Trade and Management*

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Abstract

We study how management practices shape export performance using matched production-trade-management data for Chinese and American firms and a randomized control trial in India. Better managed firms are more likely to export, sell more products to more destinations, and earn higher export revenues and profits. They export higher-quality products at higher prices and lower quality-adjusted prices. They import a wider range of inputs and inputs of higher quality and price, from more advanced countries. We rationalize these patterns with a heterogeneous-firm model in which effective management improves performance by raising production efficiency and quality capacity.

JEL codes: F10, F14, F23, L20, O19, O32.

Keywords: Management, exports, product quality, productivity.

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1 Introduction

Productivity, management practices and international trade activity vary dramatically across firms and countries (Bernard, Jensen, Redding, and Schott, 2007; Syverson, 2011). In the literature, higher measured Total Factor Productivity (TFP) has been associated with export success and superior management with higher profits. However, measured TFP is subject to many potential biases and, even if perfectly measured, still constitutes a residual "black box", while the mechanisms through which management operates remain largely unknown. From a policy perspective, improving firm capabilities is important for stimulating firm performance and aggregate growth, but this requires knowledge of the determinants of firm productivity. While it is widely believed that management strategies play a central role, especially in emerging economies trying to move up the quality ladder (Sutton, 2012), the scant evidence for this is primarily from case studies.

In this paper we perform what we believe is the first large-scale analysis of the role of management practices for export performance and in the process shed light on these questions. We uncover novel empirical facts and interpret them through the lens of a heterogeneous-firm model that disciplines the estimation approach. We study the world's two largest export economies - China and the United States - and find consistent empirical patterns in both countries despite their very different income levels, institutional quality, and market frictions. In particular, we exploit unique new data on plant-level production, plant-level management practices, and transaction-level international trade activity for 485 Chinese firms in 1999-2008 and over 10,000 US firms in 2010.

We begin with motivating evidence from a randomized control trial (RCT) that offered management consulting to Indian firms. In a study of 31 plants over 10 years initiated by Bloom, Eifert, Mahajan, McKenzie, and Roberts (2013), improving management practices exerted causal positive effects on TFP, qualitative measures of output quality, selection into exporting, and total export revenues. Motivated by these patterns, we introduce a stylized model of international trade that rationalizes the RCT results and delivers a rich set of additional predictions which we can evaluate with the comprehensive data for China and the US.

We first establish that better managed firms have superior export performance along multiple dimensions. Companies with more effective management are systematically more likely to engage in exporting. Conditional on exporting, they sell more products to more destinations and earn higher export revenues and profits. Our findings hold conditional on domestic sales, suggesting that management is disproportionately more important for trade operations.

We then present a set of results that jointly inform the mechanisms through which management strategies affect firm performance. On the sales side, better managed firms charge higher export prices within narrow destination-product markets. We estimate a model-consistent indicator of product quality, and show that better management is associated with higher output quality and lower quality-adjusted prices. On the production side, better managed firms use more expensive, higher-quality imported inputs and more inputs from suppliers in developed economies. They also source a wider range of intermediate inputs from more countries of origin.

Finally, we explore the relative and differential returns to good management. Decomposing revenue-based TFPR, we show that the management component has large explanatory power across the full range of firm trade outcomes compared to the non-management TFPR residual. We then unbundle overall managerial competence into practices linked to the supervision of physical capital (”monitoring”) and of human resources (”incentives”). Monitoring appears more important than incentive provision in the US; the two sets of practices play comparable roles in China, with incentives being more consequential in some respects. We find little evidence that the returns to effective management vary across sectors or ownership types.

We propose that these empirical patterns are consistent with management competence being a key component of total factor productivity, whereby more effective managerial practices increase both production efficiency and quality capacity. Superior management enables firms to use more sophisticated, higher-quality inputs and more complex assembly technologies that increase output quality. At the same time, better management allows firms to process inputs and execute assembly more cheaply. These efficiency and quality channels push marginal cost in opposite directions, such that the net effect of management competence on prices and quantities is ambiguous, but it unambiguously raises quality, sales, and profits. These predictions hold in model extensions with endogenous input choice, endogenous management practices, or non-management TFP components.

Our main empirical analysis exploits cross-sectional variation in management and trade activity across Chinese and American firms. We therefore do not distinguish between a causal effect of good management and an equilibrium relationship between joint outcomes of firms’ profit maximization. Instead, we view our baseline findings as conditional correlations that inform the mechanisms through which management operates. In a step towards causality, we provide consistent panel evidence based on changes within US firms over time, which is not fully immune to endogeneity concerns. We are able to convincingly establish causal effects for the subset of firm outcomes that are also observed in the India RCT.

Our findings address two open questions in two active literatures. A large theoretical and empirical literature in international trade emphasizes the role of firm productivity as a key determinant of export performance (Melitz, 2003; Bernard, Eaton, Jensen, and Kortum, 2003). More productive firms have been found to export more products to more destinations, thereby generating higher export revenues and profits. This body of work conceptualizes firm productivity as TFPQ, or the ability to manufacture at low marginal cost, such that more productive firms are more successful exporters because they set lower prices. Recent analyses point to the importance of product quality as well, showing that more successful exporters use higher-quality manufactured inputs and more skilled workers to produce higher-quality output that sells at higher prices (Verhoogen, 2008; Kugler and Verhoogen, 2012; Khandelwal, 2010; Manova and Zhang, 2012; Bastos, Silva, and Verhoogen, 2018). Yet productivity is typically measured as TFPR, or a revenue-based residual from production function estimates. This exposes it to estimation bias, and complicates the interpretation of trade-TFPR regression results (Ackerberg, Caves, and Frazer, 2015; De Loecker, 2011). An important open question in this literature is what constitutes productivity, how it should be measured, and what explains its dispersion across firms. We unpack the black box of TFPR, and identify management practices as a concrete, tangible and directly measured TFPQ component that circumvents estimation concerns. Moreover, this management component accounts for a large share of the variation in firms' trade performance, and delivers clear policy lessons.

A separate and older literature has examined the relationship between firm management, productivity and performance (Walker, 1887; Syverson, 2011). One likely route for this management-productivity link emphasized by the management literature is through lean manufacturing and improved quality (Drew, McCallum, and Roggenhofer, 2016; Sutton, 2007). Yet there is no systematic, direct evidence on the mechanisms through which management operates.[1] We demonstrate that ef-

[1]The most popular management systems - Six-Sigma, Lean, and the Toyota Production System - all emphasize that improving productivity and quality is best achieved by an ongoing focus on reducing defects. In fact, this approach is now so popular that it has spread from manufacturing across most sectors, for example to Lean Retail (Myerson, 2014), Lean Healthcare (Group, 2014)

fective management enhances firms' trade performance through both higher production efficiency and stronger quality capability.

This paper also adds to recent research on the impact of trade liberalization on the organization of production inside firms. Evidence indicates that trade reforms incentivize firms to change the number of management layers, adjust the number and wages of managers and workers along the occupational hierarchy, and upgrade management practices (Caliendo and Rossi-Hansberg, 2012; Chen and Steinwender, 2016; Chakraborty and Raveh, 2018). At the same time, improved access to imported inputs is important to the product quality, product scope and export success of firms in developing countries, because of the limited domestic supply of high-quality specialized inputs and equipment (Goldberg, Khandelwal, Pavcnik, and Topalova, 2010; Fieler, Eslava, and Xu, 2018; Manova and Zhang, 2012). This matters since poor economies often rely on international trade for growth, and specifically on exporting to large, developed and profitable markets that maintain high quality standards. Our results suggest that poor managerial practices may impede trade, growth and entrepreneurship in the world's poorest economies.

Finally, our findings speak to the literature on the implications of firm heterogeneity for aggregate productivity, welfare and the gains from trade (Hsieh and Klenow, 2009; Arkolakis, Costinot, and Rodríguez-Clare, 2012; Melitz and Redding, 2013). Evidence indicates that reallocations across firms and across products within firms, as well as productivity upgrading within firms, contribute significantly to the aggregate adjustment to trade reforms and macroeconomic shocks (Pavcnik, 2002; Bustos, 2011). The role of management practices for firm heterogeneity is thus important for understanding trade's aggregate impact, while the associated firm hetetorogeneity in worker skill and product quality matters for its distributional effects (Helpman, Itskhoki, and Redding, 2010).

The paper is organized as follows. Section 2 provides RCT evidence for the causal effects of management in India. Section 3 develops a stylized model that rationalizes this evidence and delivers rich additional predictions for the role of management competence. Section 4 introduces the unique Chinese and US data on firm management, production and trade that allow us to evaluate all model predictions. Section 5 examines the relationship between firms' management strategy and export performance, while Section 6 analyzes the mechanisms through which management operates. The last section concludes.

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and even Lean Government (Teeuwen, 2010).

2 Motivating RCT Evidence

We first present motivating evidence that management practices can exert causal effects on firms' production efficiency, quality capacity, and export activity. We exploit a randomized control trial performed by Bloom, Eifert, Mahajan, McKenzie, and Roberts (2013) who worked with the company *Accenture* to provide free management consulting services to large firms in the textile industry in Mumbai, India.[2] The study examined three sets of plants over the 2008-2011 period. 11 plants owned by 6 firms served as a pure control group and 20 plants owned by 11 firms as the treatment group. In the treated group, 14 plants were randomly selected to receive the management intervention. They had 1 month of diagnostic assessment of management practices in place and 4 months of consulting on 38 core practices across 6 key areas (factory operations, quality control, inventory control, loom planning, human resources, sales and orders). The remaining 6 plants in the treated firms were given only the 1-month diagnostic. Detailed monthly production data was collected for all three groups for a further 3 years. In 2017, Bloom, Mahajan, McKenzie, and Roberts (ming) went back to assess the long-term impact of the intervention. They collected performance metrics for 2014 and 2017, including trade activity that we are the first to analyze.

Three lessons emerge from the India RCT. First, the consulting intervention had a large long-lasting effect on firms' management strategy. The management practice adoption rate in the treatment plants rose from 25.6% to 63.4% in the first year, slipped somewhat over the next eight years to 46%, but remained significantly above its initial level or the control firms.

Second, the management intervention led to a large causal improvement in firms' TFP and product quality. Figures 1a and 1b plot the change in TFP and product defect rates during the experiment against the change in management competence for both treatment and control plants. The intervention triggered a 37.8% rise in management effectiveness on average. This caused a 43% drop in quality defects, and was one of the major drivers of the 17% increase in TFP.

Third, the management intervention significantly increased firms' export participation. In Panel A of Table 1, we explore the intention-to-treat effect with regressions of various export outcomes on a plant-level treatment dummy. Treatment plants were 0.189 more likely to export in the post-

[2]See McKenzie and Woodruff (2013) for a review of the literature on management RCTs and the impact of management intereventions on firm productivity.

treatment period, and had significantly higher export revenues conditional on exporting (up to 51.6% increase). We document similarly strong positive impacts in Panel B, where we use the treatment indicator as an instrument for the management score in a two-stage IV specification.

The key determinant of exports were management practices that guarantee quality control. International buyers offer higher prices than domestic consumers, but impose higher quality standards that require formal quality control systems. While domestic consumers will accept (at a discount) fabric with slight imperfections - stains, inconsistent coloring, holes or bunching, international buyers will not and defective shipments are returned.

