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Management and misallocation in Mexico

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Abstract

We argue that greater misallocation is a key driver of the worse management practices in Mexico compared to the US. These management practices are strongly associated with higher productivity, growth, trade, and innovation. One indicator of greater misallocation in Mexico is the weaker size-management relationship compared to the US, particularly in the highly distorted Mexican service sector. Second, the size-management relationship is weaker in smaller markets, measured by distance to the US for manufacturing firms and population density for service firms. Third, municipalities with weaker institutions, measured by contract enforcement, crime, and corruption, have a weaker size-management relation. These results are consistent with frictions lowering aggregate management quality and productivity.

Key words: misallocation, management, performance, services, manufacturing, Mexico

JEL: E22; F14; L25; O33; D24

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I. Introduction

Economists have long been interested in firms' management and organization as key drivers of productivity and growth. Adam Smith's pin factory focused on the impact of organizational specialization on productivity, while Walker (1887) claimed the single largest driver of business performance was management quality.¹ While this interest in management faded after the 1930s, there has been a resurgence of interest in the last decade, driven by the recent availability of microdata on management (Roberts, 2018). However, this work has tended to focus mainly on manufacturing firms in developed countries. This paper presents the first large scale and nationally representative analysis of management practices in a major developing country, Mexico, covering both manufacturing and service sectors.

Our analysis is based on a novel firm-level survey implemented by the National Institute of Statistics and Geography (INEGI). To ensure survey quality and international comparability, the management part of the survey followed as closely as possible (given the English to Spanish translation) the US MOPS 2010 and 2015 surveys (Buffington et al., 2018). The survey was then matched to the Census administrative data, providing additional and rich measures of performance, demographics, and other firms and area characteristics.

We find more structured management – that is, more systematic collection and use of data through monitoring, goal-setting, and stronger use of incentives in Human Resource practices (e.g., over hiring, firing, pay, and promotions) - is associated with superior firm performance (in terms of size, productivity, profitability, and innovation) in both manufacturing and services. This result is robust to a wide variety of checks and controls. While this does not imply any causal relationship, it does suggest these management practices are tightly associated with firm-level performance.²

We first document that aggregate Mexican management scores, like productivity, are well below those in the US. We then focus on whether this is driven by greater market frictions

¹ Walker was the founding president of the American Economic Association and ran the 1870 and 1880 Census that formed the basis of his views.

² Below, we discuss randomized control trials around introducing more structured management practices that also seem to find significant performance improvements (e.g., Bruhn, Karlan and Schoar, 2018, on Mexican firms).

reflected in the fact that well-managed Mexican firms are unable to reap the returns of their managerial practices in terms of greater scale because of these distortions.

To examine this, we perform a number of tests. First, we show that although firms with higher management scores attain larger size in Mexican manufacturing, the size-management relationship is half as strong as it is in US manufacturing. Moreover, the size-management relationship is much weaker among firms in the services sector than among those in the more competitive and open manufacturing sector.³ Mexican services are more shielded from international competition (especially since Mexico's accession to GATT in 1986, and NAFTA in 1994) and have greater idiosyncratic regulations than manufacturing.⁴

This comparison across countries and broad sectors is suggestive but coarse. Our second test focuses on market size. A wide class of trade and IO models suggest that reallocation should increase with integration and market size (e.g., Melitz, 2003). We measure market access (trade costs) by drive times to the US border for manufacturing firms, and by income-weighted population density for services firms. We find that proximity to the US border increases the size-management relationship for manufacturing (which relies heavily on exports to US markets), but has no effect on services. We also find that this reallocation effect is driven by the manufacturing industries that are more export-intensive. For services, we find that local market size strengthens the size-management relationship, whereas this local market size indicator has no effect on manufacturing firms. Again, this is consistent with our priors, as reallocation among service firms should be affected by local market size and not international market access.

³ In particular, the regression coefficient of firm log (employment) on the management score is 1.62 in Mexican services, is 2.75 in Mexican manufacturing, and is 3.36 in US manufacturing. Hence, for every 0.1-point change in the management score, the associated change in firm employment size over twice as large in US manufacturing as it is in Mexican services.

⁴ See Goodwin et al. (2018) and Levy (2018). A recent World Bank report assessing the regulations at sub-national level in various Mexican States (e.g., Mexico State, Tabasco, Oaxaca, etc.) found for instance that firms in the retail sector face various types of barriers at entry (e.g., municipal licenses for which there are not clearly established time terms and for which the granting criteria are not fully transparent – for instance the declaration of “urban impact” can take between 1 month and 6 years), and during operations (limitations to use of English placards and promotional boards, renovation of licenses, limitations to the hours in which retailers are allowed to be open, etc.). In the transport sector, the report found that the state law in Tabasco does not allow a private company to propose starting a service to serve a new route but only the Government can propose a new route and open a market. Similarly, the state law not only prohibits foreign companies from concessions for local transport services, but even favors local companies against those from other states of Mexico – see Goodwin et al. (2018).

Our final test focuses on institutional frictions. We measure different measures of institutional frictions relying on data that measures contract enforcement, crime, and government corruption at the local (municipality) level. We find that reallocation is significantly greater where these institutional frictions are lower.

All three designs: across countries and sectors; across market sizes; and across local institutions suggest that frictions are a major factor in depressing the performance of the Mexican economy.

The paper is structured with a detailed description of the data in section II, including some basic results on management practices and firm performance. We discuss the distribution of Mexican management practices and how they compare with the US in section III. Section IV focus on misallocation, wedges, and the importance of market frictions, international exposure for manufacturing, and market density for services, while section V concludes.⁵

I.1 Relation to Existing Literature

We contribute to several strands of the literature. First, we add to the vast and rapidly growing literature on misallocation and aggregate productivity, including Hsieh and Klenow (2009). Several recent studies have specifically focused on extensive misallocation in Mexico as a barrier to aggregate productivity (e.g., Hsieh and Klenow, 2014; Misch and Saborowski, 2020; and Levy, 2018). Methodologically we focus on the covariance between a measure of fundamental firm capability (management quality) and firm size (as indicated by the allocation of labor, a key input). The original “Olley-Pakes” (1996) covariance term (between productivity and market share.) has been found to be a robust measure of misallocation in many parts of the literature, although typically, firm capability has been measured by proxies for Total Factor Productivity (TFP). TFP is notoriously hard to measure as it is a residual,

⁵ Online Appendices include the (translated English version) of the survey questionnaire (A), Data Details (B), other empirical results (C), a municipality-level analysis (D), and the model (E).

however, and even though it is likely to be correlated with fundamental capabilities,⁶ this relationship may be weak. In this paper, we draw on the idea in Lucas (1978) defining capability as management and measure it directly.

Second, we relate to the literature on the drivers of management practices. One strand of this has focused on the role of competitive frictions. There are a large number of papers pointing to the importance of competitive pressure for productivity (e.g., the survey by Holmes and Schmitz, 2010). One of the mechanisms is that a positive impact of competition on productivity may be due to competition increasing management quality (see Leibenstein, 1966 and the survey by Van Reenen, 2011). Other strands of literature analyzing drivers of management have focused more on information and learning spillovers (e.g., Cai and Szeidl, 2017) and regulations (e.g., Bloom et al., 2019).

Third, we contribute to the large and growing literature on the effects of management on productivity. Early studies used cross-sectional or occasionally panel data (e.g., Black and Lynch, 2001; Capelli and Neumark, 2001; Huselid, 1995; and Osterman, 1994). These studies tend to find positive associations in the cross-sections, but they tend to disappear in the panel dimension. Another group of studies focuses on smaller numbers of firms, sometimes even looking across sites in a single firm.⁷ These “insider econometric” studies tend to find more positive effects of management practices. More recent studies have used randomized control trials and (more rarely) quasi-experiments (Giorcelli, 2019), which also tend to find positive results.⁸ Bruhn, Karlan, and Schoar (2018) is particularly relevant as it focuses on Mexico and finds that firms that received management consulting exhibited a much stronger job growth over the medium term (2-5 years), though they find heterogeneity in the practices that have a high impact on firm performance.

⁶ In the model of Hsieh and Klenow (2009) firm-level revenue based TFP measured (TFPR) are unrelated to fundamental firm capability, quantity based TFP (TFPQ) due to the unobservability of firm level prices. In more general models, however, which allow for fixed costs of labor or adjustment costs there is a correlation between TFPQ and TFPR (Bartelsman, Haltiwanger and Scarpetta, 2013 or Asker, Collard-Wexler and De Loecker 2014). Nonetheless, the empirical and theoretical issues with TFP measurement make more direct measurements attractive.

⁷ For example, Bartel, Ichniowski and Shaw (2007); Bandiera et al. (2005, 2007); Hamilton et al. (2003) and Lazear (2000). See Bandiera et al. (2020) for a study focusing on CEOs and performance.

⁸ Examples of RCTs include Anderson et al. (2018), Bloom et al. (2013), Brooks et al. (2018); Fryer (2017); Gosnell et al. (2020), Higuchi et al. (2017, 2019); Karlan, Knight and Udry (2015); McKenzie and Woodruff (2013). See McKenzie and Woodruff (2017) for a survey and Bandiera et al. (2017) for a meta-study.

II. Measuring management practices

We start by describing the basic survey process and then validate our management scores by comparing them to firm performance data.

II.1 Sample and survey process

Our data comes from the National Survey on Productivity and Competitiveness of Micro, Small and Medium-size Enterprises in Mexico (ENAPROCE 2015 and 2018). This is the first large-scale and representative management survey conducted in Mexico. This was implemented by the National Institute of Statistics and Geography (INEGI), using the 2014 Economic Census as the sampling frame. The data was collected by enumerators visiting in person the physical location of each firm in the survey.⁹

The 2015 survey wave had a sample frame of 4,049,051 firms, from which 26,538 were chosen by random stratification (stratified to yield representative coverage of states and industries). From this, a sample of 25,456 firms responded: a response rate of 96%. This extremely high response rate was achieved because of the mandatory nature of the surveys implemented by INEGI¹⁰ and the repeated in-person visits by enumerators. The second wave of the survey was implemented in 2018, and it was designed as a panel. Due to this design, the response rate fell to 90%, as some of the firms could not be found or were closed.¹¹ Of the firms that were located, 13.3% had problems with incomplete information due to strikes, temporary closings, and other problems that affected data collection.

The management part of ENAPROCE was designed to replicate the US Census Management and Organizational Practices Survey (MOPS)¹². For manufacturing, it was translated directly

⁹ For firms with multiple locations the enumerators would visit the headquarters. 90% of the firms are single-site.

