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Heterogeneous Trade Elasticity and Managerial Skills

Maria Bas, Lionel Fontagné, Irene Iodice & Gianluca Orefice

Highlights

- We show that managerial intensive firms have larger exporter price elasticity to real exchange rate variations.
- In particular, in the wake of a depreciation, exporters whose management intensity is one standard deviation higher than the average, increase their prices by 51% to 73% more than the average exporter.
- Our findings support the predictions of a simple theoretical framework suggesting that firms with higher managerial intensity are able to secure greater markups and hence adjust their export prices more when faced with a real exchange rate shock.

Abstract

This paper investigates the role played by firms' managerial skills in the heterogeneous reaction of exporters to common exogenous changes in their international competitiveness (here captured by changes in the real exchange rate). Relying on a simple theoretical framework, we show that firms with better managerial skills have higher profits, market power, and are able to adapt their markup more when faced with a competitiveness shock. We test this prediction relying on detailed firm-product-destination level export data from France for the period 1995-2007 matched with specific information on the firms' share of managers. Our findings show that managerial intensive firms have larger exporter price elasticity to real exchange rate variations. The effect is not trivial: in the wake of a depreciation, exporters whose management intensity is one standard deviation higher than the average, increase their prices by 51% to 73% more than the average exporter. This finding is robust to controlling for the alternative explanations suggested by the previous literature to explain the heterogeneous pass-through of firms.

Keywords

Exchange Rate Pass-through, Heterogeneous Pricing-to-market, Managerial Skills.

JEL

F12, F14, F31.

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RESEARCH AND EXPERTISE
ON THE WORLD ECONOMY

Heterogeneous Trade Elasticity and Managerial Skills*

Maria Bas† Lionel Fontagné‡ Irene Iodice§ Gianluca Orefice ¶

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1 Introduction

Real exchange rate (RER) shocks have a weak effect on aggregate trade flows, and import and export prices (Goldberg and Knetter, 1997, Goldberg and Campa, 2010, Hooper et al., 2000), in particular if compared to other price shifter shocks such as tariffs (Ruhl, 2008). This weak response of exports to exchange rate shocks has also been documented at the microeconomic level. Berman et al. (2012), Fitzgerald and Haller (2014), Fitzgerald and Haller (2018) and Fontagné et al. (2018) found that the *average* elasticity of a firm export volumes to an exchange depreciation is around 0.5-0.8. Since high performing firms are those that explain most of the variation of aggregate trade flows (Bernard et al., 2007 , Freund and Pierola, 2015, Gaubert and Itskhoki, 2021, Fernandes et al., 2023), the heterogeneity of trade elasticities helps to explain this macroeconomic puzzle.

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There is now a growing literature that relates the incomplete exchange rate pass-through to firm-level characteristics (Berman et al., 2012, Chatterjee et al., 2013, Amiti et al., 2014, Bernini and Tomasi, 2015, Chen and Juvenal, 2016, Auer and Chaney, 2009, Auer et al., 2018).[1] These studies show that the elasticities of firms' export price to real exchange rate are heterogeneous across firms and depend on firm performance (productivity, input and export quality, marginal costs and imported input intensity). Firms that perform relatively better than others in terms of productivity are able to absorb more changes in exchange rates in their markups. Thereby, their export volumes are less sensitive to real exchange rate movements, which contributes to the observed low elasticity of aggregate exports to exchange rate. Similarly, firms selling high-quality products face lower demand elasticity, a higher degree of pricing-to-market, and hence a smaller response of export volumes to a real depreciation.

However, firms are heterogeneous also in another dimension: managerial intensity. Managers play an important role on enhancing firm efficiency and profitability by reducing coordination costs and improving the organisation of different stages of the production process (Bao et al., 2022; Bloom et al., 2021). For a given level of firm productivity, firms with higher managerial intensity may ensure a smoother adjustment to marginal costs shocks, and hence a heterogeneous reaction to common RER shocks. Yet, whether there is a role for firm managerial intensity in shaping firms' pricing-to-market strategies and their incomplete real exchange rate pass-through remains an unexplored issue. The aim of this paper is to fill this gap by studying this channel and testing its empirical relevance beyond the competing explanations based on firms' TFP, product heterogeneity, output quality and marginal costs. We argue that firms with a larger share of managers are able to adjust more their markups when they face a RER shock. To our knowledge, this paper is the first to document the impact of exchange rate movements on firms' export prices depending on their managerial intensity.