This RCT evidence indicates that upgrading management strategies can improve firms' TFP, product quality, production efficiency, and export performance. This motivates the model in Section 3. While the India RCT supports causal interpretation, however, it covers a small set of establishments, tracks only basic export outcomes, and does not link efficiency and quality to export success. In Sections 4-6, we therefore exploit significantly richer data for China and the US to establish a broad set of novel conditional correlations in line with the model's predictions and mechanisms.

3 Conceptual Framework

We develop a partial-equilibrium heterogeneous-firm trade model in which management competence enhances firms' trade performance by increasing production efficiency and quality capacity. This model rationalizes the RCT evidence for India, and delivers a broad set of additional predictions that we can take to administrative data for China and the US.

We treat management effectiveness as an exogenous firm draw that is conceptually equivalent to TFP. This reduced-form formulation lends tractability and transparency, and is consistent with different micro-foundations for the role of management practices, such as monitoring under principal-agent problems, span of control trade-offs in delegation hierarchies, and dynamic incentives with career concerns (Holmstrom, 1982; Gibbons and Roberts, 2013). Since the baseline model shares many properties with Bernard, Redding, and Schott (2010), Kugler and Verhoogen (2012), and most closely Manova and Yu (2017), we summarize its key features here, and relegate further details and proofs to Online Appendix 1 and 2.

3.1 Economic Environment

A continuum of monopolistically competitive firms in country $j \in J+1$ can produce and export horizontally and vertically differentiated goods. Given CES utility $U_j = \left[\int_{i\in\Omega_j} (q_{ji}x_{ji})^{\alpha}\, di\right]^{\frac{1}{\alpha}}$ with elasticity of substitution $\sigma \equiv 1/(1-\alpha) > 1$, demand for variety i in market j is $x_{ji} = R_j P_j^{\sigma-1} q_{ji}^{\sigma-1} p_{ji}^{-\sigma}$, where R_j is aggregate expenditure, $P_j = \left[\int_{i\in\Omega_j} \left(\frac{p_{ji}}{q_{ji}}\right)^{1-\sigma} di\right]^{\frac{1}{1-\sigma}}$ is a quality-adjusted ideal price index, and q_{ji}, p_{ji} and x_{ji} are the quality, price and quantity of variety $i \in \Omega_j$. Product quality captures any objective attribute or subjective taste preference that increases consumer appeal at a given price. A sufficient statistic for unobserved quality $\ln q_{ji}$ can thus be constructed from observed price and quantity data as $\sigma \ln p_{ji} + \ln x_{ji}$ (Khandelwal, 2010).

Upon paying a sunk entry cost, firms draw firm-wide managerial ability $\varphi \in (0,\infty)$ from distribution $g(\varphi)$ and a vector of i.i.d. firm-product specific expertise levels $\lambda_i \in (0,\infty)$ from distribution $z(\lambda)$. As we show in Online Appendix 3.1 and 3.2, the main model predictions hold if firms could endogenously choose their management practices or managerial strategy were one of multiple components of firm ability.[3,4]

Firms' management competence determines both their ability to assemble inputs into final goods (*production efficiency*) and their capacity to make high-quality goods (*quality capacity*). Producing one unit of physical output requires $(\varphi\lambda_i)^{-\delta}$ units of labor with wage normalized to 1. Parameter $\delta > 0$ governs the extent to which good management lowers unit input requirements. Intuitively, effective management can improve production efficiency by optimizing inventory control, synchronizing and monitoring production targets across manufacturing stages, reducing wastage, incentivizing workers, etc.

[3]For example, entrepreneurs might receive an exogenous talent draw ϕ, adopt management practice $m(\phi)$ at cost f_m, and face marginal costs and quality that depend on overall ability $\varphi = \phi m(\phi)\lambda_i$. If $df_m/dm > 0$ and $d^2 f_m/dm^2 > 0$, then Propositions 1-4 hold for both φ and $m(\phi)$.

[4]With multiple productivity components, firm ability $\varphi = m\cdot\phi$ may depend on the entrepreneur's talent ϕ and the manager's competence for effective management m. If entrepreneurs and managers do not match perfectly assortatively due to labor market frictions, then $|corr(m,\phi)| \neq 1$. While all firm outcomes would now be pinned down by φ instead of m alone, management competence would have the same effects as in our baseline model *ceteris paribus*.

At a marginal cost of $(\varphi\lambda_i)^{\theta-\delta}$ workers, firms can produce one unit of quality $q_i(\varphi,\lambda_i) = (\varphi\lambda_i)^{\theta}$, $\theta > 0$. This captures the idea that manufacturing goods of higher quality is associated with higher marginal costs because it requires higher-quality inputs and more complex assembly processes (Baldwin and Harrigan, 2011). For example, making a high-quality dress using skilled labor, silk and pearl buttons entails more expensive inputs than making a low-quality dress using unskilled labor, cotton and plastic buttons. Similarly, a 50-part printer might be able only to print, while a 150-part model might be more difficult to build but print, scan and fax. Online Appendix 3.3 formalizes these micro-foundations: Production complementarity between firm ability and input quality induces more capable firms to use higher-quality inputs and produce higher-quality outputs (Kugler and Verhoogen, 2012). Parameter θ reflects the degree to which superior management enhances firms' capacity to produce higher quality. Intuitively, effective management can tighten quality control, ensure the compatibility of specialized inputs, facilitate complex assembly, minimize costly mistakes, etc.

3.2 Firm Behavior

Firms maximize profits from their global operations by making optimal entry and sales decisions separately for each country-product market.[5] Producers charge a constant mark-up $\frac{1}{\alpha}$ over marginal cost, and have the following price, quantity, quality, quality-adjusted price, revenues and profits for product i in market j:

$$p_{ji}(\varphi,\lambda_i) = \frac{\tau_j(\varphi\lambda_i)^{\theta-\delta}}{\alpha}, \quad x_{ji}(\varphi,\lambda_i) = R_j P_j^{\sigma-1}\left(\frac{\alpha}{\tau_j}\right)^{\sigma}(\varphi\lambda_i)^{\delta\sigma-\theta}, \tag{1}$$

$$q_i(\varphi,\lambda_i) = (\varphi\lambda_i)^{\theta}, \quad p_{ji}(\varphi,\lambda_i)/q_i(\varphi,\lambda_i) = \frac{\tau_j(\varphi\lambda_i)^{-\delta}}{\alpha}, \tag{2}$$

$$r_{ji}(\varphi,\lambda_i) = R_j\left(\frac{P_j\alpha}{\tau_j}\right)^{\sigma-1}(\varphi\lambda_i)^{\delta(\sigma-1)}, \quad \pi_{ji}(\varphi,\lambda_i) = \frac{r_{ji}(\varphi,\lambda_i)}{\sigma} - f_{pj}, \tag{3}$$

where τ_j are iceberg costs, and f_{pj} are destination-product fixed costs. Note that the empirical analysis examines free-on-board export prices and revenues, that is $p_{ji}^{fob}(\varphi,\lambda_i) = \frac{(\varphi\lambda_i)^{\theta-\delta}}{\alpha}$ and $r_{ji}^{fob}(\varphi,\lambda_i) = R_j(P_j\alpha)^{\sigma-1}(\varphi\lambda_i)^{\delta(\sigma-1)}$.

[5] See Eckel, Iacovone, Javorcik, and Neary (2015) for an alternative framework with cannibalization effects across products within firms, in which Propositions 1-4 would still hold.

Management competence exerts two opposing effects on firms' marginal costs and prices through the production efficiency and quality capacity channels. Their net effect is theoretically ambiguous and depends on the magnitudes of θ and δ. If $\theta = 0$ and $\delta > 0$, effective management improves firm efficiency but there is no scope for quality differentiation. Better managed firms then have lower marginal costs, set lower prices, sell higher quantities, and earn higher revenues and profits. Conversely, if $\theta > 0$ and $\delta = 0$, management competence improves product quality but the efficiency mechanism is moot. Now all firms share the same quality-adjusted prices, revenues and profits, but better managed companies charge higher prices, offer higher quality, and sell lower quantities.

When $\theta > 0$ and $\delta > 0$, both management mechanisms are active. In this case, superior management is associated with higher product quality, lower quality-adjusted prices, higher revenues and higher profits. However, the implications for price and quantity remain ambiguous. If $\theta > \delta$, as management competence grows, product quality rises sufficiently quickly with the cost of sophisticated inputs and assembly to overturn the effects of improved efficiency. As a result, effective management corresponds to *higher* output prices. If $\theta < \delta$ by contrast, good management practices translate into *lower* prices. In the knife-edge case of $\theta = \delta$, production efficiency and product quality are equally elastic in management capacity, and prices are invariant across the firm management distribution. Finally, better managed firms sell higher quantities if and only if $\sigma\delta > \theta$.

In sum, well-run companies perform better along multiple dimensions. Since profits rise with managerial competence φ and there are economies of scale (i.e. headquarter-, product- and market-specific fixed costs), there is a zero-profit expertise level $\lambda_j^* (\varphi)$ below which firm φ will not sell product i in country j, where $d\lambda_j^* (\varphi) / d\varphi < 0$. In addition, only firms with management ability above a zero-profit cut-off φ_j^* will serve destination j, where φ_j^* depends on j's market size and trade costs. On the extensive margin, better managed firms thus optimally manufacture more products, select into exporting, serve more export destinations, and sell more products to each destination. On the intensive margin, they earn higher revenues and profits overall, as well as in each market.

3.3 Empirical Predictions

Proposition 1 *Better managed firms are more likely to export.*

Proposition 2 *Better managed firms export more products to more destination markets and earn higher export revenues and profits.*

Proposition 3 *Better managed firms offer higher-quality products if $\theta > 0$ and the quality channel is active, but quality is invariant across firms if $\theta = 0$. Better managed firms set lower quality-adjusted prices if $\delta > 0$ and the efficiency channel is active, but quality-adjusted prices are invariant across firms if $\delta = 0$. Better managed firms charge higher prices if $\theta > \delta$ and lower prices if $\delta > \theta$, but prices are invariant across firms if $\theta = \delta$.*

Proposition 4 *Better managed firms use more expensive inputs of higher quality and/or more expensive assembly of higher complexity if $\theta > 0$ and the quality channel is active, but input quality and assembly complexity are invariant across firms if $\theta = 0$.*

4 Data

Our analysis makes use of unique, matched establishment- or firm-level data for the world's two largest exporters - China and the US - on production, international trade, and management practices. We exploit six proprietary micro data sources, three for each country, to assemble a dataset that is unprecedented in its coverage and detail. This section describes how management practices are evaluated, introduces the data, and summarizes key features of firm activity.

4.1 Measuring Management Practices

Systematic data on firms' management practices have only recently become available. Since 2004, the World Management Survey (WMS) has developed standardized measures of management competence for over 20,000 manufacturing firms in 34 countries. WMS considers multiple aspects of firm management, and evaluates the relative effectiveness of different practices within each aspect. It is conducted via double-blind phone interviews with plant managers, and covers representative firm samples with 100 to 5,000 employees in a large number of countries (Bloom and Van Reenen, 2007). Endorsements by respected institutions and highly-trained interviewers (e.g. MBAs) ensure high response rates (e.g. 45% in China). The Management and Organizational Practices Survey (MOPS) is modeled after WMS. It was introduced as a mandatory part of the US Census' Annual Survey of Manufacturing (ASM) in 2010, the first and only census management data of its kind.