¹⁰ As stated in article 45 of the Mexican Law of the National System of Statistical and Geographic information (Appendix Figure A1).

¹¹ Among the 4% of firms that did not respond in 2015, only 2% were due to real refusals and the other 2% were due to firms that had closed down. Of the firms that responded in 2018, 13.3% provided incomplete information, due to closing, strikes, or other problems. On the other hand, of the firms that did not respond in this second wave of the survey, half had either closed or could not be located by the Census enumerators.

¹² See details on US MOPS surveys back to 2010 <https://www.census.gov/programs-surveys/mops.html>

from English without any modifications. For Services,¹³ it was slightly adapted to reflect differences in operations – for example, the question about “problems in the production process” was replaced by a question about “problems with customer service” (see Appendix A for an English translation of the services questions). The reason to exactly replicate the US MOPS was to maximize the comparability of Mexican management practices to the US MOPS 2010 and 2015 samples. After data cleaning, we end up with a sample of 16,100 firms with ten or more employees and 8,497 microenterprises with fewer than ten employees.¹⁴

For every firm, a management score was constructed following Bloom et al. (2019). The responses for each of the 16 questions included in the management section are normalized to obtain a score that ranges between zero and one, where the more structured management practices (the ones that are more specific, formal, frequent, or explicit) are associated with a value of one, while the less structured practices obtain a value of zero. The responses located in between these two extreme values obtain a fraction depending on the number of categories. Once every question is scored, we calculate an unweighted average of the 16 questions to construct the management score. We also separate the overall management index into two sub-indexes assessing monitoring practices and human resource practices (i.e., incentives and targets). Our index of structured management practice is not necessarily “better” or “worse,” although, as we shall see, they are strongly correlated with a wide variety of performance measures.

For the case of microenterprises, only four questions from the US MOPS were included in the shorter survey form. The correlation between the management score calculated with this subsample of questions and the overall management score for the non-microenterprises sample is 0.86, indicating that this short score is a reasonable approximation for the overall score. To reduce respondent burden, we did not ask questions on various other aspects such as exports and FDI. Consequently, the main part of the analysis drops microenterprises, although we do show robustness to including them in the Online Appendix.

¹³ The definition of sectors (Manufacturing and Services) is shown in the Online Appendix (Appendix B).

¹⁴ See Online Appendix (Appendix B) for further details on the construction of the sample.

II.2 Management and firm performance

As an initial validation of the data, we compare the management scores to a range of firm performance measures. While this analysis is only correlational, it is helpful for establishing that in Mexico (as in the US), these types of practices are associated with better performance. In Figure 1, we pool the data from the 2015 and 2018 surveys¹⁵ and present various measures of performance by deciles of the management score. Moving from the top left to the bottom right panel, we observe that higher management scores are associated with greater labor productivity, profitability (as measured by gross operating profits divided by sales), exporting, R&D expenditure per worker, patenting, and size (as measured by the number of employees).

Table 1 presents some initial estimates, where the dependent variable in the first two columns is $\log(\text{value added per worker})$. In column (1), we allow the coefficient on management to be different in manufacturing than services, and although it is positive and significant in both sectors, it appears to be stronger in the former. However, in column (2) where we also control for capital per worker, human capital (the fraction of employees with degrees and the proportion of white-collar workers), a full set of industry dummies (6-digit NAICS), a time dummy, and allow for non-constant returns (by including size on the right-hand side), there are no significant differences across the two sectors. Based on the results from column (2), the magnitude of the coefficient of management implies that a movement from the 10th to the 90th percentile of the management score is associated with about a 30% increase in productivity in both sectors. In column (3), we use Total Factor Productivity (TFPR) as the dependent variable, measured using a Törnqvist index.¹⁶ We again find evidence of a strong and positive relationship of productivity with management practices. Finally, columns (4) and (5) re-estimate column (3), but splits the sample into manufacturing and services and

¹⁵ The main results use pooled data for the 2015 and 2018 waves of the survey due to the short period of time between the two waves. See Online Appendix Table A1 for descriptive statistics of all the variables included in the analysis.

¹⁶ This is consistent with a translog production function. This is constructed in the same way as Aw et al. (2000) – see Online Appendix B for more detail.

confirm that management is positively and significantly correlated to productivity in both sub-samples with similar coefficients.¹⁷

In summary, these results show that structured management practices are tightly and robustly linked to productivity even when we control for a large range of controls.¹⁸ Moreover, the relationship in both sign and magnitude looks similar in both the manufacturing and service sectors. While the evidence is not causal, it is consistent with the studies discussed earlier, which rely on stronger identification schemes.

III. Management Practices in Mexico compared to the US

We first describe the distribution of management practices and perform basic comparisons with the US. Then, we analyze misallocation using management as a proxy of firm-level productivity and employment as the key firm size variable.

III.1 The Dispersion of Management Practices across Mexican firms

Figure 2 shows how Mexican manufacturing management scores (shown in solid) are more dispersed, a result echoing the wide dispersion of TFP reported for Mexico in Hsieh and Klenow (2014) and Levy (2018).¹⁹ We also plot the US manufacturing management score (shown in thinner grey), which has both a higher mean (the Mexican mean is 0.47 vs. 0.64 for the US – see Table A1 and Bloom et al., 2019) and a lower variance (the Mexican standard deviation is 0.171 vs. 0.152 in the US). Turning to Mexican services, we see the management score is even lower, with a mean value of 0.44 and marginally more dispersed.²⁰ This points to more market frictions in Mexico than in the US and, within Mexico, more relative frictions in services than in manufacturing. One possible explanation that we discuss later is that

¹⁷ As a robustness test, we merged our management data with the 2014 Economic Census and constructed the same outcome variables (value added-per-worker, TFP indexes and profitability), finding very similar results as shown in Online Appendix Table A2.

¹⁸ The analysis of labor productivity for microenterprises (Online Appendix Table A3) shows that management is also informative for these very small firms as well.

¹⁹ Furthermore, as shown in Online Appendix Figures A3 and A4, neither manufacturing nor services, exhibit much improvement in the last few years.

²⁰ Note there is no US management survey of services – indeed one of the unique things about the Mexican survey is the coverage of the services sector.

service sector firms have less exposure to international competition due to lower tradability and a greater degree of regulation.

If we consider other differences in firm characteristics between the manufacturing and services sectors, we observe that manufacturing companies tend to be larger and older, while workers in the services sector tend to be more educated, with a higher share of workers with a college degree. This is consistent with the analysis of Zahler et al. (2014) for Chile, in which firms in the service sector tend to be more skill-intensive while manufacturing firms are larger.²¹

III.2 Management and Reallocation across countries and industries

One interpretation of our results so far is that reallocation through market forces is weaker in Mexico than in the US, especially in services. To investigate this hypothesis, we look at the relationship between firm size and management. In environments where market frictions are lower, we would expect better-managed firms to be relatively larger. We detail a model in Appendix E which formalizes this intuition in a simple framework with heterogeneous firms, imperfect product market competition, and regulatory/institutional distortions (modelled as an implicit revenue tax). This delivers the intuitive proposition that firm size (as measured by employment) is increasing with management, but this relationship is attenuated when distortions are higher and/or competition is weaker.

To confront these ideas with the data, Figure 3 presents the size-management relationship in (i) Mexican services, (ii) Mexican manufacturing, and (iii) US manufacturing.²² The slope of the regression line of $\ln(\text{employment})$ on our management index is 3.4 for US Manufacturing, 2.7 for Mexican Manufacturing, and 1.6 for Mexican services. This is consistent with the strongest reallocation being in US manufacturing, followed by Mexican manufacturing, and the weakest reallocation occurring in the Mexican service sector.

²¹ If we split our service sector firms into knowledge intensive business services (e.g., law, consulting, engineering) and the rest, we find the former comprise 16% of firms with almost 60% of employees being graduates. In comparison this is 20% in the remaining 84% of services, which includes much more traditional activities like retail, wholesale etc.

²² The figure plots a 50-bin scatter for each of these sectors, with the linear regression line coefficients reported below the graph. Because of Census and INEGI disclosure rules individual data points cannot be disclosed.

These relationships are confirmed within the Mexican data in a firm-level regression with $\ln(\text{employment})$ as the dependent variable in Table 2. Consistent with Figure 3, column (1) shows that the coefficient on management in services is 1.6, while for manufacturing, it is significantly higher at 2.752 ($2.752 = 1.622 + 1.131$). Column (2) controls for education, region, industry, and time dummies and again finds the same ranking. Columns (3) through (6) repeat the analysis but split the samples into manufacturing and services and confirm the result of a stronger management-size relationship in manufacturing.

Another piece of evidence pointing towards the existence of misallocation in Mexico, especially in the services sector, is the relationship between management and firm age that we again show separately for US manufacturing, Mexican manufacturing, and Mexican services in Figure 4. Here, each age bin plots the average management score in deviations from each sample mean. Dynamic reallocation implies older firms should have higher management scores as the poorly managed firms should have been selected out at a younger age (or improved their management quality as time passes). Consistent with this, we see in Panel (a) that older American manufacturing firms have higher management scores, with the implied “shakeout” being particularly strong over the first five years. Similarly, there is an upwards slope in Panel (b) between management and age in Mexican manufacturing firms, albeit slightly weaker than in the US. In principle, this could also be due to learning as firms get better with age. What is striking is that in Panel (c), there is actually a negative gradient between management scores and age in Mexican firms in the service sector. Since it is unlikely that service firms have nothing to learn, this seems more likely to be signaling the absence of strong selection effects in Mexican services.

This is consistent with Hsieh and Klenow (2014), who argue that the size-age relationship is an indicator of misallocation, as in services, clearly, market selection is not effectively leading inefficiently managed (smaller) firms to exit across their life cycle.²³

²³ This is also consistent with the observation that Levy (2018) makes about observing higher misallocation in the services sector as the productivity gap for firms within this sector is higher than in manufacturing. Regressing the TFP index over age groups, productivity appears to decrease over age groups, especially in the case of services, starting at 16 years of age. In the case of manufacturing, mostly non-significant coefficients are observed.

A further piece of evidence is shown in Figure 5. If selection is important, we would expect that the variance of management across firms falls in older cohorts as the worst managed tail is selected out. This is certainly the case in US manufacturing in Panel (a) where the standard deviation falls sharply in older age bins. By contrast, in Panel (b) for Mexican manufacturing, the spread of practices within each age bin is *not* decreasing. Finally, in Panel (c) for Mexican services, the spread of management practices is actually *rising* with age.

