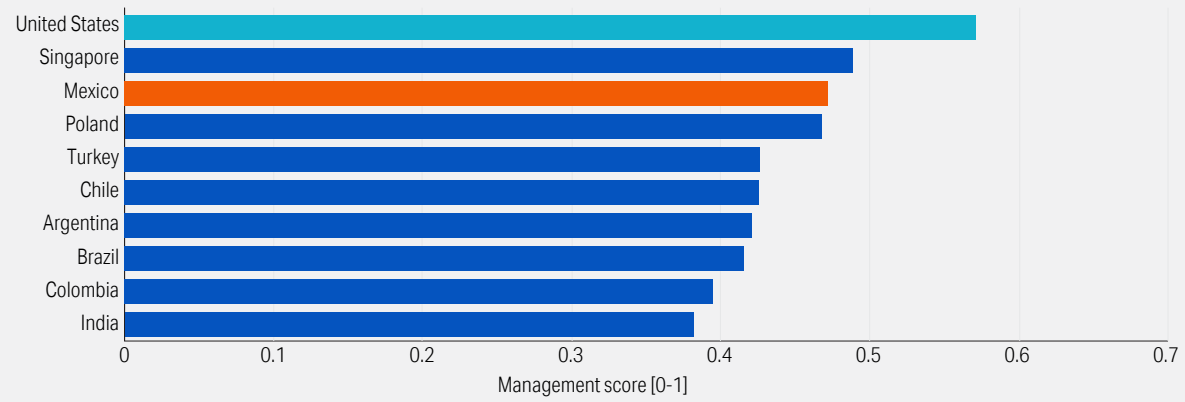
Management Analysis Using WMS versus MOPS

Comparing Mexico's management practices with a set of comparator countries using the WMS, Mexico exhibits a higher score than most of the other developing countries (figure B6.2.1). This is especially the case

for monitoring-related practices. The weakest aspect of management in Mexico appears to be related to operations, as Mexico's score is lower than those observed for Argentina and Turkey.

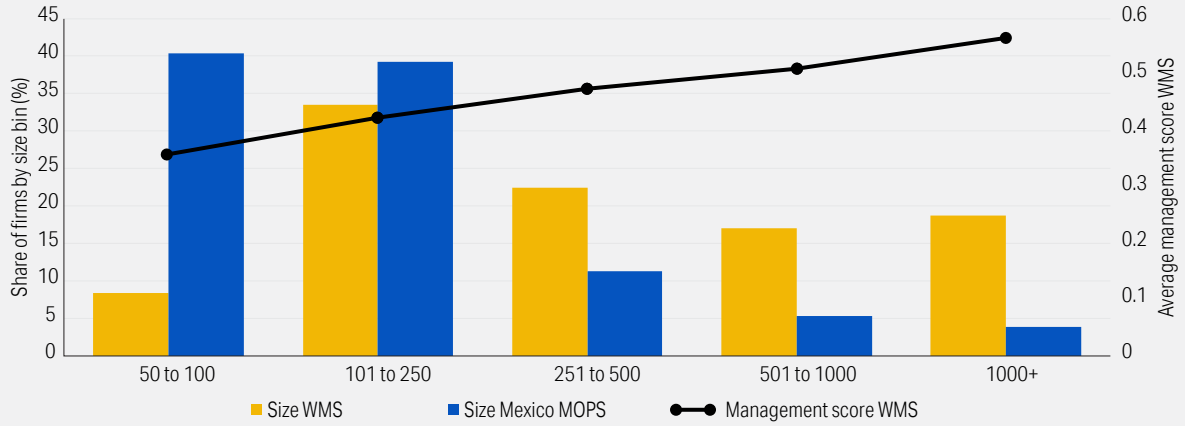
However, the WMS data should be interpreted with caution, considering the size distribution of the firms covered by this sample. As the management literature has found, there is a strong, positive relationship between management practices and firm size (Bloom et al. 2019). Due to the sectoral focus and data collection strategy of the WMS (double-blind phone surveys), the data obtained tend to include a higher share of large firms. Figure B6.2.2 compares the WMS size distribution with the one observed in the first large-scale management survey for Mexico (the National Survey of Productivity and Competitiveness for Micro, Small, and Medium Enterprises). As the figure shows, larger firms are overrepresented in the WMS and indeed exhibit better management performance. Therefore, Mexico scores better in terms of management relative to other countries. This indicates that large firms in Mexico tend to have good practices compared with other countries at a similar level of development.

Figure B6.2.1 WMS Management Score: Mexico versus Comparison Countries



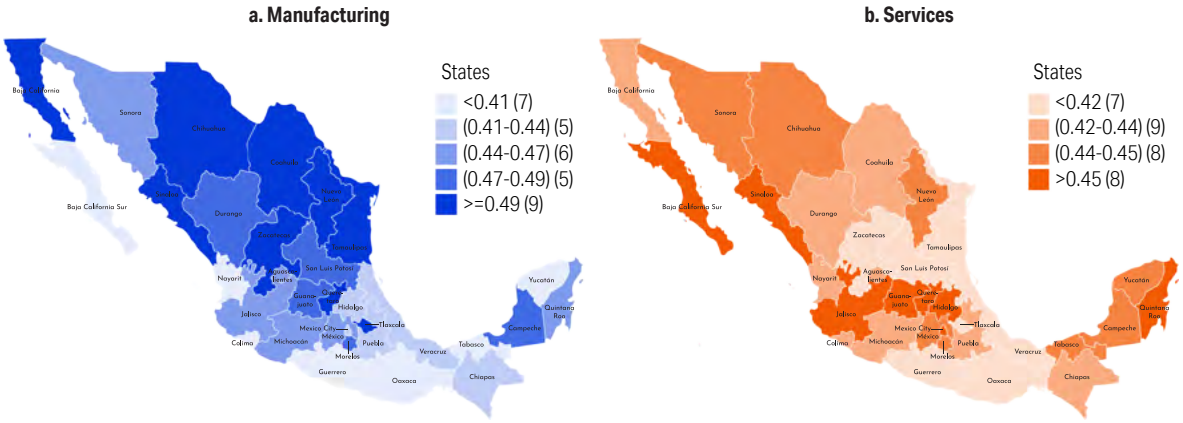
Source: Calculations using data from the World Management Survey.
Note: WMS = World Management Survey.

Figure B6.2.2 Distribution of Firms by Size: World Management Survey versus Mexican MOPS



Sources: Calculations using data from the World Management Survey; National Survey of Productivity and Competitiveness for Micro, Small, and Medium Enterprises 2015.
Note: MOPS = Management and Organizational Practices Survey; WMS = World Management Survey.

Map 6.1 Regional Distribution of Management Practices in Mexico, 2015–17



Source: Calculations using data from the 2015 and 2018 National Survey on Productivity and Competitiveness of Micro, Small, and Medium Enterprises.

managed firms in Mexico (90th percentile) are similar to the U.S. median (figure 6A.9), suggesting that there are large gaps and opportunities for catching up. The distance to the frontier is even more dramatic for the incentives-related subindex (that is, management of human resources), where at least 10 percent of the Mexican firms do not apply any of the standard good managerial practices.[76]

Mexico's whole manufacturing distribution is shifted to the left compared with the U.S. distribution. Furthermore, the dispersion is higher in the case of Mexico, indicating that a large group of badly managed firms coexist with a set of well-managed firms (figure 6A.10, panel a). These practices do not appear to have improved over time, as the distribution was practically the same in 2017 as in 2014. The geographical distribution of these practices (map 6.1, panel a) indicates that the best practices in manufacturing tend to be concentrated in the country's northern states. This region has been relatively more exposed to foreign investment and trade with the United States since the entry into force of the North American Free Trade Agreement in 1994.