WMS (MOPS) includes 18 (16) questions about the management of physical capital (*monitoring* and *targets*) and human resources (*incentives*) inside a firm, examples of which appear in Appendix

Figure 1. A first set of questions pertain to the *monitoring* of progress towards production targets via the frequent collection, analysis and dissemination of performance metrics. A second set of questions characterize the design, integration and realism of production *targets*. These questions assess to what extent targets are consistently set across production stages and tightly connected to performance, both in the short-run and long-run, for managers and non-managers. A final set of questions capture the use of *incentives* mechanisms to identify, promote and reward high performers with bonuses, while sanctioning underperformers.

Each management question is scored on a scale of 1 to 5 in WMS and 0 to 1 in MOPS, with higher values indicating more structured management involving greater monitoring, more aggressive targets, and stronger performance incentives. For each country, we first standardize the responses to each question across all firms to be mean 0 with standard deviation 1. We then average across questions to obtain a comprehensive *management score* for each firm. Finally, we standardize these management scores across firms in each country to be mean 0 and have standard deviation 1.

Appendix Figure 2 illustrates the vast dispersion in average management practices across countries in WMS. The US comes out on top, followed closely by Japan, Germany, Sweden, Canada and the UK. In the middle of the country distribution, Chinese firms are on average significantly less well managed than North American and European companies, but score better than firms in Latin America, Africa and other emerging giants such as Brazil and India.

WMS and MOPS are based on the lean manufacturing and modern human resource practices used by leading management consultants, to focus on core management practices that should benefit firm performance regardless of the industry or economic environment. Our analysis will account for the possibility that the relevance of specific management practices might vary across industries with industry fixed effects. To the extent that the management surveys are biased towards successful production practices in the West, measurement error would introduce downward bias and work against us finding consistent patterns for both China and the US.

4.2 United States

We employ three comprehensive datasets on the activities of US firms. First, MOPS documents the management practices of about 32,000 manufacturing establishments in 2010 and 2005 (as recall). The sample captures 5.6 million employees, or over half of US manufacturing employment. Figure

2A plots the distribution of the management score across plants. MOPS also includes variables that we use as noise controls, namely an indicator for filing census forms online, the tenure and seniority of the respondent, and the discrepancy between employment data in MOPS and ASM.

Second, we obtain standard accounting data on US establishments from ASM, available for 1973-2012.[6] ASM records the total output, value added, profits and production inputs (e.g. employment, capital expenditure, energy use, materials purchases) for about 45,000 plants that correspond to over 10,000 firms. We also observe firms' age, location (out of 50 states), and primary industry of activity in the US NAICS 6-digit classification.

Third, we use the US Longitudinal Federal Trade Transaction Database (LFTTD), which contains detailed information about the universe of US international trade transactions in 1992-2012, at over 100 million transactions a year. LFTTD reports the value, quantity, unit (e.g. dozens, kilograms, etc.) and organization (intra-firm vs. arm's length) of all firm-level exports (free on board) and all firm-level imports (cost, insurance and freight included) by country and product for around 7,000 different products in the 10-digit Harmonized System and around 5,000 product categories at the HS 8-digit level. We proxy prices with transaction-level unit values, and define products by both their HS code and unit to ensure comparability. Given the lumpiness and seasonality of international trade, we work at the annual frequency.

We link ASM, LFTTD and MOPS using firms' common tax identifier.[7] We perform our baseline analysis for the cross-section of about 32,000 US establishments in 2010 with contemporaneous production, trade and management data. Firms in this matched sample are on average bigger and better performing than firms without management data, but appear representative in that the relationship between standard productivity, size and performance metrics is the same in both subsamples.

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[6]MOPS was part of the 2009-2013 ASM panel in 2010, so all MOPS establishments were surveyed annually in 2009-2013. In prior years, establishments were surveyed in the Economic Census in years ending in "2" or "7" and if they were part of that year's ASM panel. Since ASM oversamples larger establishments, it tends to include a large share of export activity.

[7]We sum ASM production variables across establishments within multi-establishment firms. We take the employment-weighted average MOPS management score across plants within a firm; all results hold for the simple average. We use the age, location and industry of the firm headquarters.

4.3 China

We also exploit three comprehensive firm datasets for China. First, WMS reports the management practices of 507 Chinese firms in 2006-2007. Figure 2B plots the distribution of the management score across firms. We use WMS data on firms' primary industry (out of 82 SIC 3-digit industries) and a set of survey noise controls (interview duration, day of week and time of day; interviewer ID; interviewee gender, reliability and competence as perceived by the interviewer).

Second, we access firm-level production data for 1999-2007 from China's Annual Survey of Industrial Enterprises (ASIE). ASIE is collected by the National Bureau of Statistics and provides standard accounting information for all state-owned firms and all private firms with sales above 5 million Chinese Yuan, for over 200,000 firms a year. In addition to output, profits, value added and production inputs, we also observe firms' age, ownership structure (private domestic, state owned, foreign owned), location (out of 31 provinces), and primary industry of activity.

Third, we utilize comprehensive data on the universe of Chinese firms' cross-border transactions in 2000-2008 from the Chinese Customs Trade Statistics (CCTS), spanning over 100 million transactions a year. CCTS is collected by the Chinese Customs Office and reports the value and quantity of firm exports (free on board) and imports (cost, insurance and freight included) in U.S. dollars by product and trade partner for 243 destination/source countries and about 7,500 products in the 8-digit Harmonized System.[8] While CCTS does not distinguish between arm's-length and intra-firm flows, it indicates the trade regime of each transaction (ordinary or processing trade).

Of the 507 Chinese firms in WMS, we are able to match 485 to ASIE using a common firm identifier. We obtain the complete ASIE record for these 485 firms during 1999-2007, which produces an unbalanced panel of 3,233 firm-year observations.

Since CCTS maintains an independent system of firm registration codes, it cannot be mapped directly into ASIE or WMS. We follow standard practice in the literature and match CCTS to ASIE using an algorithm based on firms' name, address and phone number. Using ASIE as a bridge, we match 296 companies from WMS to CCTS. We then match 58 of the remaining unmatched firms in WMS directly to CCTS by postcode and name. We ensure match quality by manually researching

[8] While the HS 6-digit classification is consistent across countries, finer levels of disaggregation are not. Our baseline results at the HS-8 level hold at the HS-6 level, as well as at the most disaggregated HS-10 level (available for the US).

company webpages and reports. We thus locate detailed CCTS trade data for 354 of the 507 WMS companies, for a match rate of 70%. Of these 354 firms, 11% only export, 17% only import, and 72% both export and import according to CCTS. This is consistent with the fact that about 60% of the matched WMS-ASIE firms report positive exports on their accounts, while more firms may appear in the comprehensive CCTS records.

4.4 Summary Statistics

Table 2 summarizes the substantial variation in management practices, production and trade activity across firms in China and the US. Starting with the US, 45% of the 32,000 establishments in our 2010 matched sample export. The typical exporter sells 19 different HS-8 digit products to 13 destinations and, conditional on importing inputs, buys 20 distinct products from 6 countries, with large dispersion around these means.[9] These numbers are generally similar for the sample of 485 firms in our baseline 2000-2008 panel for China, where 58% of all firms export. On average, Chinese exporters ship 9 HS-8 digit products to 13 markets and, conditional on importing inputs, sources 33 different products from 6 origins.

Table 2 corroborates stylized facts in the literature that exporters are on average larger and more productive than non-exporters. We document that exporters are on average also better managed than non-exporters: The unconditional export management premium equals 15% of a standard deviation in China and 38% of a standard deviation in the US. In comparison, the export size premia in China and the US stand at 19% and 186% respectively based on firm output and 36% and 123% based on employment.[10]

[9]For the US, we report summary statistics for production at the establishment level and trade activity at the firm level, since this is the level at which such data are collected in ASM and LFTTD respectively. The ASM statistics look similar at the firm level.

[10]Firms are on average bigger in the Chinese sample than in the US sample because WMS covers a randomized sample of Chinese firms above a size threshold, while MOPS has comprehensive coverage of US firms.

5 Management and Export Performance

In this section, we first examine the relationship between firms' management practices and export performance. This exercise constitutes a direct test of Propositions 1 and 2. To inform the efficiency and quality mechanisms through which management operates, in Section 5 we then confront Propositions 3 and 4 with data.

We perform the entire analysis separately for China and the US. Given the vast difference in income, institutional quality and factor market frictions between the two countries, this allows us to assess whether management plays a fundamental role in firm activities, and if so, whether its function depends on the specific economic environment. To the extent that the management surveys are biased towards successful production practices in the West, measurement error would introduce downward bias and work against us finding consistent patterns for both China and the US.

5.1 Empirical Strategy

We evaluate the empirical validity of Propositions 1 and 2 with the following estimating equation for the link between firms' management competence and export performance:

$$ExportOutcome_f = \beta Management_f + \Gamma Z_f + \phi_l + \phi_i + \varepsilon_f \tag{4}$$

We consider multiple dimensions of export activity as guided by theory. In different specifications, $ExportOutcome_f$ refers to firm f's export status, log global export revenues, and various extensive and intensive margins of exporting. We measure f's managerial competence $Management_f$ with the comprehensive management z-score.

We account for any systematic variation in supply and demand conditions across firms in the same location l or industry i with fixed effects, ϕ_l and ϕ_i. These capture differences in factor costs, factor intensities, infrastructure, institutional frictions, tax treatment, etc. that might impact export performance. In the case of China, we add dummies for 31 provinces and 82 SIC 3-digit sectors. In the case of the US, we use indicators for 50 states and about 300 NAICS 6-digit industries.

We further condition on a vector of firm characteristics Z_f. We always include the full set of survey noise controls to alleviate potential measurement error in $Management_f$. We subsume the role of Chinese firms' ownership type with fixed effects for private domestic, state owned, and foreign owned companies; such data is not available for the US. We also report results with an extended set of firm controls Z_f such as age, capital and skill intensity.

The coefficient of interest β reflects the sign of the conditional correlation between firms' management competence and export performance. Given the fixed-effects structure, it is identified from the variation across companies within narrow segments of the economy. This correlation can be interpreted in two ways through the lens of our model. On the one hand, management excellence may be an exogenous productivity draw or one component of it as in our baseline model, such as managers' exogenous ability or style (Bertrand and Schoar, 2003). In this case, β would capture the causal impact of management on export success. On the other hand, a primitive firm attribute may determine both the choice of management technology and trade activity, for example if exogenously different entrepreneurs endogenously hire managers of different skill levels. Estimates of β would then reflect the equilibrium relationship between a production input and output that are joint outcomes of the firm's maximization problem. These two alternatives are isomorphic for our purposes and we do not seek to distinguish between them.[11]

MOPS spans over 10,000 US firms in 2010, and we estimate equation (4) in this cross-section. By contrast, WMS covers only about 500 Chinese firms in 2007. In order to fully exploit the information in the Chinese panel customs and production data, we estimate specification (4) at the firm-year level, controlling for changes in macroeconomic conditions with year fixed effects ϕ_t. This is motivated by the evidence in Bloom, Brynjolfsson, Foster, Jarmin, Patnaik, Saporta-Eksten, and Van Reenen (2019) and patterns in our own MOPS data that management practices evolve slowly within firms over time. We cluster standard errors by firm since $Management_f$ is measured at the firm level.