To summarize, we have shown that despite a similarly strong association of productivity with management across countries (US vs. Mexico) and sectors (manufacturing vs. services), the reallocation of economic activity to better managed firms appears (i) weaker in Mexico than in the US and (ii) weaker in Mexican services than in Mexican manufacturing. We see this when looking at the size-management correlation and the relationship between firm age and the first moment (mean) and second moment (variance) of management.

We also consider some more dynamic indicators of misallocation in Online Appendix Table A4.²⁴ In the first two columns of Panel (a), we see that employment growth is higher for firms with greater management scores for both manufacturing and services, but it is significantly higher for manufacturing (test of the difference p-value = 0.008). Similarly, the last two columns indicate that better-managed firms are significantly less likely to exit, but this relationship is stronger for manufacturing than services (p-value = 0.028). Panel (b) shows that there are similar patterns when using productivity instead of management, but the relationship is weaker (e.g., the difference is not statistically significant for employment growth).²⁵ These dynamic effects corroborate the selection mechanisms underlying our interpretation of Figures 4 and 5.

III.3 Misallocation and Output Losses

How much does misallocation matter? We consider a simple semi-parametric re-weighting approach in the style of DiNardo, Fortin, and Lemieux (1996, “DFL”). Imagine a

²⁴ The description of how exit is defined and the characteristics of exit between the two waves of the survey are shown in Online Appendix Figure A2.

²⁵ These results are robust to including labor productivity and management simultaneously (e.g. the coefficient on management in column (1) falls from 0.16 to 0.12, but remains highly significant) and alternative definitions of exit.

counterfactual where we “assign” to firms in the services sector the same degree of reallocation as Mexican manufacturing by fixing the firm management score distribution, but reallocating job shares across this distribution to the same extent as exists in manufacturing. Intuitively, since more employment is allocated to the relatively better-managed firms in the sector, this will raise the size-weighted average management score.

To implement this, we split the services sector into twenty quantile bins and calculate the fraction of employment in the twenty quantiles of the manufacturing firm distribution. The unweighted mean management in the service sector is 0.446, which rises to 0.520 when weighted by firm employment size in services. The difference of 0.074 shows substantial reallocation towards better-managed firms in the service sector, albeit less so than in manufacturing.²⁶ Re-weighting by manufacturing shares implies an increase in the weighted management score in services of 0.039 (from 0.520 to 0.559). Using results from column (1) of Table 1, such an increase of management is associated with an increase in labor productivity of 4.5% or (using the last column of Table 1) an increase in TFP of 2.2%. These might seem like small amounts, but consider that the GDP of the Mexican service sector was US\$762 billion in 2019. This implies a growth in output of between \$34.2 and \$16.7 billion due to reallocation, which is non-trivial.

IV. Misallocation in Mexico: competitive frictions and wedges

Our results indicate that frictions and wedges are important in Mexico. In this section, we consider some sharper tests by using more direct measures of these frictions.

IV.1 Proximity to the US Border

Why proximity matters (for manufacturing firms)

One striking finding in the data is the importance of proximity to the US for the management practices in Mexican manufacturing firms. In particular, Panel (a) of Figure 6 highlights how

²⁶ The equivalent increase between unweighted and size-weighted management mean is 0.091 in manufacturing.

the US bordering states, which contain *maquiladoras* – the Mexican firms particularly focused on US exports - have the highest management scores.

There are several reasons why proximity to the US might matter. Our main hypothesis is that being closer to Mexico's main export market will strengthen competitive pressure on Mexican firms, raising their management quality. In other words, proximity reduces market frictions, raising management through a selection effect (the worst managed firms exit) and potentially an incentives effect (e.g., fear of losing some or all market share increases managerial effort). An implication of this hypothesis is that proximity should matter much more for firms that are more exposed to international trade with the US. For example, it should be much stronger for manufacturing firms (which generally trade internationally) than for service firms (who generally trade domestically). A corollary of this is that within manufacturing, the proximity effect should be more important for export-intensive industries compared to those that do not.

An alternative hypothesis on why proximity might matter for management is that being closer to the US raises management through learning. This might be because of faster flows of information on managerial best practices, and/or through the managerial labor market with American managers working in Mexican firms. Note that this story is based primarily on labor markets that are geographical in nature – there is no obvious reason why it should be different for sectors that are more or less exposed to trade. We shall test this idea directly by looking for heterogeneity in the proximity to the US effect across industries with different degrees of international exposure to trade.

A third hypothesis, popular in international economics, is that higher trade with the US could benefit Mexican firms through the use of higher-quality intermediate inputs (e.g., De Loecker et al., 2016). Consistent with this, we show that all our proximity results do also raise productivity. But it is less clear why better intermediate inputs would raise management quality.²⁷ This is one reason why having access to management data is an advantage over just using productivity data: it enables us to help disentangle the mechanisms through which trade effects on productivity may be occurring.

²⁷ Service inputs could help as discussed in the previous mechanism – e.g., easier access to the managerial labor market or better consultants. Trade and management are discussed in more detail in Bloom et al. (2018).

In Panel (b) of Figure 6, we reproduce Panel (a) for services. In contrast to manufacturing, areas near the US do *not* have systematically higher management scores. Instead, the service sector shows the highest management scores in locations close to the largest Mexican cities (i.e., Mexico City, Guadalajara, Querétaro, and Monterrey). One interpretation of this, which we will pursue in the next subsection, is that *local* market size and competition is much more important for service firms (who typically sell non-tradeable outputs and are more locally oriented) than manufacturing firms.

Evidence on proximity

To measure the geographical proximity of Mexican firms to US markets, we calculate the drive time, measured in hours, between the municipality where the firm is located and the closest of the three main border crossings between Mexico and the US (i.e., Tijuana, El Paso, and Nuevo Laredo). Given that the exact location of each firm is not disclosed for confidentiality reasons, we calculate the centroid of each municipality and then calculate the time between this and each of the three border crossings.²⁸

Our results indicate that the relationship between management and proximity differs across these two broad sectors, as the drive time to the border matters for firms in manufacturing, but not for those in services. As shown in Figure 7, where we present the CDFs of management across groups of drive time to the border, management score is higher among firms with a drive time to the border below the median, that is, closer to the border.²⁹

Figure 8 Panel (a) shows that although there is a positive relationship between firm size and management, the gradient is steeper for firms closer to the border, indicating stronger forces of selection. The same is not true for services, where the slope is similar regardless of the distance to the US border. This suggests proximity to US markets increases both the mean management score and its covariance with size for Mexican manufacturing firms.

We show these results in a regression framework in Table 3. Column (1) for manufacturing firms shows that for firms located close to the US border, management is positively and

²⁸ We use Open Street Map to calculate the distances by using the command “osrmtime” in STATA. Similar results obtain from using GoogleMaps. An analysis of the municipalities is shown in Appendix D.

²⁹ Figure 7 is weighted by employment size. In Online Appendix Figure A10, we present the unweighted results, which are very similar.

highly significantly related to size (as usual). However, we also identify a significantly positive coefficient on the interaction between management and proximity to the border, indicating that the covariance between size and management is much stronger for firms closer to the border. In column (2), we repeat the same specification for service firms which shows a positive relationship between size and management, but no significant interaction with proximity. This is a placebo test, and is consistent with our priors that distance to the US border should not matter for service firms, whose outputs are generally non-tradable.

Column (3) of Table 3 subjects the results to a tougher test. If it really is the closeness to the US export market which drives the results in column (1), we would expect the interaction to be stronger for export-intensive industries. Industries that are not export intensive are more like the service firms of column (2). We build a NAICS-6 digit industry-level indicator of the export share of sales and include the triple interaction of an industry level variable of export intensity with the management*proximity variable (as well as the pairwise interactions). Consistent with our main hypothesis, there is a positive and (weakly) significant coefficient on this triple interaction.

Online Appendix C investigates a number of robustness tests. For example, we drop all firms owned by foreign companies and further control for interactions between proximity and market size with other variables correlated with management (capital, share of white-collar workers, and education), and the results do not materially change. We also show how closeness to the US border affects unweighted average management practices (reflecting selection on the extensive margin) as shown in Figure 7 as well as discontinuity designs of being right at the border.

IV.2 Local market size

We have established that the distance to the US market is a factor that matters for management practices of Mexican manufacturing companies, and interpreted this as reflecting competitive pressures from the integration with the larger and more demanding US market. An implication of this hypothesis is that for service sector firms, whose competition is mainly domestic, it should be the size of the local market that influences managerial

practices. In the presence of sunk costs of entry, a larger market size can sustain more firms and so engender more local competition (for example, see Bresnahan and Reiss, 1991; Syverson, 2004, and Aghion et al., 2008).

We measure market size at the level of metropolitan areas by population density multiplied by average income. Figure 9 shows that local market size *does* matter for services firms but does *not* for manufacturers (indeed, the relationship is reversed for manufacturing firms).³⁰ As shown in Panel (b) of Figure 10, market reallocation appears to improve with market size for services firms, but is not observed for manufacturing firms.

We put these results in a regression framework in the last two columns of Table 3. In the final columns for services, the interaction between market size and management is positive and significant, suggesting greater pressures for reallocation in the denser cities. By contrast, in column (4), this interaction is insignificant for the manufacturing sector.³¹

We subjected these results to many robustness tests in Online Appendix C. There, we show that there is also a relationship of density with unweighted management suggesting selection on the extensive margin. We also show that the results are robust using alternative measures of city size, productivity measures instead of management, and dropping very large cities like Mexico City and Nuevo Leon.

IV.3 Institutional Frictions and misallocation

As Restuccia and Rogerson (2017) argue, misallocation can be the result of different types of distortions (wedges), which can be divided into three groups. First, statutory distortions, including the regulatory framework. Second, discretionary distortions made by the government, which include the case of government corruption. Finally, there are the market frictions that we covered in the previous sections. These distortions not only contribute to the misallocation of resources, but also have potentially large effects on the productivity distribution. These distortions affect how productivity relates to size, particularly in

³⁰ Figure 9 is weighted by employment size, but the results are qualitatively similar if unweighted.

³¹ These results are robust to dropping all controls and/or using continuous variables instead of the binary indicators. For example, the interaction of management with a continuous drive time measure in an equivalent of column (1) of Table 3, has a coefficient of -0.064 and a standard error of 0.017.

developing countries, which, consequently, tend to exhibit a larger proportion of smaller firms (Bento and Restuccia, 2017).

