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Management Capabilities and Performance of Firms in the Russian Federation

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Abstract

Using the management and operational practices survey in the Russian Federation, this paper finds that an average Russian manufacturing firm adopts 43 percent of the structured management practices (a score of 0.43), a value that is far from the frontier (for example, the United States scores 0.62). This average mask the wide heterogeneity in practices, where a large share of firms adopt few structured management practices and only 3.5 percent of them have a score over 0.75. Consistent with the findings in other countries, better managed firms in Russia show stronger firm performance, measured as gross revenue per employee, value added per employee, total factor productivity, and employment growth. Improving the management score from the 10th to the 90th percentile is associated with an increase in sales per worker by 87 percent, value added per worker by 30 percent, and total factor productivity by 13.5 percent. What drives better management capabilities? Russian firms are similar to those in other countries, such that exporters and firms with foreign linkages are better managed. Switching from operating purely in the domestic market to being globally linked is associated with a significant increase in management capabilities. However, unlike the results in other countries, management capabilities in Russia are not associated with firm age, implying that firms do not learn to be better managed over their life cycle. This result points to the possibility of inefficient allocation of resources, such that learning and selection mechanism does not weed out the badly managed firms, perhaps due to the lack of pro-competitive forces.

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Section 1: Why Management Matters?

Differences in managerial quality are critical in explaining cross-country differences in income levels, productivity, innovation and firm dynamism. For example, Bloom and Van Reenen (2010) attribute differences in productivity across firms in Asia, Europe, and North and South America to the heterogeneity in management practices across firms in these regions. Other performance measures, such as profitability and survival rates, are also positively correlated with good management practices. In a follow-up study, Bloom, Sadun and Van Reenen (2012) further suggest that such heterogeneity in management accounts for up to half of the TFP gap between the U.S. and other countries. A novel finding of their work is that cross-country variation in management practices is in-fact smaller than heterogeneity between firms in the same country, suggesting that firm- and sector-specific factors were at least as important as the general business environment in shaping managerial performance. Nonetheless, differences in management is also correlated with competition, labor market flexibility, education and ownership structure.

Although the realization that management can drive firm performance dates back to Adam Smith's discussion of the pin factory and the division of labor, which was revived by Francis Walker (1887), measurement of management practices had been elusive until recently. In the last decade or so, considerable efforts have been made to close this measurement gap. Bloom and coauthors offer one of the most comprehensive methodologies relating management practices to productivity. Surveying plant managers of medium sized firms on 18 specific management practices in four broad areas: operations, monitoring, targets, and incentives in the United States, United Kingdom, France, and Germany, Bloom and Van Reenen (2007) document that higher-quality management practices (as measured by higher scores) are correlated with several measures of productivity and firm performance, including labor productivity, total factor productivity (TFP), return on capital, Tobin's Q, sales growth, and the probability of survival. For example, spanning the interquartile range of the management score distribution corresponds to a productivity change of between 3.2 and 7.5 percent.

Evidence suggests that the link between management and firm performance is in fact causal. For example, field experiments that provided consulting on management practices to a set of randomly selected large Indian firms found that relative to control plants which received no consulting services, the treated ones witnessed an increase in productivity by 17% in the first year through improved quality, efficiency and reduced inventory. Within three years of treatment, these firms were also more likely to expand production by establishing new production plants. In a related study, Giorcelli (2019) exploits a natural experiment to discern the effects of a management training program in the context of the Marshall Plan. In the 1950s, Italian firms visited the United States to receive management training under this plan. An unexpected budget cut forced the program to reduce the number of beneficiaries within the set of eligible firms and training was offered to a few randomly selected firms. Results show that Italian firms that sent their managers to the training program in the United States witnessed an increase in firm performance for at least 15 years after the treatment when compared to the set of eligible firms that were left out because of the budget cut.

Countries such as the Russian Federation were, in general, not exposed to market forces until the beginning of the 1990s and state-owned enterprises (SOEs) still continue to play a significant role in the domestic economy.[1] Thus, it is not clear that the link between management practices and firm performance can be found in transition countries as well. Following the four core management areas from Bloom and Van Reenen (2007), the European Bank for Reconstruction and Development (EBRD), in cooperation with the World Bank, conducted a survey on Management, Organization and Innovation (MOI) for 10 transition economies, including Russia.[2] The results of the face-to-face interviews conducted with 1,874 factory managers were benchmarked against Germany and India. Using the MOI survey on all transition economies, Bloom et al. (2011) suggest that an improvement in management practices scores from the lower to the upper quartile of the distribution is associated with a 9 percent increase in operating revenue,[3] an over 85 percent increase in profit margins[4] and an increase in the return on total assets[5] by almost 20 percent.[6]

Friebel and Schweiger (2012) specifically use the MOI survey data on 311 Russian firms to assess the importance of managerial quality on firm performance in Russia.[7] Their work suggests that differences in managerial quality, as measured by the four core management areas, explain relatively little in terms of variation in overall firm performance, however, it does explain some of the regional differences between firms in Russia's Far East and the rest of Russia. Furthermore, they argue that exposure to foreign competition, both in the product market and the labor market, explains the variation in adoption of good management practices across firms and broad regions.

To quantify the importance of management on the performance of Russian firms and identify potential avenues for boosting firm productivity, during July-October 2018 we conducted a survey on managerial practices in Russia using a slightly modified version of the US Census Management and Organizational Practices Survey (MOPS). The survey was deliberately designed to replicate the US Census MOPS to maximize comparability with the US as well as other countries where this survey has been conducted (e.g. Mexico and Punjab province in Pakistan, UK, Canada, Japan, China and Croatia). In consultations with the Russian authorities, the survey collects data on 978 small-medium sized manufacturing firms ranging from

[1] Despite problems in identifying the actual role of the state sector in the economy, even by moderate assessment state-owned enterprises and state corporations present much more than 20% of Russia`s GDP (by some expert assessment up to 50% considering subsidiaries, affiliates, minority shares in different assets, etc.) and almost half of all internal procurements (Danilin, 2015).

[2] The other 9 countries include - Belarus, Bulgaria, Kazakhstan, Lithuania, Poland, Romania, Serbia, Ukraine and Uzbekistan. The survey was modeled in a way that is similar to MOPS.

[3] Operating revenue is the income or sales generated from a firm's day-to-day business activities, that is, it is the revenue posted from selling the firm's products and services.

[4] Profit margin is computed as the firm's net profit per unit of sale.

[5] Return on assets is defined as the ratio of net income (profit after taxes) over total assets of the firm.

[6] As in Bloom's earlier works, the differences in the quality of management practices can be explained by competition, the availability of human capital available, and ownership.

[7] Case studies on management practices of Russian agri-business enterprises almost two decades ago revealed that management practices that were unsanctioned earlier had just begun to permeate Russian management structures by the turn of the century. Though these practices were not found to be widely successful, the interviewed managers found some of these practices to be related to their firms' competitiveness (Chacko and Wacker, 2001).

25-250 employees in five federal districts: Central (excluding Moscow oblast and Moscow city), Northwestern (excluding Leningrad oblast and Saint Petersburg city), Southern, Volga and Ural.[8] The sample frame for our work is sourced from Ruslana database of Bureau van Dijk. Survey data on managerial practices is aggregated into a single management score following Bloom et al. (2019a) and merged with data on firm performance, profitability, employment growth and other relevant metrics from Ruslana.

Analyzing this newly collected data for Russia, we draw the following four key conclusions. *First*, an average Russian manufacturing firm in our sample scores 0.43 in adoption of structured management practices, a value very similar to that in Mexico and Pakistan but behind the one observed in Croatia (0.54) the U.S (0.62). Management score is measured on a scale from 0 to 1.0, where 1 reflects adoption of all structured management practice, and 0 adoption of none. Thus, a score of 0.43 may be interpreted as if firms adopt 43 percent of structured management practices.

Second, the weaknesses in management practices particularly relating to data driven performance monitoring pulls down the overall score in Russia. Structured management relating to monitoring practices include, for example, a larger number of key performance indicators that are tracked and reviewed systematically and more frequently by managers as well as non-managers. It appears that Russian manufacturing firms are weaker on these aspects of structured management.

Third, there is much heterogeneity in adoption of structured management practices among Russian manufacturing firms in the surveyed federal districts. As in Mexico, Pakistan and Croatia, the distribution of management score has a fat left tail, implying that a large share of firms are poorly managed. Nearly 3 percent of the surveyed firms adopt no structured management practices, 60 percent of them score below 0.5 but only 3.5 percent of these firms score over 0.75. By comparison, establishments in the US not only have a much larger average score (0.6), but 18 percent of them have a score over 0.75.

Fourth, variations in management practices among Russian manufacturing firms are not driven by the differences in sectors, or in the federal districts covered by this survey but can be found in mostly idiosyncratic, firm-specific factors. Nonetheless, among the characteristics that partly explain the heterogeneity in adoption of structured management, it appears that firm size, foreign linkages and the education level of non-managers are the most relevant ones. Surprisingly firm age is not associated with better management practices, implying that unlike in the US and even in Mexico, firms do not learn to be better managed as they age. This indicates the possibility of misallocation in Russian manufacturing where learning and market selection are not operating perhaps due to the lack of pro-competitive forces.

Finally, consistent with the findings in other countries and data sets, structured management, that is, more intensive monitoring and more aggressive performance incentives (e.g., hiring, firing, pay and promotions) is associated with superior firm performance. Firms with more structured management practices have higher productivity, and employment growth. This result is highly robust to numerous checks and controls. As is true in related studies, we cannot claim that this is a causal relationship, however, our results strongly suggest that management practices have a tight association with firm-level outcomes. Among the types of management practices, those related to data driven performance

[8] During consultations it became clear that the authorities were more interested in learning about firms that are less exposed to structured management practices. Hence it was agreed to have the survey on management practices for SMEs located in the specified federal districts, and not including Moscow city and Oblast as well as Saint Petersburg.

monitoring, where Russian firms particularly lag behind other countries, are the ones more closely associated with firm performance. Finally, the link of management practices in affecting firm performance is particularly heightened for the globally linked firms.

The paper beyond this point is organized as follows: Section 2 introduces the methodology of the management survey and some descriptive results. Section 3 presents the methodology for computing management scores, and the main descriptive results on the relationship between various firm characteristics such as size, age with the observed management scores. This section also explores the drivers of better management practices. Section 4 presents a simple regression framework for assessing the link of management practices with firm performance. Section 5 concludes with policy discussion.