The score for management practices in services is lower, and the dispersion is marginally higher, compared with manufacturing (figure 6A.10, panel b). In contrast with the regional distribution observed for manufacturing, good management practices in services are concentrated mostly in the country's central region, and the states with the highest average scores are where the largest cities and largest local markets (Mexico City, Monterrey, and Guadalajara) are located (see map 6.1).

Management Practices as Drivers of Firm Performance and the Misallocation Problem in Mexico

The recent literature on management practices has consistently found a strong relationship between these kinds of practices and firm-level performance. However, this evidence has largely focused on richer countries as information availability for less developed countries was scarcer. In Mexico's case, this study takes advantage of the first large-scale[77] management survey conducted for a developing country (ENAPROCE 2015, National Institute of Statistics and Geography), which analyzes managerial capabilities in small and medium-size enterprises (SMEs) and large firms, following the U.S. Census Bureau's Management and Organizational Practices Survey methodology.[78] The relationship between management and performance holds for manufacturing firms and firms in the service sector, which is characterized by a higher level of regulatory interventions, a lower level of competition, and a limited level of tradability (figure 6A.5). The estimations for Mexico indicate that movement in management practices from the 10th to the 90th percentile leads to a doubling in labor productivity in manufacturing and an increase of around 60 percent for services.[79] Furthermore, even over a short period (three years), the management score exhibits a statistically significant correlation with firm survival. Movement from the 10th to the 90th percentile of management practices is associated with a decrease of two percentage points in exit probability in manufacturing and one percentage point in services (table 6A.6). These figures are relatively high considering that, according to ENAPROCE 2015 and 2018, the

average annual exit rate for this sample of SMEs and large firms is 2.38 percent for manufacturing and 3.87 percent for services.

In the case of Mexico, the relationship between management and size is positive, but it is not as tight as that for the United States (figure 6.4). One way to interpret this result is that although the returns in terms of size from improving managerial practices are positive in Mexico, they are lower than those in the United States. This is especially the case for firms in the service sector. This result could be indicative of misallocation. This means that management does not improve with firm age in the service sector, in sharp contrast with what is observed for the United States and, to a lesser extent, for manufacturing in Mexico (figure 6A.11). Moreover, in a context where this learning and selection of the better performing firms occur, the dispersion of management practices should decrease along the firms' life cycle. This is what is observed for firms in the United States. But for manufacturing firms in Mexico, this is only partially observed along some parts of the age distribution. Worryingly, this pattern is reversed for the service sector as the dispersion of managerial practices increases with age. This can only be driven by two factors—badly run firms that are not exiting the market because market selection mechanisms are not operating efficiently, or firms that are not improving their practices as time passes because the normal learning and catching-up process does not occur on average.

Three determinants could explain this misallocation problem in relation to different aspects of the institutional environment in Mexico. The first determinant is contract enforcement. According to Levy (2018), this is one of the particular policy failures that Mexico faces and an important driver of limited incentives to grow and invest at the firm level, which leads to lower productivity. Although it is clearly a factor external to the firm, contract enforcement can affect value chains (that is, the supplier-buyer relationship), primarily through the costs of inputs (Boehm and Oberfield 2020), as well as the firm's relationship with its employees (for example, issuing short-term contracts that promote unnecessary and inefficient labor rotation in some cases, and lack of trust in external professional managers who are not family members). Poor contract enforcement generates incentives for firms to make decisions that lead to lower efficiency. Furthermore, as Levy (2018) argues, too many resources are allocated to firms that avoid contracts or violate the applicable labor, tax, and social insurance regulations. Information from the National Survey on Regulatory Quality and Government Impact on Enterprises (ENCRIGE) 2016 is used to measure the prevalence of contract enforcement at the municipality level. For the municipalities included in the sample, the firms that have more frequently reported problems with enforcing contracts (the top 10 percent) are identified. The relationship between management and size is weaker for firms in the top 10 percent of municipalities with contract enforcement problems (figure 6A.12, panel a). For firms that are not in the top 10 percent of contract enforcement problems, an increase from the 10th to the 90th percentile of management doubles their size; for firms in the top 10 percent, this increase

Box 6.3 Management and Firm Productivity

Management practices have been found to be strongly associated with firm-level productivity (Syverson 2011; Bloom et al. 2016). Recent studies have found that management practices account for about 30 percent of cross-country productivity differences (Bloom, Sadun, and Van Reenen 2016). Furthermore, within countries, management explains around 30 percent of the differences between the 10th and 90th percentiles of firm-level productivity (Bloom, Sadun, and Van Reenen 2016). Additionally, this literature shows that the tight correlation between management and performance (labor productivity, total factor productivity, profitability, innovation, survival, and growth) is also observed in the case of energy efficiency (Bloom et al. 2019; Bloom et al. 2012), suggesting an important role of good managerial practices as a potential driver of sustainability. These conclusions are consistent with the results of rigorous randomized controlled trials and quasi-experiments that have also found positive effects of management on performance (Giorcielli 2019; Bloom et al. 2013; Bloom et al. 2020; Iacovone, Maloney, McKenzie 2021; see Bandiera et al. 2017 for a meta-study). Furthermore, as Bloom, Sadun, and Van Reenen (2016) and Cirera and Maloney (2017) explain, management is both an input and a complementary factor for promoting innovation and adoption of information and communications technology.

is 23 percentage points lower (table 6A.7).[80] This result is consistent with Levy (2018), who argues that poor contract enforcement generates incentives for firms to maintain commercial relations with a few (trustworthy) agents, limiting their growth potential. According to Levy, as well as Moody's 2015 Contract Enforceability Report, the quality of the judiciary system varies widely across Mexico's states. In this sense, Levy suggests that if all the states in Mexico had the best practices in contract enforcement, firms would increase in size by two-thirds.