One wedge that deserves attention for Mexico's case, as Levy (2018) and Misch and Saborowski (2020) argue, is contract enforcement, which is a factor that, according to Boehm and Oberfield (2020), can affect value chains, primarily through the costs of sourcing inputs. We test the relationship of misallocation with this wedge in a regression framework in column (1) of Table 4 by using information from the National Survey on Regulatory Quality and Government Impact on Enterprises (ENCRIGE) 2016. As shown in the table, firms in the top 10% of municipalities with contract enforcement problems have a lower slope of $\log(\text{employment})$ on the management score. This indicates that, in the presence of poor regulatory frameworks, better-managed firms tend to be relatively smaller.

Second, we test the case of high levels of crime. As noted by Dell et al. (2019), violence in Mexico has escalated in the past decade. In 2017, Mexico was ranked as the second deadliest conflict zone in the world. Crime can affect business operations, investment, and growth, as it increases costs for firms due to the need to invest in crime prevention, represent direct losses, alter hours of business operation, and impact behavior to hide revenues. According to the National Survey of Business Victimization (ENVE in Spanish), one-fifth of firms were forced to reduce their hours of operations due to crime. Considering the prevalence of crime in Mexico, we analyze firms located in municipalities with high crime (top 10%) using administrative records of kidnapping, which often targets wealthy executives or their families, from the Ministry of the National System of Public Security. The results show that firms in municipalities with high levels of crime tend to have a weaker relationship between size and management, consistent with the hypothesis that crime contributes to misallocation. In column (2) of Table 4, the coefficient of the interaction between management and kidnapping is significantly negative.

Third, corruption is a pervasive problem in Mexico, as according to the Corruption Perception Index of Transparency International, Mexico is ranked in 130th place out of 180 countries. Using information from ENCRIGE regarding the perceptions of government corruption, column (3) of Table 4 shows a negative and significant sign of the interaction between management and high corruption.

Finally, we construct a composite business crime index merging information on contract enforcement, kidnapping, and corruption. To do this, we standardize each indicator (share of firms with contract enforcement problems, kidnapping rate, and share for firms that report corruption), take their average, and define the top 10% municipalities based on this average composite indicator.³²

For all of these business contract-problem and crime measures, as shown in the CDFs depicted in Figure 11, we observe that firms located in the top 10% exhibit worse management practices. The regression results from Table 4 are confirmed in Figure 12, where we observe that firms in the top 10% of these contract-problem and crime measures have a flatter slope in the relationship between management practices and size.

In summary, we have provided evidence consistent with the hypothesis that institutional frictions such as contract enforcement, crime, and corruption all explain the higher level of misallocation in Mexico, by making it hard for well-managed firms to grow.

V. Conclusions

This paper analyzed management practices in a new manufacturing and services firm-level survey in Mexico. First, we confirm that more structured management is positively associated with superior firm performance (higher productivity, profitability, innovation, size, and exporting) in both the manufacturing and services sector. This is the first time that these relationships have been confirmed in a largescale survey also for firms in the services sector.

Mexican management scores have a lower mean than their US equivalents and a greater dispersion. One explanation of this is that market frictions are higher in Mexico, particularly in services that are less exposed to international trade. We document that reallocation, as measured by the relationship between size and management quality (and firm age and management quality), is weaker in Mexican manufacturing than US manufacturing, and is weaker still in Mexican services. A counterfactual exercise indicates that improving market

³² All results in Table 4 are robust to using other reasonable thresholds (e.g. using the top 5% instead of the top 10% of municipalities).

reallocation in the Mexican services sector to the level we see in the manufacturing sector could raise GDP by US\$34.2 billion.

To investigate more deeply the factors that drive misallocation, we examine the relationship between firm size and management using several observable measures of frictions. First, we use insights from the trade literature and look at the role of market size. For manufacturing, proximity to the US (as measured by drive time between our Mexican firms and the US border) is likely to matter most. We found that for manufacturing firms (especially in export-exposed industries), the size-management relationship was particularly strong when this proximity was high. By contrast, for Mexican manufacturing plants in less export-exposed industries, there was a weaker effect of proximity, and for services firms, there was no effect. Instead, for Mexican service firms we found that local market competition mattered. Metropolitan areas with larger markets had a strong size-management relationship for service firms, but did not for manufacturers who tend to sell their goods beyond the limits of the local metropolitan area (i.e., nationally or internationally). Finally, we turned to institutional factors and found that the size-management relationship was weaker in areas with low contract enforcement, high perceived corruption and/or high crime.

These results imply that competitive and regulatory reforms in Mexico and other middle-income countries could have important effects on raising productivity, allocation, and material wellbeing. Making US market access worse through increasing border frictions, by contrast, will damage management, productivity, and wellbeing.

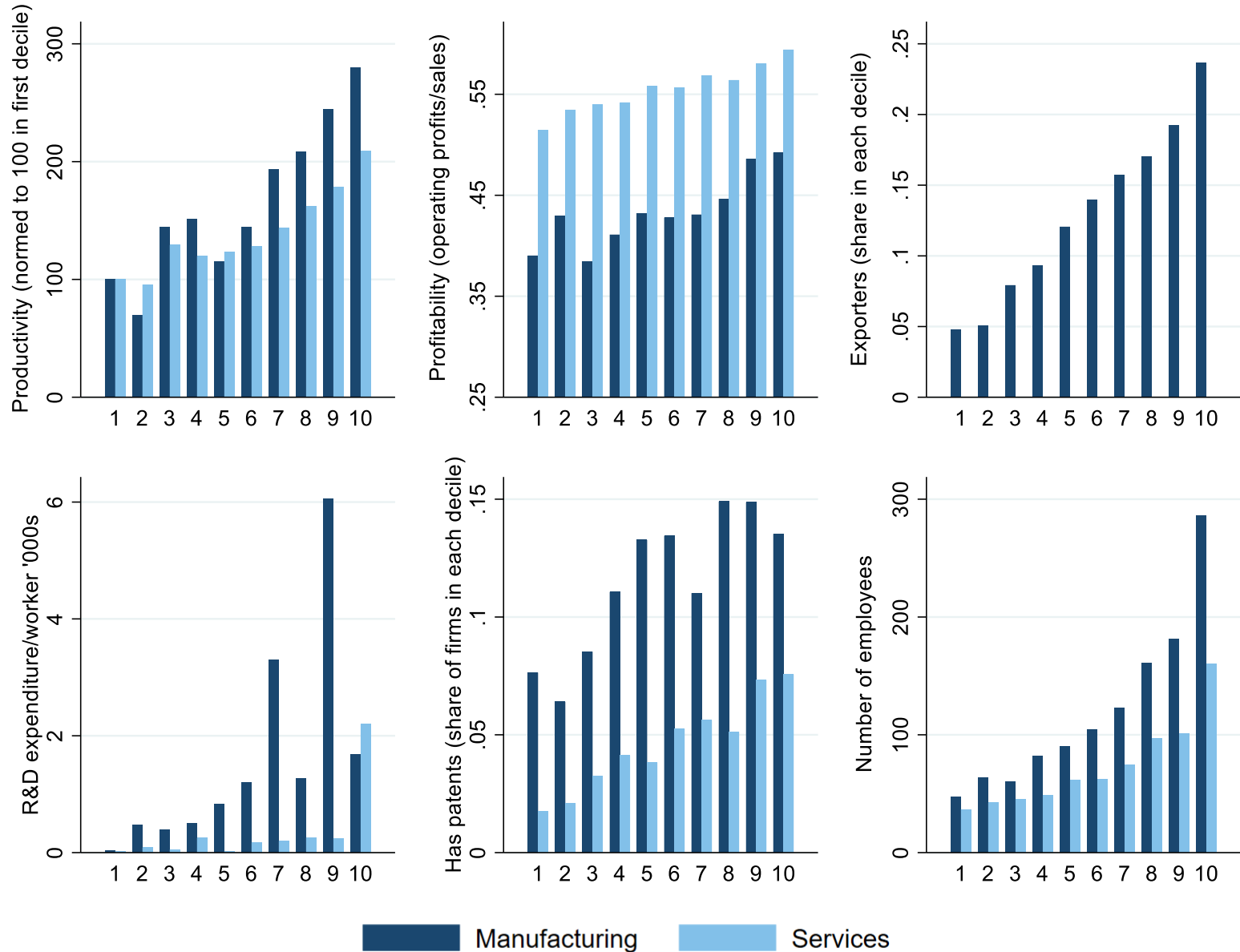
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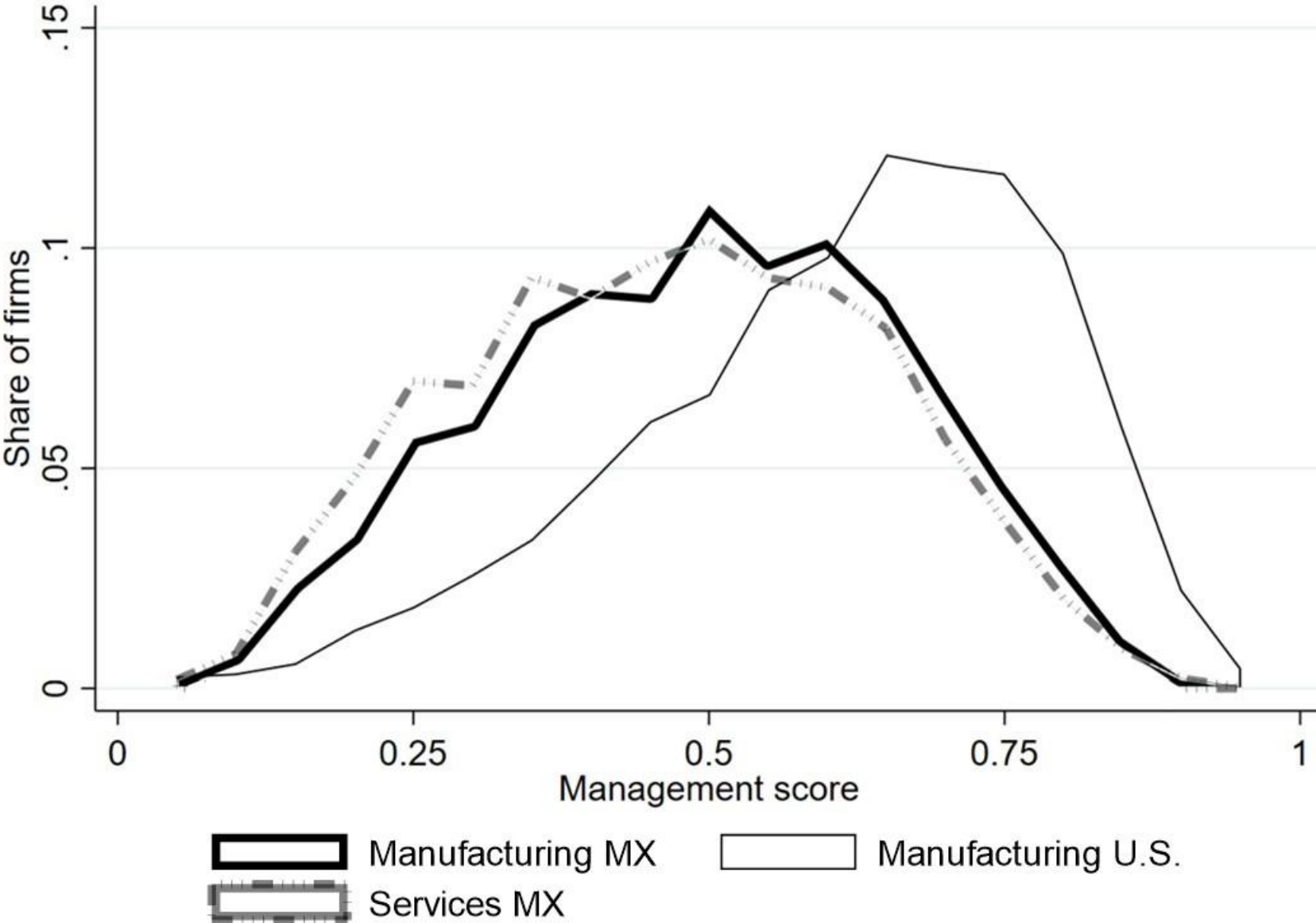
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Figure 1: Firm performance and management practices in Mexico