Section 2: The Management Survey

2.1 Why do we need a management survey?

Although managerial and organizational practices have been conceived to be critical in affecting firm outcomes on business performance, these practices are not well measured in administrative data on firms or in commercial data on companies' accounts. Earlier studies have used information on publicly traded firms to link managerial style of senior managers and company performance (e.g. Bertrand and Schoar 2003), these data are rather limited to a country such as the US. Furthermore, evidence suggests that a company is far more than simply the identity of its most senior employee (Bender et al, 2015). Critically, this type of data on its own does not tell much about how firms are managed or organized. Therefore, over the last decade Bloom and co-authors have attempted to fill this gap in data by collecting comprehensive information on management practices (see Bloom et al. 2014).

Bloom et al. (2016) propose the following three broad management and organizational capabilities to be important for firm productivity: (i) performance monitoring: collecting and analyzing information on daily activities of the firm for continuous improvement, (ii) target setting: using and stretching short and long run targets, tracking outcomes, and taking appropriate action, and (iii) performance incentives: rewarding high-performing employees, and retraining or moving underperformers and careful hiring. To collect information on these practices, two alternative strategies could be deployed: (i) Open-ended questions (e.g. world management survey, WMS)[9] and (ii) Closed-ended questions (e.g. Management and Organizational Practices Surveys, MOPS).[10]

2.2 Sample and MOPS survey process in Russia

To collect data on managerial practices, we follow the MOPS framework which is comprised of 36 multiple choice questions about the establishment. The survey is split in three broad sections: management practices (16 questions), organization (13 questions) and background characteristics (7 questions). In response to a request from the Ministry of Economic Development, we modified the instrument to include questions that can help understand the reasons why Russian firms do not adopt structured management practices. The survey was conducted through telephonic interviews of company managers, who are senior

[9] Designing these surveys takes some expertise in terms of selecting questions and response grids and hence intense training and monitoring of the interview team. The full questionnaire is available on www.worldmanagementsurvey.com.
[10] The full questionnaire is available on http://bhs.econ.census.gov/bhs/mops/form.html

enough to have an overview of management practices but not so senior as to be detached from day-to-day operations.

2.3 RUSLANA as Sampling frame

The data on firm performance in Russia are basic, substantially limiting the ability of researchers to apply the latest techniques for measuring and understanding firm productivity (see Kilinc, 2019). Consultations with the authorities and academics confirmed that nearly all analysis is done with firms' financial/accounting data, which are available from Rosstat via third-party aggregators like Ruslana, Spark, and Integrum. These data sets allow for very basic analysis of productivity (e.g., output per worker) or require analysts to impose fairly strict assumptions/theoretical structure on the data. Although Rosstat collects very detailed data on firm inputs and outputs, as well as quantities and prices, these data are confidential by Russian law and hence they are difficult to access (even in anonymized form). Therefore, researchers generally shy away from using them – creating a perception that data quality may be uneven and disabling positive feedback loops from data users to data producers.

Ruslana is a commercial data set, which contains administrative data covering more than 9 million companies in Russia (Ruslana is a subset of Bureau van Dijk's global Orbis data set, comprising of Russia, Kazakhstan, and Ukraine). Cusolito and Winkler (2015) use this data set for the period 2005-2013, comprising of 30,000 to 40,000 firms per year, amounting to a total of more than 300,000 firm-year observations. Since Ruslana is not a census nor a representative survey, the results based on an analysis of these data could be biased. For example, it represents only about 10 percent of total wage employment in the Russian economy and small firms are particularly under-represented. Likewise, Cusolito and Winkler (2015) show that while the share of firms in many sectors covered in RUSLANA is similar to Rosstat, there are important differences. In particular, wholesale and retail trade firms are over-represented in Ruslana, while real estate, education and other services are under-represented. However, given that Ruslana is the only reliable source of firm-level information and that it does a good job at matching the evolution of employment and value added over time (Cusolito and Winkler, 2015), we use Ruslana as the reference population for our work. Moreover, given that we study the impact of managerial capabilities on firm performance in manufacturing, the lower coverage of small firms, over-representativity in certain services does not affect the usefulness of our approach in using Ruslana as the reference population.

2.4 Sample Stratification

Taking the reference population from Ruslana, the sample was stratified by sector and federal districts. Within sectors, only manufacturing was considered and the following six aggregate groupings were used in stratification: Food and beverage (ISIC Revision 4 codes: 10 and 11); Textile, apparel and leather (ISIC Revision 4 codes: 13-15); Chemical, rubber and non-metallic products (ISIC Revision 4 codes: 19-23); Basic metals and metal products (ISIC Revision 4 codes: 24 and 25); Electronics and electrical equipment (ISIC Revision 4 codes: 26 and 27); and Machinery and motor vehicles, including transport (ISIC Revision 4 codes: 28-31). The following five Federal districts were used in stratification: Central (excluding Moscow oblast and Moscow city); Northwestern (excluding Leningrad oblast and Saint Petersburg city); Southern; Ural; and Volga. In all sectors and federal districts only small and medium firms (25-250 employees) were

included for sampling purposes.[11] Of a total of 7,732,018 active firms recorded in Ruslana, there are a total of 28,370 firms that are within the identified sector, federal district and size parameters. The sample is further restricted to firms with non-missing information on sales, employment, capital, and cost from 2012-2016 if the firm is established prior to 2012. Firms born after 2012 are included if this information is non-missing for all years within this duration. This leaves us with a total of 14,105 firms in the sampling frame.

2.5 Response rate and selection bias

Bloom et al. (2016) note that for these types of surveys private sector firms often only have response rates of 5 to 10 percent which raises an obvious concern about selection on unobservables. To reach a target of 997 manufacturing firms in the selected sector and size categories, we contacted a total of 12,912 firms during July-October 2018. Of these firms, only 59.6 percent could be contacted, with 17 percent of the firms making hard refusals to participate, while another 15 percent of the firms did not fit the actual parameters of the sampling frame perhaps due to changes in firm operations or due to incorrect recording in Ruslana. Lastly, of the 997 successful interviews, 19 firm had to be dropped out of the sample because of reliability issues, which brought the final survey sample to 978 firms. Overall, the response rate among firms that could be contacted and those that were within the identified parameters is close to 17 percent.

It is worth noting that an average firm in our survey is *larger* in terms of employment (within the SME category) and *older* than the sampling frame. The average size in the sampling frame is 62 employees, whilst in our survey it is 83 employees (See Table 1). Likewise, the average age in the sampling frame is 12.3 years, whilst in our survey it is 21.7 years. Our survey has 28 percent of firms reporting to have exported in 2017 as compared to the observed 9.5 percent in the sampling frame when matching Ruslana information with customs data for 2016.[12] However, part of the difference could also be indicative of a selection bias.[13] To understand this, Annex Table A.1 presents a regression of respondent dummy on a host of firm characteristics to show that relative to all firms in the sample frame, respondents are more likely older, larger and exporters. Given our finding that exporters have better managerial capabilities (see section 3), we use this information to infer that the overall management score in Russia may be over-

[11] Small firms are defined as those with no more than 100 employees and/or 800 million RUB in sales; medium firms are defined as those with no more than 250 employees and/or 2,000 million RUB in sales.

[12] Customs data are another source of trade data that record each transaction by all exporting firms. These data are then matched to the Ruslana sample frame. The share of exporters in these matched data could be biased downward partly due to mismatches between customs data and survey responses and upward because the sample frame is not the full universe of firms. Moreover, it should also be noted that the percentage of surveyed firms that reported to be exporting in 2016 is 15%, which is 13 percentage points lower than that reported by respondents in 2017.

[13] Annex table A.2 presents the results of an OLS regression of the probability of conducting a successful interview against a series of firm characteristics. Size, age and having exported in 2016 according to customs data come out as being positively and significantly associated to a higher probability of being interviewed. Thus, based on these statistics one may get an impression that the management score in Russia is overstated. However, it should also be remembered that larger cities like Moscow and St. Petersburg are not covered, which are more likely to have firms exposed to structured management practices. Finally, given that Ruslana is not a representative sample, it is difficult to establish the direction and extent of the bias.

stated in our survey. Also, we will carry out a series of checks to our analysis in order to control for selection bias (see Annex 3 for more details).

Table 1: Descriptive statistics of surveyed firms

Variable	Mean	SD	p(10)	p(25)	p(50)	p(75)	p(90)
Number of employees (RUSLANA)	83.3	57.2	28	36	64	115	174
Firm age in years	21.7	23.7	4	9	14	22	57
Exporter status (dummy)	28.0%	44.9%	0	0	0	1	1
Supplier to foreign firm (dummy)	6.5%	24.7%	0	0	0	0	0
More than 50% privately owned (dummy)	94.7%	22.4%	1	1	1	1	1
More than 50% foreign owned (dummy)	2.8%	16.4%	0	0	0	0	0
More than 50% state owned (dummy)	2.6%	15.8%	0	0	0	0	0
More than 80% of managers with higher degree (dummy)	67.7%	46.8%	0	0	1	1	1
More than 20% of non-managers with higher degree (dummy)	39.2%	48.8%	0	0	0	1	1
Sales per worker, in thousand USD (2016)	62.5	130	5.2	14.5	32.8	60.8	117
Fixed assets per worker, in thousand USD (2016)	19.8	98.2	0	0.7	3.1	10.7	33
Value added per worker, in thousand USD (2016)	8	13.7	2.5	4.3	5.9	9.1	16
TFP index	6.6	5.2	3.8	4.5	5.7	7.3	9.5
Profit margin, in %	0.70%	35.90%	-7.50%	0.20%	2.80%	7.60%	13.90%

Note: TFP index is recovered from production function estimates for each 2-digit (NACE rev. 2) industry. Fixed-effects model (within estimator) is used. For reference, the average TFP index for the manufacturing sector in Russia was 7.30 in 2012 and 7.31 in 2016 (Kilinc, 2019).

Firm responses to questions on managerial practices are aggregated into a single management score following Bloom et al. (2019a) in two steps. *First*, the responses to each of the management practice question are normalized on a 0-1 scale: the response which is associated with the most structured management practice is normalized to 1, and the one associated with the least structured is normalized to zero. More structured management practices are those that are more specific, formal, frequent or explicit.[14] *Second*, the management score is calculated as the unweighted average of the normalized responses. Thus, the final score on a firm's management practice is scaled from 0 to 1. Firms with the extreme score 0 are those that selected the options that show little structure around performance monitoring, targets and incentives in the firm, while those with perfect score of 1 represent an establishment that selected the top category revealing an explicit focus on performance monitoring, detailed targets and strong performance incentives. We also separate the overall management index into two sub-indexes separately assessing monitoring practices and practices relating to incentives and targets.