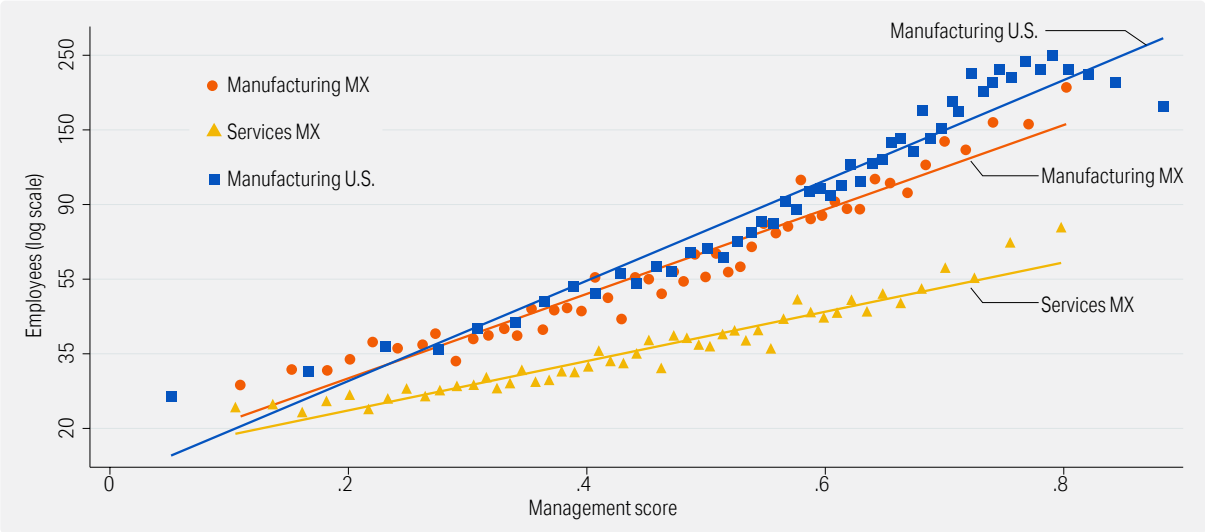
The second factor that has often been discussed as a potential barrier to growth in Mexico is crime. Violence has escalated in the country over the past decade (Dell, Feigenberg, and Teshima 2019). In 2017, Mexico held the second place as the most dangerous conflict zone globally, measured by deaths directly attributed to the struggle against organized crime, according to the Armed Conflict Survey from the International Institute for Strategic Studies. Crime can affect business operations, hold back investment and innovation, and create incentives for firms to stay smaller and under the radar. Additionally, crime creates extra costs as firms need to invest in security and crime prevention instead of pursuing alternative and more profitable business ventures. Furthermore, crime generates incentives for reducing hours of operation and maintaining a low profile, which could mean staying small to avoid becoming a target.[81] For firms in municipalities with a higher incidence of crime (proxied by being in a municipality in the top 10 percent of kidnapping incidence[82]), the relationship between management practices and size is weaker than for firms in other locations (figure 6A.12, panel b, and table 6A.7). The magnitude of the difference is similar to that seen in municipalities characterized by lower contract enforcement.

The third potential factor affecting misallocation, which is widely considered a significant problem in Mexico, is corruption. As pointed out by Restuccia and Rogerson (2017), corruption generates distortions in the allocation of resources toward more inefficient uses. This occurs as a consequence of discretionary decisions made by the government or other actors that benefit specific firms independently of the viability of their business projects or profitability. As Restuccia and Rogerson argue, examples of this behavior are preferential permits, subsidies, or government contracts, as well as the selective enforcement of regulations and taxes.[83] In the context of Mexico, the issue of bribes or lack of transparency in obtaining permits and contracts is often raised by entrepreneurs as a key problem, as shown in the results of the ENCRIGE. According to Transparency International's Corruption Perceptions Index, Mexico is ranked 130 of 180 countries. Therefore, it is not a surprise that this problem is one of the Mexican government's main targets. Moreover, according to Morris (2012), Mexico's corruption problems are strongly tied to crime and drug trafficking. Using data from ENCRIGE on the top 10 percent of municipalities that face corruption, the relationship between management and employment is much weaker than for firms in other municipalities, which is consistent with misallocation being driven by corruption (figure 6A.12, panel c).[84] The magnitude of the effect of corruption in changing the relationship between management and size is much higher than that for contract enforcement and kidnapping. In this case, a change from the 10th to the 90th percentile in the management score leads to a doubling of firm size in municipalities with low corruption levels, while in the top 10 percent of municipalities where corruption is more prevalent, this figure decreases to 28 percent (table 6A.7).

The government has taken important measures to tackle corruption. First, the legal reforms undertaken that classifies corruption as a severe crime; the elimination of immunity for the President when there is presumption of corruption crimes; the legal reform to enhance citizens participation mechanism through consultation and presidential recall. Furthermore, the set of legal reforms conducted to fight organized crime and the creation of the National Guard. As a result, Mexico improved its position in the Corruption Perception Index by Transparency International: its position improved 14 places between 2018 and 2020, after being stagnated since 2014. 61 percent of the population, between 2017 and 2019 approves and support these actions. According to the National Survey of Regulatory Quality and Governmental Impact 2020 (ENCRIGE). In 2020, the share of firms that perceived corruption acts fell by 10.7 pp in comparison with 2016. The number of corruption acts reported by firms decreased 21 percent in 2020 in comparison with those reported in 2016. As a result, according to the National Survey of Regulatory Quality and Government Impact on Companies (*Encuesta Nacional de Calidad Regulatoria e Impacto Gubernamental en Empresas* (ENCRIGE)), the confidence in the federal government increased by 35.9 percentage points between 2016 and 2020.

Finally, a composite business crime index is calculated as the top 10 percent of the mean normalized scores for each institutional obstacle (contract enforcement, kidnapping, and corruption). This measure summarizes

Figure 6.4 Management and Firm Size



Source: Calculations using data from the National Survey on Productivity and Competitiveness of Micro, Small, and Medium Enterprises 2015 and 2018.

how institutional weaknesses contribute to an inefficient allocation of resources (figure 6A.12, panel d).

Other factors could partially mitigate the harmful effects of the institutional environment variables, some of them directly related to competition. Competition operates potentially through two channels. On the one side, competition generates incentives for firms to improve their organizational and managerial practices to avoid falling behind their competitors. On the other side, competition could lead to a selection effect, as firms that are less well managed are driven to exit the market. Considering the geographical distribution of management practices, the analysis looks at whether the degree of misallocation differs according to a measure that proxies proximity to a large and competitive market, such as the United States, and uses drive time to the closest point on the border as this measure.[85] In this context, the hypothesis that is tested is whether being closer or more connected to the U.S. market is associated with a better allocation of resources (figure 6A.13). "Far from the border" is defined as being above the median time to the U.S. border. The results indicate that being closer to the border contributes to a better allocation of manufacturing firms' resources, but not for services. Analyzing this further, what is behind these results is competition in the U.S. market. The sharpest increases in the size-management relationship are observed for firms that are both close to the border and export to that market (see column (3) in table 6A.8). The result that proximity to the U.S. market does not really matter for firms in the service sector is in line with the hypothesis as the relevant market for firms in the service sector tends to be the local national market since in most cases, these businesses produce services that are not tradable.

To assess whether more competitive market environments lead to lower misallocation, the analysis looks at whether the size of the local market (measured as population density times the average income at the metropolitan area level) explains differences in the elasticity of size to management. Indeed, firms in larger local markets (market size greater than the median) exhibit a tighter relationship between management and size than those in smaller markets (figure 6A.13, panel d). This result does not hold for manufacturing, where the size-management relationships are relatively similar between firms in large and small local markets, confirming the hypothesis that for firms producing tradable goods, what matters is not the local market. Resources appear to be better allocated in services firms located in large local markets (table 6A.8). In contrast, this kind of market does not matter for allocation in the manufacturing sector.

What Drives Management Practices?

As pointed out by Bloom et al. (2019), the management literature has identified a series of drivers that explain why firms are managed differently. This chapter has already explored two of the drivers that explain the issue of misallocation, namely, the business or institutional

environment and the level of market competition (proximity to the United States and size of the local market).

