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MEXICO

SELECTED ISSUES AND ANALYTICAL NOTES

November 2017

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October 23, 2017

Approved By
Western Hemisphere Department

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CONTENTS

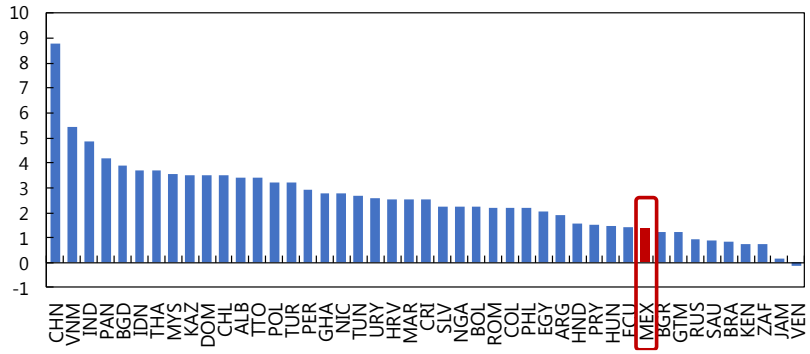
MEXICO'S STRUCTURAL REFORM AGENDA: EARLY SIGNS OF SUCCESS[1]

Over the past five years, the Mexican authorities have been implementing an ambitious structural reform agenda in a coordinated effort to lift productivity growth. The reforms targeted a broad range of industries, dissolved state monopolies, promoted competition in network industries, and addressed labor market, education and governance shortcomings. This chapter discusses Mexico's reforms and attempts to assess their economic impact. The analysis suggests that external headwinds have masked evidence that the reforms are achieving many of the intended transformations in the targeted sectors. Nevertheless, earlier estimates of growth payoffs may have been optimistic and would require doubling down on past efforts. Priority should be given to reforms targeting the rule of law and attendant improvements in security and reduction in the prevalence of corruption, which are not only important to improve the business environment but are also key in allowing the existing reform efforts to bear fruit.

A. Introduction

1. The Mexican authorities have been implementing an ambitious reform agenda. Five years ago, and amid disappointing GDP growth over several decades, stakeholders across the political spectrum agreed that lifting productivity growth would necessitate decisive action on structural reform (Figure 1). When the current government took office in December 2012, it signed an agreement with the two main opposition parties (PAN and PRD) to promote political cooperation. The effort was aimed at boosting competition and increasing access to services across a range of industries while addressing current and future pressures from declining oil revenues and population aging. Many of the reforms are now well advanced while others are still in the process of being completed.

Figure 1. Real GDP Per Capita Growth
(1990-2016 Average, Percent)



Sources: IMF World Economic Outlook; and IMF staff calculations.

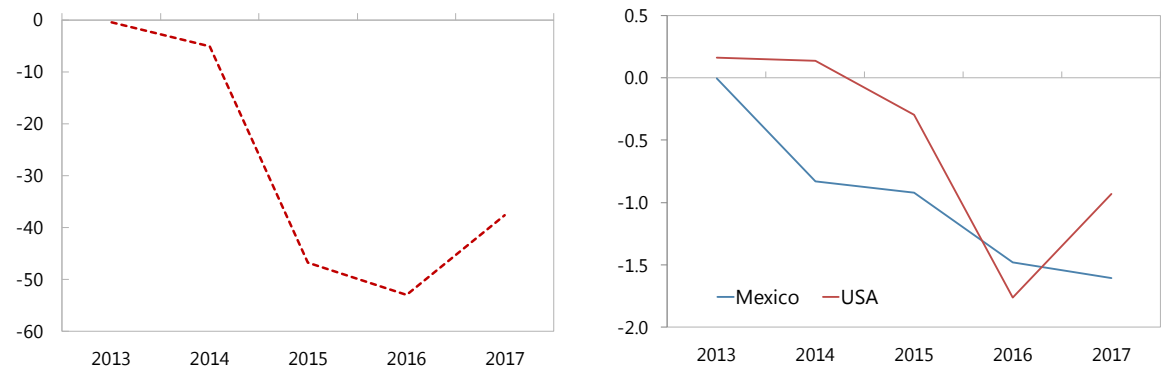
2. Five years after the *Pacto por México,* a major growth acceleration is not yet in sight. At the time of the pact's approval, the authorities estimated that the reforms could boost growth to 4-5 percent a year, from an average of around 2.7 percent over the previous 20 years.

[1] Prepared by Christian Saborowski.

Staff's projections at the time were more conservative but also suggested that medium-term growth would be lifted by around ¾ to 1 percentage points per year to 3½ - 4 percent. However, such growth rates have yet to materialize. This could in part be explained by the fact that any positive impulses are being masked by both a weak external environment and a faster-than-anticipated decline in existing oil fields, including due to insufficient investment amid the decline in international oil prices (Figure 2).

Figure 2. Worsening External Environment

Revisions in Oil Price and Growth Projections Between Fall 2013 and Fall 2017 WEOs



Sources: World Economic Outlook; and IMF staff calculations.

3. While initial projections for growth payoffs may have been optimistic, the reforms' impact is unlikely to have fully materialized to date. A detailed look at the industries central to the reform efforts suggests that the reforms have contributed to higher investment and lower consumer prices as well as more widespread access to services. Recent studies highlight that reforms often entail short-term costs and take time to implement (Duval and Furceri, 2016, and IMF, 2016). In particular, these studies find that the positive growth impact of major product market reforms in OECD countries tends to become statistically significant only after three years, and fully materializes after about seven years (raising GDP on average by a cumulative 1.5 percent). In the case of the Mexican reforms, with most of the major pieces of legislation approved over the course of 2013 and 2014, these findings would suggest that the reforms should be beginning to show results only now.[2] Moreover, some reforms would have been a drag on activity in the short-term (e.g. liberalization of fuel prices - by reducing consumer

[2] There are many reasons why delays in growth payoffs should be expected. For example, oil field auctions only began in 2015, and fields may take years to start production even after successful exploration; investments in electricity generation typically take years before the new plants start producing; attracting private investments into the telecommunications sector that was previously dominated by a single firm is a complex undertaking and thus requires an element of learning by doing.

purchasing power). Nevertheless, the analysis in this chapter attempts to better understand whether there is evidence that the reforms are working as intended. The analysis focuses on two of the major reforms, namely in the energy and telecommunications sectors.

B. Energy Reform

Oil and Gas Sector

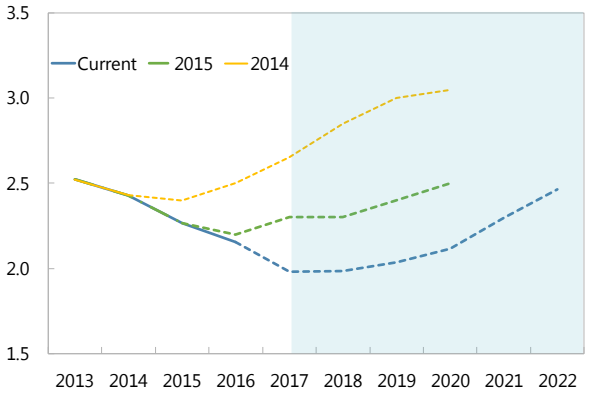
4. The energy reform broke a powerful state monopoly and opened the sector to private investment. Congress approved several constitutional amendments in December 2013 - and passed all the secondary legislation in August 2014 - to end a 75-year old monopoly in the oil and gas sector. The reform promoted open and competitive markets between state enterprises and private firms in upstream, midstream and downstream operations. It also allowed the state to enter a wide range of risk-sharing contracts with the private sector. In the electricity sector, the reform encouraged greater private participation in generation and improved the regulation and management of transmission and distribution. The reform further increased the autonomy of Pemex and CFE (the state-owned oil and gas, and electricity companies, respectively) and strengthened their financial positions to permit investments in their assets and operations. Moreover, the launch of a wholesale electricity market in early 2016, operated by the newly created National Center for Energy Control, should allow private companies to produce and sell electricity and compete with CFE.

5. The government also started liberalizing gasoline prices. Prices had historically been set by the government. The recent liberalization effort began last year with the introduction of a price band within which prices could fluctuate; and in January 2017, the authorities reduced the subsidy element and allowed the price of gasoline to increase by some 17 percent month-on-month. The process of fully moving to market-determined prices by abolishing regulatory price limits began in March 2017 and is expected to finish at end-2017. While prices remain subject to daily smoothing on the part of the government, with variable excises (IEPS) buffering the difference between the retail price and the producer price, they already now more closely track developments in global markets.

6. The reform has succeeded in attracting private players along the value chain. Within a few years, the sector has attracted close to 70 exploration and production firms, around 60 transportation and storage infrastructure companies and close to 30 oil retailers, according to the Ministry of Energy (SENER). The country's natural gas import capacity has grown by 270 percent since 2012. Total investments committed to oil exploration alone total some $3 billion and could rise to more than $60 billion as per the contracts auctioned so far, depending on the success rate of exploration.

7. The decline in oil production nevertheless has continued. Oil production has fallen from 2.5 million barrels per day to about 2 million barrels since 2012, a decline of some 20 percent (Figure 3). About half of the drop is due to the further decline of Mexico's aging Cantarell field which produced more than 2 billion barrels per day on average in 2005 and whose production fell from some 450 million barrels per day in 2012 to about 200 million at end-2016. This outcome contrasts with projections in 2014 which saw oil production falling to 2.4 million barrels before recovering to 2.5 million in 2016 and 3 million by 2019. The new PEMEX management that took over in February 2016 revised production targets to more conservative levels; Pemex subsequently met its target in 2016 for the first time in 5 years. Production is now expected to bottom out in 2018 and rise to 2.5 million barrels by 2022. Even at these levels, the increase in production relative to the trough will amount to an increase in real GDP of some 0.5 percent.[3]

Figure 3. Oil Production Forecast Vintages
(Millions of barrels per day)



Sources: Comisión Nacional de Hidrocarburos (CNH); SENER; and IMF staff calculations.