Section 3: Management in Russia: Some descriptive results

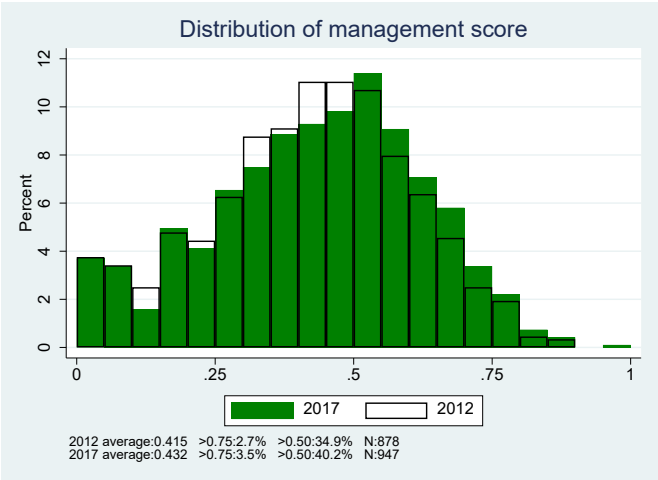
3.1 Do firms in Russia adopt structured management practices?

Similar to the findings in other countries such as the United States (Bloom et al., 2019a), Croatia (Grover et al., 2019), Mexico (Bloom et al., 2019b) and Pakistan (Lemos et al., 2016), management practices across

[14] Some examples are in Bloom et al. (2019a) while detailed instructions for assigning scores are available on the US census website. Available on http://bhs.econ.census.gov/bhs/mops/SUR766_9.html

Russian firms are very heterogeneous. Of the 978 manufacturing firms surveyed in the five federal districts in Russia, 947 of them have more than 10 non-missing responses that allows for computing a more precise management score (Bloom et al., 2019a).[15] The average management score for manufacturing firms in the surveyed federal districts in 2017 was 0.432 – that is, on an average the surveyed firms adopt 43% of overall structured management practices (Figure 1). The spread is large, however. Looking at the tails of the distribution in figure 1, it is visually clear that the left tail is much thicker than the right – a large share of the surveyed firms are poorly managed, only 3.5% of them adopt more than 75 percent of the structured management practices while a similar share turns away from adopting any (a management score of 0). Nearly 60 percent of the surveyed firms adopted less than 50 percent of overall structured management practices. Recall data from 2012[16] indicates that the average management score was slightly lower at 0.415, suggesting a very small increase of 0.017 in the period 2012-2017.[17]

Figure 1: There is large heterogeneity in adoption of structured management practices



Note: this figure plots the distribution of the management score in our sample. The 2012 data point corresponds to that year or the year the firm started operations, if later than that. Only firms with more than 10 non-missing answers in the Management questionnaire are included.

3.2 How do Russian firms compare with other countries?

Comparing Russian management practices with those in Croatia, Mexico, Pakistan and the United States – countries for which comparable data are available, Table 2 suggests that, *first*, an average Russian manufacturing firm in the surveyed federal districts is closer to its counterpart in Mexico (average score, 0.42) and Pakistan (average score, 0.44) but farther from structured management practices adopted in

[15] For the purposes of our paper, we consistently use this set of 947 firms for the analysis henceforth. Nonetheless, Annex Figure A.1 shows the distribution for the full sample of 978 firms.

[16] For the year 2012, this is a recall variable since the survey asked retrospectively about that year; for new firms which were not operating that year, this data point refers to the year operations started.

[17] Bloom et al. (2019a) exploit the panel variability in their sample of US firms and show that the quality of recall information correlates with the survey respondent's tenure in the company. In our work, when restricting the analysis to surveyed firms with respondents working in the firm in both 2012 and 2017, we find that the change in the average management score is 0.006. This further confirms the lack of change in management practices among surveyed firms during this period.

Croatia (0.542) and the United States (average score, 0.62).[18] *Second*, although the fat left tail and the thin right tail in the distribution of management score is evident in not only Russia, but also in Croatia, Mexico and Pakistan, the comparison with the US is starker. In the US, 18 percent of the establishments have a score higher than 0.75 and barely a quarter have a score lower than 0.50. *Third,* among the components of management scores, an average surveyed Russian firm scores much lower on the structured management practices related to data driven performance monitoring relative to Croatia, Mexico, Pakistan and the United States. By comparison, adoption of structured management practices on human resources and target setting for an average surveyed is higher in Russia relative to that in Mexico.[19]

Table 2: Russia not only far from frontier but also has large share of poorly managed firms

[18] For comparator countries, the sample frame varies significantly. For example, MOPS in the US used the sample frame of the Annual Survey of Manufacturing, comprising of around 50,000 plants in each wave for the years 2010 and 2015. Nearly 74,000 responses for the two years were received, that is, an average response rate of 74 percent. Likewise, in Mexico the survey was conducted for nearly 25,000 firms in manufacturing and services, with a response rate of 96 percent. The survey in Russia is perhaps closest to that in Croatia where 727 firms were interviewed face to face across five broad regions, with response rate similar to that in Russia (about 17 percent). Although the survey in Croatia covered both manufacturing and services, in this paper we present comparisons with manufacturing only. It is also worth reminding that although much of the lagging regions in Russia is not surveyed, the survey also skips bigger cities and agglomerations such as Moscow, Moscow Oblast, Saint Petersburg and Leningrad Oblast. Due to restricted coverage on location and size of the firms in Russia, management score could go in either direction. For example, we do not cover smaller firms (less than 25 employees) in Russia (which are covered in both Mexico and the US), and likewise, we do not cover much of the lagging regions in Russia as well. A broader coverage could therefore also pull down the current management score, depending on the share of firms that is added on either end of the location or size distribution. Furthermore, as we will learn later in the paper, a low response rate in Russia is likely leading to an overestimation of the observed management score.

[19] This interesting finding is explored more in Annex table A.2, where we compare the average score of firms surveyed in Russia in each of the 16 questions on management practices to the scores of the US firms as detailed in Bloom et al. (2019a).

	Mean	SD	p(10)	p(25)	p(50)	p(75)	p(90)
Russia 2012 (recall)							
	0.415	0.186	0.152	0.295	0.432	0.545	0.649
Data driven performance monitoring	0.299	0.218	0	0.133	0.25	0.467	0.6
Incentives and targets	0.483	0.219	0.167	0.35	0.5	0.639	0.75
Russia 2017							
	Mean	SD	p(10)	p(25)	p(50)	p(75)	p(90)
Management score	0.432	0.192	0.152	0.306	0.45	0.567	0.675
Data driven performance monitoring	0.323	0.227	0	0.133	0.3	0.5	0.633
Incentives and targets	0.496	0.221	0.167	0.361	0.523	0.663	0.762
Croatia (Grover et al., 2019)							
	Mean	SD	p(10)	p(25)	p(50)	p(75)	p(90)
Management score	0.542	0.15	0.333	0.431	0.558	0.657	0.724
Data driven performance monitoring	0.501	0.163	0.300	0.367	0.483	0.617	0.75
Incentives and targets	0.562	0.191	0.298	0.44	0.595	0.698	0.788
Mexico (Bloom et al., 2019b)							
	Mean	SD	p(10)	p(25)	p(50)	p(75)	p(90)
Management score	0.42	0.201	0.125	0.275	0.44	0.576	0.673
Data driven performance monitoring	0.465	0.232	0.133	0.278	0.5	0.639	0.75
Incentives and targets	0.386	0.235	0	0.2	0.398	0.568	0.7
Pakistan (Lemos et al., 2016)							
	Mean	SD	p(10)	p(25)	p(50)	p(75)	p(90)
Management score	0.443	0.174	0.206	0.311	0.453	0.571	0.666
Data driven performance monitoring	0.524	0.207	0.25	0.4	0.533	0.667	0.767
Incentives and targets	0.419	0.227	0.114	0.227	0.432	0.603	0.712
United States (Bloom et al., 2013)							
	Mean	SD	p(10)	p(25)	p(50)	p(75)	p(90)
Management score	0.615	0.172	0.379	0.521	0.648	0.742	0.806
Data driven performance monitoring	0.643	0.199	0.365	0.521	0.677	0.792	0.865
Incentives and targets	0.583	0.215	0.3	0.474	0.623	0.739	0.819

Note: This table compares the distribution of the management score and its subcomponents across countries. Data driven performance monitoring includes questions 1 to 5 of the management score questions detailed by Lemos et al. (2016), and incentives and targets includes questions 6 to 16.[20]

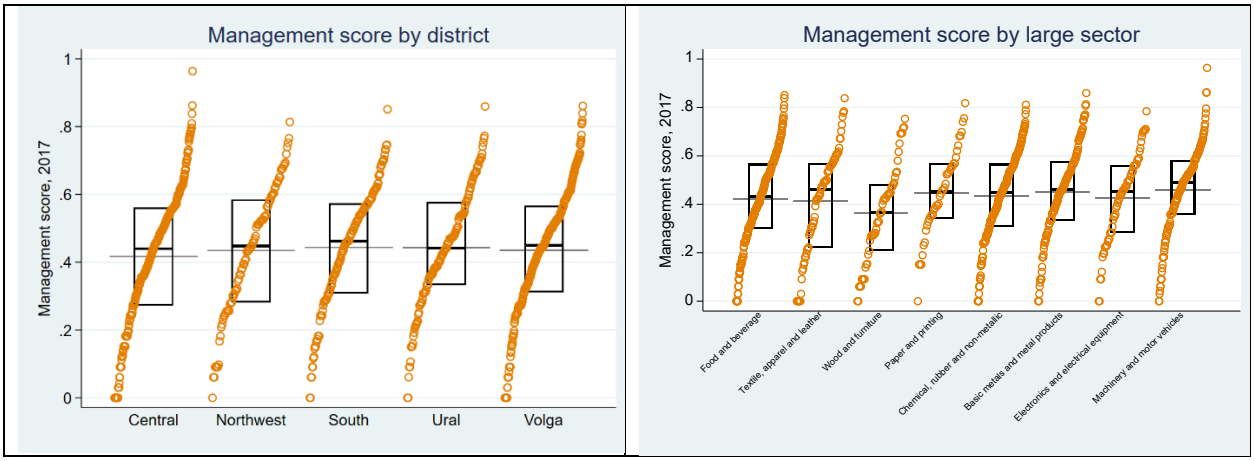
3.3 Do management practices vary across federal districts and sectors?