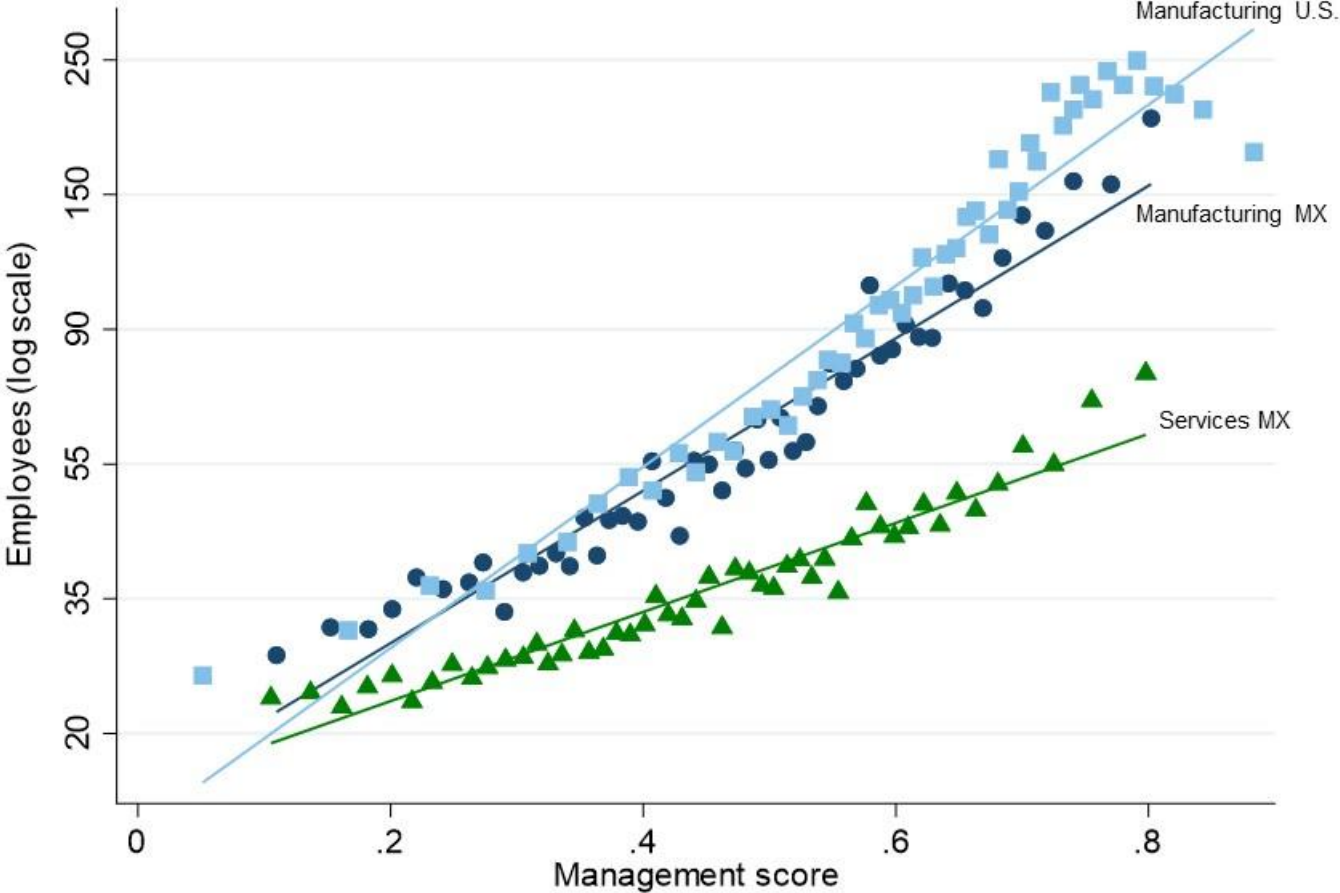
Notes: 6,643 observations on manufacturing firms and 17,684 observations on service firms. Along the x-axis, we measure deciles of the management score.

Figure 2: Management distributions across firms



Notes: Management score distributions. 6,643 observations on Mexican manufacturing firms; 17,684 observations on Mexican services firms; 32,000 U.S. establishments from Bloom et al. (2019)

Figure 3: Reallocation – Manufacturing and Services 2014 and 2017



● Manufacturing MX	Slope 2.752*** (0.0837)
▲ Services MX	1.621*** (0.0475)
■ Manufacturing U.S.	3.360*** (0.123)

Notes: Bin scatter with 50 quantiles from Mexican and U.S. firm-level management data. Lines are OLS regressions for log(employment) on management scores. 6,643 observations on Mexican manufacturing; 17,684 observations on Mexican services; and 32,000 US manufacturing plants (Bloom et al., 2019). aggregated into 18,000 firms.

Figure 4: Age and Management score: mean

(a) Manufacturing US

(b) Manufacturing Mexico

(c) Services Mexico

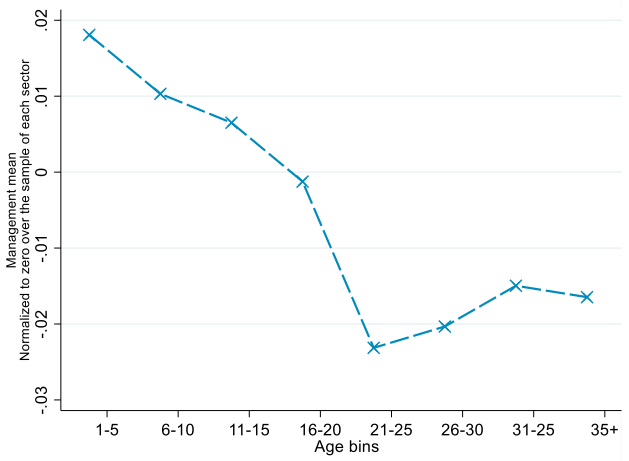
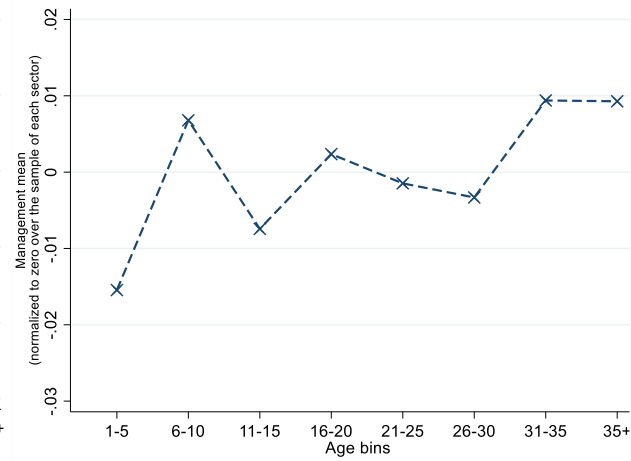
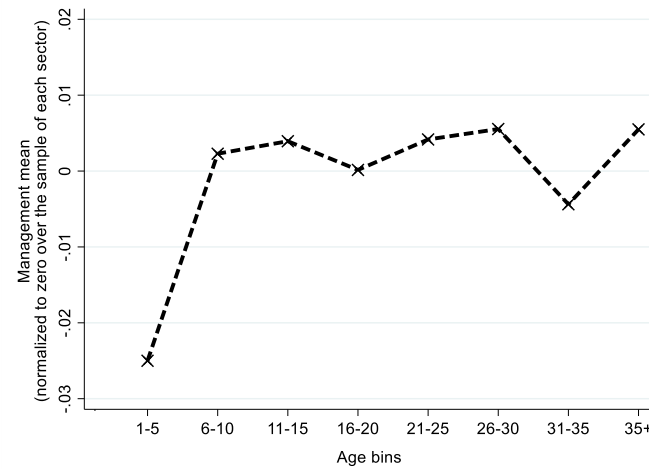
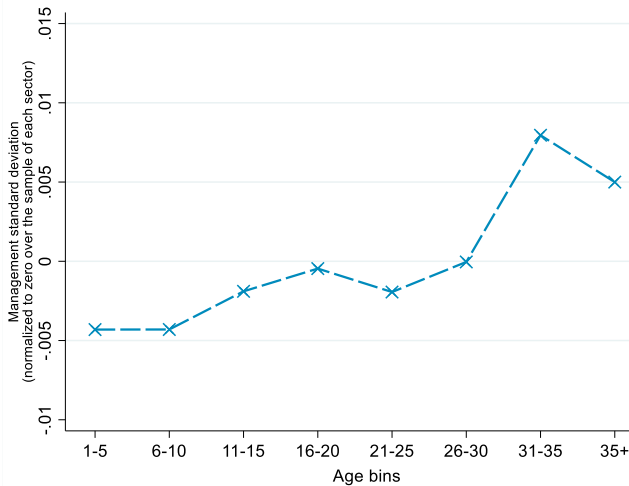
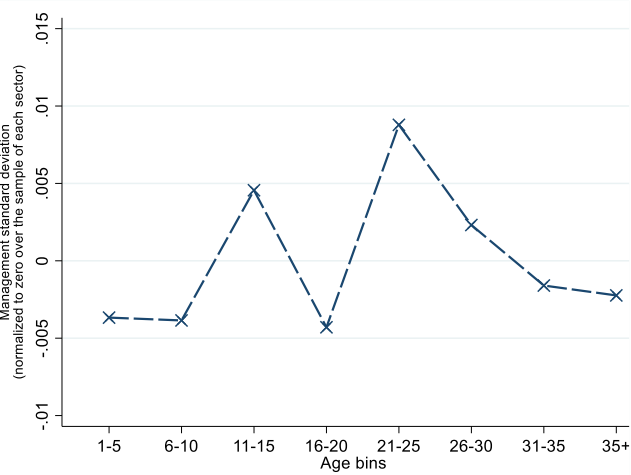
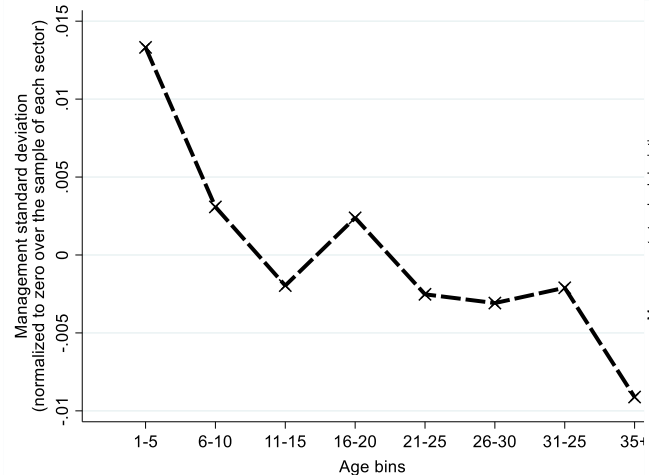