8. While initial projections had to be revised notably, strong investor interest underpins the expectation that the new targets can be reached. Investor interest has been a success in an environment of disappointing oil prices (Figure 2) and declining capital expenditures in the sector around the world.[4] Two licensing rounds have already been completed and the third one is ongoing. Pemex was awarded 83 percent of proven and probable reserves in "Round Zero" in August 2014. As part of "Round One", Pemex signed its first deep water farm-out contract for the Trion field with BHP Billiton in March 2017. An auction of 15 shallow-water blocks, which is part of "Round Two", was successfully concluded in June 2017 with ten blocks awarded, two of which to joint-ventures involving Pemex. In July 2017, a first successful discovery at the Zama-1 well (off the coast of the state of Tabasco) was made by an international consortium, which constitutes one of the largest oil finds in recent history and the country's first major oil find by a foreign firm.

9. The willingness to optimize auction design on the go was crucial for their success and will continue to be going forward. Given the complexity of the reform, a process of learning from experience is key. When the first tender in Round 1 attracted only two successful

[3] This calculation simply multiplies the share of oil and natural gas extraction in GDP by the projected growth in oil production.

[4] Global capital expenditure in the oil sector has dropped by some 40 percent between 2014 and 2016 (IMF, 2017).

bids, the authorities loosened some of the auction requirements which laid the ground for the success of future rounds. Similarly, the authorities capped royalty offers at 25 percent for natural gas and 45 percent for oil in later rounds to avoid high royalty bids from distorting incentives to invest and fully develop the auctioned sites (sunk costs are limited when bids consist of high royalty offers and low up-front payments or guaranteed investments). Going forward, continued optimization of auction design will be crucial to ensure that investment and production in the auctioned sites live up to their full potential.

10. Any new finds will take time to lift production. A potential near-term boost to oil production is likely to come from investments in already producing fields with proven reserves. Developing new fields will require more time. While production in onshore fields can potentially begin very soon after successful exploration, production in shallow water fields would typically come on stream only some 1-3 years after oil is successfully discovered. Deep water fields, in turn, would require at least 5-10 years after contracts are won, and are thus unlikely to be relevant for the medium-term outlook for oil production shown in Figure 3 (see De Imus, 2014).[5]

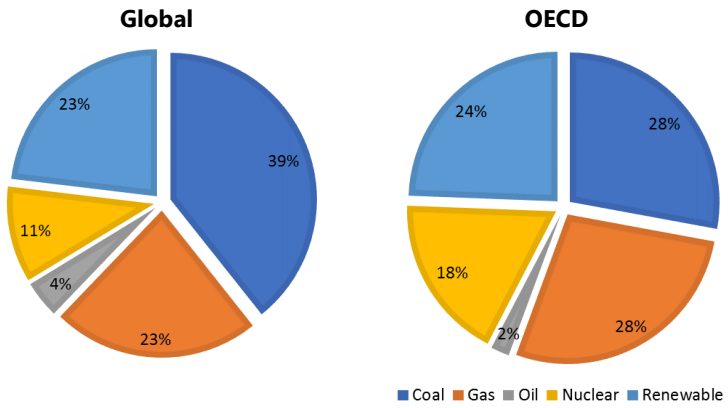
11. Farm-out contracts will be crucial in raising production levels in the near term. With the vast majority of producing sites with an existing infrastructure and over 80 percent of Mexico's proven and probable reserves in Pemex's hands, production increases in coming years will depend on PEMEX' ability to develop its assets. Despite welcome improvements in Pemex's balance sheet, the sheer scale of the required investments is likely to necessitate private participation to allow PEMEX to capitalize on its assets and to contribute to a notable boost in oil production in the near term. The farm-out agreement for the Trion Block as well as the latest farm-out contracts awarded at the beginning of October (two onshore fields and one in shallow waters) highlight the determination of Pemex's new management to take advantage of these opportunities.

Electricity Sector

12. The energy sector reform also has the potential to boost the economy by reducing high electricity prices. Electricity is an important source of energy in Mexico, especially for the industrial sector. Mexican electricity prices for residential consumers and agricultural producers are subsidized and regulated, but prices for industrial producers are not. Remarkably, the prices for industrial producers were around double those observed in the US prior to the reform (Alvarez and Valencia, 2015).

[5] The farm-out contract with BHP Billiton could start production relatively early as the field is close enough to U.S. production sites to benefit from existing infrastructure.

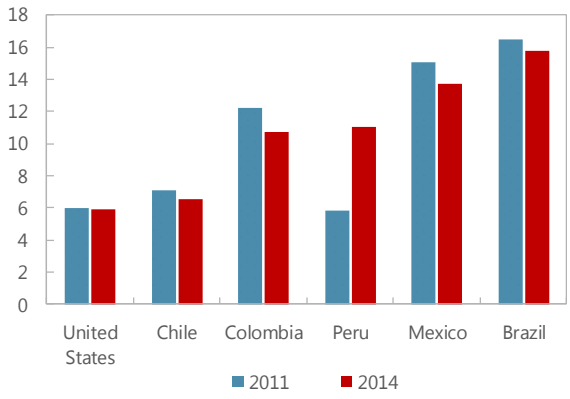
Figure 4.Electricity Generation by Source in 2016



Sources: International Energy Agency; and IMF staff calculations.

13. High prices are due to both Mexico's dependence on oil in electricity generation as well as its high distribution and transmission losses. Electricity generated using renewable resources—hydroelectric generation in particular—tends to be far less costly than fossil fuel-based generation. Among fossil fuels, generation using oil derivatives is particularly expensive. Mexico compares unfavorably to OECD peers and countries around the globe in the share of fossil fuels and particularly oil derivatives used in electricity generation which partly explains its high electricity prices (Figure 4). A second important factor is distribution losses. In Mexico, losses have reached some 14-16 percent of generation in recent years, and thus much more than in most peer economies (Figure 5). While an important component of these losses is electricity theft, the largest component is technical losses attributable largely to an aging infrastructure (see Alvarez and Valencia, 2015).

Figure 5. Transmission and Distribution Losses
(Percent of Output)



Sources: World Development Indicators; and IMF staff calculations.

14. The continued shift out of oil derivatives as an input to generation will put downward pressure on prices. The current pricing formula for industrial electricity consumers is administered by the government and is set to reflect a weighted average of input costs. Consequently, electricity prices move closely in line with the local currency prices of oil, natural gas and coal which together accounted for close to 80 percent of total electricity inputs in 2015 (Figure 6). Since about 2012, the Mexican electricity sector has shifted out of oil derivatives and into the use of cheaper natural gas (Figure 7). Going forward, the reform is expected to reinforce this shift as well as to increase generation using clean energy sources. Private investments in the energy sector have already supported this shift (Figure 8), including through gas-fired generation plants (more than 50 committed thus far) as well as a significant expansion in Mexico's gas pipeline network - which has grown from 7,092 miles before the reform to more than 8,500 miles by end-2016 and has another 3,161 miles under construction. Moreover, the first two clean energy auctions in 2016 collectively procured approximately 5,000 MW (wind, solar and geothermal), not including capacity contracts which would imply an increase of about 10 percent in Mexico's generation capacity.

Figure 6. Electricity Prices for Industrial End-Users

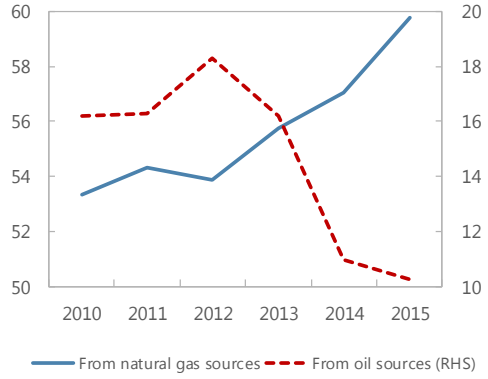
Prices in Mexican Pesos and normalized to 2013Q4 = 100

Sources: SENER; WEO, WDI; and IMF staff calculations; Weighted Commodity Price calculated as the prices of oil, natural gas and coal, weighted by their input shares in Mexican electricity production.

15. It is important to continue to incentivize private participation in generation and transmission to fully reap the reform's growth payoffs. As argued in Alvarez and Valencia (2016), with natural gas about 71 percent cheaper than fuel in 2013, replacing the entire 18 percent input share of oil derivatives at the time with natural gas would imply a long-term price decline of some 13 percent. The analysis suggests that such decline would boost manufacturing growth by between 1.4 and 3.6 percent and overall GDP by between 0.2 and 0.6 percent. Consequently, the reduction in the share of oil derivatives from 18 percent to 10 percent already achieved (Figure 7) would be consistent with a GDP boost of some 0.1–0.25 percent. While CFE's improved balance sheet will permit further investments in generation and

Figure 7. Oil vs. Gas in Electricity Generation

(Percent of Total)



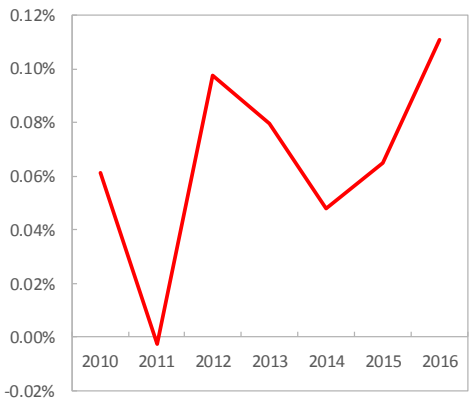
Sources: World Development Indicators; and IMF staff calculations.

transmission, taking steps to facilitate private sector participation will be crucial to further boost natural gas and clean energy based generation. An updated pricing formula, set by the regulatory body rather than the government that transparently reflects generation cost - as currently in consideration - would set the right incentives.