Management scores among surveyed firms across the five federal districts in Russia are indicative of only small regional variation (Figure 2, left panel). Firms in the Central federal district have the lowest average scores (0.417) and largest spread, while the highest average management score is among firms in South federal district (0.443). Differences in management scores within the surveyed federal districts are not statistically significant. Looking at variations across sectors (Figure 2, right panel), the highest average management score (0.457) is found among surveyed firms in the machinery and motor vehicles sector

[20] Although Lemos et al. (2016) continue to compare the results obtained from Pakistan with that in the US, it should be noted that the definition for data driven performance monitoring includes question 8 in Bloom et al. (2019a), while this question is excluded from the incentives and targets sub-index. Following Lemos et al. (2016), we continue to compare the result from Russia with the US as well.

and the lowest score (0.362) among those in the wood and furniture sector. Alternatively, when aggregating sectors along the technological dimension (that is, low-tech vs. high-tech), as expected lower scores are found among surveyed firms in low technology sectors. Differences across sectors and federal districts could result from differences in firm composition – for example, it is possible that certain federal districts have firms with higher share of the educated employees due to proximity to major universities or that certain sectors offer scale economies and hence have firms that are naturally larger in size. In these instances, firm characteristics may offer greater explanatory power in explaining the variation in management score.

Figure 2 –There is modest variation in management scores across federal districts and sectors



Note: this figure plots the management score of firms across federal districts. Each orange circle represents a firm. The grey thin line indicates the average score, the top of the box indicates the p75 score, the bottom of the box indicates the p25 score and the black solid line indicates the median score.

3.4 Which firm characteristics drive differences in management practices?

Firm characteristics may play a key role in explaining variations in management score (Table 4). Both unconditional and conditional correlations[21] suggest that, *first*, in line with prior studies, global exposure or foreign linkages is positively correlated with management score.[22] These linkages could be identified in the form of backward linkages with foreign firms or those that are exporting internationally. The finding of a positive association of management capabilities with firm size and the share of employees with professional degree is also in agreement with the literature. Doubling firm size is associated with an increase in management score by about 0.05.[23]

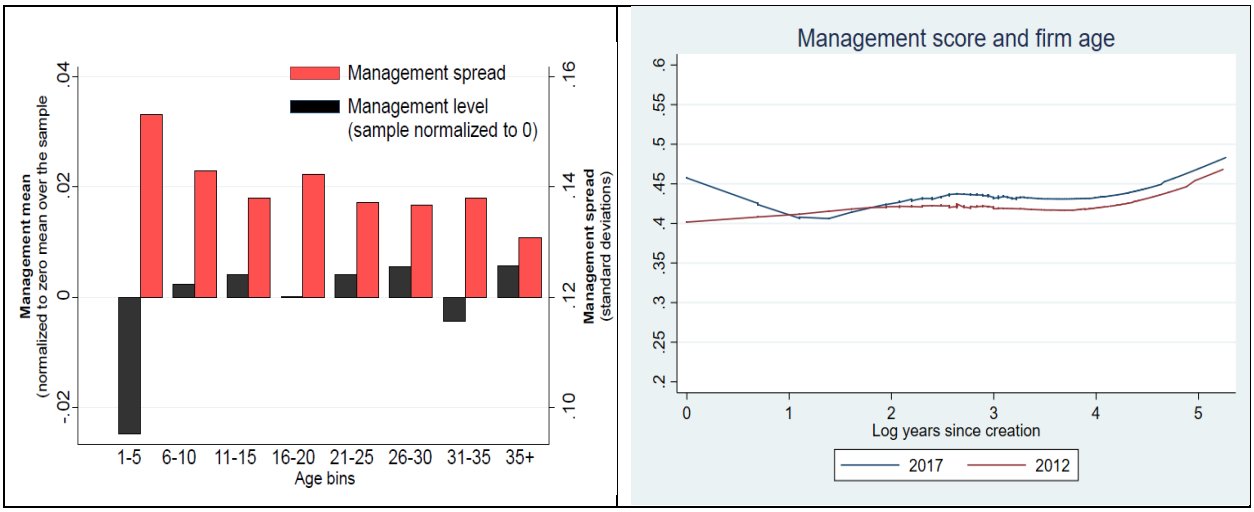
[21] The explanatory power of firm characteristics in unconditional correlations is limited.

[22] The relationship with foreign ownership is positive and significant in an unconditional setting but the variable loses significance in a joint estimation. Within exporters, the export destination makes no difference: the management score is statistically the same across those that export to CIS countries, to the EU or to the rest of the world. Figure A.2 in the Annex presents the result graphically.

[23] Although it is true that management practices are crucial for the performance of medium and large firms, the link of management with performance is shown to extend throughout the size distribution in the US and Mexico (Bloom et al., 2016; 2019b). In Bloom et al. (2019b), only four questions from the U.S. MOPS were selected for microenterprises. The correlation between the management score calculated with this subsample of questions and the overall management score for SMEs and large firms is 0.86, indicating that this short score is a good measure of management practices. This result is similar to McKenzie and Woodruff (2017) who find an important role for management in micro-firms in developing countries.

Second, unlike the results from prior studies on management practices in the United States and Pakistan, firm's age is completely uncorrelated with management practices in Russia. In the case of Mexico and U.S., manufacturing firms improve their management scores with age – presumably through a combination of learning (firms get better with age) and selection (over time, badly-managed firms exit). In particular, the case of the US manufacturing illustrates that firms' management score rises with age, as poorly managed firms either improve or exit the market (Bloom et al., 2014; Figure 3, left panel). This results in a decline in dispersion of management practices as firms age, because of the exit of poorly managed firms at an early stage of their life cycle, implying that older firms in the US are more similar in their management capabilities.

Figure 3: In the US manufacturing, management score rises with age but not so in Russia



Note: The left panel plots the dispersion and the level (normalized to 0 at the mean) of the management score for US firms; source is Figure 8 in Bloom et al (2013a). The right panel of Figure 3 figure plots the relationship between management score (vertical axis) and firm age (horizontal axis, expressed in logarithms). The lines are locally weighted smoothed regressions for the management score values calculated for 2017 and recalled from 2012 (or the year the firm started operations).

By comparison, firms in Russian manufacturing not do not seem to improve with age (Figure 3, right panel). Following similar analysis in Bloom et al. (2019b) on Mexico and the work of Hsieh and Klenow (2014) regarding the life cycle of firms, this finding appears to be indicative of inefficient allocation of resources in Russian manufacturing where badly managed firms continue to survive and clearly, market selection is not operating perhaps due to the lack of pro-competitive conditions.[24] In the case of Mexican services, for example, Bloom et al. (2019b) show that management practices actually deteriorate with firm age. Their work highlights the importance of regulations in shaping sectoral and national misallocation such that the extent of reallocation of labor inputs is lowest in the highly regulated Mexican services relative to that in Mexican or US manufacturing. Nonetheless, a similar lack of positive relationship between firm age and management score is also observed in Croatia (Grover et al., 2019). In Russia, an additional explanation for the lack of relationship between age and management practices may

[24] In the US it is well known that "up-or-out" dynamics in which unsuccessful firms exit or are bought out by more successful competitors who absorb the labor and capital released by exiting firms drives productivity and business dynamism (Haltiwanger et al., 2013). In the case of Russia, such selection dynamics does not seem to work in a similar way, and that firms that remain badly managed still continue to survive.

be found in institutional barriers to firm exit, which extends the life cycle of unproductive firms: in fact, there is evidence that business groups in Russia shift capital from stronger to weaker firms as a way of defending their assets in a perceived weak institutional environment (Estrin et al., 2009).

Third, the overall explanatory power of observed firm characteristics in explaining management score remains rather limited, even after controlling for district and sector fixed effects (columns 8 and 9 of Table 3) – in the most complete specification (column 9) explains only 10.6% of the overall variation in the management score implying that 90 percent of the variation in management practices is explained by idiosyncratic, firm-specific factors.[25]

We use these results to reflect more on the selection bias noted earlier. The fact that firm size and exporting activities are correlated with higher management score and also associated with a higher probability of being interviewed successfully in the survey, suggests that the average management score computed among surveyed firms may actually over-estimate the quality of management practices in Russia. In this sense, it is possible that Russian firms may be farther from the frontier than the survey suggests. For example, applying statistical techniques, to weigh firms by the inverse probability of being selected into the survey (as in Lemos et al., 2016) the average management score drops to 0.419. Likewise, if the sample is reweighted such that the average firm characteristics in terms of exporting status, size, and sector[26] match those of the sampling frame the average management score drops further to 0.404.

Table 3: Firms that are larger, globally linked or in more competitive environment have better managerial capabilities

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dep. var.:				Management score, 2017					
Log (employment)	0.045***							0.042***	0.039***
	(0.009)							(0.011)	(0.011)
Log (age)		0.008						0.000	0.000
		(0.005)						(0.009)	(0.009)
Exporter			0.067***					0.040**	0.040**
			(0.013)					(0.016)	(0.016)
Foreign owned or foreign supplier				0.139***				0.106***	0.104***
				(0.021)				(0.028)	(0.027)
Low concentration sector					(0.016)			(0.008)	0.037**
					(0.014)			(0.012)	(0.016)
More than 20% of non-managers with degree						0.041***		0.033***	0.033***
						(0.011)		(0.012)	(0.012)
More than 80% of managers with degree							0.026*	0.005	0.002
							(0.014)	(0.012)	(0.013)
District dummies	No	No	No	No	No	No	No	Yes	Yes
Sector dummies	No	No	No	No	No	No	No	No	Yes
Observations	912	913	941	941	941	794	893	741	741
R^2	0.025	0.001	0.025	0.04	0.002	0.011	0.004	0.083	0.098

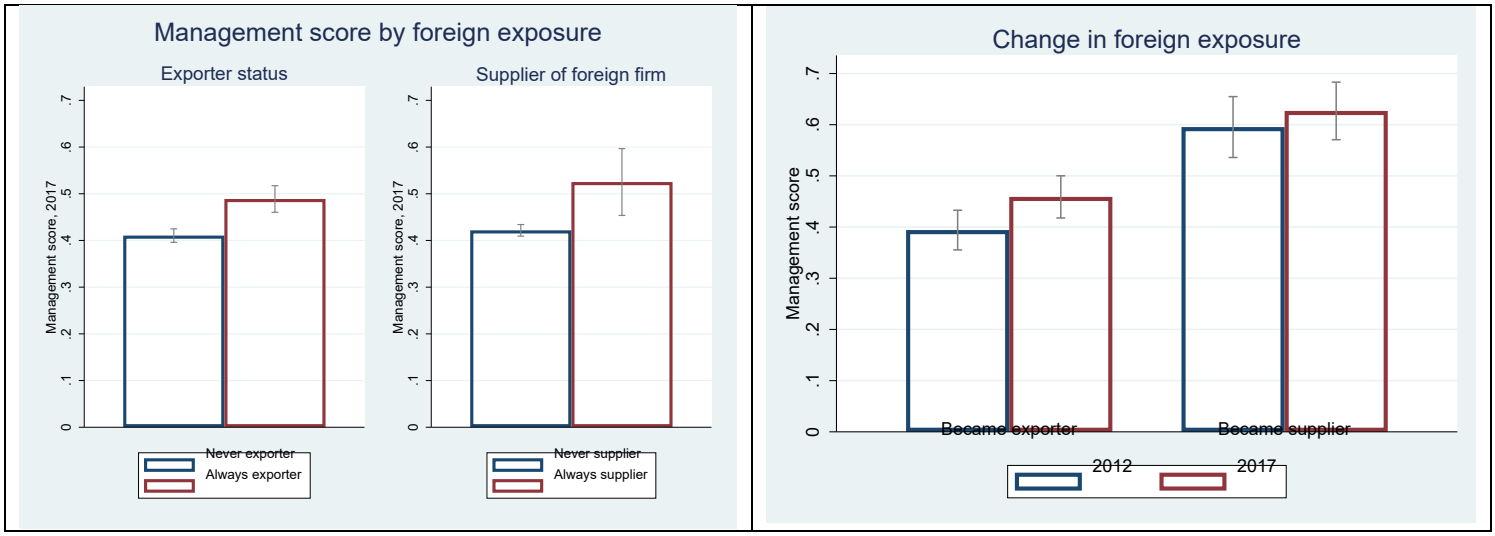
Notes: Low concentration sectors are those large industry-federal district sectors where the Herfindahl index is in the bottom 25%. Clustered standard errors at the district-large sector level in parentheses. Significance: * p<0.10, ** p<0.05, *** p<0.01.