Our identification strategy is guided by a simple theoretical framework of firm heterogeneity and variable markups based on the work of Melitz and Ottaviano (2008) that rationalizes the mechanism through which firms' managerial intensity affects the exporter price elasticity to RER shocks. The main prediction of our theoretical framework is that firms with higher managerial intensity are able to earn more profits, have higher markups, and hence will absorb more exchange rate shocks in their export prices (conditional on firm productivity). We provide strong empirical

[1]See Burstein and Gopinath (2014) for a survey of the exchange rate pass-through literature.

evidence confirming this prediction, consistent with a larger exporter price elasticity to RER variations. Importantly, we show that this within-firm managerial intensity channel is still present when we control for the firm productivity and product performance mechanism (Berman et al., 2012, Chatterjee et al., 2013) as well as the quality channel (Bernini and Tomasi, 2015 and Chen and Juvenal, 2016), and the marginal cost mechanism (Amiti et al., 2014).[2]

We show this new empirical evidence using longitudinal employer-employee data from the *Déclaration Annuelle des Données Sociales* (DADS) and French trade flows from the French Customs Data for the period 1995-2007. By providing detailed information on workers' occupation, the DADS data allows us to construct the share of managers within the firm. Namely, we define firms' managerial intensity as the share of managers over total workers within the firm in the initial year of the sample, 1995.[3] We match this measure with the firm-product-destination country export data from French Customs for the period 1995-2007. The final dataset provides information on the unit values (here used as a proxy of the free-on-board export price) at firm-product-destination country-year level and the share of managers in the firm. The RER between France and the destination country is defined as the product between the ratio of consumer price index (foreign over domestic) and the nominal exchange rate, and therefore varies by destination-year.[4] We restrict our sample to Extra-Eurozone destinations, to focus on markets that feature a sufficient variation in the real exchange rate during the period 1995-2007.

Our identification strategy exploits the variation of export prices within firm-product-destination over time as well as exogenous changes in real exchange rate across years for a given destination (i.e. *within* identification), and allows reactions to common real exchange rate shocks to depend on the initial managerial intensity of the firm. Firm-product-destination and year fixed effects reduce the omitted variable concerns. We always control for the heterogeneous effects of real exchange rate movements depending on firm productivity (measured by firm TFP) and firm-product performance measured by the rank of the product in the firms' total exports to a destination in a year. This allows us to take into account the alternative channels of productivity, product

[2]Other channels through which the managerial intensity of the firm affects firms' pricing-to-market decisions are related to firm productivity and output quality. The literature on managerial practices shows a positive effects of managerial skills on firm productivity (Bloom and Van Reenen, 2007, Bloom and Van Reenen, 2011, Bloom et al., 2013 and Caliendo et al., 2020). Moreover, Verhoogen (2008), Brambilla et al. (2012) and Bas and Paunov (2021) present evidence on skill-quality complementarity while the skill-biased technical change channel suggests that more skill intensive firms are also more productive ones (Burstein et al., 2013, Burstein and Vogel, 2017). We show that our explanation is robust to controlling for both the productivity and the quality channel.

[3]A battery of robustness checks using alternative proxies of managerial intensity is provided in section 5.

[4]An increase in the exchange rate means a depreciation.

quality and product performance emphasized in the literature (Berman et al., 2012; Chatterjee et al., 2013; Chen and Juvenal, 2016). In order to strengthen the validity of the new source of heterogeneous pricing-to-market behavior that is identified in this paper, we conduct a series of robustness checks controlling for alternative channels, such as the potential variability of firms' responses to changes in the import-side RER movements and product quality. Additionally, we test the robustness of our results using alternative proxies of a firm's managerial intensity. These checks support the validity and the robustness of the identified source of heterogeneity.