5.2 Export Status, Revenues and Profits

We first establish in Table 3 that better managed firms are significantly more likely to export and earn higher export revenues conditional on exporting. In Columns 1 and 5, we examine firms' export status by setting the dependent variable $ExportOutcome_f$ to 1 if a firm reports any exports and 0 other-

[11] Reverse causality does not pose classical estimation bias: If higher export revenues induce firms to upgrade management because of economies of scale, this would be consistent with our argument. This mechanism may be amplified if firms learn about managerial practices from their foreign buyers and markets (Atkin, Khandelwal, and Osman, 2017).

wise. We estimate equation (4) in the matched ASIE-WMS sample for China and the matched ASM-MOPS sample for the US, respectively.[12] Firms employing more effective management practices are systematically more likely to enter foreign markets.[13] In Columns 3 and 7, we then re-estimate specification (4) using the log value of global exports as the outcome variable $ExportOutcome_f$ in the matched CCTS-WMS sample of Chinese exporters and the matched LFTTD-MOPS sample of US exporters.[14] Well-run exporters realize substantially higher sales abroad.

The strong association between management competence and export activity persists when we add an extended set of firm characteristics Z_f in Columns 2, 4, 6 and 8. We control for firm age using information on the year of establishment from ASIE and ASM. We find some evidence that older US manufacturers export more. We further condition on firms' production technology as reflected in their capital intensity (log net fixed assets per worker) and skill intensity (share of workers with a college degree; log average wage). The results corroborate prior evidence in the literature that more skill- and capital intensive firms are more active exporters, although the point estimates are not always precisely estimated. To guard against omitted variable bias, we always include this broader vector of controls Z_f in the rest of the analysis.

Our findings point to potentially large economic consequences from improving management practices. Based on the estimates with the extended set of controls, a one-standard-deviation rise in the management z-score is associated with 5% higher probability of exporting and 23% higher export revenues in China; these numbers are 3% and 37% for the US. Given the large management gaps across countries in Appendix Figure 2, this implies that variations in management competence could account for substantial differences in trade intensity across countries. These magnitudes are also sizeable relative to the role of firm age, skill- and capital intensity (comparable statistics for these are in the range of 2% to 28%).

In Appendix Table 1, we corroborate the baseline findings for the US with more stringent spec-

[12]For the US, we observe export status at the plant level from ASM and all other trade outcomes at the firm level from LFTTD. We run the baseline regressions for export status at the plant level, and note that corresponding coefficient magnitudes are 30%-50% higher at the firm level.

[13]We report OLS results, but similar patterns hold with other estimators such as Probit or Logit.

[14]We measure firms' global exports based on the customs records that cover the universe of trade transactions. Similar results hold for total exports as reported in production surveys.

ifications that exploit available panel data.[15] We first find similar resutls when we regress export outcomes in year 2011 on firms' management score in 2010. We then regress the change in trade activity from 2005 to 2010 on the concurrent change in firms' management competence. Within-firm upgrading of management practices is associated with significant improvements in export performance, controlling for state and industry fixed effects that now absorb divergent time trends. Point estimates are typically an order of magnitude smaller, consistent with management exerting greater effects on performance levels than growth rates.

In addition to export status and revenues, Proposition 2 also has implications for firms' export profits. While ASIE and ASM report firms' consolidated global profits, in Appendix Table 2 we exploit the available information as best we can to provide indicative evidence of a positive link between effective management and export profits. We confirm that superior managerial practices are associated with higher total profits. Morover, this holds even conditioning on domestic sales, calculated as the difference between total turnover and total exports.

5.3 Extensive and Intensive Export Margins

As a first step to understanding the mechanisms through which management contributes to export success, we decompose exporters' trade activity into the number of foreign markets they enter and the sales they make in each market. We find that better managed firms have the capacity both to serve more export markets and to sell more in individual markets.

We measure the extensive margin of firm exports with the log number of destinations they supply, the log number of products they ship to at least one country, and the log number of destination-product markets they penetrate. We quantify the intensive margin with average log exports per destination-product. We define products at the granular HS 8-digit level. We re-estimate equation (4) using each export margin in place of $ExportOutcome_f$, and report our findings in Table 4. Appendix Table 3 contains symmetric regressions without the wider set of firm controls Z_f.

We consistently observe positive significant coefficients on $Management_f$ across all specifications (except for the intensive margin in China). For Chinese firms, a one-standard-deviation improvement in managerial competence is associated with 19% more export destinations, 17% more

[15] In 2010 (2015), MOPS asked US firms about their management practices in both 2005 and 2010 (2010 and 2015). The contemporaneous and recall data for 2010 line up well.

export products, 22% more destination-product markets, and 2% higher exports in the average market (Columns 1-4). For American companies, these magnitudes stand respectively at 13%, 17%, 20%, and 18% (Columns 6-9). Overall, the extensive margin of market entry accounts for just over half of the contribution of management to firm exports in the US and about 90% in China.[16]

These results are in line with the theoretical predictions for the margins of firms' export activity summarized in Proposition 2. As a check on internal consistency, we consider the variation in export sales across a firm's destination-product markets. In the model, exporters add foreign markets in decreasing order of profitability. As a result, better managed firms serve more markets by entering progressively smaller markets where they earn lower sales. Further analysis supports this composition effect. For each firm, we identify its largest destination-product market by sales revenues, and regress log exports to this top market on $Management_f$. We obtain much larger coefficients than those for the intensive margin that are significant for both China and the US (Columns 5 and 10). As we replace the outcome variable with log average sales to the top two, top three, etc. export markets, we record progressively lower point estimates as anticipated.

5.4 Exports vs. Domestic Activity

In theory, effective management improves firm performance both at home and abroad, such that better managed firms have higher domestic sales, higher probability of exporting, and higher export revenues. The elasticities of these three outcomes with respect to management differ and generally depend on modeling assumptions about demand. In our CES set-up, strong management increases firm revenues proportionately in all markets served, but it also induces entry into more markets. As a result, total exports rise faster with management competence than domestic sales.

Appendix Table 4 corroborates these predictions in the data. Better managed firms do sell more at home, with domestic sales twice as elastic as exports with respect to management in China and about on par in the US. When we then control for log domestic sales in the regressions for firms' export status, global export revenues and various export margins, we continue to record positive significant coefficients on $Management_f$ (except for the intensive margin in China as before).

[16]These calculations are based on comparing coefficients estimates in specifications for different export outcomes, such as Column 8 of Tables 2 and 3.

6 Management Mechanisms

Having established that advanced managerial practices are associated with superior export performance, we next examine the mechanisms through which management operates. We first provide evidence for the production efficiency and quality capacity channels. We then consider the relationship between management competence and TFP. We conclude by exploring whether the returns to management vary across management dimensions and segments of the economy.

6.1 Efficiency and Quality

To assess if effective management improves firms' production efficiency, quality capacity or both, we evaluate the empirical validity of Propositions 3 and 4. We establish robust patterns consistent with management acting through both the efficiency and quality channels.

6.1.1 Structural Estimates

We first analyze the link between firms' management practices, product quality, and quality-adjusted prices per Proposition 3. We exploit the rich dimensionality of the data and examine firms' behavior in finely disaggregated export markets. This allows us to study the role of management while accounting for supply and demand conditions with an extensive set of fixed effects:

$$\ln(Quality_{fdp}) = \beta^q Management_f + \Gamma^q Z_f + \phi^q_l + \phi^q_{dp} + \varepsilon^q_{fdp} \tag{5}$$

$$\ln(Price_{fdp}/Quality_{fdp}) = \beta^{p/q} Management_f + \Gamma^{p/q} Z_f + \phi^{p/q}_l + \phi^{p/q}_{dp} + \varepsilon^{p/q}_{fdp} \tag{6}$$

Through the lens of our model, coefficient β^q identifies structural parameter θ, which governs the effect of management on product quality. Similarly, coefficient $\beta^{p/q}$ identifies structural parameter δ, which captures the effect of management on productive efficiency. According to Proposition 3, $\beta^q > 0$ and $\beta^{p/q} < 0$ if and only if management operates through the quality and the efficiency channel, respectively. Note this interpretation is conservative given the potential for variable mark-ups.[17]

[17]If better managed firms set higher mark-ups, our conclusions for β^q would be unaffected, but

The unit of observation is now the firm–destination–HS8 product(-year). $Price_{fdp}$ is the export unit value that firm f charges for product p in destination d (in year t). We use free-on-board export prices that exclude duties, transportation costs and retailers' mark-up, such that $Price_{fdp}$ corresponds to the sum of f's marginal cost and mark-up. We construct model-consistent proxies for firms' export product quality and quality-adjusted price from their export prices and quantities by product, destination (and year). Since $\ln q_{ji} \propto \sigma \ln p_{ji}^{fob} + \ln x_{ji}$, log quality $\ln q_{ji}$ can be inferred as the sum of log quantity x_{ji} and log free-on-board price p_{ji}^{fob}, adjusted for the elasticity of substitution across varieties σ. We set $\sigma = 5$ (the median in the literature), but our results are robust to alternative values (Khandelwal, Schott, and Wei, 2013).

We continue to include location fixed effects ϕ_l and the full set of firm controls Z_f, as well as year fixed effects for China. Instead of fixed effects for firms' primary industry, we now condition on destination-product pair fixed effects ϕ_{dp}.[18] These subsume variation in total expenditure, consumer price indices and trade costs across countries and products in the model, as well as any differences in consumer preferences, institutional frictions and other forces outside the model. In these stringent specifications (5) and (6), the coefficient on $Management_f$ is thus identified from the variation across firms within narrow segments of the global economy, such as Chinese exporters of men's leather shoes to Germany or US exporters of cell phones to Japan. We conservatively cluster standard errors by firm to accommodate correlated shocks across destinations and products within firms.

Equations (5) and (6) are in the spirit of prior studies of the relationship between measured firm productivity (TFPR), prices and revenues (Kugler and Verhoogen, 2009; Manova and Zhang, 2012). Since these variables are all constructed from the same raw data on sales and quantities, a common challenge in this literature has been ruling out estimation bias arising from correlated non-classical measurement error in the right- and left-hand side variables. We circumvent this problem by using direct measures of management practices that are entirely independent of the sales and quantity data.

The evidence in Table 5 lends strong support to managerial competence improving both production efficiency and product quality. In both China and the US, management is associated with significantly higher export quality (Columns 1 and 5) and significantly lower quality-adjusted prices

p_{ji}^{fob}/q_{ji} would be inflated and we would be less likely to find $\beta^{p/q} < 0$.

[18] All results for China hold when we distinguish between processing and ordinary exports and include a complete set of destination–product–trade regime triple fixed effects.