Figure 5: Age and Management score: spread

(a) Manufacturing US

(b) Manufacturing Mexico

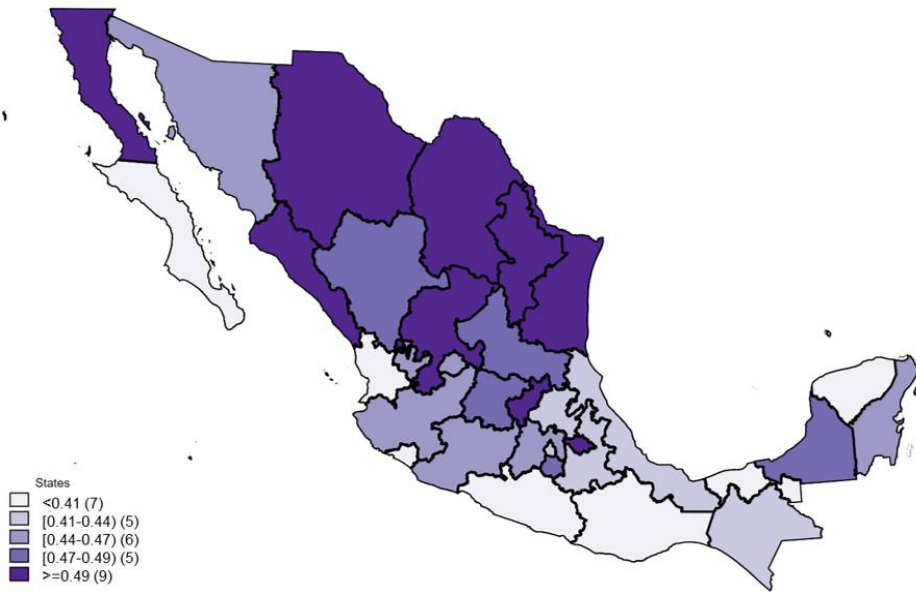
(c) Services Mexico



Notes: The mean and variance of management score as a function of firm age. 6,643 observations on Mexican manufacturing; 17,684 observations on Mexican services; and 32,000 US manufacturing plants.

Figure 6: Management scores by state

(a) Manufacturing



(b) Services



Notes: 6,643 observations on Mexican manufacturing; 17,684 observations on Mexican services. Authors' calculations with data from ENAPROCE 2015 and 2018, INEGI.

Figure 7: CDFs Management score drive time to the border

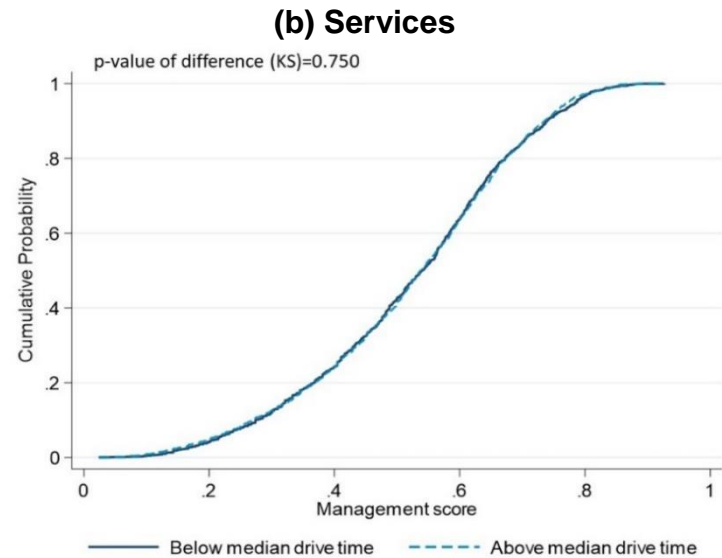
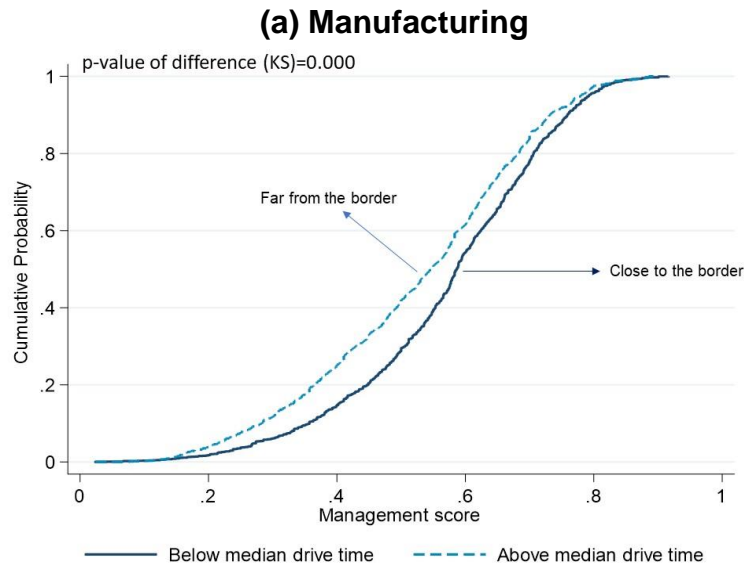
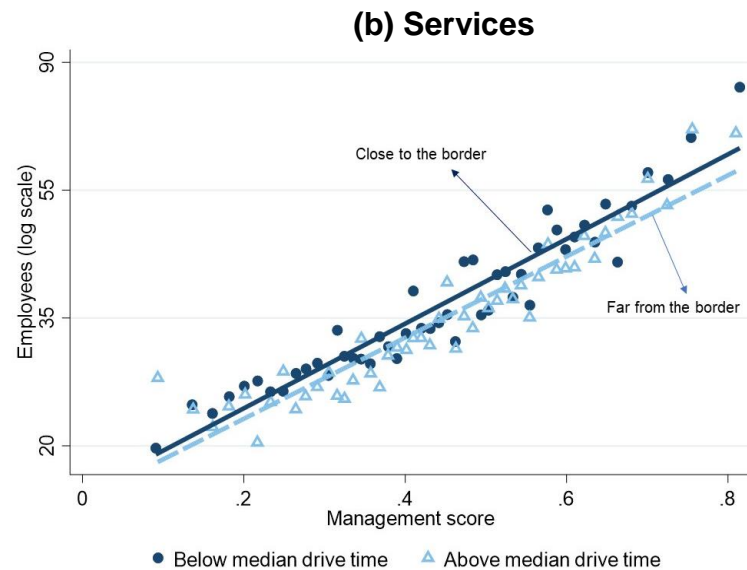
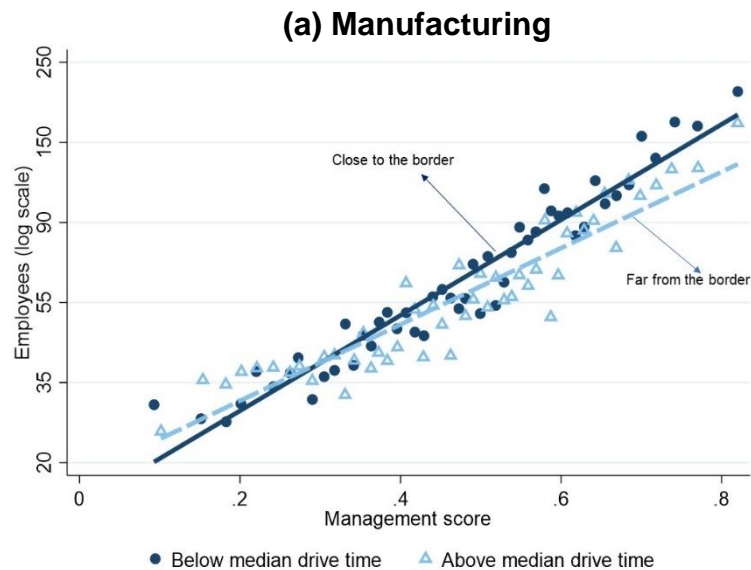


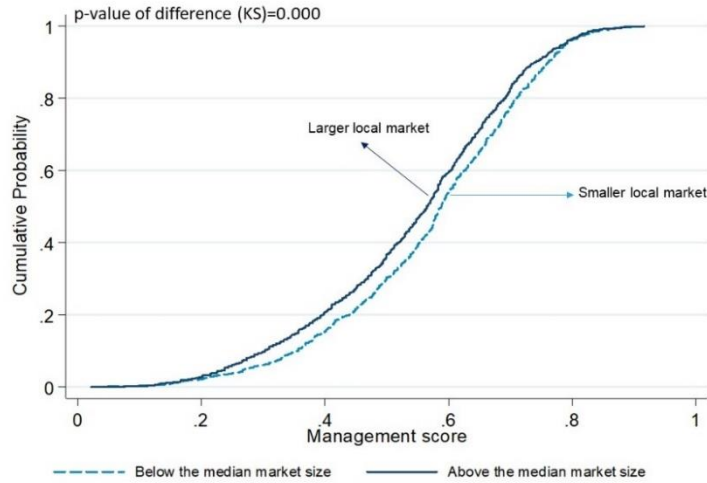
Figure 8: Sources of misallocation: Drive time to the border



Notes: 6,643 observations on Mexican manufacturing; 17,684 observations on Mexican services. CDFs are weighted by firm employment size.