3.5 Do foreign linkages affect management practices over time?

[25] Sector and district fixed effects are not statistically significant, implying that the variation in management capabilities across districts and sectors in figure 2 is accounted by differences in firm composition rather than district- or sector-specific factors.
[26] See Annex 2 for details on these procedures.

Given the positive association of foreign exposure with management score in a cross-section (Table 3), we are encouraged to analyze this relationship over time using the recall information for 2012. Focusing first on exports, we classify firms into three groups: those that did not export in 2012 and 2017 (*never exporters*), those firms that did not export in 2012 but did so in 2017 (*became exporters*), and those firms that exported in both years (*always exporters*).[27] We can also do an analogous classification for suppliers of foreign firms: those that did not supply to a foreign firm in 2012 and 2017 *(never suppliers*), those firms that did not supply to a foreign firm in 2012 but did so in 2017 (*became suppliers*), and those firms that did it in both years (*always suppliers*). The left panel of Figure 4 compares those groups whose foreign exposure didn't change: in 2017, those that always exported had a significantly higher management score than those that never did, and similarly those that were always suppliers to foreign firms with the respect to those that never did. The right panel compares the management scores in 2012 and 2017 for those firms that changed their foreign exposure, and it is evident that firms that switched to becoming exporters or suppliers to foreign firms witnessed a significant increase in management capabilities – particularly the ones that became exporters.[28] It is worth noting that, although our evidence is limited to a simple positive association between exporting status and management practices, Tanaka (2019) has provided causal evidence showing that in Myanmar export activities drive better management practices.[29]

Figure 4: Management capabilities improve with global linkages



Note: the left panel plots the average management score in 2017 of firms in four groups: "never exporters" (didn't export in either 2012 or 2017) or "never suppliers" (didn't supply a foreign firm in either 2012 or 2017) and "always exporters" (exported in both 2012 and 2017) or "always suppliers" (supplied a foreign firm in both 2012 and 2017). The right panel plots the average management score of firms in 2012 and 2017 for two groups: "became exporters" (didn't export in 2012 but did so in 2017, "became suppliers" (didn't supply a foreign firm in 2012 but did so in 2017).

3.6 Who informs firms of better management practices? And why is it that some firms do not adopt structured practices?

[27] There are very few firms that became non-exporters - 15 of 978 firms in total; 13 of 578 firms if we restrict the respondent's tenure to 6 years or more, and we drop these firms from this analysis.

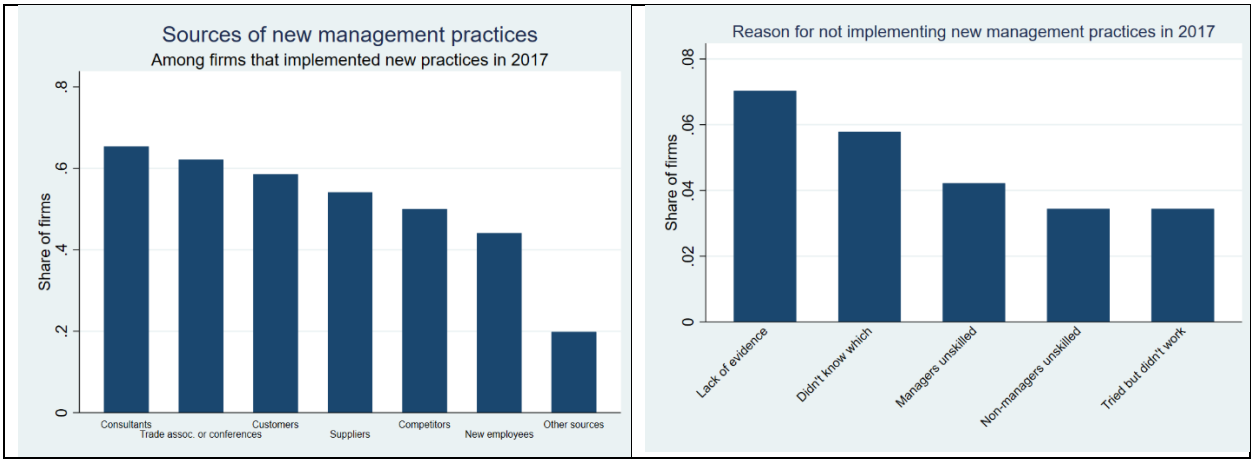
[28] A pseudo-panel fixed effect regression shows that this effect is statistically significant; becoming an exporter is associated with an increase in management score of 0.04 (Annex Table A.4, column 2).

[29] Tanaka uses the episode of rapid trade opening in Myanmar during the early 2010s and finds that exporting causes an improvement in management practices as well as in working conditions.

Firms reporting to have adopted new management practices attribute the source of information to multiple channels (Figure 5, left panel). This includes not only consultants (65 percent) and trade associations or conferences (62 percent), customers (59 percent), suppliers (54 percent) but also competitors (50 percent) and new employees (44 percent). Thus, structured management can be learned from many channels, although from a policy perspective, policy makers may have greater influence on trade associations or conferences in improving the circulation of such information flows. Likewise, flexible labor market policies may facilitate labor mobility from one firm to another, carrying their knowledge and skills, and allowing for a more open learning environment.

The survey also included questions relating to the reasons for not adopting structured management practices (Figure 5, right panel). Of the group of firms reporting to not have adopted structured management practices did so primarily because they did were not aware of the evidence on the benefits of these practices (70 percent), while other firms found the implementation to be too costly as they found it difficult to understand the most relevant management practices that will help them improve (58 percent). Some firms also reported the lack of managerial and non-managerial skills needed for implementing these practices, while a few others reported attempting to adopt but were faced with no success (35 percent). Next, we present evidence on the effectiveness of better managerial practices and illustrate their association with firm performance, which will help fill the evidence gap identified by company managers in Russia.

Figure 5: Lack of evidence on the effectiveness of management practices hinders adoption



Note: this figure plots the most mentioned sources of new management practices among the subset of firms that implemented new management practices in 2017. This was a multiple-choice question in which firms could choose more than one source. Note: the bars specify the reasons for not adopting new management practices, and the shares are estimated over the total number of firms which answered "no" to the question "Did the firm implement any new management practice in 2017?".

Section 4: Management and firm performance

Differences in management practices are meaningful, from an economy-wide point view, insofar as they make a difference on firm performance. However, as noted in the last section, interviewed managers in Russia that do not adopt new management practices allude to the lack of evidence on the effectiveness of such practices. Recent evidence from countries such as the US, Croatia, Mexico and Pakistan has

established that management practices are tightly linked to firm performance in these countries, it is therefore imperative to illustrate such a connection in the context of Russia as well.

To motivate this analysis, figure 6 presents unconditional correlations of firm performance measures by each decile of management scores. Evidently, relative to other firms, the ones in the 9th and 10th deciles of the management score distribution are more likely to be found in the top quartile of sales per worker and total factor productivity. Moving from the 10th percentile to the 90th percentile in management score (from 0.152 to 0.675) is associated with 87 percent increase in in Sales/Worker.[30] The analogous associated increase in value added per worker is close to 30 percent, while in TFP is about 13.5 percent.

Figure 6: Firms in higher deciles of management score have larger share of better performing firms

Note: this figure plots the share of firms in the top quartile of sales per worker (left panel) and in the top quartile of the TFP index (right panel) by decile of the management score.

In order to systematically test this positive relationship between management capabilities and firm performance, we follow Bloom et al. (2019a) approach and start from a standard production function:

$$Y_i = A_i K_i^{\alpha} L_i^{\beta} I_i^{\gamma} e^{\delta M_{i,}} e^{\mu X_i}$$

Where Y_i is output (or firm's total sales), A_i is total factor productivity (excluding management practices), K_i denotes the firm's capital stock (in our case, its fixed assets), L_i is employment, I_i are intermediate inputs, X_i is a vector of additional factors such as the employees' education and M_i is the management score.

Dividing by employment and taking logs we obtain the following equation that can be estimated with our data set:

$$log\left(\frac{Y_i}{L_i}\right) = \alpha log\left(\frac{K_i}{L_i}\right) + \gamma log\left(\frac{I_i}{L_i}\right) + (\alpha + \beta + \gamma - 1)L_i + \delta M_i + \mu X_{it} + f_s + \theta_d + u_i$$

[30] The associated increase in TFP is small (12 percent) because overall, TFP varies much less across firms than sales per worker (see Table 2). The 90-10 ratio in TFP is 2.53 while in sales per worker it is 22.67.

Where we have substituted A_i by a set of sector (NACE 2-digit) fixed effects f_s and district fixed effects θ_d. and a stochastic residual u_i. Standard errors are clustered by the broad sector-district at which our sample was stratified. The estimation output for OLS regression is presented in columns (1) to (3) of Table 5, where management score is presented as a z-score. Results with the original management score are presented in Annex Table A.3.