Figure 8. Investment in the Energy Sector

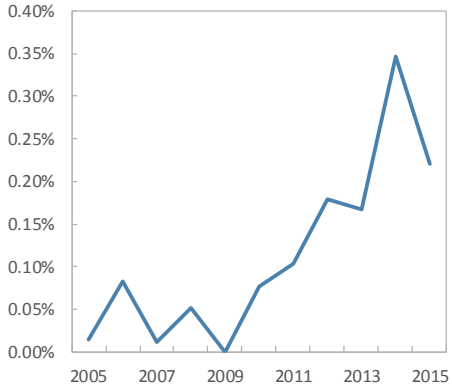
FDI in Electricity Sector

(Percent of GDP)



Investment in Energy with Private Participation

(Percent of GDP)



Sources: INEGI, World Development Indicators; and IMF staff calculations.

16. Further efforts are needed to reduce transmission and distribution losses, including by proactively providing opportunities for private participation. While the state maintained its monopoly in transmission and distribution following the reform, CFE is permitted to enter contracts with private entities to invest in the ailing infrastructure. With easy access to cheap natural gas from the US, a sizable reduction in transmission losses paired with the expected shift into clean energy and natural gas-based generation, electricity prices at or even below US levels could be possible. Such changes are unlikely to be forthcoming without increased private participation. Awarding contracts directly to the private sector, in addition to possible joint ventures with CFE would be a welcome addition and could significantly accelerate the process.

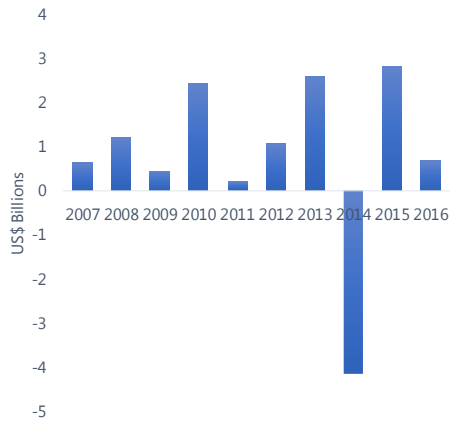
C. Telecommunications Reform

17. The main objectives of the telecommunications reform were to increase competition and improve access to services. The reform created a new independent regulatory agency, the Instituto Federal de Telecomunicaciones (IFT), and charged it with regulating broadcasting and telecommunications. IFT has the power to impose asymmetric regulations on any 'dominant' player in the telecoms or broadcasting sectors if needed to enhance

competition.[6] The reform also opened the sector to foreign investment and created specialized courts for broadcasting, telecommunications and economic competition matters. A new set of rules for the sector was presented by IFT in 2014.

18. The reform has attracted important investments though FDI has yet to take off. Investment in Mexico's telecommunications infrastructure has grown from some 0.4 percent of GDP in 2014 to 0.6 percent in 2016 according to IFT. Some major foreign investments have also taken place since the outset of the reform. These include AT&T's acquisition of Iusacell-Unefon and Nextel in 2014/15, with the US company now holding a market share of more than 10 percent in both the mobile telephony and broadband markets. Similarly, Eutelsat entered the satellite market by acquiring SATMEX in 2014. Nevertheless, FDI has yet to pick up and, going forward, it will be important to continue adjusting regulations to ensure a competitive environment and attract further investments (Figure 9).[7] The Red Compartida, a new wholesale broadband network, is expected to be in operation by the first quarter of 2018 and will provide wholesale access of broadband technology to more than 90 percent of the country.[8]

Figure 9. FDI in Telecommunications Sector
(US$ Billions)



Sources: INEGI; and IMF staff calculations.

19. New entrants in the market for both fixed and mobile telecommunications have enhanced competition although the market remains concentrated. Historically, America Movil has been the largest player in the telecommunication market in Mexico (Figure 10). The company comprises Telcel, a mobile telephony and mobile broadband provider, and two fixed telephony (Telmex) and broadband (Telnor) providers which together constitute the only fixed network with nationwide coverage. Since the reform, America Movil's market share has declined across all markets. Telmex and Telnor's market shares in the fixed telephony and fixed broadband markets dropped by 6 and 9 percent, respectively, while Telcel's market share in the mobile telephony and broadband markets dropped by some 5 and 12 percentage points. While these

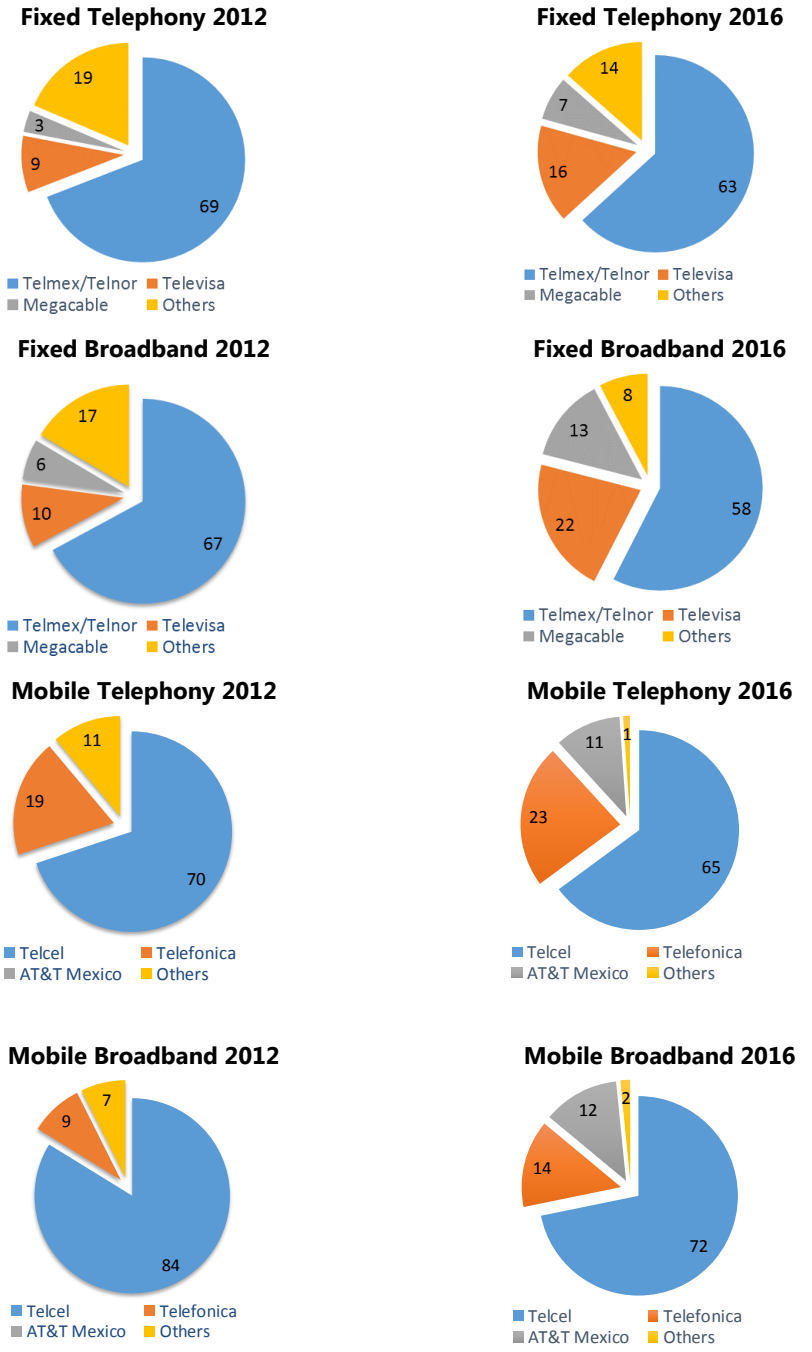
[6] In August of this year, the Supreme Court ruled unconstitutional a law requiring America Movil, Mexico's largest wireless provider, to permit other operators to use its network free of charge. Nevertheless, the ruling explicitly gives IFETEL the power to set the fees which will apply starting January 2018.

[7] IFT has recently requested a functional separation of Telmex into separate wholesale and retail arms.

[8] The winning bidder for the network construction (Altan consortium) was announced in November 2016. It has committed to invest about US$7.5 billion to build a network in the 700 MHz band. Altan would provide access to mobile operators who, in turn, would use the network to provide a consumer mobile product. The advantage of a wholesale only network is that new entrants can enter the market almost immediately and without having to face the cost of building a mobile network by themselves.

changes constitute important developments, America Movil continues to sustain a foremost position in each of the four markets and continued vigilance is needed to ensure a competitive environment.

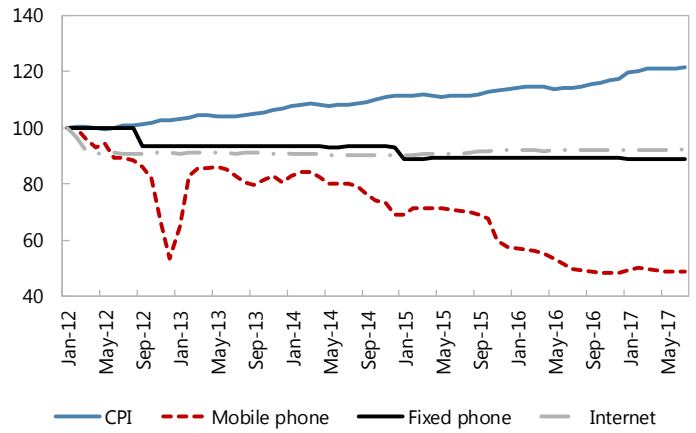
Figure 10. Evolution of Market Shares in Mexico's Telecoms Market



Sources: Sources: Instituto Federal de Telecomunicaciones and IMF staff calculations.