Our findings show that exchange rate pass-through for export prices is incomplete and depends on firm managerial intensity. While the average pass-through of the real exchange rate to export prices is 95%, firms whose management intensity is one standard deviation higher raise their export prices by a range of 51% to 73% more in the wake of a depreciation. Our analysis has interesting policy implications. It points out that not all firms are equally exposed to aggregate competitiveness shocks: those with lower managerial intensity are less resilient. On the other hand, companies with more managerial capacity are better able to extract foreign profits from the modulation of their export prices according to variations in the real exchange rate. These differing capabilities prompt us to reconsider the role of managers within exporting firms. At the aggregate level, our analysis implies that a country-sector adaptation to foreign shocks, as well as the dynamics of aggregate relative prices, must be evaluated (also) based on the managerial intensity of firms therein.

This result complements the findings in the literature. Relying on a similar sample of French exporting firms during the period 1995-2005, Berman et al. (2012) show that for a 10% exchange rate depreciation, the average French exporting firm raises its export price by 0.8% so that the average pass-through is 92%. They also show that more productive firms increase their export prices more when facing a real exchange rate depreciation. Amiti et al. (2014) use Belgian firm-product-level customs data on exports and imports and show that large and importing firms have a real exchange rate pass-through of around 50 percent, while small firms that do not source intermediate goods from abroad have almost a complete real exchange rate pass-through. Chatterjee et al. (2013) rely on customs firm-product data for Brazil during the period 1997-2006 and find that within firms, pricing-to-market is stronger for the products that have a lower marginal cost within the firm production. When Brazilian exporters face a real exchange rate depreciation, they increase markups but this effect is lower for least productive products within the firm (with higher firm-product- marginal costs). The present paper contributes to this literature by proposing a new channel through which firm characteristic also affects firms' pricing-to-market and the incomplete pass-through: the intensity in managerial skills within the firm. Importantly, we show that this within-firm managerial intensity channel is still present when we control for the firm productivity, product performance and marginal cost mechanisms.

A distinct, although related, literature focuses on the role of product quality as a key determinant of firms' pricing-to-market decisions in order to explain the incomplete pass-through of real exchange rate into firm prices. Relying on product-country level data on import and retail prices Antoniades and Zaniboni (2016), Auer and Chaney (2009) and and Auer et al. (2018) investigate the relationship between pass-through and product quality relying on different measures of product quality such as hedonic quality indices, data on prices and unit values. They find evidence that pass-through into prices falls with quality. Bernini and Tomasi (2015) rely on Italian firm level data for the period 2000-2006 and the methodology developed by Chatterjee et al. (2010) to identify how imported input and export product quality affect the pass-through of real exchange rate into prices. Their main findings show that imported input quality is less sensitive to exchange rate variations and have a weaker effect in reducing exchange rate pass-through into the export price of high-quality varieties. Chen and Juvenal (2016) and Chen and Juvenal (2020) rely on customs data for Argentinean wine exporters and expert ratings for wine producers to proxy the quality of products for the period 2002-2009. They also find a heterogeneous response of firms' export prices depending on product quality to RER changes (Chen and Juvenal, 2016) and to distance and tariff changes (Chen and Juvenal, 2020). They show that pricing-to-market increases with the quality of the wines and so the pass-through decreases with product quality. We go one step further and contribute to this literature by providing empirical evidence that managerial intensity matters to explain the heterogeneous response of exporters to RER changes when we control for the heterogeneous effects of output quality.