(Columns 2 and 6). Formally, $\theta^{CH} = 0.531$, $\delta^{CH} = 0.385$, $\theta^{US} = 0.048$ and $\delta^{US} = 0.045$. Based on these estimates, upgrading management by one standard deviation entails a 53% increase in product quality and a 39% decline in quality-adjusted prices in China. These numbers are both 5% for the US, such that quality and quality-adjusted prices are equally elastic with respect to management competence. These patterns hold in panel data for the US (Appendix Table 1): Lagged management practices are correlated with current efficiency and quality, and managerial improvements are associated with efficiency and quality upgrading.

The results suggest that management may matter more for both productive efficiency and product quality in China than in the US, $\delta^{CH} > \delta^{US}$ and $\theta^{CH} > \theta^{US}$. One possible explanation is diminishing returns to management, since management practices are on average worse in China. The estimates also indicate that management may have a relatively bigger effect on quality than on efficiency in China compared to the US, $\theta^{CH} - \delta^{CH} > \theta^{US} - \delta^{US} = 0$. We explore this further with the following estimating equation for prices:

$$\ln(Price_{fdp}) = \beta^p Management_f + \Gamma^p Z_f + \phi_l^p + \phi_{dp}^p + \varepsilon_{fdp}^p \quad (7)$$

The relationship between prices and management is indeed significantly positive in China and insignificantly different from 0 in the US (Columns 3 and 7). This suggests that when quality levels are relatively low, improvements in managerial competence are likely to boost product quality much more than efficiency. This is consistent with the hypothesis of Sutton (2007) that moving up the quality ladder through better management practices is critical for emerging economies.

The elasticity of export quantity with respect to management is theoretically ambiguous, $\delta\sigma - \theta \gtrless 0$. In practice, it is indistinguishable from 0 in China and positive in the US (Columns 4 and 8).

6.1.2 Robustness

We perform several specification checks to alleviate concerns with alternative interpretations of the results for export prices and quality. First, qualitatively similar patterns obtain when we infer product quality using alternative values for the price elasticity of demand $\sigma = \{4, 7, 10\}$ instead of the baseline $\sigma = 5$. The results also hold when we allow σ to vary across SIC 3-digit industries using estimates from Broda and Weinstein (2006) (Panel A of Appendix Table 5).

Second, management practices may affect not only production efficiency and product quality, but also mark-ups; this channel is moot in our model because CES preferences imply constant mark-ups. The prior literature has shown that in environments with variable mark-ups and no quality differentiation, more productive firms charge lower prices even though they set higher mark-ups (Melitz and Ottaviano, 2008). With alternative market structures or strategic behavior, however, mark-ups could in principle rise sufficiently quickly with productivity to dominate the associated decline in marginal cost and result in higher prices. Under quality differentiation, variable mark-ups might therefore confound the inference of quality from price and quantity data, and lead us to under- or over-estimate the role of management effectiveness for firms' quality capacity and production efficiency. To alleviate this concern, we confirm that the results change little when we control for firms' market share as a proxy for their ability to extract higher mark-ups (Panel B of Appendix Table 5). We use a Chinese (US) firm's share of total Chinese (US) exports to a given destination-product, $\frac{Exports_{fdp}}{\sum_f Exports_{fdp}}$, as an indicator of its market power there.

6.2 Input Characteristics

We next test the predictions of Proposition 4 for the quality of firms' intermediate inputs and the complexity of their assembly technology. We proxy the latter with input characteristics that we construct from data on firms' total material purchases (ASM/ASIE) and imported input purchases by product and country of origin (LFTTD/CCTS). As common with production data, we do not observe detailed information on domestic inputs.

We estimate specifications of the following two types:

$$InputCharacteristic_f = \beta Management_f + \Gamma Z_f + \phi_l + \phi_i + \varepsilon_f \quad (8)$$

$$InputCharacteristic_{fop} = \beta Management_f + \Gamma Z_f + \phi_l + \phi_{op} + \varepsilon_{fop} \quad (9)$$

As in equation (4), the unit of observation in regression (8) is the firm, and we include the same set of controls (location and industry fixed effects, noise and firm controls). Similar to equation (5), the unit of observation in regression (9) is the firm-origin country-product, and we condition on the same controls (location fixed effects, origin country-product pair fixed effects, noise and firm controls). We continue to cluster errors by firm and to exploit the panel for China, adding year fixed effects.

6.2.1 Input Quality

In the model, producing goods of higher quality is associated with higher marginal costs. One possibility is that this reflects the need for higher-quality intermediate inputs.[19] Table 6 provides evidence consistent with better managed firms sourcing more expensive, higher-quality inputs from richer countries of origin ($\theta > 0$).[20] In Columns 1-2 and 6-7, we estimate regression (8) for the log value of imports and the log share of imports in total input purchases. In both China and the US, better managed firms have higher imports, consistent with their operating on a bigger scale and using more inputs overall. Better managed Chinese producers also import a bigger share of their inputs, in line with priors about the paucity of specialized, high-quality domestic inputs in China. By contrast, the insignificant estimates for the US serve as a corroborating placebo test.

Columns 3 and 8 confirm that well-run companies source inputs from richer, more developed economies. Such economies are believed to produce higher-quality, more sophisticated goods because they employ advanced technologies and more skilled workers (Schott, 2004). In these specifications, the outcome variable is the weighted average log GDP per capita across a firm's supplier countries, using imports as weights. A one-standard-deviation rise in management competence is associated with 4%-5% higher average origin-country income.

In Columns 4 and 9, we estimate regression (9) for the log unit value of firm imports by product and country. Advanced management practices are accompanied by higher imported input prices in China, but not in the US. In Columns 5 and 10, we find that better managed firms use higher-quality imported inputs, where we infer imported-input quality in the same way as export product quality. Improving management effectiveness by one standard deviation corresponds to 10% and 58% higher imported-input price and quality in China, but only 0% and 5% in the US. Appendix Table 1 provides consistent panel evidence for the US: Lagged management practices are strongly correlated with current input sourcing strategies, and improvements in management quality are associated with input

[19] Recall the dress example: Following the same design and assembly steps, a producer can use cheap cotton and plastic buttons to make a cheap, low-quality dress or expensive silk and pearl buttons to make an expensive, high-quality dress.

[20] As we show in Appendix 2.3, one justification for the quality production function in our model is complementarity between input quality and management competence in the production of output quality. We find some evidence consistent with this mechanism in unreported results for the US.

quality upgrading within firms over time.

These results suggest that at lower levels of management competence and product quality good management can help firms to not only more effectively source and process inputs from advanced countries, but also to better identify high-quality suppliers within each country. This additional channel might contribute to the higher elasticity of output quality with respect to management documented above for China relative to the US.

6.2.2 Assembly Complexity

An alternative rationalization for higher marginal costs of producing higher-quality goods is that it requires the coordination of multiple production stages and efficient inventorization to assemble a wider range of specialized inputs (Johnson and Noguera, 2012). We proxy the complexity of firms' assembly technology with the variety of their imported inputs, measured as the log number of HS-8 products, origin countries, or origin country-product pairs in a firm's import portfolio. As Table 7 demonstrates, better managed companies indeed source more distinct inputs from more suppliers, after conditioning on their log number of export products.

In light of Proposition 4, the patterns in Tables 5 and 6 support the idea that effective management enables firms to produce higher-quality products using higher-quality inputs and more complex production processes.

6.3 Management and TFP

The results indicate that successful export performance is closely related to the use of sophisticated management practices. We now explore the relationship between management competence and firm productivity.

Unlike the theoretical notion of quantity-based total factor productivity TFPQ, standard TFPR measures are constructed from data on sales revenues and input costs. TFPR thus incorporates input and output prices and mark-ups (De Loecker, 2011), which introduces bias in regressions of firm outcomes such as export activity on TFPR. As a production function residual, TFPR also constitutes a conceptual black box. Separately, TFPQ is the single attribute that determines all firm outcomes in many models, while in practice TFPR is positively but imperfectly correlated with many firm metrics (e.g., Bartelsman, Haltiwanger, and Scarpetta (2013)). This points to either measurement error in

TFP and/or multiple firm attributes playing a role (Hallak and Sivadasan, 2013).

We view management competence as a measurable, tangible counterpart to the theoretical concept of TFPQ, or an important component of TFPQ. On the one hand, management practices are measured independently from firms' production and trade activity and immune to the estimation and black-box concerns with standard productivity measures. On the other hand, TFPR is in principle more comprehensive and reflects both management and non-management dimensions to productivity, albeit measured with error.

We investigate the relationship between observed management practices and estimated TFPR in Table 8. We construct $TFPR_f$ as in Levinsohn and Petrin (2003) using survey data on firm sales, capital expenditures, labor costs and material purchases, and accounting for differences in production technology across industries and ownership types. Column 1 confirms that the conditional correlation between $Management_f$ and $TFPR_f$ is indeed strongly positive. Columns 2-3 then replicate regression (4) for $TFPR_f$ in place of $Management_f$. TFPR enters positively and significantly, except for Chinese firms' export status.

We next decompose $TFPR_f$ into two components by regressing it on $Management_f$ with no other controls: the projection onto $Management_f$ and the residual term $nonManagementTFPR_f$. In Columns 4-12, we regress the full range of firms' export and import outcomes on both $Management_f$ and $nonManagementTFPR_f$ to assess their absolute and relative contribution.[21] The bottom three rows show what percent share of a 1-standard-deviation spread in each trade outcome can be explained by a 1-standard-deviation spread in each productivity component. We refer to this metric as *explanatory power*, and also report its ratio across the two TFPR components.

We find that both productivity dimensions matter in an absolute sense, especially given the large set of fixed effects included. The estimates for $Management_f$ are similar to the baseline and always highly economically and statistically significant: its explanatory power is 4.5-19% (China) and 0.5%-13.1% (US) depending on the trade outcome. In a few instances, $nonManagementTFPR_f$ is imprecisely estimated or plays a negligible role. The relative explanatory power of $Management_f$ varies from 0.9 to 7.4 times that of $nonManagementTFPR_f$ for China, with an average ratio of 2.3. The two productivity components are of more comparable relevance in the US, where the ratio varies from 0.4 to 5.5 with a mean of 1.3.

[21] We bootstrap standard errors to account for how $nonManagementTFPR_f$ is constructed.

6.4 Differential Returns to Management

A policy-relevant question is whether some managerial practices are more beneficial to firm performance than others. Also of interest is whether effective management is especially crucial to firm success in certain environments or segments of the economy. We now explore several dimensions along which the returns to managerial competence may vary. While we find some degree of differential returns, it is limited in terms of magnitude or significance.

Management components We first unpack the role of different management practices. The baseline management score aggregates information across 16 questions in the MOPS US survey and 18 questions in the WMS China survey. We group and average these questions into two subcomponents: $Monitoring_f$ reflects the management of physical capital, production inputs and production processes through the setting of operation targets and monitoring progress towards these targets, while $Incentives_f$ captures the management of human resources through the provision of effort- and performance based incentives.

In Table 9, we regress each trade outcome on $Monitoring_f$ and $Incentives_f$ to gauge their absolute and relative significance. We generally find qualitatively similar patterns for both sets of management practices when considered one at a time. Monitoring strategies appear quantitatively more important for firms' overall export performance and specific efficiency and quality channels in the US. By contrast, monitoring and incentives play comparable roles for overall export activity in China, with incentives being more consequential for certain efficiency and quality dimensions. Given the high correlation between $Monitoring_f$ and $Incentives_f$, the significance and differential magnitude of the estimated elasticities are typically dampened in horse-race specifications with both management components.