20. Strengthened competition contributed to a sharp fall in prices of telecom services. In particular, since end-2011, prices dropped by some 36 percent in nominal terms (17 percent since end-2012), driven almost entirely by mobile tariffs which dropped by some 51 percent over the same period as AT&T consolidated its position as a competitor in the market. Prices for fixed lines declined significantly less; the very slight price declines for internet services reflect at least in part the improved quality and breadth of services offered, including through significant advances in speed. Nevertheless, even these price declines are notable in real terms as the consumer price index increased by some 22 percent over the same period (Figure 11).[9]

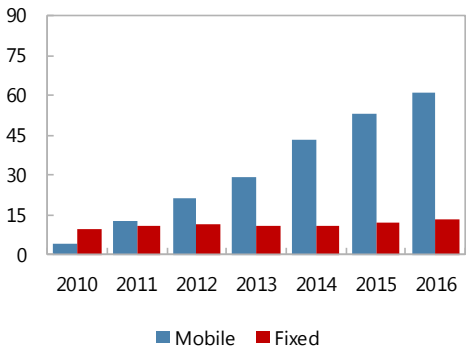
Figure 11. Telecommunications Prices



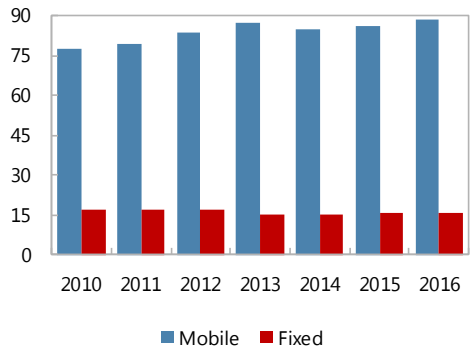
Sources: INEGI; and IMF staff calculations.

Figure 12. Access to Telecommunication Services

Broadband
(Per 100 Persons)



Telephone
(Per 100 Persons)



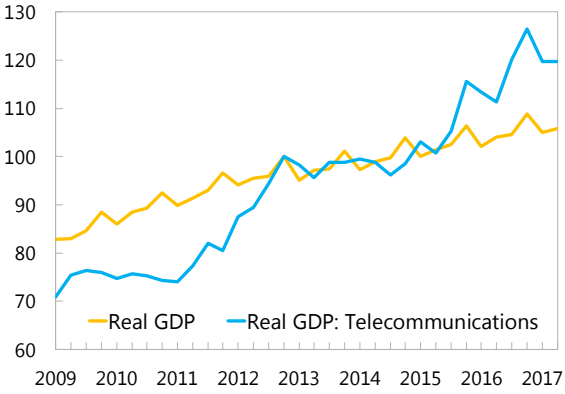
Sources: World Development Indicators; OECD; and IMF staff calculations.

[9] The price declines would have also directly reduced consumer price levels by more than one percentage point

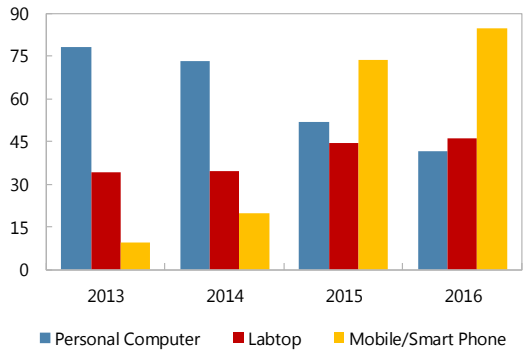
Figure 13. Telecom Sector Growth

Telecom Sector GDP

(2012Q4 = 100)



Internet Use by Device



Sources: Instituto Federal de Comunicaciones; INEGI; Encuesta Nacional sobre Disponibilidad y Uso de Tecnologías de la Información en los Hogares (ENDUTIH), 2016; and IMF staff calculations.

21. Access to telecommunications services has also improved notably since the reforms, especially for mobile devices. Between 2011 and 2016 the penetration rate for mobile phone subscriptions increased from 79 to 91 per 100 inhabitants (Figure 12). Over the same period, the number of mobile broadband subscriptions shot up from 12 to 61 per 100 inhabitants. While mobile broadband access has grown in other countries as well (e.g. from 59 to 99 in the OECD on average), growth rates in Mexico are striking. As a result of such increasing penetration and lower prices, internet usage has also increased dramatically, driven mostly by mobile devices (Figure 13, right panel).

22. Economic activity in the sector has increased significantly since the reforms. As of June 2017, the sector had grown by some 20 percent since end-2012. (Figure 13, left panel). This implies that the sector added some 0.6 percentage points to Mexico's GDP, about three times as much as it would have had it grown at the same rate as overall GDP.[10] Given that this growth started from a low base, there still appears to be space to grow further as the sector's transformation continues. In addition to growth in the sector itself, increased access to broadband, as well as lower prices can be expected to give a boost to activity as well, although studies in the literature differ substantially in terms of estimated elasticities as well as the relative importance of fixed and mobile technologies (see Minges, 2016). Moreover, there are important synergies with the financial sector reform discussed in the next section as wider access to mobile telecommunications technology can help boost access to financial services.

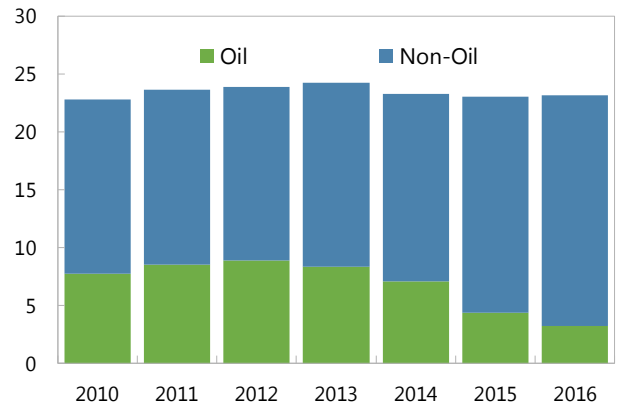
[10] This compares to the Fund's projection in 2014 that the reform could add some 0.4 to 0.8 percent of GDP. See Box 4 in 2014 Art IV for Mexico.

D. Other Reforms

23. Significant progress has also been made with the implementation of reforms in other sectors.

- **Fiscal reform:** Congress approved a reform to boost tax revenues in 2013. Changes in the income tax code included limits on deductions and exemptions, new tax brackets, new taxes on certain dividends and gains, the elimination of the tax consolidation regime for corporate groups, and the elimination of both the tax on cash deposits and the business cash flow tax. VAT changes included the elimination of a reduced border rate. A new excise tax was placed on sugary beverages and high-calorie food, pesticides and carbon-producing products. The reform has helped substantially boost non-oil revenue as intended to help offset the decline in oil revenues and prospective demographic changes (Figure 14).

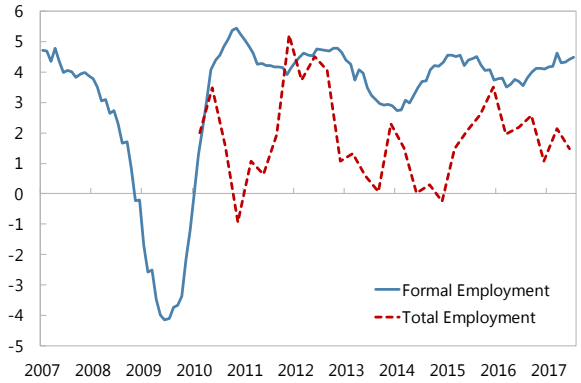
Figure 14. Fiscal Revenue
(Percent of GDP)



Sources: World Economic Outlook; and IMF staff calculations.

- **Labor market reform**: The reform introduced new contractual modalities, including flexible labor contracts, to boost hiring and labor market participation. It streamlined the settlement of labor lawsuits and capped compensation for unjustified dismissals to provide judicial certainty and reduce separation costs. Productivity and labor skills replaced seniority as main criteria for promotion and hiring and put in place tighter regulations for outsourcing. Further changes to the articles of the Constitution dealing with the labor justice system were published in February 2017 but still require changes to local and federal bodies to become effective. Finally, the reform introducing unemployment insurance for formal workers and universal pensions for all retirees is still pending in the Senate.

Figure 15. Employment
YoY Growth, NSA

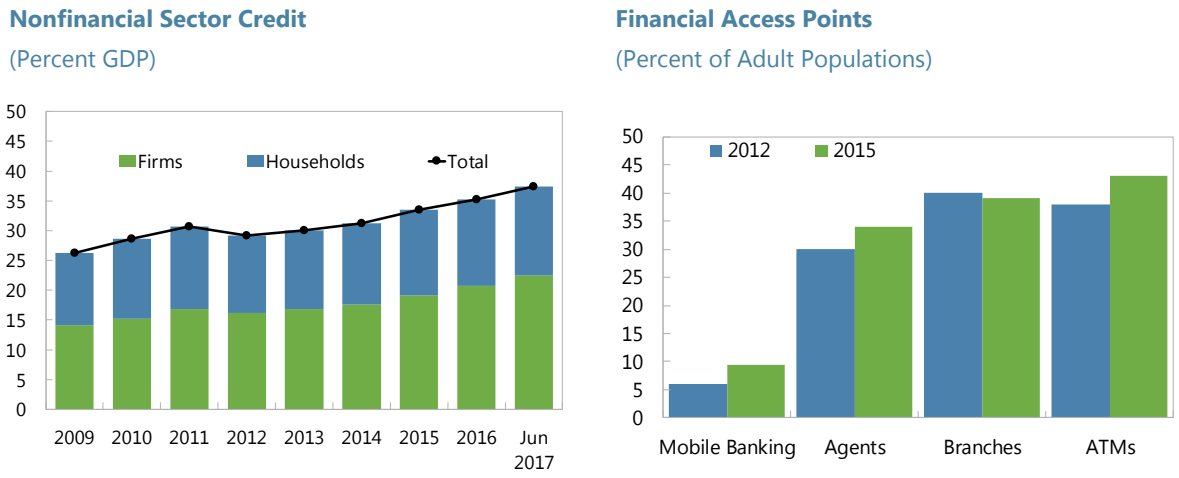


Sources: Haver; and Fund Staff calculations.

Nevertheless, there has been a visible trend towards formal rather than informal job creation in recent years (Figure 15).

- **Financial sector reform**: The reform aimed to spur financial deepening by promoting competition and streamlining bankruptcy procedures. It introduced new provisions allowing clients to switch banks more easily and strengthened the legal framework for consumer protection. The reform provided for the creation of specialized courts that should allow for faster processing of collateral in case of default. The authorities also increased the role of development banks in support of underserved sectors, including SMEs, and launched a National Strategy for Financial Inclusion in 2016. The reforms appear to have contributed to further credit deepening including through automobile and payroll loans, with credit depth increasing from 30 percent of GDP to 37 percent between 2013 and June 2017 (Figure 16, left panel). At the same time, there has been a gradual, albeit small, increase in financial access points which should support financial inclusion going forward (Figure 16, right panel). Similarly, the share of corporate loans going to SMEs has increased, albeit from very low levels.