The first finding here is that, indeed, access to larger markets is associated with better managerial practices. Access to larger markets for manufacturing firms that produce tradable goods is proxied by drive time (in hours) to the U.S. border. Manufacturing firms that are closer to the U.S. border exhibit a better management score (figure 6A.14 and table 6A.9). Access to larger markets is especially important for firms in sectors that are characterized by greater exposure to the U.S. market, measured by their export share. The interpretation is that firms that are more tightly connected to the United States learn from this integration and their competitors or are forced to improve their organizational and managerial practices to be able to compete successfully.

For services firms, the markets that matter are the local ones as these firms produce services that are non-tradable and can only be supplied locally. The measure of access to larger markets is the product of the population density and the average income at the metropolitan area level (see columns (5) and (6) in table 6A.10).

Ownership is among the factors driving management practices that recent analyses have highlighted (Bloom et al. 2019). In general, previous studies have found that multinational firms tend to exhibit more sophisticated managerial practices (see Bourke et al. 2020). This is also the case for Mexico, as foreign-owned firms tend to have better management and organization (table 6A.11). Furthermore, and consistent with previous studies, family-owned firms that are not managed by an external professional manager but where the chief executive officer is a family member tend to have the worst management practices (Bloom, Sadun, and Van Reenen 2015). All these results hold for both the manufacturing and service sectors.

An additional result, not previously highlighted in the literature on management, indicates that firms that provide training tend to have significantly higher management scores (table 6A.12).[86] This can be interpreted in at least two ways. First, the learning process associated with training involves managerial capabilities, which, in turn, leads to the implementation of better management practices. Second, training may be part of the virtuous circle in which better managed firms pursue innovation and the adoption of better technologies, which require human capital as a complementary factor.

Does Technology Adoption Matter for Productivity? Focus on ICT

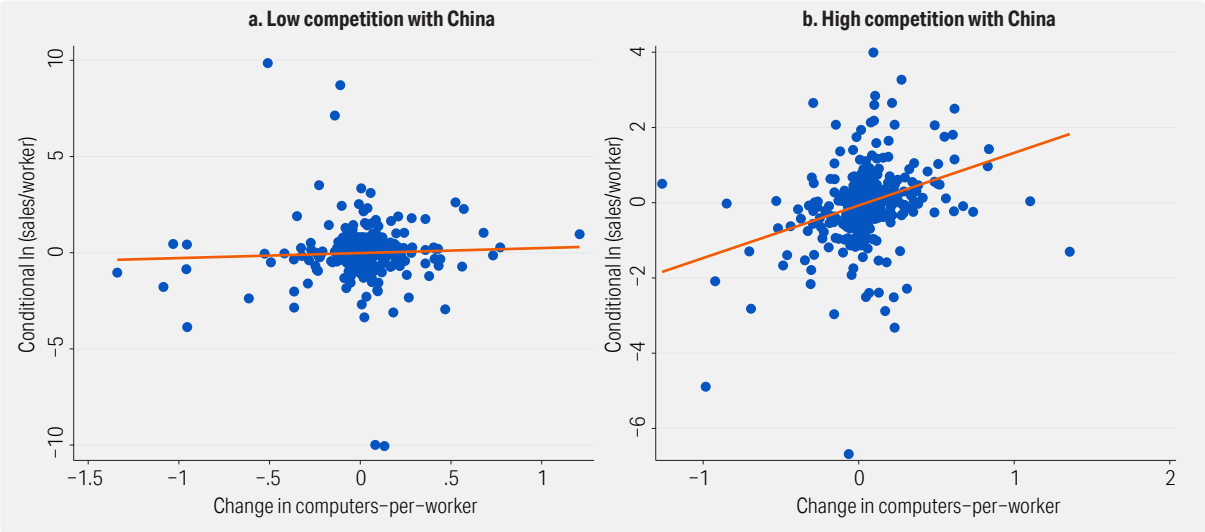
The literature on the impact of technology adoption (mainly ICT) is broad, especially for developed countries. Initial studies during the 1980s could not find any effect of ICT adoption on productivity, leading to what is regarded as the "Solow paradox," where ICT could be seen everywhere, except for the productivity statistics. However, during the 1990s, this strand of literature benefited from more detailed microdata that allowed for resolving the paradox. Several studies find a positive and strong relationship between ICT adoption and performance variables (see Caroli and Van Reenen 2001; Bresnahan, Brynjolfsson, and Hitt 2002; Brynjolfsson and Hitt 2003). However, as Cusolito and Maloney (2018) point out, recent studies indicate that technology adoption returns may be drying up. Draca, Sadun, and Van Reenen (2007) and Acemoglu et al. (2014) go further and argue that the Solow paradox still needs to be convincingly resolved, for example, by using natural experiments.

Evidence on the impact of ICT adoption on firm performance in developing countries is very limited. This poses the question of which potential mechanisms and complementary channels explain why ICT adoption may have different impacts across different firms or in different firms, which has rarely been explored. The analysis in this section aims to fill this gap. The role of ICT has become particularly important in the context of the COVID-19 crisis as firms have increased their adoption of these technologies to mitigate the negative impact (see box 6.4).

An important characteristic of ICT, as explained in the literature, is that to succeed in adopting these technologies, a set of complementary factors or intangible assets is required. Firms need to pursue complementary organizational changes or training, which can be very costly. Therefore, at first, firms may not be willing to undertake these investments, unless they face the appropriate incentives to do so.

Recent studies point to competitive pressure as a factor that may create these incentives. As Iacovone et al. (2013) and Bloom, Sadun, and Van Reenen (2015) argue, external competition shocks may induce faster technical change by speeding up the process of creative destruction and therefore affecting firm-level

Figure 6.5 ICT Use, Performance, and Competition



Source: Calculations using data from the National Survey on Information Technologies 2009 and 2013, National Institute of Statistics and Geography.

performance. A competitive shock that has been widely analyzed over the past few years is the emergence of China after it joined the World Trade Organization, a large and exogenous shock that has increased competitive pressures across the world, as shown in recent work (Autor, Dorn, and Hanson 2015, 2016). For Mexico, Iacovone et al. (2013) find that a selection mechanism might be operating in response to Chinese competition, promoting reallocation within firms and affecting exit.

This section analyzes whether external competition shocks (measured in this case as Chinese competition at the sectoral level) can accelerate the creative destruction process or incentivize the adoption of technologies to enable a temporary escape from competition (Aghion et al. 2001). To analyze this, a panel of firms is constructed using data from Mexico's National Survey on Information Technologies in 2009 and 2013, which includes detailed information on ICT use at the firm level.[87]

The positive expected relationship between ICT adoption and performance (measured as sales per worker) in Mexico is only observed for firms in sectors that experienced the emergence of strong competitive pressures because of import penetration from China (figure 6.5). To go beyond the simple correlation, this relationship is tested using an instrumental variable approach to address the potential endogeneity associated with ICT adoption. The results indicate that there is no benefit (returns[88] are not statistically different from zero) from ICT adoption for firms in sectors where competition from China has been low, while returns are significant and positive for firms in sectors that faced higher competition from China (table 6A.13). The magnitude of this effect is economically significant: a 10-percentage point increase in the share of computers per worker leads to an 8 percent increase in sales per worker for firms in sectors facing the average level of competition (average across all manufacturing sectors), while in firms faced with the highest level of Chinese import penetration, the returns are more than fourfold (35 percent).