Figure 9: CDFs Management score market size

(a) Manufacturing



(b) Services

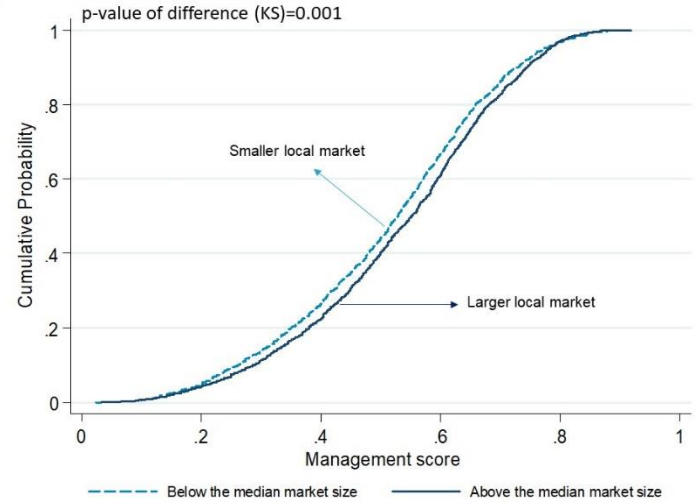
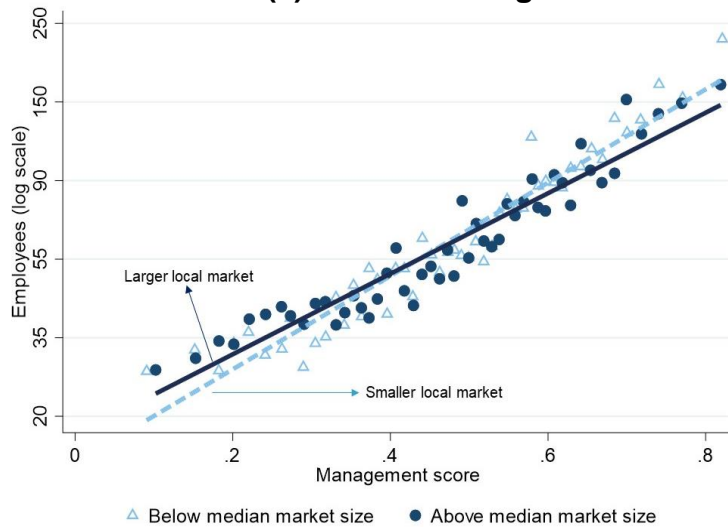
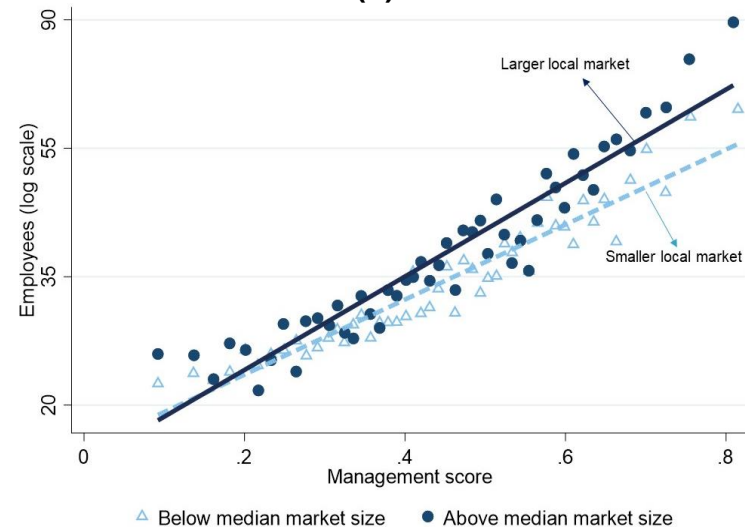


Figure 10: Sources of misallocation: market size

(a) Manufacturing

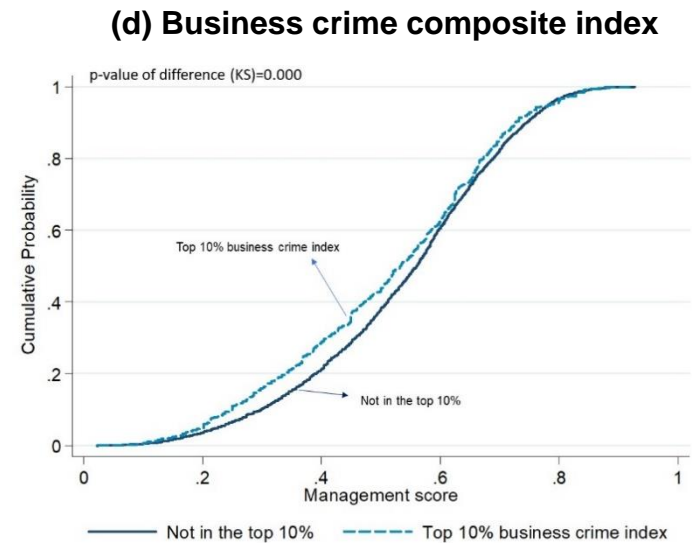
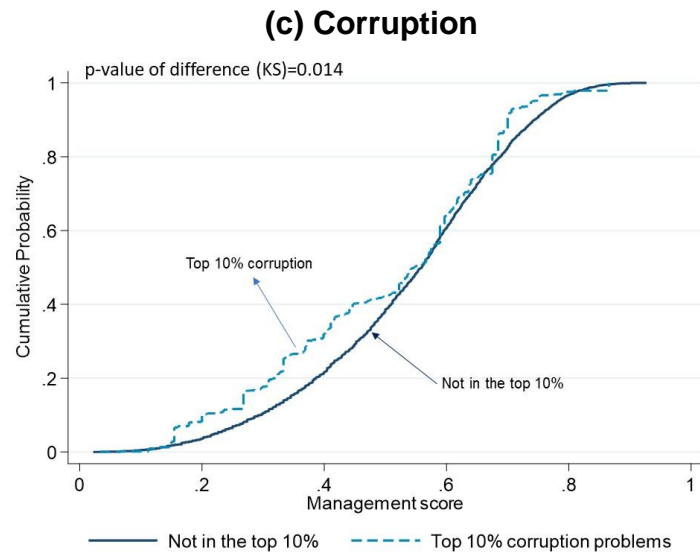
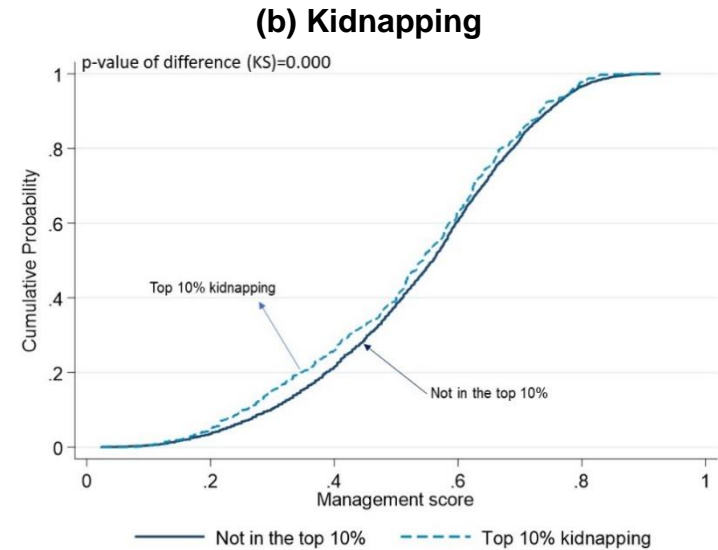
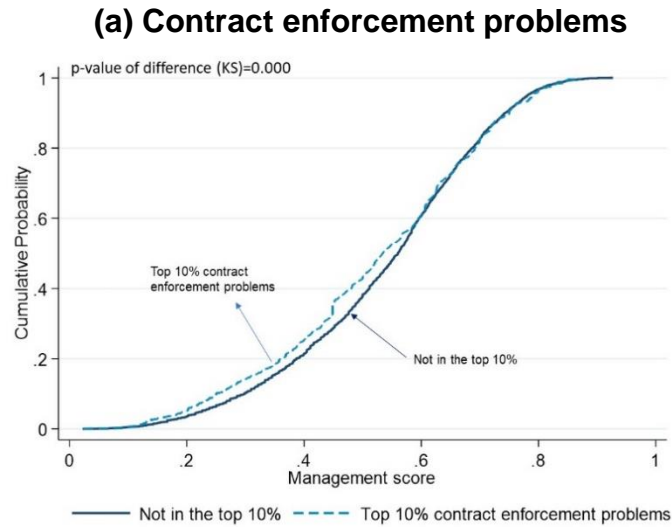


(b) Services



Notes: 6,643 observations on Mexican manufacturing; 17,684 observations on Mexican services. CDFs are weighted by firm employment size.