Figure 16. Credit Depth and Financial Inclusion



Sources: Banxico; OECD Economic Survey 2017; and IMF staff calculations.

- **Education reform**: The 2013 Education Reform Bill has laid the basis for a merit-based system for the recruitment and promotion of teachers and ended a system where only union members could become teachers and hold guaranteed lifetime positions. The reform was violently opposed by teachers, leading to some concessions including on the transparency and effectiveness of teacher evaluation.[11] The focus has now shifted toward improving school

[11] While teachers would undergo mandatory periodic evaluation, the individual evaluation results will not be made public, undermining the effort to add transparency to the teaching process. Teachers will also be able to contest the results, and fired teachers would be able to appeal their cases in court.

building and revising the curriculum. More targeted spending on education could further enhance the impact of the education reform by (i) rebalancing the composition of education spending towards investment in equipment and facilities which is very low; (ii) more careful auditing of the payroll to better identify ghost workers and curb teacher absenteeism; and (iii) improving teaching quality.

- **Governance reform**: The 2015 constitutional reform created a National Anti-Corruption System (NACS). The goal was to improve coordination among the relevant authorities. Secondary legislation, approved in 2016, included requirements for greater disclosure of assets, identification of conflict of interest and proof of fiscal standing by public officials (General Administrative Responsibilities Law). The NACS is a major step forward and showcases institutional strength and the strength of civil society. Implementation of the NACS will be critical to ending the corruption trap where the existing structure of incentives are self-perpetuating, to improve economic efficiency and to increase productivity by reducing misallocation of resources and rent-seeking behavior. The appointment of a special prosecutor for anti-corruption will be crucial for the effective implementation of the reform.

24. The reforms payoffs have benefitted from positive synergies but also depend on a strong rule of law to take full effect. There are important complementarities between the reforms. For example, increasing formal employment has allowed a larger share of the population to access bank accounts and to apply for payroll loans. These same benefits, in turn, have made it more attractive to formalize work relationships. Similarly, the more widespread use of mobile information technology has allowed more customers to access banking services. At the same time, however, it is evident that big reform payoffs will require increased attention to strengthening the rule of law, including by combating corruption and crime. A good example is the financial sector reform where the value of collateral will depend on the likelihood that it can be seized in case of default. Similarly, achieving large gains in reducing informality will require strong enforcement in the labor justice system. Finally, as shown in Chapter 2 of this Selected Issues Paper, reducing informality, corruption and crime would also contribute to reduced resource misallocation in the economy.

E. Conclusion

25. The implementation of the *Pacto por México* has already led to important transformations in the Mexican economy. While initial estimates of potential growth payoffs may have been optimistic, external headwinds have masked important signals that the reforms are working. From a macroeconomic perspective, the reforms have already contributed to increasing investment, falling prices and more widespread access to services.

26. The reforms will take more time to fully feed through to the broader macro economy and lift growth. The delayed impact of the reforms owes to their complexity as well as some important short-term costs. At the same time, weaknesses in the rule of law will have weakened their impacts. Nevertheless, the transformations have highlighted the positive

synergies associated with a broad approach to structural reform that exploits complementarities between different sectors.

27. Building on existing reforms will be key, and priority should be given to reforms targeting the rule of law. Continued weaknesses related to informality, corruption and crime would stifle private investment and would likely impede the broader reform effort from exerting its full impact on the economy. Improving the efficiency and quality of law enforcement and judicial institutions would be critical in this regard**.**

References

Alvarez, J. and F. Valencia, 2015, "Made in Mexico: Energy Reform and Manufacturing Growth," IMF Working Paper 15/45.

De Imus, P., 2014, "The Impact of Mexico's Energy Reform on Hydrocarbons Production," IMF Art IV Consultation for Mexico 2014, Selected Issues Paper.

Duval, R. and D. Furceri, 2016, "The Effects of Product Market Reforms: The Role of Macroeconomic Conditions", paper prepared for the Seventeenth Annual Jacques Polak Research Conference, available under https://www.imf.org/external/np/res/seminars/2016/arc/index.htm.

Minges, M., 2016, "Exploring the Relationship Between Broadband and Growth," Background Paper, World Development Report, The World Bank.

IMF, 2016, *April World Economic Outlook*, Chapter 3.

IMF, 2017, *April World Economic Outlook*, Special Feature on "Commodity Market Developments and Forecasts, with a Focus on the Role of Technology and Unconventional Sources in the Global Oil Market".

OECD, 2017, Telecommunication and Broadcasting Review of Mexico 2017.

STRUCTURAL WEAKNESSES AND RESOURCE MISALLOCATION IN MEXICO[1] [2]

This chapter argues that improving the allocation of capital and labor within narrowly defined sectors in Mexico could be an important source of productivity growth that remains largely untapped. The analysis suggests that reducing resource misallocation by a quarter could boost the annual growth of Mexico's manufacturing and services output by around 1.4 percentage points per year over a 20-year period. It also finds that the largest potential gains are concentrated in some of Mexico's poorest states in the South. By employing a simple regression analysis, the paper identifies key areas for reforms including to strengthen the rule of law and financial inclusion which would level the playing field and reduce arbitrary advantages given to less productive firms, thus reducing resource misallocation.

A. Introduction

1. Five years after embarking on an ambitious reform agenda, growth in Mexico has yet to accelerate. External headwinds have masked signals that the reforms are achieving many of the intended transformations in the targeted sectors, but a sustained acceleration in economic activity is not yet in sight. While the structural reforms implemented in recent years should help lift potential growth to around 2.7 percent over the medium-term, higher growth rates will require doubling down on past efforts (see Chapter 1 of this Selected Issues Paper).

2. Previous studies have shown that improving the efficiency of resource allocation would tap a potentially large source of productivity growth. Resource misallocation arises because of distortions that prevent the allocation of resources to their most productive use within narrowly defined sectors. While these distortions are often difficult to identify, the framework by Hsieh and Klenow (2009) allows quantifying the potential total factor productivity (TFP) gains from alleviating them. Such potential gains appear to be higher in Mexico than in many regional and emerging market peers (Busso et al., 2013, and IMF, 2017).

3. The analysis in this chapter confirms that growth dividends from alleviating distortions can be substantial. The chapter uses unique data from the Mexican Economic Census compiled by INEGI to compute measures of resource misallocation**.** The data cover all Mexican non-agricultural formal and informal firms with fixed establishments in urban areas and is compiled every five years. Based on the latest survey in 2013, our findings suggest that reducing the gap between

[1] Prepared by Florian Misch and Christian Saborowski.

[2] This chapter uses confidential data from Mexico's Economic census, accessed through the National Institute of Statistics and Geography (INEGI) Microdata Laboratory. All results and information shown are not part of INEGI's official statistics.

Mexico's actual and efficient allocation of resources by a quarter could boost growth of manufacturing and services output by around 1.4 percentage points per year over a 20-year period.[3]

4. Growth dividends would be especially large in Mexico's South which includes some of the poorest states in the country. There is significant heterogeneity in the level of resource misallocation across sectors and states within Mexico. Regional variation is large even relative to cross-country differences, providing confidence that it is possible, at a minimum, to reduce resource misallocation to the level observed in the more efficient states. Moreover, resource misallocation among formal firms is much lower than across the entire economy, and there are large differences between manufacturing and services subsectors.

5. Simple regressions suggest that measures to reap productivity gains should include reforms that strengthen the rule of law and broaden access to financial services. The analysis uses simple linear regressions to establish correlations between resource misallocation – calculated across narrow economic sectors that are also differentiated by region – and potential explanatory variables. The findings suggest that resource misallocation correlates with informality, crime and low access to financial services as well as markets with entry barriers.

6. The paper is structured as follows. Section B summarizes the concept of resource misallocation and considers the link to structural reforms in Mexico. Section C discusses the data sources and the variables used for the analysis. Section D estimates resource misallocation for the aggregate economy and for individual states and sectors. Section E presents the econometric results. Section F concludes and summarizes the policy implications.

B. Theoretical Background[4]

7. Aggregate TFP depends not only on the productivity of individual firms, but also on the allocation of resources. In a well-functioning economy, firms that are more productive than their competitors should increase their market share over time and employ a greater share of capital and labor. Resource misallocation arises when capital and labor are poorly distributed so that less productive firms receive a larger than warranted share of the available resources.

8. The presence of distortions can give rise to resource misallocation. Distortions include poorly designed government policies or poorly functioning markets that allow less productive firms to gain market share at the expense of more productive ones. While these distortions are not necessarily observed, at least not in a direct way, the framework by Hsieh and Klenow (2009) can be used to quantify distortions indirectly by measuring the potential TFP gains from removing them.

9. Sector-specific measures of resource misallocation are derived from a model of monopolistic competition. Each firm in a given sector faces the same production technology and

[3] The efficient allocation would arise if all resources within each narrowly defined sector were employed by the most productive firm or, conversely, if all firms converged to the highest level of productivity in the sector.

[4] This section draws on IMF (2017).

maximizes profits subject to firm-specific wedges (modelled akin to firm-specific taxes) that distort output decisions and the capital-to-labor ratio. Total output within each industry is aggregated using a constant elasticity of substitution production function.