A possible hypothesis explaining why competition could provide the "right" incentives to adopt ICT effectively is that complementary investments in organizational change and innovation are more likely to be made. To test this hypothesis, two indexes are constructed, one for product and process innovations and another for marketing and organizational innovations.[89] The results indicate that firms that invest in ICT and face a high degree of competition tend to innovate more. Instead, firms that invest in ICT and face a lower level of competition are not more likely to innovate than those that do not invest in ICT (figure 6A.15). These results hold when controlling for several firm-level covariates (table 6A.14). The findings indicate that ICT adoption is positively correlated with innovation only when firms face a certain level of competition. This is shown by the positive and statistically significant coefficient on the interaction between ICT adoption (proxied by a positive change in the number of computers per worker) and increased competitive pressure from China (proxied by changes in Chinese import shares between 2001 and 2009). Instead, the coefficient of ICT adoption alone is negative or nonsignificant.

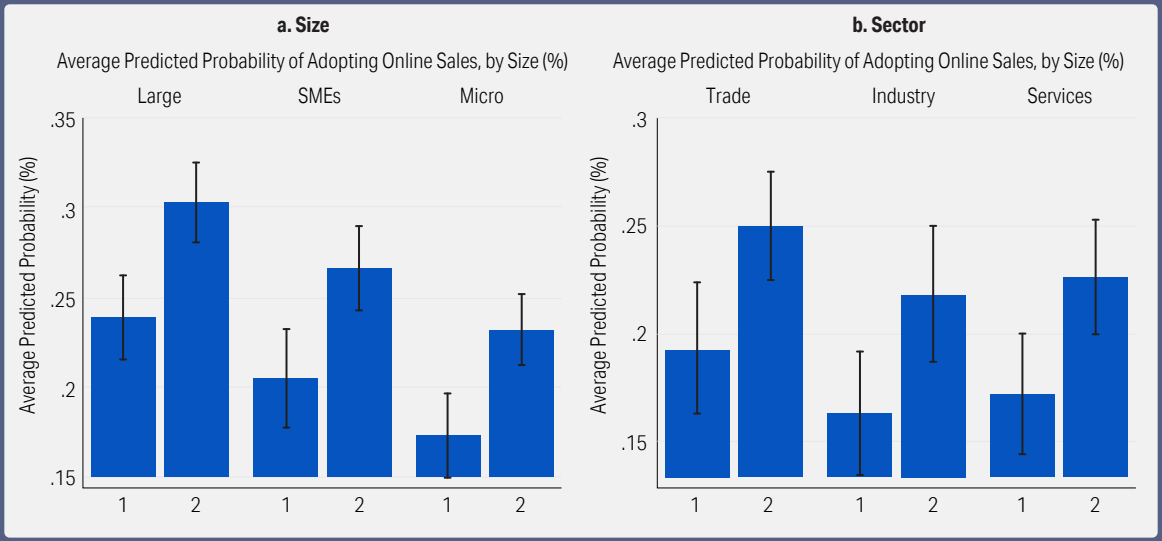
Box 6.4 Effects of Digital Technology Adoption during the COVID-19 Pandemic

The COVID-19 pandemic has forced many firms to adopt a variety of response measures to ameliorate the negative economic impact. One of the measures that firms have implemented globally is the use of digital platforms to carry out their operations. Considering the results in this chapter on adoption of information and communications technology (ICT), to turn this ICT adoption into an opportunity for productivity growth and fully exploit the potential of this digitalization, firms will need to make complementary organizational changes, such as improving their managerial capabilities.

Using recent information gathered by the National Institute of Statistics and Geography through the Survey on the Economic Impact Generated by COVID-19 on Enterprises (eCOVID), this box analyzes Mexican firms' adoption of digital solutions during the pandemic and the effects of these technologies on employment and sales. The eCOVID consists of a two-wave panel survey of Mexican firms that studies the effects of the pandemic on economic activity as well as different response measures that firms have implemented relative to March 2020. The reference period of the first wave corresponds to April 2020, and the reference period of the second wave is August 2020. Among the firm response measures studied in the survey is whether firms carried out sales through the internet and/or through digital platforms during the reference period. This variable is used to measure firms' digital uptake during the pandemic.

The calculations show firms' average predicted probability of adopting online sales during the first and second waves of the eCOVID. The average predicted probability of a firm carrying out online sales was 17.8 percent in April 2020. In August 2020, the average predicted probability of firms using digital solutions to carry out their operations increased to 23.4 percent. This implies that as the pandemic progressed, many firms were more willing to use digital technology to sell their products and services. It also shows the strain that health measures may have had on firms, forcing them to innovate and use other technologies to keep their operations running.

Figure B6.4.1 Average Predicted Probability of Adopting Online Sales, by Firm Size and Sector

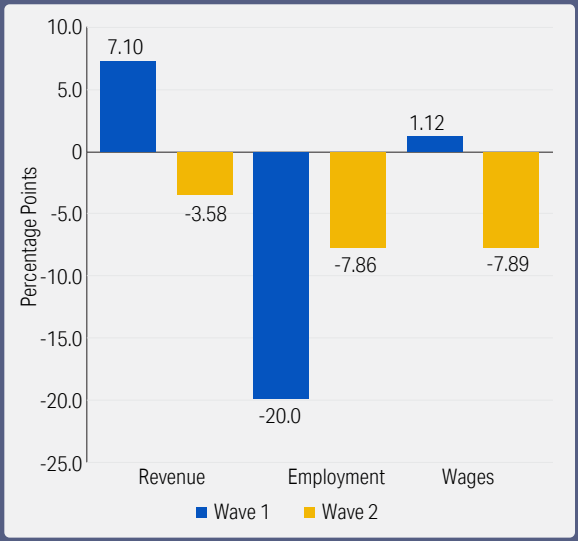


Source: Survey on the Economic Impact Generated by COVID-19, National Institute of Statistics and Geography.
Note: The average predicted probability for each wave is estimated from probit regression of a dummy that signals whether the firm carried out online sales on size, sector, and wave. Wave 1 = April 2020; wave 2 = August 2020. Values are reductions among adopters minus reductions among nonadopters.

The average predicted probability of using digital solutions was higher in August 2020 relative to April 2020, across size groups and sectors (figure B6.4.1). Analysis of firms' probability of adopting online sales by size

reveals that larger firms were more likely to adopt digital sales than smaller firms. Thus, larger firms innovate more than smaller firms, even during economic recessions. Analysis of the average predicted probability of adopting online sales by sector indicates that firms in trade were more likely to adopt online sales compared with firms in services and manufacturing industries. In August 2020, around 25 percent of firms in the trade sector carried out digital sales, while 23 percent of firms in services and 22 percent of firms in manufacturing performed online sales. These findings suggest that trade services are more easily sold through online platforms relative to manufactured goods and other types of services.

Figure B6.4.2 Difference in the Percent Reduction in Revenue, Employment, and Wages between Digital Adopters and Nonadopters



Source: Survey on the Economic Impact Generated by COVID-19, National Institute of Statistics and Geography.
Note: These results were calculated from regressions of sales, employment, or wages on size, sectors, and firm operation response variables such as working from home, emergency credit applications, home delivery, online sales, discounts, and supplying new goods or services.