Finally, our paper contributes to the literature linking various dimensions of firm performance to managerial skills. The new channel we highlight echoes the previous studies suggesting that firms with greater managerial skills (Bloom and Van Reenen, 2007; Bloom et al., 2021; Mion et al., 2022) or in skill-intensive sectors (Burstein and Vogel, 2017) are more profitable and have higher market power and thereby, are able to absorb more cost-shocks in their prices. Caliendo et al. (2020) rely on matched employer-employee Portuguese data and present evidence that adding a layer of management increases firm' efficiency measured by quantity-based productivity. Bloom and Van Reenen (2007) rely on micro-data of manufacturing firms in the US, France, Germany and the UK and show that managerial practices are positively associated with not only firm-level productivity, sales growth and survival rates, but also to firm' profitability. Bloom et al. (2021) show that better managed firm are more likely to export, earn higher export revenue and sell more products at destination. Using Portuguese matched employer-employee data, Mion et al. (2022) show that the presence of managers with some knowledge of the target destination doubles the firm's probability of entering in that market. We contribute to this literature by showing that firms with higher managerial intensity adjust differently to common exogenous shocks of real exchange rate and that this heterogeneous reaction helps understand the weak elasticity of trade with respect to RER shocks.

The remainder of this paper is organized as follows. The next section presents a simple framework that rationalizes the main channel through which managerial intensity affects the exporter price elasticity. Section 3 describes the data used in our empirical analysis and presents descriptive evidence on the relationship between real exchange rate movements and firm's managerial intensity. Section 4 presents the empirical identification strategy and the main findings. Section 5 presents robustness tests. The last section concludes.

2 Theoretical Motivation

This section presents a simple theoretical framework based on the model of Melitz and Ottaviano (2008) – MO hereafter – to rationalize the channels through which the managerial intensity of firms affects their pricing-to-market. We extend the heterogeneous firms' trade model of MO to include heterogeneous managerial intensity and see how firms with different levels of managerial intensity react to a change in their international competitiveness (here approximated by changes in the real exchange rate).

We base our analysis on the quasi-linear demand system with horizontal product differentiation that allows for endogenous markups.[5] The inverse demand for each variety exported by firm i to

[5] Preferences over goods are described by the quasi-linear quadratic utility function: $U = q_0^c + \alpha \int_{i\in\Omega} q_i^c di - \frac{1}{2}\gamma \int_{i\in\Omega} (q_i^c)^2 di - \frac{1}{2}\beta \left(\int_{i\in\Omega} q_i^c di\right)^2$,where $\alpha, \gamma, \beta > 0$; q_0^c is the consumption of the numeraire good ($q_0^c > 0$) and q_i^c is the consumption level of each variety of the differentiated good. The substitution between the differentiated varieties and the numeraire is captured by α and β parameters, while γ represents the degree of product differentiation between the varieties. The maximization of the quasi-linear quadratic utility function subject to the consumer's budget constraint gives the optimal linear demand.

country j is: $p_{i,j}/\epsilon_j = \alpha - \gamma q^c_{i,j} - \beta Q_j$, where ϵ_j is the nominal exchange rate between the home country and country j, $q_{i,j}$ is the individual consumption of a variety and Q_j is total consumption in country j. On the supply side, we assume that firms are indexed by their firm type θ_i, that represents a combination of two firm characteristics: (i) production inputs efficiency, φ_i, and (ii) firm managerial intensity, λ_i, combined in the following way: $\theta_i = \varphi_i + \lambda_i$. The idea is that two firms with identical production input efficiency (φ_i) may have different output levels due to the role of managers in the firm (e.g., coordination capability, problem-solving, etc.). Hence, each firm of type θ_i combines production workers l_i and intermediate goods x_i (the purely variable inputs) to produce the final good q_i with a Cobb-Douglas technology:

$$q_i = \theta_i l_i^\rho x_i^{1-\rho}. \tag{1}$$

The production input efficiency, φ_i, is a technological parameter that measures the efficiency of firm's production inputs (i.e. production workers and intermediate goods). The intensity of management (λ_i) adds to the efficiency of production inputs because managers help to solve the complex problems mentioned above. Managers are considered non-variable inputs (i.e., not proportional to quantity q_i); therefore, for simplicity, they do not appear in the Cobb-Douglas production function. Firms with a higher share of managers (λ_i) have a greater capacity to solve problems, face uncertainty, and cope with unexpected real exchange rate shocks. Indeed, firms with higher managers are able to reduce coordination costs and synchronize production targets across different stages of production. Bloom et al. (2021) argue that managers solve problems by optimizing inventory control and monitoring production targets. Syverson (2011) consider managers as "*conductors of an input orchestra*", and as such, they are able to affect the production quantity q_i on top of the efficiency of production inputs.