Country and industry heterogeneity China and the US have very different levels of economic development, institutional efficiency, and average management competence. We find that the overall export performance of Chinese and American firms is equally sensitive to good management in terms of export entry and revenues. This points to a fundamental role for management, rather than idiosyncracies of specific economic contexts. Yet the efficiency and quality returns to management at the firm-product and firm-product-destination levels can be significantly bigger in China than in the US, consistent with diminishing returns to management in improving production efficiency and quality capacity.

Unreported analysis confirms that our results are not driven by differences in the composition of Chinese and US trade flows: Similar patterns obtain when we weight US export (import) regressions at the firm-product and firm-country-product level by the number of Chinese exporters (importers) in each HS-6 product or country-product market.

We also assess whether the importance of management strategies varies systematically across products or industries (unreported). We expand specifications for export and import prices, quality and qualiy-adjusted prices at the firm-product-country level to include the interaction of $Management_f$ with various product and industry characteristics. Based on the Rauch (1999) indicator for product differentiation at the HS-6 level, management practices matter more for firm efficiency and quality in differentiated rather than homogeneous goods in China, while the opposite holds for the US. However, these patterns are often not statistically significant. Using industry measures at the ISIC-3 level from Braun (2003), management competence appears more closely associated with improved efficiency and quality in less capital intensive and in more skill intensive sectors in China. The opposite, if less significant pattern emerges for the US. We observe no systematic variation across sectors with different advertising and R&D intensity.

Ownership structure Finally, we consider the relationship between firms' ownership structure, management practices and trade activity. This informs the potential for productivity-enhancing spillovers in managerial know-how from multinational to domestic firms, as well as concerns about poor management practices in state-owned firms.

The Chinese customs data distinguish between private domestic firms (DOM), state-owned enterprises (SOE), and affiliates of foreign multinationals (MNC). On average, MNCs are better managed than DOMs, which are in turn better managed than SOEs. In unreported regressions, we find some variation in the management elasticity of different trade outcomes across ownership types, but it is rarely statistically significant.

The US customs data identify each firm-country-product level transaction as intra-firm or arm's-length. We label firms with at least one intra-firm transaction as multinational, whether they be US- or foreign-owned. On average, MNCs are better managed than DOMs, and the management elasticity of different trade outcomes is generally higher for MNCs.

7 Conclusion

This paper examines for the first time the role of management practices for firms' trade activity. We theoretically and empirically establish that management competence enhances firms' production efficiency and quality capacity, and thereby performance: It enables firms to more effectively source foreign inputs and process them into higher-quality outputs, which in turn improves export performance. Moreover, management practices have large explanatory power compared to the residual non-management component of TFP.

We find that better management is associated with greater efficiency and quality in both China and the US, and that it matters relatively more in China, especially for the quality channel. Given the striking differences in economic and institutional development between these two countries, our results suggest that management capability plays a fundamental role that is not specific to particular economic environments. They also speak to policy concerns about the impact of limited management know-how on structural transformation and moving up the quality ladder in developing economies.

More broadly, our findings shed light on the nature and consequences of firm heterogeneity. A promising avenue for future work is uncovering the reasons for weaker managerial ability in some firms and countries compared to others and the scope for policy interventions in this context.

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Table 1. Motivating Evidence: India RCT, 2008-2017

Dep Variable:	Exporter Dummy (1)	Log (1+ Exports) (2)	Log Exports (3)
Panel A. Intention to Treat (Reduced Form)			
Treatment	0.189*	0.665**	0.416**
	(1.78)	(2.84)	(3.77)
Panel B. Management Impact (IV 2nd Stage)			
Management	0.899	3.16**	1.95**
	(1.66)	(2.44)	(2.68)
1st Stage (Management on Treatment)	35.5	35.5	20.5
Data frequency	Yearly	Yearly	Yearly
Years	2008,11,14,17	2008,11,14,17	2008,11,14,17
Firms	17	17	12
Plants	31	31	22
# Observations	109	109	66

This table examines the relationship between firms' management practices and trade activity following a randomized control trial that provided management consulting to plants in the textile industry in India, 2008-2017. Results are at the plant-year level from the long-run follow-up in Bloom et al. (2017) collecting yearly data. The pre-treatment period is 2008, and the post-treatment period is 2011, 2014, and 2017. The sample includes 14 intervention plants in treated firms that received both initial diagnostics and management consulting, 6 non-intervention plants in treated firms that received only initial diagnostics, and 11 control plants that received neither. T-statistics in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level using the sample-size appropriate t-distribution tables.

Table 2. Summary Statistics

Panel A. Characteristics of exporters and non-exporters

	China		US	
	Exporters	Non-exporters	Exporters	Non-exporters
# Observations	1,875	1,358	14,000	18,000
Management	0.06	-0.09	0.12	-0.26
Log Gross Output	11.72	11.55	10.6	9.55
Log Employment	6.46	6.15	4.76	3.96
TFPR	4.86	4.77	4.3	4.07
Log Value Added / L	3.73	3.95	5.04	4.78

Panel B. Firms' management, export and import activity

	China		US	
	Mean	St Dev	Mean	St Dev
Management	0	1	0	1
# Export Observations	2,236		13,000	
Log Exports	14.80	2.31	13.79	2.77
# Export Products	8.65	11.58	18.94	47.50
# Export Destinations	12.85	14.99	12.95	16.72
# Import Observations	2,048		10,000	
Log Imports	13.87	2.97	13.93	2.96
# Import Products	33.45	51.43	19.67	43.09
# Import Origins	6.30	5.67	6.20	8.02

This tables provides summary statistics. China: all firms in the matched WMS-ASIE sample for 1999-2007 (Panel A) and all exporters in the matched WMS-CCTS sample for 2000-2008 (Panel B). US: all plants in the matched MOPS-ASM sample for 2010 (Panel A) and all exporting firms in the matched MOPS-LFTTD sample for 2010 (Panel B).

Table 3. Export Status and Export Revenues

	China				US			
Dep Variable:	Exporter Dummy		Log Exports		Exporter Dummy		Log Exports	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Management	0.040**	0.048***	0.260**	0.231*	0.042***	0.031***	0.488***	0.373***
	(2.30)	(2.75)	(2.14)	(1.81)	(13.92)	(10.13)	(21.72)	(16.79)
Capital Intensity		-0.010		0.145		-0.020***		0.193***
		(-0.76)		(1.43)		(-6.04)		(7.35)
Wage		0.041*		0.401**		0.106***		0.904***
		(1.82)		(2.17)		(9.82)		(11.84)
Age		0.030		0.153		0.044***		0.411***
		(1.53)		(1.01)		(11.47)		(13.29)
Fixed Effects	Province, SIC-3 Industry, Own, Year				State, NAICS-6 Industry			
Noise Controls	Y	Y	Y	Y	Y	Y	Y	Y
R-squared	0.41	0.43	0.40	0.43	0.26	0.27	0.33	0.37
# observations	3,233	3,123	2,236	1,935	32,000	32,000	13,000	13,000

This table examines the relationship between firms' management practices, probability of exporting, and global export revenues. In Columns 1-2 and 5-6, the sample includes all Chinese firms and US establishments in the matched sample with balance sheet and management data, and the dependent variable is a binary indicator equal to 1 for exporters. In Columns 3-4 and 7-8, the sample includes all exporters in the matched sample with trade and management data, and the dependent variable is log total exports. *Management Score* is the standardized average score across all questions about firms' management practices. *Capital Intensity* is log net fixed asset per worker. *Wage* is log labor cost per employee. *Age* is log firm age in years. All columns control for the share of workers with a college degree; noise controls (interview duration and time of day; interviewer dummies; interviewee gender, reliability and competence as perceived by the interviewer). All regressions for China include fixed effects for firm province, main SIC-3 industry, year, and ownership status (private domestic, state-owned, foreign-owned). All regressions for the US include fixed effects for firm state and main NAICS-6 industry. Standard errors clustered by firm (China) and robust (US). US sample sizes rounded for disclosure reasons. T-statistics in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level.

Table 4. Extensive and Intensive Margins of Exports

	China					US				
Dep Variable:	Log # Dest	Log # Prod	Log # Dest-Prod	Log Avg Exports per Dest-Prod	Log Exports Top Dest-Prod	Log # Dest	Log # Prod	Log # Dest-Prod	Log Avg Exports per Dest-Prod	Log Exports Top Dest-Prod
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Management	0.185***	0.166***	0.215***	0.017	0.196*	0.134***	0.165***	0.195***	0.177***	0.320***
	(2.80)	(3.33)	(2.89)	(0.20)	(1.74)	(13.08)	(15.32)	(15.13)	(12.75)	(16.05)
Fixed Effects	Province, SIC-3 Industry, Own, Year					State, NAICS-6 Industry				
Noise Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Firm Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
R-squared	0.44	0.42	0.40	0.45	0.43	0.37	0.33	0.37	0.32	0.36
# observations	1,935	1,935	1,935	1,935	1,935	13,000	13,000	13,000	13,000	13,000

This table examines the relationship between firms' management practices and the extensive and intensive margins of their exports. The dependent variable is firms' log number of export destinations in Columns 1 and 6, log number of export products in Columns 2 and 7, log number of destination-product pairs in Columns 3 and 8, log average exports per destination-product in Columns 4 and 9, and log exports in a firm's highest-revenue destination-product in Columns 5 and 10. A product is HS 8-digit. All regressions for China include fixed effects for firm province, main SIC-3 industry, year, and ownership status. All regressions for the US include fixed effects for firm state and main NAICS-6 industry. All columns also include a full set of firm and noise controls as described in Table 3. Standard errors clustered by firm (China) and robust (US). US sample sizes rounded for disclosure reasons. T-statistics in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level.

Table 5. Production Efficiency and Product Quality

	China				US			
Dep Variable:	Log Export Quality	Log Qual-Adj Export Price	Log Export Price	Log Export Quantity	Log Export Quality	Log Qual-Adj Export Price	Log Export Price	Log Export Quantity
Structural Parameter:	θ^{CH}	$-\delta^{CH}$	$\theta^{CH} - \delta^{CH}$		θ^{US}	$-\delta^{US}$	$\theta^{US} - \delta^{US}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Management	0.531*	-0.385*	0.146**	-0.200	0.048***	-0.045***	0.003	0.034***
	(1.95)	(-1.82)	(2.16)	(-1.49)	(2.60)	(-2.91)	(0.68)	(2.83)
Fixed Effects	Province, Dest-Product, Own, Year				State, Dest-Product			
Noise Controls	Y	Y	Y	Y	Y	Y	Y	Y
Firm Controls	Y	Y	Y	Y	Y	Y	Y	Y
R-squared	0.90	0.89	0.92	0.79	0.96	0.95	0.97	0.83
# observations	58,101	58,101	58,101	58,101	290,000	290,000	290,000	290,000

This table examines the relationship between firms' management practices and the price, quality, quality-adjusted price and quantity of their exports. The dependent variable is log export product quality in Columns 1 and 5, quality-adjusted log export unit value in Columns 2 and 6, log export unit value in Columns 3 and 7, and log export quantity in Columns 4 and 8, by firm-destination-product. Quality is estimated as demand elasticity (set to 5) x unit value + quantity as descrbed in the text. *Structural Parameter* is the model parameter identified from the reduced form coefficient on *Management*. A product is HS 8-digit. All regressions for China include fixed effects for firm province, destination-product pair, year, and ownership status. All regressions for the US include fixed effects for firm state and destination-product pair. All columns also include a full set of firm and noise controls as described in Table 3. Standard errors clustered by firm. US sample sizes rounded for disclosure reasons. T-statistics in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level.