For firms that reported reductions in revenue, employment, and wages, those that adopted digital sales experienced a lower percentage reduction compared with firms that did not adopt online sales (figure B6.4.2). For the first wave of the survey, these differences are mainly observed in employment reduction, as firms that used e-commerce exhibited a 20 percentage point lower reduction in employment. However, in this first wave, no significant differences were observed in wages between digital adopters and nonadopters. For the second wave, the revenues of firms that adopted digital sales fell by about 4 percentage points less on average than those of firms that did not adopt digital technologies. Firms that carried out online sales reduced employment and wages by 8 percentage points less compared with those that did not use the internet for sales, on average. These results show that firms that adopted digital business solutions for their operations were more able to ameliorate the negative economic shock compared with firms that did not adopt digital business solutions.

Policy Recommendations

Interventions External to the Firm

Foster competition and market access. The results in this chapter indicate that competition and market access improve management and generate the right incentives for pursuing innovation and adopting ICT. Therefore, it is crucial to implement policies to remove regulatory barriers to entry, make markets more contestable, and eliminate protections for badly run incumbents (Scur et al. 2021). The financial cost of these kinds of policies is low, while the benefits are high.[90] In practice, and considering this cost-benefit relationship, the main reason these policies are not implemented has to do with some firms with market power pushing against pro-competitive policies. Specifically, in the case of Mexico, this means strengthening the Federal Economic Competition Commission so that it can promote competition and impose sanctions against anti-competitive practices.

Improve enforcement of contracts and the rule of law. A salient characteristic of Mexico's institutional environment is that in most cases, the legal framework exists but enforcement is poor. This generates distortions in incentives that lead to misallocation. Among the channels that could be driving these misallocation problems, as Levy (2018) mentions, is that firms tend to limit their commercial relationships to avoid having commercial disputes, in turn limiting their own growth. To improve contract enforceability, policy actions could be implemented on at least three fronts. First, it is important to improve the organizational capabilities within the judicial system by setting general technical standards

and designing training programs for judges and other officials involved in the process. Basically, this means improving management and organizational practices within the judiciary system. Second, it is important to work toward reducing disparities across states in judicial quality, which create distortions in the incentives for locating or making commercial transactions in different states. For this purpose, monitoring and benchmarking mechanisms should be generated, as well as mechanisms for sharing the best practices. Third, although, as mentioned in Teplova and Pascual Dapenda (2020), some progress has been made with oral proceedings for commercial contract enforceability, which has significantly reduced the workload of courts, some mechanisms should be aimed at improving the handling of commercial cases. Such mechanisms include the use of specialized courts, like those in the State of Mexico, as well as some alternative dispute resolution mechanisms, including training professional mediators who can help settle commercial disputes without the need for judges.

Enhance the potential of trade, access to markets, and foreign direct investment (FDI). During the past 25 years, Mexico has worked intensively toward liberalization through the negotiation of several free trade agreements. Furthermore, the majority of these agreements include access to markets, which is especially important for manufacturing firms. Deepening access to markets generates incentives for upgrading organizational and managerial practices. Removing barriers to access to foreign markets and improving infrastructure that specifically targets access to large foreign markets are key for creating incentives to improve firms' managerial capabilities. The results also suggest an important role of FDI as a positive correlate of management and because of the spillovers it can generate in other related firms (mainly horizontal and backward spillovers) (see online annex 6B). A key recommendation emerging from these results is that maintaining an environment that is supportive of foreign investments is key. In particular, it is crucial to ensure certainty for FDI by following the rules of international agreements. These policies have a medium-term scope.

Focus on the key role of general education and skills. The benefits of higher education and skills are manyfold as they go beyond firm-level capabilities. As explained in the management literature, the supply of institutions (universities) that train future managers directly affect these kinds of practices (Scur et al. 2021). Management practices are complementary to skills. Studies of firms and entrepreneurs have found that higher levels of education are correlated with better managed, larger firms that grow faster, and these results are robust for countries at different levels of development (McKenzie and Woodruff 2017; Queiró 2018; Bender et al. 2018; Cornwell et al. 2020). However, focusing specifically on the returns to management practices, the benefits of education are not as high as the costs. Although it is necessary for the country's overall development, this type of policy has the drawback of being typically long-term, especially considering the distortions and lags in education generated during the COVID-19 crisis.

Rationalize labor regulation. According to the management literature, burdensome labor regulations tend to be negatively correlated with management (Bloom et al. 2019; Bloom et al. 2012). In Mexico's case, in addition to generating incentives for informality, the laws make hiring and firing costs expensive. Beyond payroll taxes and social security contributions, firms are subjected to substantial uncertain labor costs related to convoluted labor regulations that often end in lengthy disputes in courts. Firing costs, measured as severance pay for redundancy dismissal in Mexico's main cities, are double the ones exhibited in Brazil and five times those in the United Kingdom and France. Making labor markets more flexible improves incentives within firms as it becomes easier to implement performance-based promotions and changes among bad performers. However, the scope for having a less regulated labor market is quite narrow as it only affects management through incentives. Furthermore, although making labor regulations more flexible is a low-cost policy (from a financial perspective), these kinds of reforms entail complexities like negotiating with unions and interest groups; therefore, they can be considered medium-term policies.

At the same time, providing social protection for workers and establishing long-term labor relationships generates incentives for firms to invest in workers' training, which is complementary to management and organizational practices. Therefore, it is important to take a balanced approach to ensure enough flexibility for firms to be able to take action in cases of underperformance and provide incentives for workers. At the same time, it is important to generate incentives for firms to pursue the acquisition of key complementary inputs, such as skilled workers, that could enhance other types of management practices (data-driven management and target setting).

Within-Firm Interventions

Expand access to information and diagnostic studies. One of the problems associated with management practices is that firms tend to overestimate the quality of their managerial and organizational practices. Therefore, regardless of the high returns associated with improvements in management, most firms do not invest in these firm-level capabilities due to a lack of information. To address this constraint, a mix of information and targeted support for firms has proven to have a positive effect on performance (Scur et al. 2021). For example, interventions indicating how firms are ranked against other firms with similar characteristics (benchmarking) can contribute to overcoming the information problems that prevent firms from pursuing improvements in management practices. This type of intervention has the characteristics of being low-cost and easily implemented, and it has a medium-term framework. Subsidized diagnostic services, where the firms receive a voucher for a diagnostic of their management and organization, could be used. Online self-diagnostic tools could also provide an initial benchmark for firms and serve as a starting point to provide information about their shortcomings and potential returns to improving their management and organization.

Provide vouchers for "insourcing" professional managers. One of the characteristics of management in Mexico is that family ownership and firm governance matter for management, and external professional managers in family firms exhibit more structured practices (Bloom and Van Reenen 2007; Bloom, Sadun, and Van Reenen 2015). In this sense, an intervention that provides vouchers so that firms can formally hire professional management can generate the right incentives for SMEs. However, beyond the financial incentive, a key issue would be to provide enough trust and signals about the quality of these professional managers, which could be achieved for example through a system of referrals or public assessment of their previous results in other companies.