4.1 Management matters for firm performance

The results in table 4 suggest that management capabilities are positively and significantly associated with firm performance, whether measured as gross sales per worker, TFP, value added per worker or employment growth. When looking at unconditional correlations (columns 1, 5, 9 and 13), a one standard deviation (SD) increase in management score is associated with a 0.327 increase in log sales per employee, 0.051 SD increase in log TFP and 0.114 increase in log value added per employee and 0.069 SD increase in log employment growth. In terms of elasticities, a 10-percentage point increase in the management score is associated with an increase of 18 percent in sales per worker, 2.6 percent in TFP and 6 percent in value added per worker (see Annex table A.4). These correlations are robust to the use of sample weights to control for selection bias (see Annex tables A.8 and A.9). Table 5 compares the coefficients of similar unconditional correlations across these countries in both elasticity and z-score format suggesting that the findings in Russia are within a comparable range of the countries where MOPS has been conducted. For example, in the United States, a similar change in management score is associated with a 14.5 percent increase in sales per worker (Bloom et al., 2019a). The associated increase in value added per worker is 9 percent in the United States, 12 percent in Pakistan and 15 percent in Mexico.[31] As the evidence presented in this paper comprises of simple association between firm performance and better management practices, it is natural to have concerns regarding endogeneity in adoption of better management practices. For example, it is possible that more productive and efficient firms develop more sophisticated management capabilities as a part of learning by doing, rather than other way round. Due to limitations in our survey data (e.g. information on management practices are based on one year of data collection), we are unable to test for the causality of management practices with superior firm performance in Russia. Nonetheless, the literature on other countries has shown that indeed there is a causal relationship going from improved management practices to increased productivity. For example, in the case of post-war Italy Giorcelli (2018) finds long term effects of better management practices on performance of firms (e.g. productivity, sales, and survival) relative to machinery purchases or technology. The key channel through which skills improved firm performance was by helping managers make better investment decisions—investing in new plants or new machines, for example—which made their production more efficient. The fact that the coefficients obtained from our analysis are similar to those found in the existing literature (see Table 5), reassuring in that better management practices in Russia will likely drive positive effects on firm performance.

Another interesting finding in Table 4 is that the type of management practices affects the productivity indicator in distinct ways. Columns 2, 6, 10 and 14 of Table 4 show the unconditional correlation of the two sub-types of management practices – those related to data driven performance monitoring and those relating to incentives and targets. Data driven performance monitoring has a stronger association with increased sales per worker and employment growth, whilst the latter have a stronger association with

[31] The specifications in columns 8 and 9 exclude intensity of intermediate inputs as regressors because intermediate inputs are included in the computation of value added, which is defined as sales minus cost of intermediate inputs.

increased TFP and increased value added per worker. Data driven performance monitoring includes specific practices that help managers define their key performance indicators (e.g. inventory, sales, absenteeism) and appropriately track them over time, while incentives management practices relate to how managers and non-managers are awarded bonuses and promotion.

The association of management capabilities with firm performance is weaker when controlling for input intensity of capital, labor and materials, and for the firm's global linkages.[32] The drop in the magnitude of coefficients in the conditional results is somewhat expected: if management practices are considered as another input to production in a Cobb-Douglas framework, then it becomes complementary to all other factors. Hence, improved management practices will be associated with greater physical and human capital intensity, so that controlling for these will reduce the coefficient on management practices.

[32] A firm is defined to be globally linked if it is either an exporter, a supplier of a foreign firm or is foreign owned.

Table 4: Higher managerial capabilities among Russian firms is associated with superior firm performance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Log Sales per worker				Log TFP index				Log VA per worker				Log Empt. Growth (2012-17)	
Management score: total (Z-score)	0.327***		0.026*		0.051***		0.038**		0.114***		0.047**		0.069***	
	(0.043)		(0.015)		(0.018)		(0.015)		(0.023)		(0.018)		(0.022)	
Management score: Data-driven performance monitoring (Z-score)		0.243***		0.003		0.007		0.004		0.033		0.003		0.064***
		(0.042)		(0.011)		(0.019)		(0.018)		(0.027)		(0.025)		(0.020)
Management score: Incentives and targets (Z-score)		0.157***		0.027		0.051**		0.039**		0.095***		0.049**		0.021
		(0.047)		(0.018)		(0.019)		(0.018)		(0.023)		(0.021)		(0.020)
Input variables	No	No	Yes	Yes	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Control for firm's global linkages	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Sector dummies	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes
District dummies	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Observations	906	906	778	778	778	778	778	778	744	744	744	744	398	398
R^2	0.053	0.058	0.888	0.888	0.014	0.016	0.167	0.168	0.02	0.02	0.19	0.19	0.602	0.605

Notes: Clustered standard errors at the district and large sector level in parentheses. Input variables are log capital per employee, log materials per employee (excluded for VA per worker and employment growth) and log employment. Control for firm's global linkages are dummy variables for exporter status and foreign supplier status.
Significance: * p<0.10, ** p<0.05, *** p<0.01.

Table 5: The magnitude of correlations between management score and firm performance is in line with the results on other countries

Measured change in management	Russia	US	Mexico	Pakistan
Z-score: associated increase in firm performance by a one standard-deviation change in management score				
Log Sales per worker	0.327	0.232		
Log Value added per worker	0.114	0.149	0.281	0.198
Elasticity: associated increase in firm performance by a 0.10 change in management score				
Log Sales per worker	18.0%	14.5%		
Log Value added per worker	5.9%	9.0%	15.0%	12.0%

Note: the values for US come from Bloom et al. (2019a); the values for Mexico come from Bloom et al. (2019b); the values from Pakistan come from Lemos et al. (2016).

An alternative way of analyzing the robustness of the relationship between management practices and firm performance is by controlling for idiosyncratic firm characteristics in a panel setting. To this end, the recall data in our survey allow us to estimate a pseudo-panel by linking it to historical information on firm performance available in Ruslana. Table 6 shows the result for the three performance variables which allow for such analysis – sales per worker, TFP and value added per worker. The analysis shows that the positive correlation is significant, even when input variables and firm fixed effects are included in the regression, for sales per worker and TFP. Only in value added per worker the relationship becomes statistically insignificant. The results show that one standard deviation increase in management score is associated with 0.103 SD increase in log output per worker and 0.108 SD increase in log TFP, but the change in value added per worker is not significant. These changes imply that a 10 percent increase in management score is associated with 5 percent increase in output per worker and 6 percent increase in TFP.[33]

Interestingly, when splitting the management score in its two components, data driven performance monitoring practices emerges as being more strongly associated with improved firm performance. One SD increase in monitoring related management practices is associated with 0.073 SD increase in log output per worker, 0.088 SD increase in log TFP and 0.166 increase in log value added per employee. Surprisingly the correlation of management practices relating to incentives and targets are not associated with increases in firm performance.

Table 6: Managerial capabilities on monitoring can have larger correlation with firm performance

	(1)	(2)	(3)	(4)	(5)	(6)
	Log Sales per worker		Log TFP index		Log VA per worker	
Management score: total (Z-score)	0.103*		0.108*		-0.021	
	(0.055)		(0.06)		(0.06)	
Management score: Data-driven performance monitoring (Z-score)		0.073*		0.088*		0.166**
		(0.042)		(0.05)		(0.08)
Management score: Incentives and targets (Z-score)		0.040		0.028		-0.239**
		(0.042)		(0.04)		(0.11)
Input variables	Yes	Yes	No	No	Yes	Yes
Control for firm's global linkages	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1064	1064	1064	1064	1022	1022
Firms	532	532	532	532	511	511
R^2	0.764	0.765	0.026	0.029	0.024	0.038

Notes: This table is a panel estimation of the specifications in Table 4 for all performance variables, except employment growth due to unavailability of firm-level information on management practices for prior years. See Table 4 for other notes.

4.2 Heterogeneous effects of management practices on firm performance

In table 7 we interact the management score with a set of firm characteristics, which served as controls in the full specification in table 4. Focusing on sales per worker as the main performance variable of interest, these interactions suggest that, *first,* the importance of management practices is heightened for firms that are externally linked – in fact, for exporters the cumulative effect of an increase in management score is almost six times as much as that of non-exporters; the effect is similar when expanding the

[33] See Annex table A.6 for results in non-standardized management score format.

definition to include those which are suppliers of a foreign firm or are foreign owned (column 3). The intensive margin of foreign exposure (column 4) does not appear to be relevant. *Second,* the returns to improving management capabilities is associated with a larger change in sales per employee in environments that have lower levels of competition in district-sector markets. This seemingly counter-intuitive result can be justified, for example, in initially non-competitive environments where potentially underutilized capacity or demand can be unleashed more dramatically by improving management practices.[34] *Third*, unlike the case of the US where management practices matter more for the performance of younger firms (Bloom et al., 2019a), the importance of management capabilities in Russian firms do not respond to firm age in affecting firm performance. This result continues to hold after controlling for input intensity variables, sector and federal district fixed effects. Several standard models of market selection (e.g. Jovanovic, 1982; Hopenhayn, 1992) are consistent with a pattern in which there is a relationship between management practices and growth for young firms. Plants have heterogeneous managerial capabilities when they are born, however, with a rapid selection process where weaker establishments exit the market, there is less of a relationship between growth and management practices among incumbent plants that have matured to their steady state size. The fact that this pattern is not observed in our data is indicative of difficulties in firm exit in Russia.[35] Lack of competition could be a possible reason for this deficiency in market selection.

Table 7: Foreign linkages make management score more relevant for firm performance

	(1)	(2)	(3)	(4)	(5)	(6)
	Log Sales per worker					
Management score (Z-score)	0.034**	0.011	0.006	0.029*	0.057***	0.025
	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)
Mgmt score (Z) X exporter		0.054*				
		(0.03)				
Mgmt score (Z) X foreign linkages			0.054*			
			(0.03)			
Mgmt score (Z) X export intensity				0.123		
				(0.09)		
Mgmt score (Z) X low concentration					-0.060*	
					(0.03)	
Mgmt score (Z)X age						0.000
						(0.00)
Input variables	Yes	Yes	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes
District dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	778	778	778	778	778	754
R^2	0.886	0.888	0.889	0.886	0.887	0.885

Notes: Clustered standard errors at the district and large sector level in parentheses. Input variables are log capital per employee, log materials per employee and log employment. Column 2 includes a dummy variable for exporter status. Column 3 includes a dummy variable taking a value of 1 if the firm is either an exporter, a supplier to a foreign firm or is foreign owned. Column 4 includes export intensity as an additional variable. Column 5 includes a dummy variable for large sector-federal districts whose H-index is in the bottom 25%. Column 6 includes age as additional variable. Significance: * p<0.10, ** p<0.05, *** p<0.01

The differential effect of foreign exposure on firm performance is confirmed in a pseudo-panel analysis that exploits recall data on management practices in 2012 (Table 8), where we again note that the

[34] The significance of these results are sensitive to the definition of market (sector, district or sector and district).
[35] Table A.6 presents the corresponding table in non-standardized management score format.

association of management practices with performance is heightened for firms with foreign linkages.[36] The magnitude of this interaction term is larger than that in the cross-sectional estimates presented in Table 8. It is also worth pointing out that in a panel analysis, the correlation of management score with firm performance is almost twice as high in most specifications.