10. Resource misallocation is measured as the aggregate TFP gain that could be achieved if resources were allocated to their most productive use. In particular, the framework by Hsief and Klenow (2009) allows calculating the ratio of the actual level of aggregate output to the hypothetical level of aggregate output that would be achieved with an efficient allocation. The aggregate TFP gains from fully eliminating resource misallocation would thus be given by:

$$TFPgain = 100 \times (Y_{efficient}/Y - 1) \quad (1)$$

Resource misallocation relative to the level of a top-performing country denoted by $Y^*/Y^*_{efficient}$ can then be expressed as

$$TFPgain = 100 \times (Y_{efficient}/Y \times Y^*/Y^*_{efficient} - 1) \quad (2)$$

11. Only a subset of reforms can be thought of as directly targeting resource misallocation. Policy measures aimed at boosting productivity can target (i) the creation and growth of firms at the technological frontier (e.g., support for technological innovation), (ii) all firms irrespective of their characteristics (e.g., labor market reforms), or (iii) firms that are not at the frontier (Haldane, 2017). To have a direct impact on resource misallocation, such reforms would need to either boost the productivity of non-frontier firms or support the allocation of resources to frontier (the most productive) firms. While non-frontier firms are often ignored by policy makers, their sheer numbers imply that the returns to even modest improvements in their productivity could be very large (Haldane, 2017).

12. Not all elements of the recent package of reforms necessarily reduce resource misallocation, at least not in the short term. The energy and telecommunication reforms, for example, broke monopolies, strengthened competition and attracted investment, including from foreign companies close to the technology frontier. While improved competition may lead to a reduction in resource misallocation in the longer term, attracting highly competitive firms may simply move out the technological frontier - and thus increase resource misallocation - in the short term. The labor market and governance reforms, in turn, were intended to strengthen the rule of law and address problems related to informality and corruption, two potential distortions to the efficient allocation of resources. However, their implementation remains incomplete. Reforms that focused on supporting the productivity of non-frontier firms included those to increase financial inclusion (see Chapter 1 of this Selected Issues Paper).

C. Data

13. This paper uses firm-level data from the latest wave of the Mexican Economic Census to compute measures of resource misallocation within narrow sectors. This data is unique in that it covers the universe of non-agricultural formal and informal firms with fixed establishments in

urban areas regardless of their sub-sector and size. The economic census is compiled every five years. The latest wave of data from 2013 was used to compile both the measures of resource misallocation (within NAICS 4-digit sectors) and most explanatory variables. The remaining explanatory variables were calculated based on the 2010 Population Census and INEGI's SIMBAD database.

14. A standard methodology was used to transform the data and choose parameter values. At the firm-level, all observations with negative or zero value added, capital, sales and labor input (including labor provided by the owner of the firm) were excluded. In addition, the tails of the distribution of computed firm-specific output wedges, capital wedges, and total factor productivity were removed.[5] The choice of parameter values required for the estimation mostly follows IMF (2017). The output elasticities of labor and capital for each industry are approximated by their cost shares in the United States from the Bureau of Economic Analysis. The rental price of capital is set to 0.1, assuming real interest and depreciation rates of 5 percent, whereas we assume a uniform wage rate across firms.[6] The elasticity of substitution between the output of different firms is set to 3.

D. TFP Gains from Reducing Resource Misallocation in Mexico

Aggregate TFP Gains

15. Mexico could reap significant TFP gains by reducing resource misallocation. In the baseline specification, fully eliminating resource misallocation would increase aggregate TFP of the manufacturing and services sectors by almost 125 percent of GDP. However, in line with IMF (2017), it is straightforward to express the gains relative to those calculated for Sweden to avoid measurement errors and factors omitted from the model from biasing the estimate up. Sweden is a good reference point as its efficiency of resource allocation corresponds to the 90th percentile of the distribution of countries in IMF (2017), with relatively small potential TFP gains. Closing the gap to Sweden would imply TFP gains of almost 70 percent for Mexico.

16. The estimated extent of resource misallocation is only moderately sensitive to the underlying data and sample used. For example, the production function approach described above uses firm-level employment as the labor input variable. However, employment does not account for differences in wages, which in turn may reflect differences in human capital and the type of labor employed. An alternative approach replaces the labor variable with the firm-level wage bill in the production function (see also Busso et al, 2013).[7] The estimated amount of misallocation, however, deviates only modestly from the baseline estimate (116 instead of 125 percent of GDP). In

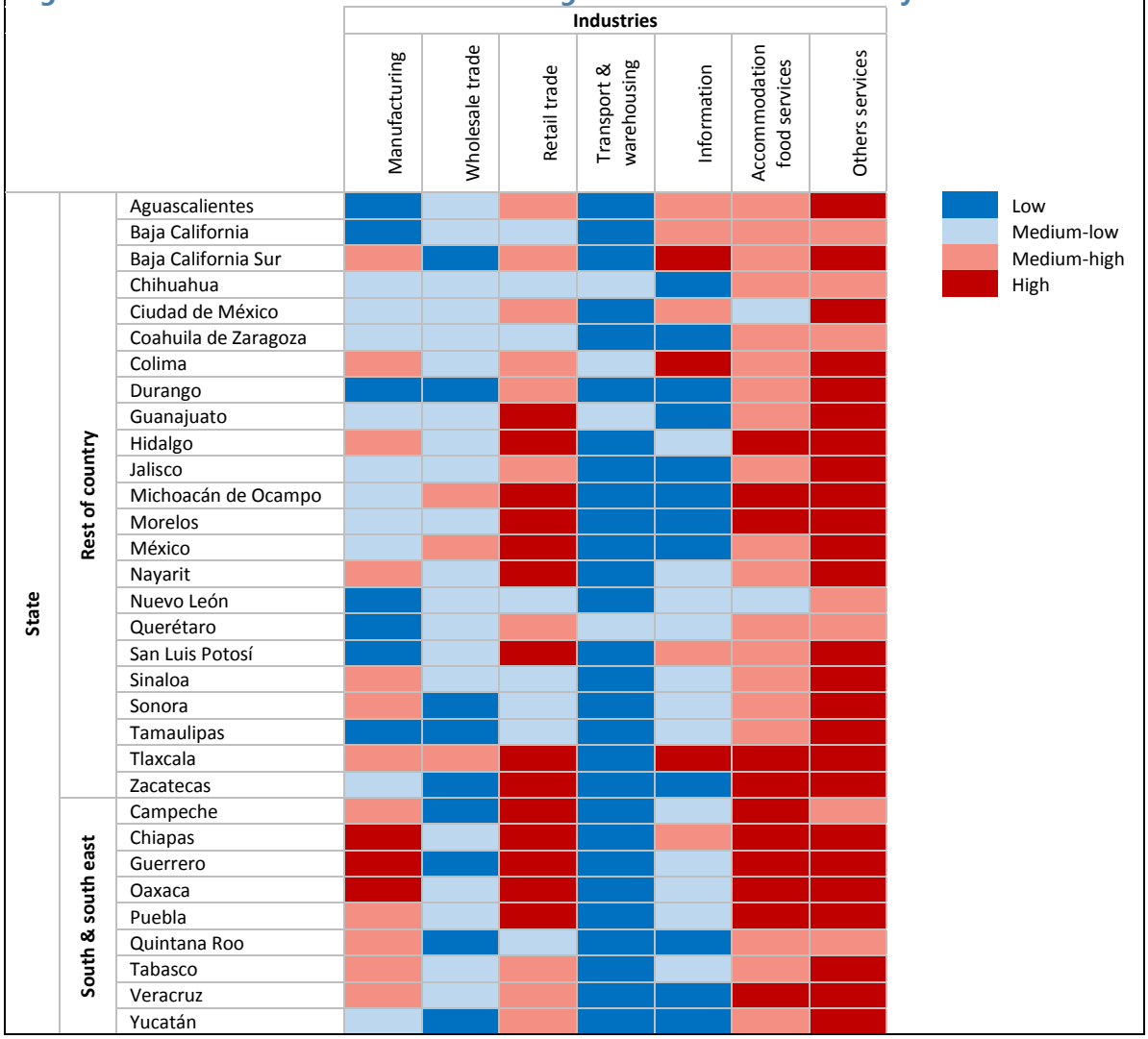
[5] Sectors were excluded if they are likely dominated by public institutions and not-for-profit organizations and if firm-level TFP is difficult to compare to other sectors among other reasons. These include mining, utilities, construction, real-estate and rental, professional and technical services, management of companies, education, health, arts, and public administration. Sector-state pairs with less than 10 firms were also excluded.

[6] In a robustness check, we use the cost of labor instead to account for differences in hours worked and human capital.

[7] In owner-operated firms without any employees or where all employees are family members which obtain a share of the profit, explicit wages are often not paid, implying that the sample size decreases.

a second robustness check, a different threshold to identify outliers is used, but still the estimates do not change in a noteworthy way.

Figure 1. Potential TFP Gains from Reducing Resource Misallocation by State and Sector



17. Our results are qualitatively similar to those in previous studies. Using economic census data from 2004, Busso et al. (2012) find that TFP gains from eliminating resource misallocation amount to some 95 percent for Mexico, and thus more than in all other Latin American countries the authors consider. IMF (2017) uses World Bank Enterprise Survey data for the manufacturing sector and suggests that TFP gains in Mexico could be between 93 and 130 percent for 2010 and 2006, respectively.

Decomposition of Aggregate Resource Misallocation

18. Aggregate TFP gains in Mexico mask considerable geographical and sectoral heterogeneity. To shed more light on the drivers of TFP gains from reducing resource misallocation, this subsection decomposes the aggregate results. The interquartile range in the distribution of TFP gains in individual sectors within each of the Mexican states amounts to around 100 percentage points. Moreover, variation is also significant between different sectors within each state (Figure 1).

19. States with high resource misallocation appear to be concentrated in Mexico's South and are among the poorest ones. Figure 2 illustrates the variation in TFP gains from eliminating resource misallocation across states. Large gains are clearly concentrated in Mexico's Southern states. In fact, in the Southern and South-Eastern states of Mexico (based on Mexico's official definition), the gains are on average 25 percentage points higher than in the rest of the country. Moreover, three of the four states where misallocation is largest are also among the country's poorest (Chiapas, Guerrero and Oaxaca).