Table 6. Imported Input Quality

	China					US				
Dep Variable:	Log Imports	Log $\frac{\text{Imports}}{\text{Inputs}}$	Log Avg Origin Income	Log Import Input Price	Log Import Input Quality	Log Imports	Log $\frac{\text{Imports}}{\text{Inputs}}$	Log Avg Origin Income	Log Import Input Price	Log Import Input Quality
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Management	0.550***	0.222*	0.046**	0.101**	0.576***	0.344***	-0.003	0.037***	-0.001	0.051**
	(4.32)	(1.86)	(2.11)	(2.36)	(3.03)	(11.83)	(-0.03)	(3.89)	(-0.34)	(2.55)
Fixed Effects	Province, Own, Year					State				
Noise Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Firm Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	--	--	Y	Y	Y	--	--
Origin-Prod FE	--	--	--	Y	Y	--	--	--	Y	Y
R-squared	0.56	0.50	0.38	0.81	0.78	0.31	0.27	0.21	0.97	0.93
# observations	1,778	1,778	1,778	76,626	76,626	10,000	10,000	10,000	140,000	140,000

This table examines the relationship between firms' management practices and imported input quality. The dependent variable is log firm imports in Columns 1 and 6, log share of imports in total intermediate inputs in Columns 2 and 7, log average GDP per capita across origin countries in Columns 3 and 8, log import unit value by origin country-product in Columns 4 and 9, and log import product quality by origin country-product in Columns 5 and 10. Quality is estimated as demand elasticity (set to 5) x unit value + quantity as described in the text. A product is HS 8-digit. All regressions for China include fixed effects for firm province, year, and ownership status. All regressions for the US include fixed effects for firm state. Columns 1-3 and 6-8 include fixed effects for firm main industry (SIC-3 for China, NAICS-6 for the US). Columns 4-5 and 9-10 include origin country-product pair fixed effects. All columns also include a full set of firm and noise controls as described in Table 3. Standard errors clustered by firm in Columns 1-5 and 9-10 and robust in Columns 6-8. US sample sizes rounded for disclosure reasons. T-statistics in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level.

Table 7. Assembly Complexity

	China			US		
Dep Variable:	Log # Origins (1)	Log # Import Prod (2)	Log # Origin-Prod (3)	Log # Origins (4)	Log # Import Prod (5)	Log # Origin-Prod (6)
Management	0.168***	0.123*	0.145**	0.058***	0.079***	0.087***
	(4.24)	(1.82)	(2.09)	(7.41)	(6.81)	(6.97)
Log # Export Products	0.245***	0.387***	0.441***	0.426***	0.561***	0.632***
	(7.69)	(6.97)	(7.77)	(66.14)	(58.70)	(60.40)
Fixed Effects	Province, SIC-3 Industry, Own, Year			State, NAICS-6 Industry		
Noise Controls	Y	Y	Y	Y	Y	Y
Firm Controls	Y	Y	Y	Y	Y	Y
R-squared	0.61	0.64	0.67	0.56	0.51	0.53
# observations	1,566	1,566	1,566	10,000	10,000	10,000

This table examines the relationship between firms' management practices and imported input complexity. The dependent variable is firms' log number of origin countries in Columns 1 and 4, log number of imported products in Columns 2 and 5, and log number of origin country-product pairs in Columns 3 and 6. A product is HS 8-digit. All regressions for China include fixed effects for firm province, main SIC-3 industry, year, and ownership status. All regressions for the US include fixed effects for firm state and main NAICS-6 industry. All columns also include a full set of firm and noise controls as described in Table 3. Standard errors clustered by firm (China) and robust (US). US sample sizes rounded for disclosure reasons. T-statistics in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level.

Table 8. Management vs. TFPR

		Export Performance					Quality and Efficiency			Imported Input Quality and Assembly Complexity		
Dep Variable:	TFPR	Exporter Dummy	Log Exports	Exporter Dummy	Log Exports	Log # Prod-Dest	Log Export Quality	Log Qual-Adj Exp Price	Log Export Price	Log Avg Origin Income	Log Imp Input Quality	Log # Origin-Prod
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel A. China												
Management	0.150***			0.053*	0.261**	0.250**	0.520*	-0.363	0.157	0.047***	0.620***	0.194
	(3.48)			(1.74)	(2.36)	(2.08)	(1.69)	(-1.63)	(0.74)	(3.09)	(9.66)	(1.60)
TFPR		-0.006	0.274***									
		(-0.45)	(3.54)									
Non-Manage TFPR				-0.006	0.257***	0.139***	0.242***	-0.192***	0.049**	-0.034**	0.410***	0.117***
				(-0.57)	(4.07)	(3.67)	(2.62)	(-2.66)	(2.05)	(-2.44)	(67.17)	(3.83)
R-squared	0.49	0.42	0.44	0.43	0.44	0.41	0.90	0.89	0.92	0.38	0.78	0.60
# observations	2,800	2,802	1,880	2,800	1,880	1,880	54,565	54,565	54,565	1,731	70,270	1,731
Share of 1 st dev in outcome explained by 1 st dev in attribute:												
Management				10.7%	11.3%	19.0%	5.4%	4.8%	7.1%	9.1%	4.5%	12.2%
Non-Manage TFPR				1.5%	12.1%	11.5%	2.7%	2.8%	2.4%	7.1%	3.3%	8.1%
Ratio				7.4	0.9	1.7	2.0	1.7	2.9	1.3	1.4	1.5
Panel B. US												
Management	0.090***			0.031***	0.364***	0.191***	0.042***	-0.046***	-0.004	0.037***	0.050**	0.199***
	(10.10)			(9.72)	(17.21)	(14.81)	(2.96)	(-3.72)	(-1.08)	(4.12)	(2.01)	(13.64)
TFPR		0.040***	0.307***									
		(11.49)	(12.09)									
Non-Manage TFPR				0.037***	0.273***	0.156***	0.025**	-0.024**	0.001	0.003	0.035***	0.142***
				(10.56)	(10.79)	(9.82)	(2.14)	(-2.45)	(0.38)	(0.37)	(2.12)	(8.38)
R-squared	0.83	0.28	0.38	0.28	0.41	0.39	0.97	0.96	0.98	0.21	0.93	0.34
# observations	32,000	32,000	13,000	32,000	13,000	13,000	290,000	290,000	290,000	10,000	140,000	10,000
Share of 1 st dev in outcome explained by 1 st dev in attribute:												
Management				6.2%	13.1%	11.6%	0.5%	0.7%	0.1%	4.3%	0.7%	12.8%
Non-Manage TFPR				16.3%	22.2%	21.3%	0.7%	0.8%	0.1%	0.8%	1.1%	20.5%
Ratio				0.4	0.6	0.5	0.7	0.9	1.8	5.5	0.6	0.6

This table examines the relationship between firms' management practices, total factor productivity, and trade activity. *TFPR* is revenue-based TFP measured as in Levinsohn-Petrin. *Non-Management TFPR* is the residual from the regression of TFPR on management and no other controls or fixed effects. All regressions for China include fixed effects for firm province, year, and ownership status. All regressions for the US include fixed effects for firm state. Columns 1-6, 10 and 12 include fixed effects for firm main industry (SIC-3 for China, NAICS-6 for the US). Columns 7-9 and 11 include destination or origin country-product pair fixed effects. All columns also include a full set of firm and noise controls as described in Table 3. Standard errors boostrapped 600 times in Panel A and 1,000 times in Panel B. US sample sizes rounded for disclosure reasons. T-statistics in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level.

Table 9. Management Components

	Export Performance			Quality and Efficiency			Imported Input Quality and Assembly Complexity		
Dep Variable:	Exporter Dummy	Log Exports	Log # Prod-Dest	Log Export Quality	Log Qual-Adj Exp Price	Log Export Price	Log Avg Origin Income	Log Imp Input Quality	Log # Origin-Prod
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A. China: Estimation with Both Components									
Monitoring	0.069***	0.127	0.120	0.057	0.014	0.071	0.017	0.277	0.408***
	(2.92)	(0.75)	(1.06)	(0.19)	(0.06)	(1.06)	(0.53)	(0.98)	(3.59)
Incentives	-0.033	0.128	0.117	0.526*	-0.432**	0.093	0.032	0.331	-0.168
	(-0.58)	(0.86)	(1.15)	(1.92)	(-2.03)	(1.40)	(0.96)	(1.24)	(-1.53)
# observations	3,123	1,935	1,935	58,101	58,101	58,101	1,778	76,626	1,778
Panel B. China: Estimation with Single Component									
Monitoring	0.060***	0.217	0.202**	0.330	-0.211	0.119*	0.041*	0.521***	0.287***
	(3.48)	(1.63)	(2.55)	(1.27)	(-1.03)	(1.95)	(1.89)	(2.67)	(4.04)
Incentives	0.032*	0.211*	0.196***	0.558**	-0.424**	0.134**	0.044**	0.527***	0.114
	(3.48)	(1.78)	(2.77)	(2.28)	(-2.23)	(2.18)	(1.97)	(2.88)	(1.61)
# observations	3,123	1,935	1,935	58,101	58,101	58,101	1,778	76,626	1,778
Panel C. US: Estimation with Both Components									
Monitoring	0.022***	0.307***	0.157***	0.050**	-0.050***	-0.005	0.045***	0.052**	0.101***
	(6.99)	(13.11)	(11.29)	(2.56)	(-3.88)	(-1.10)	(4.52)	(2.57)	(7.67)
Incentives	0.013***	0.141***	0.077***	0.017	-0.006	0.001	-0.003	0.014	0.011
	(4.63)	(6.57)	(6.04)	(1.03)	(-0.06)	(0.16)	(-0.29)	(0.86)	(0.88)
# observations	32,000	13,000	13,000	290,000	290,000	290,000	10,000	140,000	10,000
Panel D. US: Estimation with Single Component									
Monitoring	0.026***	0.335***	0.173***	0.038***	-0.037***	0.001	0.044***	0.057***	0.201***
	(8.64)	(15.05)	(13.19)	(2.63)	(-2.94)	(0.30)	(4.64)	(2.84)	(13.65)
Incentives	0.019***	0.224***	0.120***	0.010	-0.012	-0.002	0.010	0.027*	0.104***
	(6.97)	(11.02)	(9.98)	(0.83)	(-1.11)	(-0.55)	(1.07)	(1.74)	(7.62)
# observations	32,000	13,000	13,000	290,000	290,000	290,000	10,000	140,000	10,000

This table examines the role of the *Monitoring* and *Incentives* components of firms' management practices. All regressions for China include fixed effects for firm province, year, and ownership status. All regressions for the US include fixed effects for firm state. Columns 1-3, 7 and 9 include fixed effects for firm main industry (SIC-3 for China, NAICS-6 for the US). Columns 4-6 and 8 include destination or origin country-product pair fixed effects. All columns also include a full set of firm and noise controls as described in Table 3. Standard errors clustered by firm, except for Columns 1, 2, 7 and 9 for the US where they are robust. US sample sizes rounded for disclosure reasons. T-statistics in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level.