Table 8: Management has heightened response on firm performance for globally linked firms

	(1)	(2)	(3)	(4)	(5)
	Log Sales per worker				
Management score	0.102*	0.097*	0.076	0.116*	0.098*
	(0.06)	(0.06)	(0.05)	(0.06)	(0.06)
Mgmt score (Z) X exporter		0.028			
		(0.04)			
Mgmt score (Z) X foreign linkages			0.063*		
			(0.03)		
Mgmt score (Z) X export intensity				-0.146	
				(0.28)	
Mgmt score (Z) X low concentration					0.024
					(0.02)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes
Observations	1064	1064	1064	1064	1064
R^2	0.764	0.764	0.765	0.766	0.766

Notes: This table is a panel estimation of the specifications in Table 8. See Table 8 for other notes.

Section 5: Policy conclusions and discussion

This paper presents novel evidence on managerial capabilities of Russian manufacturing firms. Surveying nearly a thousand manufacturing firms in five federal districts. Central (excluding Moscow oblast and Moscow city), Northwestern (excluding Leningrad oblast and Saint Petersburg city), Southern, Volga and Ural, our analysis suggests that: *first*, an average Russian manufacturing firm scores 0.43 in adoption of structured management practices, a score very similar to that in Mexico and Pakistan but behind the one in Croatia (0.54) and the United States (0.62). Said differently, an average firm in Russia adopts only 43 percent of the structured management practices, as compared to 62 percent of the practices adopted by an average American firm. *Second*, the weaknesses in management practices particularly relating to data driven performance monitoring pull down the overall score in Russia. *Third,* there is much heterogeneity in adoption of structured management practices among Russian manufacturing firms in the surveyed federal districts. As in Croatia, Mexico and Pakistan, the distribution of management score among Russian firms has a fat left tail, implying that a large share of firms in Russia are badly managed. *Fourth*, among the firm characteristics that explain at least a portion of the variation in management practices, firm size, foreign linkages and the education level of non-managers are the most relevant. Surprisingly firm age is not associated with better management practices, implying that unlike in the US and Mexico, firms do not learn to be better managed as they age. Thus, it is possible that lack of pro-competitive forces in Russia does not promote learning and possibly hinder market selection. *Finally,* our work confirms that better management practices is associated with superior firm performance. Firms with more structured management practices have higher productivity, profitability, and growth. This result is highly robust to

[36]Table A.7 presents the corresponding table in non-standardized management score format.

numerous checks and controls. Among the types of management practices that matter most, our results suggest that those related to data driven performance monitoring, where Russian firms particularly lag behind other countries, are the ones more closely associated with firm performance. Finally, the link of management practices in affecting firm performance is particularly heightened for the performance of firms that are externally linked.

Following the ABC framework for firm growth proposed in Grover, Medvedev and Olafsen (2019),[37] Russia could possibly enhance firm productivity and business dynamism by focusing on policies that contribute to improving ***A****llocative efficiency*. The fact that management capabilities do not respond to firm age is an indication of a lack of learning and selection mechanism in Russian manufacturing sector. Policies that, for instance, address the shortcomings of the exit laws may allow inefficient firms to leave the market and make space for better managed firms. Our paper also finds evidence of learning on management practices from global exposure and hence it is critical address bottlenecks to foster ***B****usiness to Business linkages*. In this context, policies to attract FDI, programs that link domestic firms with foreign firms and those that connect firms to export markets can encourage better selection. Lastly, policies that seek to improve ***C****apabilities of firms*, by offering incentives to adopt structured management practices can go a long way in improving aggregate productivity, as this paper confirms a tight association of better management capabilities with superior firm performance.

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[37] This framework proposes that policies for improving firm dynamism and supporting job creation should steer away from picking potential winners and focus on improving **A**llocative efficiency, strengthening **B**usiness-to-business spillovers, and building firm **C**apabilities. These policies rely on encouraging innovation, network and agglomeration economies, global linkages, worker skills and managerial capabilities, and financial development to rebalance growth/productivity policies.

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Annex 1: Disaggregate scores for each question in the management survey

Data driven performance monitoring is composed of the average score of questions 1 to 5. Russian firms lag considerably in all of them with respect to US firms. In particular the worst scores are the ones relating to display board location, review of KPIs by nonmanagers and the number of KPIs followed. These results show that, overall, firms in Russia tend not to track very well their own performance -44% track no KPI at all- and employees know little about how their own firm is doing -within those firms that do track KPIs, in 32% of them nonmanagers never review them. In fact, firms in the sample also lag considerably on the employees' awareness of operational targets (question 8, pertaining to incentives and targets): in the US, firms adopted 71% of the most structured management practice in that dimension -all managers and most workers are aware of the firm's targets- while in Russian firms that were surveyed that share was 48% -meaning that even a portion of managers are not usually aware of operational targets.

With respect to bonus policies, Russian firms perform as well as US firms, but they lag considerably on promotion criteria and management of underperformance. Among Russian firms, 38% do not promote non-managers at all, and 47% of them do not promote managers. This last figure is particularly striking and represents one of the biggest differences in management practices between the US and Russia. With respect to underperformance, 65% of the surveyed firms stated that they rarely or never dismiss an underperforming non-manager, and 72% of them rarely or never dismiss an underperforming manager. What emerges from this summarized comparison is that Russian firms have a rather stagnant body of employees: any kind of employee, either non-manager or manager, is both not dismissed and not promoted. While this may reflect overall preference for job stability in Russia,[38] it still reveals how Russian firms lag considerably in their human resources management practices with respect to US firms.

[38] According to the second round of the Life in Transition Survey (2010), 64% of Russian respondents preferred a job with an average salary, not much chance of promotion but safe in the long term, to a job with high salary, a lot of chance of promotion but less job security. Moreover, 45% of the respondents preferred a job in the public sector, 20% preferred self-employment and only 25% preferred private sector employment.

Table A.1 – Management score questions, Russia and US

	Management score questions	Russia 2017	US	Difference
1	What happens when a problem arise?	0.694	0.846	-0.152
		(0.353)	(0.213)	
2	# of key performance indicators (KPI)	0.396	0.753	-0.357
		(0.375)	(0.267)	
3	Frequently KPI reviewed by managers	0.236	0.524	-0.288
		(0.255)	(0.222)	
4	Frequently KPI reviewed by nonmanagers	0.173	0.426	-0.253
		(0.262)	(0.281)	
5	Display boards location	0.151	0.513	-0.362
		(0.310)	(0.442)	
6	Time frame of operational targets	0.665	0.684	-0.019
		(0.314)	(0.363)	
7	Difficulty to achieve operational target	0.696	0.746	-0.050
		(0.250)	(0.252)	
8	Awareness of operational targets	0.477	0.713	-0.236
		(0.412)	(0.329)	
9	What are non-managers' bonuses based on?	0.555	0.266	0.289
		(0.370)	(0.299)	
10	Percent of non-managers receiving bonuses	0.712	0.69	0.022
		(0.297)	(0.265)	
11	What are managers' bonuses based on?	0.495	0.332	0.163
		(0.368)	(0.278)	
12	Percent of managers receiving bonuses	0.782	0.73	0.052
		(0.240)	(0.282)	
13	Criteria for non-managers' promotion	0.582	0.834	-0.252
		(0.467)	(0.32)	
14	Criteria for managers' promotion	0.488	0.81	-0.322
		(0.474)	(0.356)	
15	When is an under-performing non-manager reassigned or dismissed?	0.327	0.619	-0.292
		(0.453)	(0.412)	
16	When is an under-performing manager reassigned or dismissed?	0.259	0.521	-0.262
		(0.420)	(0.415)	

Note: this table compares the average score for each of the 16 questions that are used to compute the management score between Russia and the US (data from Bloom et al., 2019a). Standard deviations included in parentheses. The point difference is included in the very last column of the right

Annex 2: Selection bias analysis

As detailed in section 2, the average characteristics of firms included in the survey differ substantially from those of the sample frame, a fact which suggests the presence of non-random selection into the survey. In table A.2 we present the results of a regression estimated on the whole set of firms in our sample frame in which the dependent variable is a dummy that indicates whether the firm was successfully interviewed or not. The regressors correspondent to the firm's age, its size in terms of employment, its export activities according to customs data and the federal district of location. The results show that older, bigger and exporting firms had a higher probability of being successfully interviewed.

Table A.2 Selection bias in survey response

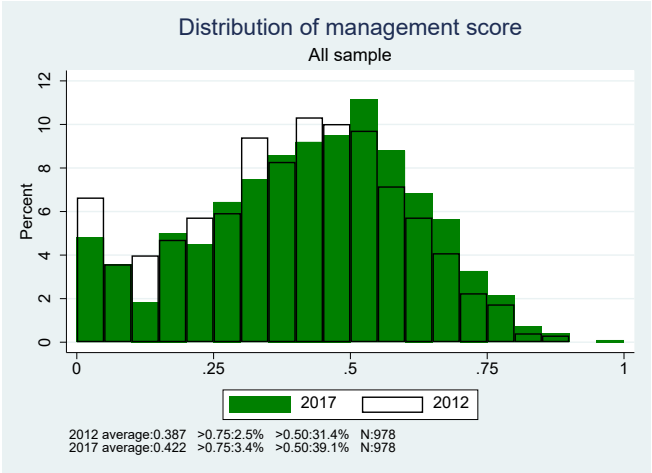
Dep. var.: ==1 if successful interview	(1) OLS	(2) Probit
Log firm age	0.012**	0.088***
	(0.005)	(0.032)
Log employment	0.043***	0.269***
	(0.006)	(0.031)
Exporter in 2016, customs data	0.021**	0.125***
	(0.008)	(0.041)
Central federal district	-0.004	-0.019
	(0.016)	(0.096)
South federal district	-0.003	-0.019
	(0.017)	(0.101)
Volga federal district	-0.021	-0.143
	(0.017)	(0.106)
Ural federal district	-0.005	-0.031
	(0.016)	(0.092)
Observations	12440	12440
R^2	0.017	0.029

Clustered standard errors at the district-large sector level in parentheses. The reference category for federal districts is the Northwestern federal district. Pseudo-R2 value reported for column 2. Significance: * p<0.10, ** p<0.05, *** p<0.01.