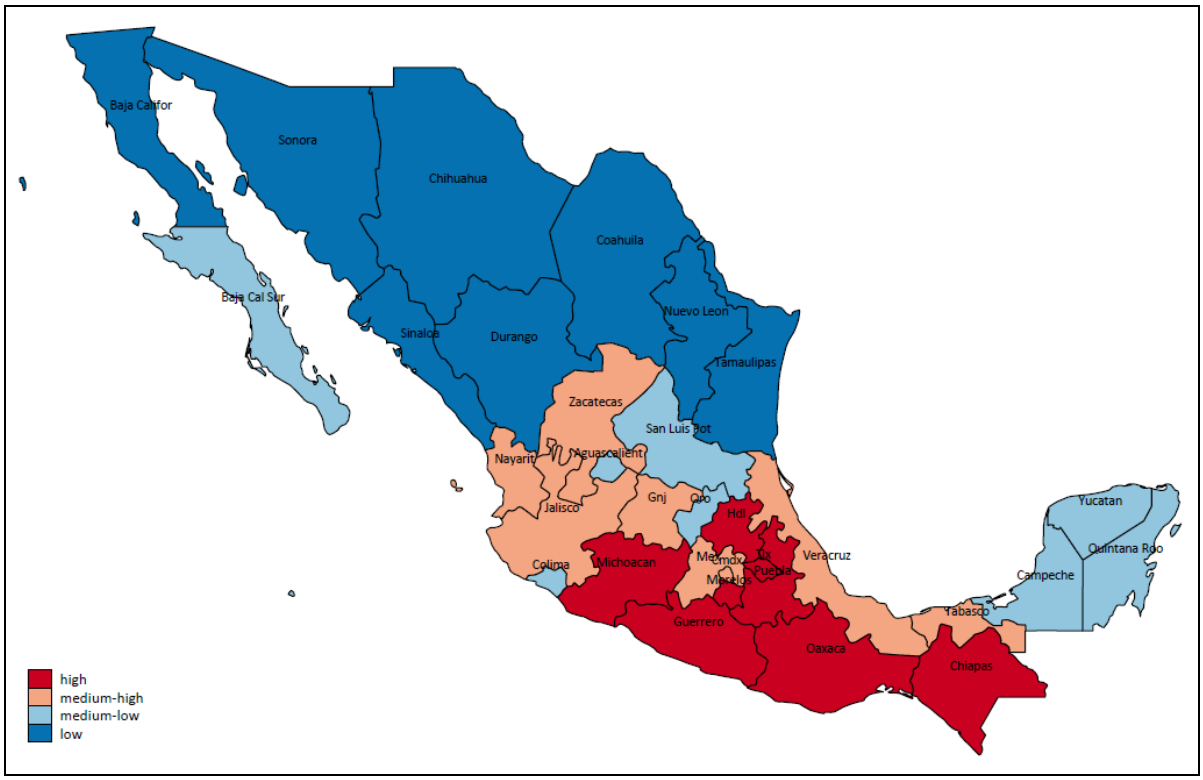
20. Between-state differences in potential TFP gains are large relative to estimates of cross-country differences in previous studies. State-level TFP gains in Mexico range from around 80 to 190 percent. This range is larger than the range for a sample of ten Latin American economies reported in Busso et al (2013) (around 90 percentage points). When omitting potential outlier states by calculating the interquartile range, the gap still amounts to 45 percentage points. This is larger than the interquartile range of potential manufacturing TFP gains across advanced economies and amounts to some two thirds of the interquartile range for a large sample of developing countries that IMF (2017) reports.

21. Potential TFP gains in manufacturing are significantly lower than those in services sectors. The difference between the potential TFP gains in the two sectors amounts to 22 percentage points. Previous studies find similar results for other countries. Dias et al. (2016), Garcia-Santana et al. (2015) and Benkovskis (2015) find that in Portugal, Spain and Latvia, resource misallocation in services is between 22 and 32 percentage points higher compared to manufacturing. IMF (2017) also finds qualitatively similar differences in a cross section of advanced economies. Arias-Ortiz and others (2014) and Dias, Robalo, and Richmond (2016) generally attribute these differences in sensitivity to regulation and tax structures, and to the larger presence of informal firms, respectively.

22. The estimated TFP gains from eliminating distortions are much lower when only formal firms are considered. In particular, the estimated gains drop from 125 to 90 percent of GDP when excluding informal firms (defined as establishments that do not pay social security contributions and VAT on their sales). This suggests that tax evasion is one important distortion that drives resource misallocation. Intuitively, informal firms enjoy a cost advantage over their formal competitors and could thus absorb more resources than they should according to their relative productivity level (IMF, 2017). This finding is robust to alternative definitions of informality, including firms that pay less than 16 percent of their wage bill in social security contributions (which is slightly below the minimum mandatory share; see Busso et al., 2013), or firms that neither pay social security contributions, nor value added, income or excise taxes.

Figure 2. Variation in Resource Misallocation across Mexican States

Potential TFP Gains from Reducing Resource Misallocation by State



Sources: INEGI; IMF staff calculations.

Potential TFP Gains and Growth Effects under Policy Scenarios

23. The large overall TFP gains as well as the variation across sectors and states suggests that the returns to reforms could be substantial. For instance, to give a sense of magnitude, reducing aggregate resource misallocation by a quarter could boost growth of the non-oil manufacturing and services output by around 1.4 percentage points for 20 years.

24. One possible avenue would be to reduce the large variation in resource misallocation across states and sectors. The following scenarios could be considered:

- **Reduction in state-level resource misallocation disparities.** As the efficiency of resource misallocation varies significantly across states, the first scenario assumes that resource misallocation in the bottom three quarters of the states improves to match the 25th percentile in terms of efficiency. This could be achieved through targeted regional reforms and development efforts and would entail aggregate TFP gains of up to 20 percent that arise solely from reducing resource misallocation.

- **Expansion of the formal economy.** The second scenario assumes a reduction in the size of the informal economy by 50 percent. This could be achieved, for instance, through improved enforcement and incentive schemes for firms to formalize. As discussed above, the level of misallocation falls from 125 to 90 percent when only formal firms are considered. Assuming that the size of the informal economy was halved, TFP gains of more than 15 percent could arise.

E. Regression Analysis

25. This section examines correlations between resource misallocation and observed distortions. The dependent variable in the regressions is resource misallocation as defined above and in Annex II, calculated for each of Mexico's 3,139 sector-state pairs (the product of an approximate average of 98 different sectors in each state and 32 states). The baseline regressions include a total of 2,138 observations as the bottom and top 15 percent of sector-state pairs in terms of the level of resource misallocation are excluded. Most of the explanatory variables are calculated as averages or standard deviations across firms in a given sector and state can are based on information from the economic census and municipality statistics.

26. The simple linear regressions include sector and state fixed effects. All regressions use heteroscedasticity-consistent standard errors. Annex II presents the variables used in the analysis along with their sources. In general, averages of variables are meant to explain whether companies operate in an environment that is conducive to an efficient allocation of resources. For example, a high share of informal firms could suggest that these companies have unfair cost advantages that allow them to attract more resources than they should per their relative level of productivity. Standard deviations, in turn, are computed to directly measure cross-firm variation in variables that affect firm-level TFP. For example, a high variation in electricity expenditures in a narrow sector may imply differences in electricity prices which in turn could be correlated with differences in productivity.

27. The set of explanatory variables reflects several of Mexico's structural challenges. The set of regressors could be divided into three broad groups. The first comprises indicators that measure structural constraints to the efficient allocation of resources in a given sector-state pair. These include not only informality and crime but also the composition of firms by age and size. Informality and crime would be expected to distort the allocation of resources by deterring investment and favoring firms with unfair tax- or security- related cost advantages. The composition of firms, in turn, is relevant to the extent that it proxies for barriers to entry or monopolistic practices. The second group includes detailed information on access to services such as the internet, electricity and financial services. Finally, the third group includes other firm specific variables such as indicators measuring FDI receivership and cooperation with foreign companies.

28. The baseline specification is shown in Regression 1 in Table 1. All regressors are statistically significant at least at the 90 percent level of confidence. They also have the expected coefficient signs and are mostly significant when included individually in the regressions (not shown here).

Table 1. Mexico: Baseline and Robustness

	(1)	(2)	(3)	(4)	(5)	(6)
Informality, Share	48.928***		47.895***	49.457***	57.578***	48.416***
	[9.544]		[9.619]	[9.563]	[7.933]	[9.586]
High Crime, Share	18.454**	17.160**			17.785**	18.202**
	[7.261]	[7.260]			[7.270]	[7.274]
Young Firms, Share	-22.388**	-21.154**	-20.792*	-21.566**	-21.870**	
	[10.611]	[10.703]	[10.634]	[10.591]	[10.522]	
Number of Employees, STD	2.792**	2.545*	2.832**	2.899**	2.576*	2.839**
	[1.345]	[1.366]	[1.348]	[1.340]	[1.347]	[1.351]
Bank Account, Share	-16.128*	-34.496***	-15.001*	-15.610*		-15.639*
	[8.655]	[7.410]	[8.652]	[8.637]		[8.618]
Electricity Costs, STD	90.395*	90.028*	92.526**	94.745**	93.217**	91.877**
	[46.951]	[46.618]	[47.089]	[47.035]	[46.866]	[46.827]
Informality2, Share		42.984***				
		[13.523]				
High Homicides, Share			13.208			
			[8.505]			
High Robberies, Share				17.973**		
				[7.573]		
Bank Credit, Share					-12.907	
					[14.028]	
Young Firms2, Share						-13.426
						[9.036]
Observations	2,138	2,138	2,138	2,138	2,138	2,138
R-squared	0.553	0.549	0.552	0.553	0.553	0.553
Industry effects	yes	yes	yes	yes	yes	yes
State effects	yes	yes	yes	yes	yes	yes

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

29. Regression results suggest that informality and crime constitute important distortions to the efficient allocation of resources. Regression 1 suggests that a higher share of informal firms in a given state-sector pair is associated with more productivity dispersion. Intuitively, by evading taxes and therefore getting a cost advantage, informal firms could attract a larger share of an economy's resources than would be justified by their relative level of productivity. Similarly, the share of firms located in high-crime municipalities within a state-sector pair is statistically significantly associated with more resource misallocation. This is unsurprising given that crime affects firms in an idiosyncratic fashion that would lead to variation across firms in the associated reduction in productivity. Moreover, high levels of crime would allow unproductive firms to attract relatively more resources than expected if they are better able to deal with security concerns than productive firms.