After profit maximization, the optimal export quantity, price, markups and profits set by a firm i are determined by:

$$q_{i,j}(\varphi_i, \lambda_i) = \frac{L\tau_j\chi_i}{2\epsilon_j\gamma}\left[\frac{1}{\theta^*} - \frac{1}{\theta}\right] \tag{2}$$

$$p_{i,j}(c_i, \lambda_i) = \frac{\tau_j\chi_i}{2}\left[\frac{1}{\theta^*} + \frac{1}{\theta}\right] \tag{3}$$

$$\mu_{i,j}(\varphi_i, \lambda_i) = \frac{\tau_j \chi_i}{2} \left[\frac{1}{\theta^*} - \frac{1}{\theta} \right] \tag{4}$$

$$\pi_{i,j}(\varphi_i, \lambda_i) = \frac{L(\tau_j \chi_i)^2}{4\epsilon_j \gamma} \left[\frac{1}{\theta^*} - \frac{1}{\theta} \right]^2 \tag{5}$$

Here, $\frac{1}{\theta^*} = \frac{1}{\varphi_i^* + \lambda_i^*} = \frac{\epsilon_j(\alpha - \beta Q_j)}{\chi_i \tau_j}$ represents the firm type threshold, at which operating export profits in market j become zero.[6] The firm with type θ^* is the marginal firm that is able to export to market j making zero profits and selling the product at the marginal cost $(\chi_i \tau_j / \theta^*)$, where χ_i is a function of wages in the home country w and the price of intermediate goods p_x: $\chi_i = w^\rho p_x^{1-\rho}$ and τ_j indicates the trade variable (iceberg) costs faced by firms when exporting to country j. As clearly emerges from eq. (3), firms with lower cost do not pass on all of the cost differential to consumers by lowering prices (incomplete pass-through), they have market power. Firms with greater managerial intensity (λ_i) are also able to grasp higher profits and markups – see eq. (5). Exogenous shocks to the international competitiveness of firms can be modeled as changes in the *real* exchange rate $e_j = (\epsilon_j w_j)/w$, with w_j indicating the wage in country j. From eq. (3), we see that the elasticity of export prices to the real exchange rate is positive and increases with firm managerial intensity (λ_i):

$$\eta_{p_j(\lambda_i)} = \frac{dp_j(\lambda_i)}{de_j} \frac{e_j}{p_j(\lambda_i)} = \frac{\lambda_i + \varphi_i}{\lambda_i + \varphi_i + \theta^*} \tag{6}$$

Firms with higher managerial intensity have larger export price elasticity to real exchange rate variations. The underlying intuition is that firms with more managers, by having larger markups, are able to charge higher prices in presence of a common depreciation shock. This prediction from an easy-and-nice extension of the MO model is tested empirically in what follows. Note also that the elasticity of export prices to real exchange rate also increases with the efficiency of production inputs φ_i – as showed in Berman et al. (2012). For this reason, in our empirical exercise we always control for the production input efficiency (here approximated by value added TFP using production-workers and intermediate as variable inputs).

[6] From the inverse demand for each variety exported, we can derive the price bound at which the demand for a variety is driven to 0: $p_{i,j} = \epsilon_j(\alpha - \beta Q_j)$ that equals the price of the marginal exporter $p_{i,j}(\theta^*) = \chi_i \tau_j / \theta^*$. From this condition we obtain $\frac{1}{\theta^*} = \frac{\epsilon_j(\alpha - \beta Q_j)}{\chi_i \tau_j}$.