Since the evidence shown on section 4 indicates that better management practices are found among bigger and exporting firms, the results of table A.2 suggest that, a priori, better managed firms were possibly more probable of being included in the survey sample. This may generate a selection bias in our analysis. In order to control for such bias, we use sample weights to compensate for it. In particular, we follow two approaches. The first one is applied by Lemos et al. (2016) on their analysis of management practices in Pakistan and consists in using as weights the inverse selection probability that result from column 2 in table A.2. The second approach follows a maximum entropy estimation (Wittenberg, 2010) and constructs weights such that average firm characteristics in the weighted survey match those of the sample frame. In particular, we choose as "target" characteristics to be matched the firm size in terms of employment (defined in 7 size groups), the exporting status (defined by 2 groups – exporting and non-exporting) and large industrial sector (8 groups). These three characteristics define 112 groups and the weights are estimated such that the percentage of firms in each of these groups in the survey corresponds to the same percentage in the sample frame.

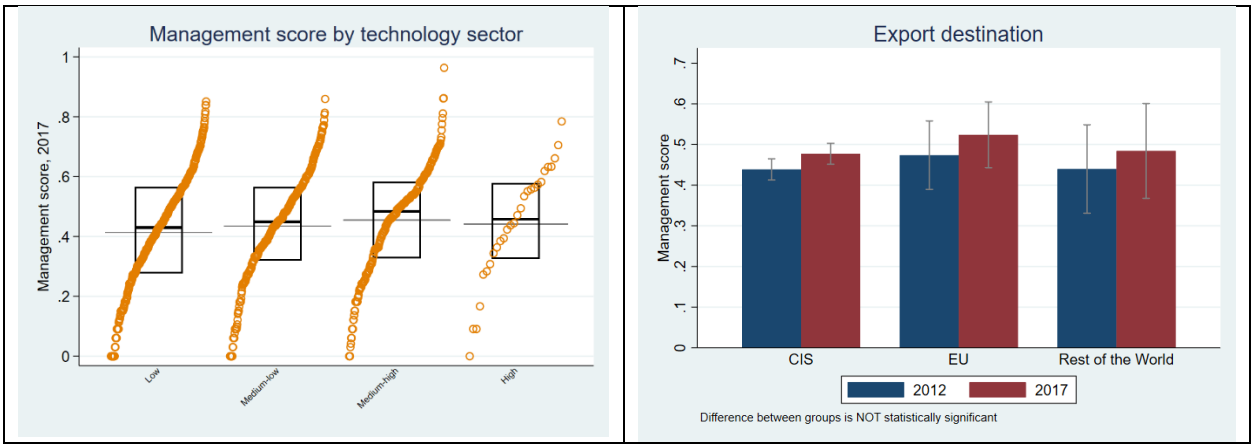
Annex 3: Figures

Figure A.1



Note: this figure plots the distribution of the management score in our sample. The 2012 data point corresponds to that year or the year the firm started operations, if later than that.

Figure A.2



Note: this figure plots the management score of firms across large sectors. Each orange circle represents a firm. The grey thin line indicates the average score, the top of the box indicates the p75 score, the bottom of the box indicates the p25 score and the black solid line indicates the median score. Note: this figure plots the management score of firms across export destinations. Values are estimated within the sample of firms that exported in each year (170 in 2012, 257 in 2017).

Annex 4: Annex Tables

Annex table A.3 – Accounting for differences in management practices, panel analysis, FE regression

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Management score				
Log (employment)	0.005*							0.004*
	-0.003							-0.002
Exporter		0.039***						0.016
		-0.014						-0.01
Foreign owned or foreign supplier			0.05					0.066*
			-0.032					-0.037
Export intensity				0.114**				0.007
				-0.053				-0.009
Low concentration sector					-0.005			-0.006
					-0.004			-0.004
More than 20% of non-managers with degree						0.025**		0.022*
						-0.011		-0.013
More than 80% of managers with degree							0.041	-0.008
							-0.042	-0.018
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1456	1456	1456	1456	1456	1190	1346	1176
Firms	728	728	728	728	728	595	673	588
R^2	0.072	0.101	0.082	0.068	0.069	0.036	0.05	0.093

Notes: This table presents a panel regression of the specifications in Table 3. See Table 3 for all other notes.

Annex table A.4 – Management score and firm performance, cross-section

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Log Sales per worker				Log TFP index				Log Empt. Growth (2012-17)		Log VA per worker			
Management score: total	1.654***		0.133*		0.258***		0.191**		0.348***		0.574***		0.239**	
	(0.218)		(0.077)		(0.090)		(0.077)		(0.111)		(0.114)		(0.091)	
Management score: Data-driven performance monitoring		1.052***		0.012		0.030		0.018		0.285***		0.145		0.012
		(0.184)		(0.049)		(0.080)		(0.077)		(0.087)		(0.116)		(0.108)
Management score: Incentives and targets		0.691***		0.120		0.223**		0.170**		0.089		0.421***		0.216**
		(0.210)		(0.078)		(0.084)		(0.080)		(0.086)		(0.103)		(0.092)
Input variables	No	No	Yes	Yes	No	No	No	No	Yes	Yes	No	No	Yes	Yes
Control for firm's global linkages	No	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes
Sector dummies	No	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes
District dummies	No	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes
Observations	906	906	778	778	778	778	778	778	398	398	744	744	744	744
R^2	0.053	0.058	0.888	0.888	0.014	0.016	0.167	0.168	0.602	0.605	0.02	0.02	0.19	0.19

Notes: This table replicates the results in Table 4, where management score is measured in non-standardized format. See Table 4 for all other notes.

Annex table A.5– Management score and firm performance, panel analysis

	(1)	(2)	(3)	(4)	(5)	(6)
	Log Sales per worker		Log TFP index		Log VA per worker	
Management score: total	0.519*		0.544*		-0.100	
	(0.276)		(0.279)		(0.298)	
Management score: Data-driven performance monitoring		0.325*		0.389*		0.703**
		(0.189)		(0.202)		(0.331)
Management score: Incentives and targets		0.164		0.113		-1.006**
		(0.179)		(0.166)		(0.487)
Input variables	Yes	Yes	No	No	Yes	Yes
Control for firm's global linkages	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1188	1188	1188	1188	1140	1140
Firms	594	594	594	594	570	570
R^2	0.764	0.765	0.026	0.030	0.024	0.037

Notes: This table replicates the results in Table 6, where management score is measured in non-standardized format. See Table 6 for all other notes.

Annex table A.6 – Heterogeneous effects of management score on firm performance, cross-section

	(1)	(2)	(3)	(4)	(5)	(6)
			Log Sales per worker			
Management score	0.173**	0.054	0.031	0.147*	0.290***	0.129
	(0.079)	(0.096)	(0.107)	(0.087)	(0.068)	(0.098)
Mgmt score X exporter		0.275*				
		(0.146)				
Mgmt score X foreign linkages			0.273*			
			(0.139)			
Mgmt score X export intensity				0.620		
				(0.446)		
Mgmt score X low concentration					-0.301*	
					(0.164)	
Mgmt score X age						0.001
						(0.004)
Input variables	Yes	Yes	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes
District dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	778	778	778	778	778	754
R^2	0.886	0.888	0.889	0.886	0.887	0.885

Notes: This table replicates the results in Table 7, where management score is measured in non-standardized format. See Table 7 for all other notes.

Annex table A.7 – Heterogeneous effects of management score on firm performance, panel analysis

	(1)	(2)	(3)	(4)	(5)
			Log Sales per worker		
Management score	0.515*	0.477*	0.373	0.569*	0.505*
	(0.290)	(0.265)	(0.236)	(0.298)	(0.276)
Mgmt score X exporter		0.169			
		(0.188)			
Mgmt score X foreign linkages			0.332*		
			(0.177)		
Mgmt score X export intensity				-0.323	
				(1.589)	
Mgmt score X low concentration					0.078
					(0.101)
Input variables	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes
Observations	1064	1064	1064	1064	1064
Firms	532	532	532	532	532
R^2	0.764	0.764	0.765	0.764	0.765

Notes: This table replicates the results in Table 8, where management score is measured in non-standardized format. See Table 8 for all other notes.

Annex table A.8 – Management score and firm performance, cross-section: control for selection bias (inverse selection probability weights)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Log (Output/Employment)				Log TFP index recovered from prod.				Log (Value Added/Employment)				Log Empt. Growth (2012-17)	
Management score: total (Z-score)	0.322***		0.024		0.045**		0.027		0.110***		0.003		0.075***	
	(0.055)		(0.019)		(0.019)		(0.021)		(0.025)		(0.025)		(0.025)	
Management score: Data-driven performance monitoring (Z-score)		0.283***		0.012		0.018		0.011		0.029		-0.032		0.086***
		(0.048)		(0.014)		(0.019)		(0.019)		(0.026)		(0.025)		(0.022)
Management score: Incentives and targets (Z-score)		0.123**		0.017		0.035*		0.021		0.095***		0.029		0.010
		(0.058)		(0.019)		(0.020)		(0.020)		(0.024)		(0.024)		(0.022)
Input variables	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Control for firm's global linkages	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Sector dummies	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes
District dummies	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Observations	904	904	776	776	776	776	776	776	742	742	742	742	398	398
R^2	0.048	0.058	0.886	0.886	0.012	0.012	0.183	0.183	0.021	0.021	0.27	0.272	0.659	0.665

Notes: This table replicates the results in Table 4 but uses sampling weights estimated as the inverse probability of firm selection into the sample using the specification in column (2) of table A.2

Annex table A.9 – Management score and firm performance, cross-section: control for selection bias (maximum entropy weights)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Log (Output/Employment)				Log TFP index recovered from prod.				Log (Value Added/Employment)				Log Empt. Growth (2012-17)	
Management score: total (Z-score)	0.254***		0.033		0.056**		0.043		0.121***		0.010		0.085***	
	(0.074)		(0.025)		(0.025)		(0.027)		(0.027)		(0.024)		(0.030)	
Management score: Data-driven performance monitoring (Z-score)		0.38***		0.015		0.019		0.017		0.032		-0.042		0.109***
		(0.080)		(0.018)		(0.020)		(0.022)		(0.035)		(0.032)		(0.022)
Management score: Incentives and targets (Z-score)		0.089		0.024		0.046*		0.033		0.103***		0.042		0.008
		(0.070)		(0.023)		(0.025)		(0.025)		(0.030)		(0.028)		(0.027)
Input variables	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Control for firm's global linkages	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Sector dummies	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes
District dummies	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Observations	902	902	774	774	774	774	774	774	740	740	740	740	397	397
R^2	0.027	0.033	0.884	0.884	0.017	0.017	0.162	0.162	0.026	0.026	0.291	0.294	0.708	0.716

Notes: This table replicates the results in Table 4 but uses sampling weights estimated through the maximum entropy approach (Wittenberg, 2010) so average firm characteristics of the survey in terms of exporting status, size and sector match those of the sampling frame.