30. Low barriers to entry and the absence of dominant firms appear to be associated with a more efficient allocation of resources. Regression 1 shows that a higher share of young firms - those in operation for less than 2 years - tends to come with lower resource misallocation. A possible explanation is that a high prevalence of young firms reflects low barriers to entry and an environment conducive to firm growth in line with productivity developments. The analysis also finds that high variation in firm sizes is associated with elevated levels of misallocation. This can be interpreted as suggesting that the prevalence of very large firms makes the sector more prone to limiting the ability of small firms in gaining a foothold.

31. The efficient allocation of resources also appears to be constrained by a lack of access to finance and by the high cost of electricity. Regression 1 suggests that a high share of firms with bank accounts is associated with lower misallocation. This is intuitive in that an important role of the financial sector lies precisely in facilitating an efficient allocation of resources. Moreover, a high average share of expenditures on electricity in total sales is associated with higher misallocation. There are at least two potential explanations for that. First, electricity prices vary across regions in Mexico. If companies in a narrow sector have similar production functions, a higher share of electricity expenses may indicate higher electricity prices and thus a higher cost base. Second, the fact that electricity prices were extremely high in Mexico in 2013 (see Chapter 1 in this Selected Issues Paper) may amplify relative cost disadvantages of companies that are less efficient in their use of electricity.

32. The results are generally robust to changes in the definition of our main explanatory variables. Regressions 2-6 in Table 1 substitute one regressor at a time with alternatives. Regression 2 includes a broader definition of informality under which firms are considered informal not only if they make no social security payments at all but also if these payments amount to less than 16 percent of wages and salaries (see Annex II). The new indicator carries a very similar coefficient as our preferred definition and is also highly significant. Regressions 3 and 4 replace the composite indicator of the incidence of crime with more specific proxies for crime, e.g., the incidence of homicides and robberies. While only the robberies variable is significant, both coefficients carry the expected positive sign and do not differ much in magnitude from that on the overall crime variable. Regression 5 replaces our indicator of the prevalence of bank accounts with an indicator of bank

credit. Once again, the coefficient sign is negative as expected, yet the variable is not significant, suggesting that access to a bank account, including to conduct daily operations, is somewhat more important than access to credit. Finally, Regression 6 replaces the share of young firms with an alternative definition in which all firms younger than 4 years are classified as young instead of only those younger than 2 years. Here also, the coefficient sign is as expected but the variable is not significant.

Table 2. Mexico:Alternative Controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Informality, Share	48.928***	44.918***	48.962***	49.709***	38.886***	33.459**	48.872***	48.966***
	[9.544]	[10.650]	[9.549]	[9.498]	[11.045]	[16.620]	[9.553]	[9.560]
High Crime, Share	18.454**	19.626***	18.405**	18.556**	24.178***	28.975***	18.501**	18.705**
	[7.261]	[7.413]	[7.247]	[7.266]	[7.882]	[9.969]	[7.251]	[7.449]
Young Firms, Share	-16.128*	-19.083*	-16.153*	-18.035**	-24.283**	-8.479	-16.084*	-16.083*
	[8.655]	[10.283]	[8.648]	[8.713]	[10.191]	[14.679]	[8.660]	[8.674]
Number of Employees, STD	-22.388**	-24.775**	-22.395**	-23.890**	-26.306*	-21.977	-22.288**	-22.524**
	[10.611]	[10.935]	[10.607]	[10.645]	[14.534]	[18.661]	[10.629]	[10.624]
Bank Account, Share	2.792**	1.429	2.798**	2.779**	3.066**	1.587	2.779**	2.794**
	[1.345]	[1.380]	[1.345]	[1.345]	[1.444]	[1.344]	[1.347]	[1.347]
Electricity Costs, STD	90.395*	89.762*	90.651*	92.549**	135.964**	115.212*	90.527*	89.872*
	[46.951]	[48.152]	[47.013]	[46.878]	[56.426]	[63.829]	[46.927]	[46.938]
Internet Access, Share		-5.160						
		[6.682]						
Internet Use, Share			-8.092					
			[42.813]					
Internet Sales, STD				0.212				
				[0.146]				
FDI, Share					-4.955			
					[5.715]			
Foreign Cooperation, Share						-10.566		
						[10.742]		
High Population, Share							-0.982	
							[6.139]	
Firms Per Capita, Mean								-22.885
								[131.995]
Observations	2,138	2,038	2,138	2,138	1,628	919	2,138	2,138
R-squared	0.553	0.552	0.553	0.554	0.587	0.555	0.553	0.553
Industry effects	yes	yes	yes	yes	yes	yes	yes	yes
State effects	yes	yes	yes	yes	yes	yes	yes	yes

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

33. The baseline specification is robust to including a range of other explanatory variables. Regressions 2 to 4 in Table 2 aim at establishing a link between internet access and usage and resource misallocation. Intuitively, firms without internet access would face information disadvantages regarding potential customers and new technologies; and they may also be constrained in their access to customers in faraway regions. Regressions 5 and 6 examine the link between cooperation with foreign firms and resource misallocation to test whether foreign market

participation contributes to a more competitive environment. While all these additional regressors carry the expected coefficient signs, they are not significant. Finally, Regressions 7 and 8 aim to confirm that population or firm density matter for resource misallocation. A possible hypothesis is that better access to infrastructure and consumers in more densely populated areas would allow firms to reduce costs compared to their competitors in more remote areas. However, including the share of firms in high population municipalities as well as an indicator of the average number of firms per capita in the regressions does not yield convincing results. While the variables' coefficients carry the expected signs, they are not significant.

F. Conclusion

34. This analysis suggests that there is much scope for boosting productivity through reducing resource misallocation in Mexico. Potential gains from eliminating distortions that prevent an efficient allocation of resources appear to be higher than in many regional and emerging market peers. Using data from the Mexican Economic Census to compute measures of resource misallocation, the paper's findings suggest that reducing misallocation by a quarter could boost growth of the manufacturing and services output by around 1.4 percentage points per year over a 20-year period.

35. Growth dividends would be especially large in Mexico's South which includes some of the country's poorest states. There is significant heterogeneity in the level of resource misallocation across sectors and states within Mexico. Regional variation is large even relative to cross-country differences. The high variation and level of resource misallocation can in part be explained by the presence of a large informal sector as resource misallocation among formal firms is much lower than across the entire economy.

36. Strengthening the rule of law and improving access to financial services would boost productivity significantly. A simple regression analysis suggests that resource misallocation is closely associated with informality, crime and low access to financial services as well as markets with entry barriers and potentially dominant firms.

References

Busso, M., Fazio, M. and Levy, S., 2012. "(In)Formal and (Un)Productive: The Productivity Costs of Excessive Informality in Mexico," Research Department Publications 4789, Inter-American Development Bank.

Hsieh, C. T., and Klenow, P. J., 2009. "Misallocation and manufacturing TFP in China and India," The Quarterly Journal of Economics, 124(4), 1403-1448.

IMF, 2017, "IMF Fiscal Monitor: Achieving More with Less," International Monetary Fund, Washington, D.C.

Annex I. Variable Definitions and Sources

Variable	Definition (at state-sector level)	Source
Dependent Variable		
Resource Misallocation	Measure of the gains of eliminating resource misallocation based on the methodology by Hsieh and Klenow (2009)	2013 Economic Census
Baseline Regressors		
Informality, Share	Average across firms of dummy that takes the value 1 when the firm does not indicate any social security payments.	2013 Economic Census (Question J300A/J000A)
High Crime, Share	Average across firms of dummy that takes the value 1 for firms located in municipalities above the 75th pctile of crime incidence.	2010 Population Census
Bank Account, Share	Average across firms of dummy that takes the value 1 when the firm has a bank account.	2013 Economic Census (Question O551A)
Young Firms, Share	Share of firms in operation for less than 2 years.	2013 Economic Census (Question G111A)
Number of Employees, STD	Standard deviation across firms of number of firms' emploees.	2013 Economic Census (Question H001A)
Electricity Costs, STD	Standard deviation across firms of the share of firms' electricity expenses in total sales.	2013 Economic Census (Question K041A/A111A)
Other Regressors		
Internet Access, Share	Average across firms of dummy that takes the value 1 when the firm has internet.	2013 Economic Census (Question Z102_1A)
Internet Use, Share	Average across firms of dummy that takes the value 1 when the employees in the firm use the internet for more than just search and administrative activities.	2013 Economic Census (Question Z105)
Internet Sales, STD	Standard deviation of firms' share of total sales made over the internet.	2013 Economic Census (Question F316)
FDI, Share	Average across firms of dummy that takes the value 1 when a firm is an FDI recipient.	2013 Economic Census (Question D311)
Foreign Cooperation, Share	Average across firms of dummy that takes the value 1 if a firm cooperated with firms from other countries.	2013 Economic Census (Question D315)
High Population, Share	Average across firms that takes the value 1 in municipalities that have a population in above the 75th pctile	2010 Population Census
Firms Per Capita, Mean	Average across firms of the share of firms in the total population in each firm's municipality	2010 Population Census and 2013 Economic
Informality2, Share	Average across firms of dummy that takes the value 1 when the firm's social security payments are smaller than 16 percent of wage and salary payments.	2013 Economic Census (Question J300A/J000A)
High Homicides, Share	Average across firms of dummy that takes the value 1 for firms located in municipalities above the 75th pctile of homicides incidence.	2010 Population Census
High Robberies, Share	Average across firms of dummy that takes the value 1 for firms located in municipalities above the 75th pctile of robberies incidence.	2010 Population Census
Bank Credit, Share	Average across firms of dummy that takes the value 1 when the firm receives bank	2013 Economic Census
Young Firms2, Share	Share of firms in operation for less than 4 years.	2013 Economic Census
South	Dummy that takes the value 1 for the following states: Campeche, Chiapas, Guerrero, Oaxaca, Puebla, Quintana Roo, Tabasco, Veracruz, Yucatan.	Authors' calculations