3 Data and descriptive evidence

3.1 Data

Our analysis relies on three main sources of data. First, we use the French Customs Data from the *Direction Générale des Douanes et des Droits Indirects* (DGDDI) to obtain information on export values (in euro) and quantities (volume in tons) of each French firm in a given destination j, product p (6-digit of the Harmonized System HS) in the period 1995-2007. This database is quasi-exhaustive of the universe of exporting French firms, and allows us to compute the export unit values by taking the ratio of the value of exports over the quantity of the HS6 product shipped by a firm in a given destination-year.[7] Here we use export unit values as proxy for the free-on-board product export price of firms. The aggregation bias concern is reduced here because we calculate export price at HS 6-digit (and destination) level.

The second main dataset is the *Déclaration Annuelle des Données Sociales* (DADS Postes). This is an administrative dataset of matched employer-employee information collected by the INSEE (*Institut National de la Statistique et des Études Économiques*). It contains information on the employment at the level of the firm, and the occupation category of its workers (2-digit of the PCS classification). The data are based on mandatory reports of gross earnings, completed by employers to comply with French payroll taxes. All wage-paying individuals and legal entities established in France are required to file payroll declarations.[8] The DADS dataset allows us to construct three different measures of firm managerial intensity based on workers' occupation as explained in detail in the next section.[9]

The third source of data is FICUS, a data set that reports the balance sheet information (value added, sales, total employment, capital, intermediate inputs, main domestic activity, etc.) for French firms over the period 1995-2007. These data are used to compute TFP and the value added per worker, used here as proxy for the productivity of firms. The dataset covers the period from 1995 to 2007 and includes between 700,000 and 920,000 firms per year in all sectors.

[7] Although reporting of firms having trade values below 39,000 euros (within the EU destination) or transaction values below 1,000 euros (extra-EU destinations) is not mandatory, there are in practice many observations below these thresholds. We restrict our sample period until 2007 to exclude the financial crisis period that affected the pricing decisions of French exporters.

[8] Following Harrigan et al. (2023), we apply a cleaning procedure to the DADS data. First, we retain only full-time workers employed for the entire year and exclude records with entry errors, such as missing or zero values for hours worked, net salary, or sector code. Second, we remove firms belonging to juridical categories 4, 7, and 9, which correspond to entities governed by public law.

[9] The DADS *postes* dataset lacks worker identifiers, preventing us from tracking individual workers over time.

The final source of data provides macroeconomic variables. GDP and the real exchange rate are computed using the Penn World Tables. The real exchange rate between France and each destination country is calculated as the average annual nominal exchange rate multiplied by the ratio of foreign to domestic consumer price indexes. It is normalised to 1 in 1995 for each country, with an increase indicating depreciation. Data on price indexes and nominal exchange rates come from the Penn World Tables and the IMF's International Financial Statistics. To capture variations in the real exchange rate across destinations and over time, we limit our sample to non-Eurozone countries as in Berman et al. (2012).

The final dataset has information on: (i) unit values set by each French firm on each HS6-destination country combination and time, (ii) firm level managerial intensity and (iii) the real exchange rate between France and the destination country in each year. Finally, we restrict our observations to firms for which the declared main activity belongs to manufacturing. This notably excludes wholesalers. Table A1 in the Online Appendix shows the number of firm-HS6-destination combinations, the total amount of exports, the number of products, destinations, as well as the number of exporting firms in our estimation sample by year.

3.2 Definition of variables

The first important step is to define managers within the workforce of French firms. Workers are classified based on the French "Occupations and Socio-occupational Categories" (*Professions et Categories Socio-Professionnelles*,PCS).[10] We rely on the occupation classification at 2-digit as in Harrigan et al. (2023), and define firms' managerial workers as those workers classified as chief executive officers (CEO) and chief technical officers (CTO). Executive officers correspond to the PCS 2-digit code 37 (*"Cadres administratifs et commerciaux d'entreprise"*) and technical officers to the PCS 2-digit code 38 ("*Ingénieurs et cadres techniques d'entreprise*"). Our measure of managerial intensity is the share of firm's managerial workers (executive and technical officers) over total labor in the initial year 1995. We fix the managerial intensity of a firm in the initial year to avoid concerns that may arise from the endogenous hiring of managers during the period of analysis. In a robustness check we use the managerial intensity of firms in the first year the firm is observed in the DADS data.