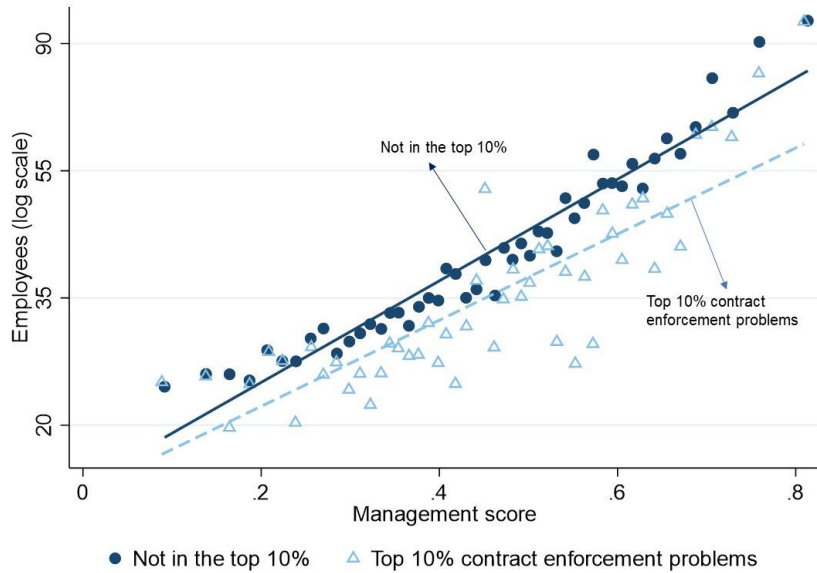
Figure 11: CDFs Management score according to institutional strengths



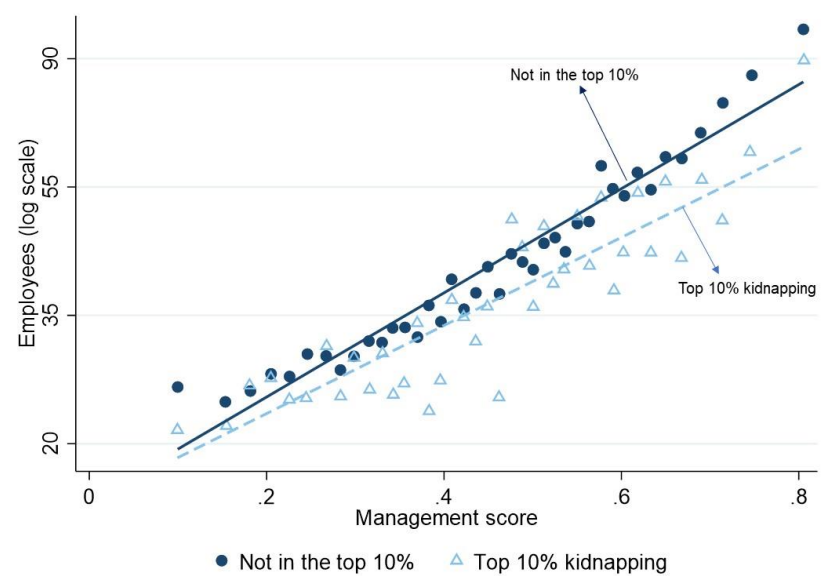
Notes: 6,643 observations on Mexican manufacturing; 17,684 observations on Mexican services. CDFs are weighted by firm employment size.

Figure 12: Sources of misallocation: Institutional strengths

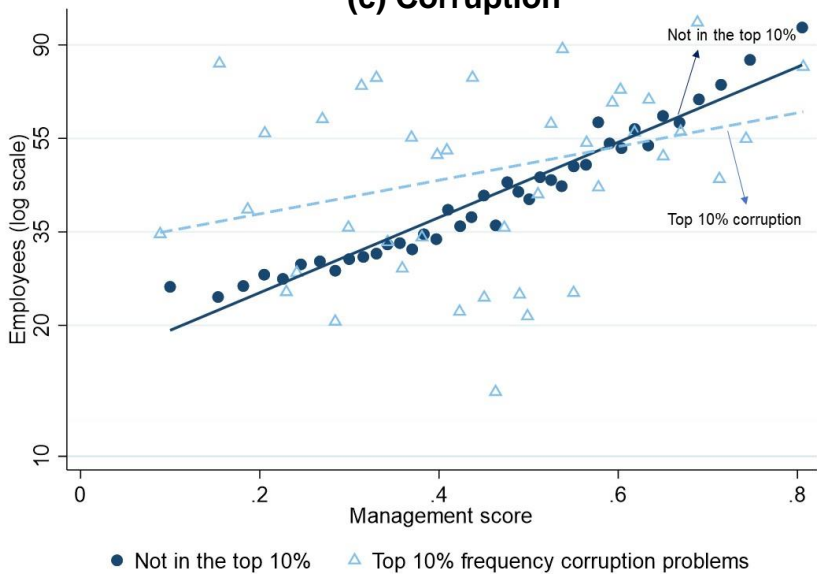
(a) Contract enforcement problems



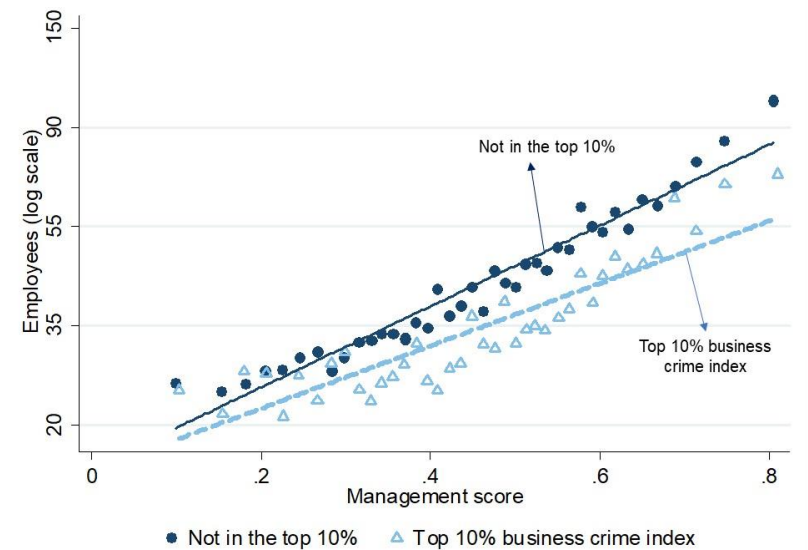
(b) Kidnapping



(c) Corruption



(d) Business crime composite index



Notes: 6,643 observations on Mexican manufacturing; 17,684 observations on Mexican services

Table 1. Management Practices and Firm Performance

Dependent Variable:	Manufacturing and services			Manufacturing	Services
	(1)	(2)	(3)	(4)	(5)
	log(Value Added per Employee)		log(TFP)	log(TFP)	log(TFP)
Management score	1.1375*** (0.1379)	0.5674*** (0.1468)	0.3466*** (0.0739)	0.3301*** (0.0826)	0.3466*** (0.0738)
Manufacturing dummy*Management score	0.8102*** (0.2213)	-0.0346 (0.2447)	-0.0165 (0.1106)		
log(capital/employee)		0.1800*** (0.0135)			
log(employees)		0.2589*** (0.0302)			
Share white-collar workers		0.0499 (0.1937)			
Share of workers with a college degree		0.3654*** (0.1165)			
% rise in productivity associated with moving from 10 th to 90 th percentile of management distribution	<i>Manufacturing</i>	144.7	27.7	16.4	16.4
	<i>Services</i>	69.6	30.1	17.5	17.5
Observations		18,251	18,251	18,251	6,598
					11,653

Notes: Robust standard errors clustered at the firm level. * Significant at the 10% level, ** 5% level, *** 1% level. 5 regional dummies and a time dummy included in all regressions. Column (2) also includes interactions of the manufacturing dummy with capital intensity, employees and skills variables but these are not shown (so the linear coefficients are the results for the services sector for these variables). TFP is constructed using a Törnqvist index approach (see Data Appendix, section B.3.1).

Table 2. Management Practices and Firm Size

Dependent variable=ln(workers)	Pooled regression					
	Manufacturing and services		Manufacturing		Services	
	(1)	(2)	(3)	(4)	(5)	(6)
Management score	1.622*** (0.0475)	1.380*** (0.0453)	2.752*** (0.0837)	2.219*** (0.0807)	1.621*** (0.0475)	1.380*** (0.0452)
Manufacturing dummy*Management score	1.131*** (0.0967)	0.834*** (0.0918)				
6-digits NAICS	No	Yes	No	Yes	No	Yes
Region	No	Yes	No	Yes	No	Yes
Time	Yes	Yes	Yes	Yes	Yes	Yes
Skills control	No	Yes	No	Yes	No	Yes
Observations	24,327	24,327	6,643	6,643	17,684	17,684

Notes: Robust standard errors clustered at the firm level in parentheses. * Significant at the 10% level, ** 5% level, *** 1% level. 5 regional dummies included in all regressions. Column (2) also includes interactions of the manufacturing dummy with skills variables but these are not shown. Skills are measured as the share of workers with a college degree.

Table 3. Sources of misallocation: Competition & market size

Dependent variable=ln(workers)	Drive time to the border		Exports & drive time	Market size	
	(1) Manufacturing	(2) Services	(3) Manufacturing	(4) Manufacturing	(5) Services
Management score*Share of exports*Drive time below the median			1.970* (1.116)		
Management score	1.775*** (0.109)	1.266*** (0.072)	1.543*** (0.181)	2.226*** (0.184)	1.192*** (0.0634)
Drive time below the median*Management score	0.469*** (0.169)	0.0851 (0.099)	0.0209 (0.269)		
Management score*Share of exports			1.498* (0.822)		
Drive time below median*Share of exports			-0.635 (0.561)		
Market size above the median*Management score				-0.208 (0.219)	0.324*** (0.108)
6-digits NAICS	Yes	Yes	Yes	Yes	Yes
Municipality fixed effects	Yes	Yes	Yes	Yes	Yes
Time	Yes	Yes	Yes	Yes	Yes
Observations	6,643	17,684	6,643	6,643	17,684

Notes: Robust standard errors clustered at the municipality level. * Significant at the 10% level, ** 5% level, *** 1% level.

Table 4. Sources of misallocation: Institutional environment

	(1)	(2)	(3)	(4)
Dependent variable=ln(workers)	Top 10% share firms contract enforcement problems	Top 10% kidnapping	Top 10% share firms with gov. corruption problems	Top 10% Business crime composite index
High level*Management score	-0.256* (0.139)	-0.258* (0.135)	-1.044*** (0.170)	-0.401*** (0.125)
Management score	1.605*** (0.0583)	1.557*** (0.0527)	1.590*** (0.0557)	1.612*** (0.0389)
Share of firms in municipalities with high-level	9.58%	7.13%	8.72%	8.76%
6-digits NAICS	Yes	Yes	Yes	Yes
Municipality fixed effects	Yes	Yes	Yes	Yes
Time	Yes	Yes	Yes	Yes
Observations	24,327	24,327	24,327	24,327

Notes: Robust standard errors clustered at the municipality level.

* Significant at the 10% level, ** 5% level, *** 1% level. 5 regional dummies included.

Data on difficulties to enforce contracts and on whether firms face government corruption was obtained from National Survey on Regulatory Quality and Government Impact on Enterprises (ENCRIGE) 2016.

To construct these variables we used the questions on (a) whether the firms in ENCRIGE experienced problems in terms of contract enforceability, (b) The frequency of corruption practices in their state (highly frequent and frequent).

Kidnapping data was obtained from administrative records on crime, which was calculated at the municipality level.

The Business crime composite index was calculated as the top 10% of the average of the standardized shares of corruption problems, kidnapping, and problems with contract enforcement.

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