Figure 1. Motivating Evidence: India RCT, 2008-2011

Figure 1A. Management and TFP

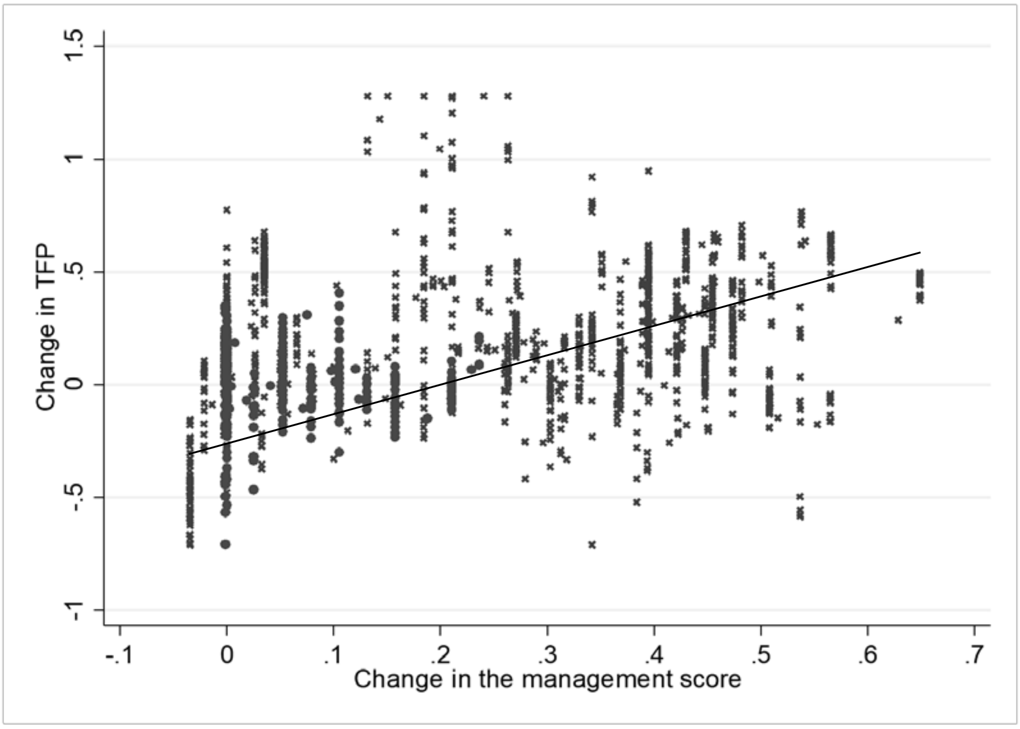
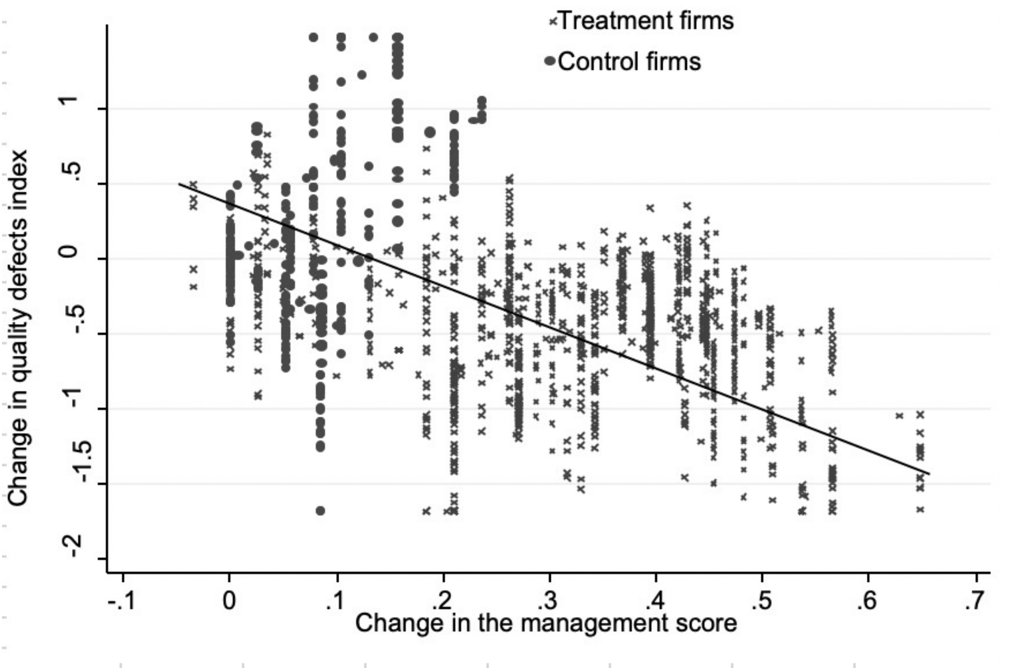


Figure 1B. Management and quality defects index



This figure displays how improvements in firms' management practices relate to improvements in log total factor productivity (top) and quality control in production (bottom) following a randomized control trial that provided management consulting to plants in the textile industry in India, 2008-2011. It plots the firm-by-week change in log total factor productivity against the firm-by-week change in the management score (top) and in the log quality defects index (bottom), both relative to their pre-experiment average. The quality defects index measures the severity-weighted number of defects per roll of fabric. See Bloom et al. (2013) for experiment details.

Figure 2. Management Practices across Firms

Figure 2A. US MOPS

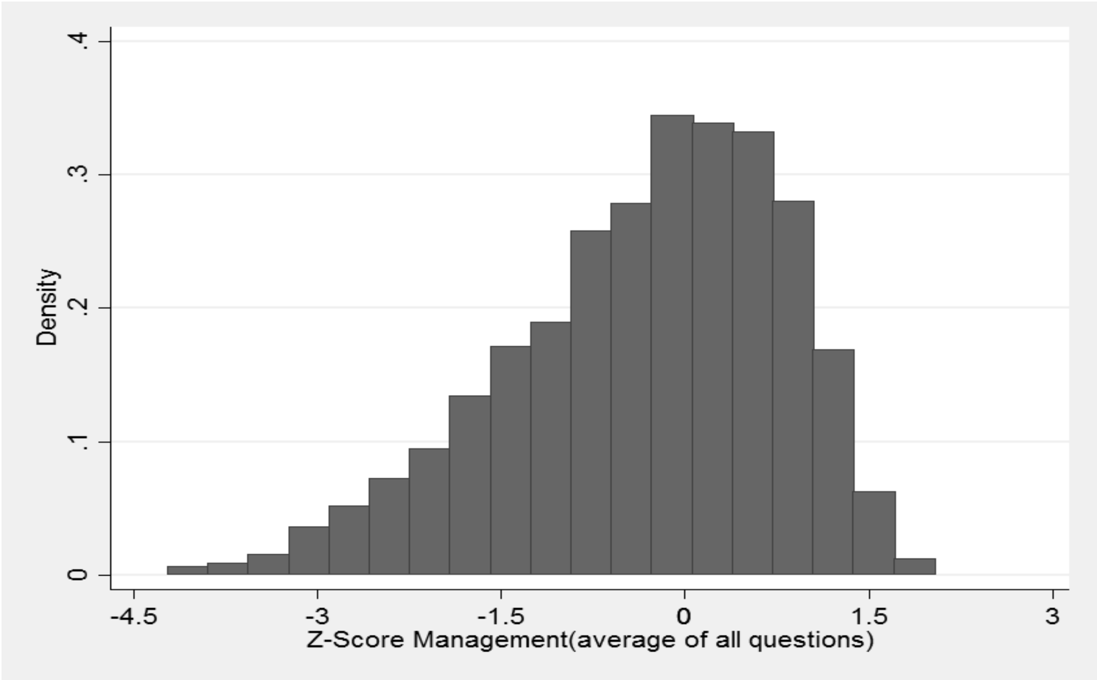
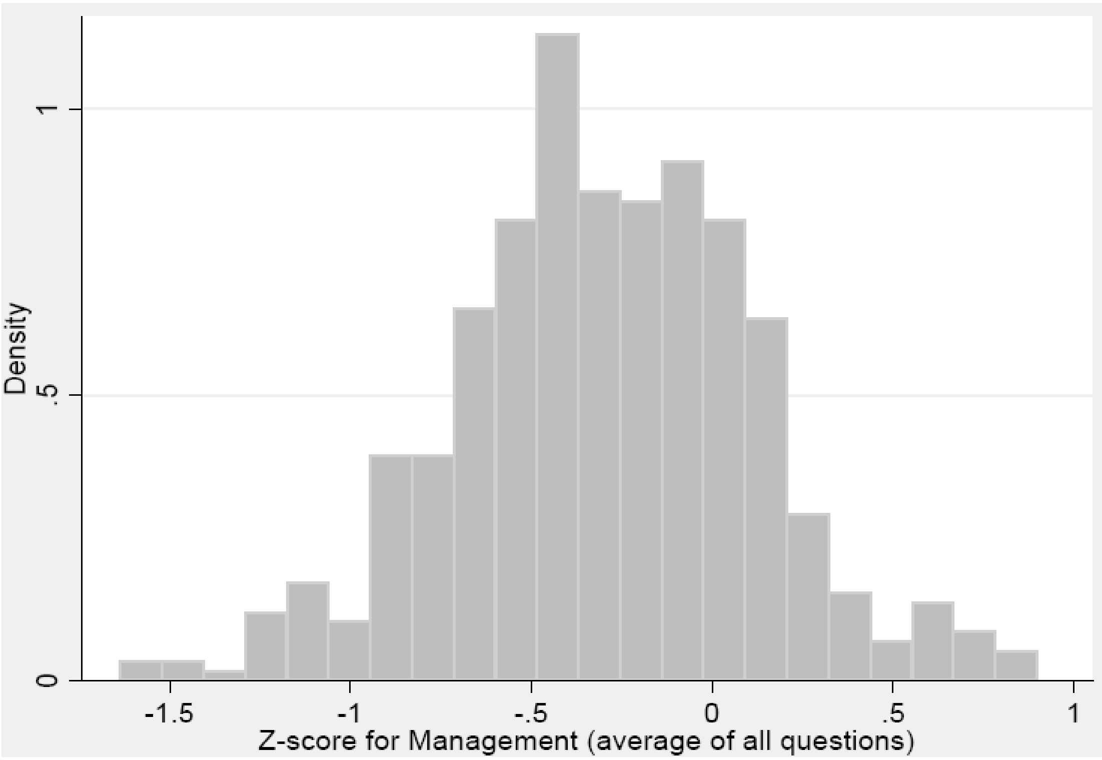


Figure 2B. China WMS



This figure plots the MOPS management score distribution for the US (top) and the WMS management score distribution for China (bottom). The management scores are averaged across all questions before being normalized for the regression analysis.