Revise the structure and system of programs to support innovation and introduce effective schemes following international good practices. In the case of Mexico, innovation efforts have been dispersed across government agencies and show significant overlap. For example, the Ministry of Economy's efforts overlap with some National Council for Science and Technology programs, and the same occurs with state-level interventions. Moreover, some gaps in the scope of these programs are observed as investment tends to focus on the early stages of the innovation process, and there is no follow-up along the firm's technological maturity cycle. Decisions and strategies in terms of innovation and R&D have clearly not been based on evidence as, for example, in 2010, the tax credit on R&D was repealed and substituted by grants, but later tax credits were reinstated in 2017 without providing any assessment on the reasons behind these decisions.

It is crucial to improve the current investments to support innovation in terms of quantity, but also quality and effectiveness. It is also crucial to define and improve targeting as key to maximize returns on investments in innovation, and to identify higher-quality investments and concentrate effort around these instead of dispersing support among many smaller and low-quality investment programs (Bloom, Van Reenen, and Williams 2019).

Create a program of subsidized loans or grants for young firms. Young firms with high potential should be especially targeted for subsidized loans. Evidence has proved that financial frictions have an important impact on innovation. As mentioned in chapter 5 of this report, young firms are particularly affected by these frictions; therefore, focusing on them is desirable. For more details on how to design and implement these types of instruments, it is crucial to build on good international practices as discussed by Cirera et al. (2020).

Enhance training and in-firm consulting. The literature has found positive results for this type of intervention even in the short term (Bloom et al. 2013; Iacovone, Maloney, and McKenzie 2021; Campos et al. 2017). However, the costs vary widely depending on the type, intensity, and quality of the intervention (Scur et al. 2021; McKenzie et al. 2020). The following are among the main features that these interventions should have:

- Governments should only partially fund this kind of intervention. The firm should still fund some part to generate commitment mechanisms (for example, matching grants).
- Information is key. The government could provide a list of certified consultants that could help to overcome informational constraints.
- Programs that require more screening for enrollment and that are more intensive and selective have larger effects on performance.

- These kinds of programs should be designed to be carefully evaluated (impact evaluation) and monitored.
- The scope and characteristics of training should be specific to different types of firms. It is crucial to match the type of training to the type of enterprise. In this sense, based on the evidence, the following policies could be pursued:

    - *Microenterprises (entrepreneurship programs).* The majority of firms in Mexico are microenterprises, with a mode of one-employee establishments (see chapter 3). Therefore, it is crucial to target firms of this size. In Mexico's specific case, the National Institute of the Entrepreneur disappeared in August 2019, and support to firms of this size has occurred mainly through microcredits. Furthermore, during the pandemic, the main channel for supporting firms was a credit of 25,000 pesos for microenterprises (see box 4.1, in chapter 4). Based on empirical studies, the strategy for firms of this size is to implement programs combining traditional training (teaching) with personal initiative training (aspirations and soft skills). Although conventional training programs based on teaching (covering topics like generating business ideas, business plans, permits, costing, pricing, record-keeping, budgeting, marketing, human resources, and stock controls) have been shown to improve performance, interventions targeting attitudes and focusing on generating a particular mindset and aspirations have shown high returns and cost-efficiency. Therefore, interventions that combine both hard skill and soft skill approaches should be pursued. Furthermore, this kind of intervention should be adapted for specific groups, such as women and young entrepreneurs. For example, these programs should help women to go beyond the traditional sectors in which they participate, which tend to be less profitable, and to overcome gender barriers. To do so, in addition to traditional teaching and personal initiative, they could include features such as role models and mentorship, which have proved to be efficient in the case of Mexico (Cucagna, Iacovone, and Rubiano-Matulevich 2020; Iacovone, Calderón, and MacGregor 2018).
    - *SMEs and large firms.* The case of medium-size and large firms, as well as high-growth startups, requires different programs that consider their specificities. The following are among the instruments on hand for SMEs and large firms:

        - *Interventions (training programs) focused on production and quality management.* This approach includes training on lean manufacturing, a close analysis of the workflow, and bottlenecks, which should induce workers to reduce waste, improve workspace organization, and maintain machinery and equipment.
        - *Business consulting for SMEs.* This approach starts with diagnostics evaluating the existing management practices and identifying areas of improvement. This type of program could be anchored in supplier development programs to ensure that firms understand and seize the benefits of pursuing these consulting and training programs and implement the changes suggested by consultants.
        - *Business consulting for large firms.* Following the evidence provided by Iacovone, Maloney, and McKenzie (2021), group-based consultancy might be a cost-efficient alternative that could provide the desired results.

- *High-growth entrepreneurs or startups.* For this kind of firm, it is important to define clear selection criteria to be eligible for programs. The evidence indicates that the selection of higher-quality ventures is key for this type of program's success.

    - *Accelerator and incubator programs.* In addition to some basic training, mentoring, networking, and ensuring financing for pursuing these ventures are the most important features of these programs. It is crucial to ensure that through government subsidies for startups or by filling the information gaps with financial institutions, these firms obtain the needed financing to develop and grow. These programs should also include peer interactions with similar but slightly better firms that are not direct competitors (McKenzie et al. 2020).
    - *Co-location of accelerators.* This policy generates incentives for high-tech and high-impact firms to locate together to take advantage of agglomeration effects with the objective of pursuing innovation.

Conclusions

This chapter took advantage of various novel, firm-level databases to analyze empirically the factors that boost productivity within firms, that is, productivity levers that are associated with firm decisions. The chapter focused on innovation, management practices, and ICT adoption and analyzed the particular aspects that appear to be relevant for Mexico's case and could be important in supporting future policy reforms. The results emphasize the importance of generating the right incentives for firms to materialize the benefits of pursuing these firm performance drivers.

The chapter analyzed the patterns and characteristics of innovation in Mexico. The results indicate that Mexico, similar to other countries in Latin America and the Caribbean, exhibits important lags in most input and output indicators of innovation. Furthermore, the problem is a dynamic one as, at least over the past 10 years, Mexico has not been making significant progress. This result is mainly driven by the fact that Mexican firms do not pursue frontier innovation (R&D and patents); instead, they mostly adapt and imitate technologies from advanced countries.

Mexico has significant opportunities for catching up in innovation investment. In terms of innovation output, Mexico is in line with other Latin American countries, except Chile. Considering the inverted U-shape of innovation across developing countries (see Goñi and Maloney 2017), Mexico is close to the peak, indicating relatively high returns to innovation investment.

Another interesting result that is consistent with the existing literature is that firms with access to finance have a higher probability of innovation. However, firms exhibit decreasing returns to financing over innovation because as they increase their financing level, their probability of pursuing innovation rises but at a decreasing rate.

Further analysis of the drivers of innovation showed that management practices have an important role in innovation and technological capabilities at the firm level. Moreover, implementing structured management practices becomes even more important for firms with higher levels of technological capability.

Additionally, the chapter showed that although firms in Mexico implement fewer management practices than those in the United States, which can be regarded as the frontier, the impact of good managerial practices on labor productivity and total factor productivity is similar.

However, the chapter also revealed that the dispersion of managerial capabilities is higher in Mexico, especially in the case of services, which is a symptom of potentially larger misallocation. The results are supportive of the hypothesis that misallocation is strong, especially in the case of the service sector, and could explain why Mexican firms invest sub-optimally in management and organization. The chapter found that selection mechanisms that should lead to a better allocation of resources and exit of firms that are not well managed do not appear to be at work. In the service sector, average management practices do not improve over the firm life cycle, and the spread does not decrease. Institutional weaknesses such as corruption, poor contract enforcement, and crime appear to be significantly associated with this misallocation, while competition and better market access tend to reduce it. The results suggest that competition and access to larger markets are not only crucial for improving allocative efficiency, but also are drivers of the implementation of more structured management.

Finally, the chapter analyzed the returns to ICT investments in terms of productivity (that is, value added per worker). The key finding here, which is very important to inform future policies aiming at promoting ICT adoption among Mexican firms, is that productivity is unlikely to respond to ICT investments alone—firms must also have the right incentives, such as those provided by competitive and well-functioning markets. This is because competitive pressures generate incentives for firms not only to invest in ICT, but also to make efforts in terms of complementary investments such as organizational changes, which are crucial for efficient adoption of ICT.

Table 6.1 Summary of Policy Recommendations

Policy	Term	Costs	Benefits	Other considerations
External to the firm				
Competition and market access	Medium	Low	High	• Strengthen the Federal Economic Competition Commission's faculties to promote competition and sanctions against anti-competitive practices.
Enforcement of contracts and the rule of law	Medium	Medium	High	• Improve organizational and management practices in the judicial system. • Improve monitoring, benchmarking, and sharing of best practices across states. • Implement mechanisms to improve commercial cases such as specialized courts and alternative dispute resolutions.
Trade and FDI	Medium	Low	High	• Focus on certainty and compliance with international agreements.
Labor regulation	Medium	Low	Medium	• Make labor regulations more flexible to reduce firing costs and improve within-firms management in terms of incentives. • Balance flexible labor market and social protection to provide the right incentives for both employees and employers and, therefore, improve management.
General education	Long	High	Low	• Specifically for management, the benefits of higher education are not as high as the costs. • Substantial lags as a consequence of COVID-19.
Within-firm interventions				
Information (benchmarking)	Medium	Low	Medium	• Provide a mix of information and targeted support.
Vouchers for insourcing professional managers	Medium	Medium	High	• Provide vouchers for formally hiring professional management to generate the right incentives for SMEs.
Innovation vouchers & R&D tax credits	Medium	High	Medium	• Conduct a public expenditure review to reduce overlap of federal and state programs. • Identify higher-quality investments, especially among SMEs—targeting is key.
Subsidized loans for young firms	Short	Medium	High	• Promote innovation by mitigating financial frictions for young, high-growth firms.
Training and in-firm consulting	Short/ medium	High	Medium	• Provide partial funding from the government (for example, matching grants) to generate commitment. • Promote information on suppliers of training and rigorous screening. • Conduct M&E. • Create tailor-made interventions for different *types* of firms: • *Microenterprises:* training + personal initiative. Include role models and mentoring. • *SMES:* training programs based on production and quality management; business consulting; anchored in suppliers' development programs. • *Large firms:* business consulting; group-based interventions. • *High-growth entrepreneurs or startups:* accelerators and incubators; co-location to take advantage of agglomeration effects.

Sources: Based on Scur et al. 2021; Bloom, Van Reenen, and Williams 2019; McKenzie et al. 2020.

Note: FDI = foreign direct investment; M&E = monitoring and evaluation; R&D = research and development; SMEs = small and medium-size enterprises.

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Endnotes

71 The chapter refers to annex figures and tables that are provided in online annex 6A.

72 Maloney and Valencia Caicedo (2017) show that the ability to identify, absorb, and adapt technologies, as measured by the number of engineers per capita in 1900, explains the income level a century later, conditional on initial income level. They show that in 1900, countries such as Argentina, Chile, Denmark, Sweden, and the southern United States had similar levels of income but vastly differing capacities to innovate. These differences, in turn, predicted well today's differences in income: the Nordic countries and U.S. states accelerated and moved ahead while Latin America lost ground.

73 A linear probability model is estimated in table 6A.1.

74 The technological capabilities score is a normalized score (ranging from 0 to 1) that indicates the frequency with which the firm purchases licenses for products or processes, assimilates or documents technologies, adapts and modifies technologies, generates its own technology, files for patents, or sells technology to other companies.

75 The instrument is based on the idea that in sectors that are characterized by a higher level of complexity (measured as the share of relationship-specific inputs in each sector), good managerial practices tend to be more important for innovation. Additionally, in states where there is a higher supply of MBA graduates, a higher quality of management and organization among local firms is expected (as shown by Bloom et al. 2019). Figure 6A.7 shows that MBA programs at the state level are highly correlated with the average management score. To strengthen the identification, the analysis also controls for location and sectoral fixed effects. Therefore, the analysis only relies on the interaction between the supply side (supply of MBA graduates) and the demand side (sectoral level of complexity) in a difference-in-differences approach.

76 As mentioned by Scur et al. (2021), good management practices, as measured by the WMS and later in the Management and Organizational Practices Survey, include noncontroversial topics where there is consensus about good and bad practices. An example of this kind of practice is having a reasonable number of key indicators and monitoring them regularly, as well as having a system that identifies workers who are not performing well and providing incentives for those who perform well.

77 This survey is not only nationally representative, but also representative at the regional, sectoral, and size levels.

78 See box 6.2 for more information on this methodology.

79 Results on the effects of management on firm performance and misallocation are based on Bloom et al. (2021).

80 Calculating the rate of change under discrete compounding as $\exp(\hat{\beta} * \Delta management) - 1$.

81 According to the National Survey on Business Victimization, one-fifth of firms report being forced to reduce hours of operation due to crime.

82 The analysis uses data from the Executive Secretary of the National System of Public Security.

83 Furthermore, as explained by Paunov (2016), corruption can even affect incentives for innovation and the adoption of quality certificates and patents.

84 Interestingly, badly managed firms in municipalities with widespread corruption are larger, on average, than firms located in municipalities with lower levels of corruption. This could result directly from firms with poor management obtaining contracts and permits easily in municipalities where the government makes discretionary decisions.

85 The drive time to the border is constructed by using OpenStreetMap to calculate the distances between the centroid of each municipality and the three main border crossings along the border between Mexico and the United States (Tijuana, El Paso, and Nuevo Laredo). The command osrmtime in Stata is used.

86 As table 6A.12 shows, once the analysis controls for various firm-level characteristics, the coefficients are not significantly different between manufacturing and services.

87 Due to the construction of this panel of firms, the competition shock analyzed, and the instrumental variable, the panel ends up with mostly large manufacturing firms. See Iacovone, Pereira Lopez, and Schiffbauer (2016) for further information on the data set and methodology used for this analysis.

88 Returns are measured by the increase in value added per worker, and ICT adoption is proxied by the increase in the number of computers per worker.

89 The product and process innovation index includes cost reductions, time saving, labor productivity increases, access to knowledge sources, exchange of ideas, plant and production scaling, and improvements in industrial design of products and processes. The organization and marketing innovation score comprises access to new markets, better within-firm communication, increased logistics efficiency, implementation of automatized systems, improved communication with clients, higher diversity in product delivery, and more personalized product or service orders. Both scores range from 1 to 10.

90 The main barrier to these policies is the political economy equilibrium in which incumbents have strong veto power and influence.

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