Alternatively, we define managerial positions using the Occupational Information Network

[10] A description of the classification is available at this link.

(O*NET) classification from the U.S. Bureau of Labor Statistics. We use this classification to obtain two further proxies of the managerial intensity of firms. First, from O*NET we identify occupations with titles containing “Manager”, “Chief” or “Executive”, and compute the share of those occupations in the total employment of the firm. Second, we use O*NET to differentiate science, technology, engineering, and mathematics (STEM) occupations based on tasks. Namely, we distinguish managerial roles from those related to R&D, engineering, and sales. This task-based classification enables us to calculate the shares of firm’s employment in the following occupations: (i) R&D workers, (ii) managers, (iii) technicians, and (iv) sales staff. These ratios better isolate the firm’s managerial intensity from other high-skilled occupations within the firm.[11]

Table 1 presents descriptive statistics on firms’ managerial intensity. We provide yearly data for firms with positive export flows to destinations outside the Eurozone (our estimation sample). The dataset consists of 298,843 firm-year observations with non-missing employment data for the period 1995-2007. The median number of employees in the sample is 23, while the average is approximately 98, indicating a skewed firm size distribution.

The average employment share of managers in the estimation sample is 10.6% (defined as chief executive officer and chief technical officer, corresponding to PCS codes 37 and 38). Interestingly, the share of managers in French firms grew at an average annual rate of 0.3% during the period 1995-2007. Based on the O*NET classification, managers account on average for the 10.7% of the workforce, showing a similar steady increase of 0.3% per year. In contrast, managers engaged in STEM-related activities constitute a smaller share, around 1.9%.

[11] The list of the 923 occupations in the ONET classification can be found at this link. The mapping from ONET to PCS classes follows several intermediate steps. First, SOC19 is converted to SOC10 (O*NET) link. Then, SOC10 is mapped to ISCO08 using David Autor’s maps, available on his webpage. Next, ISCO08 is linked to ISCO88 and then to PCS03 using the R package *SocialPosition*, available on CRAN. Finally, PCS03 is converted to PCS82 through a combination of the maps in *SocialPosition* and manual adjustments for certain missing entries. As a result of this process, 14 entries could not be linked between PCS03 and SOC19 (corresponding to 15 PCS82), representing approximately 3%, mainly due to the final step. Additionally, 6% of PCS82 codes do not have a corresponding PCS03 and therefore lack an SOC19 match. These missing links have been manually completed.

Table 1: Descriptive Statistics

Variable		Obs	Mean	Median	Std. Dev
Firm Level					
# Employees		298,843	98.4	23	628.1
Δ% # Employee		215,008	0.5%	0%	37.6 p.p.
Export Value (mln)		298,843	3.87	0.08	4.58
Δ% Export Value		215,008	2.9%	0.06%	143 p.p.
Managerial Intensity					
Share of managers:					
	Managers (CEO+CTO)	298,843	10.6%	6.3%	14.7 p.p.
	Managers (CEO)	298,843	4.6%	0.6%	9.5 p.p.
	Managers (O*NET)	172,164	10.7%	5.1%	15.5 p.p.
	Managers (STEM)	172,164	1.9%	0.4%	4.1 p.p.
Δ% *Share of managers*:					
	Managers (CEO+CTO)	215,008	0.3%	0%	10 p.p.
	Managers (CEO)	215,008	0.2%	0%	7.7 p.p.
	Managers (O*NET)	109,853	0.3%	0%	3.6 p.p.
	Managers (STEM)	91,351	0.2%	0%	3.9 p.p.

Notes: Authors' computationss from French customs data matched with DADS, 1995–2007. The summary statistics are computed on the estimation sample, which only includes firms with non-Eurozone transactions. The growth rate in export sales represents the percentage change in export value for firms within a destination-HS6 market. Because of exporter turnover in product-destination pairs, we can only compute this export growth rate for firms exporting the same HS6 product to the same destination in two consecutive periods. Similarly, the growth rate in managerial intensity measures the percentage change in each firm's share of managers over consecutive time periods.

3.3 Descriptive evidence

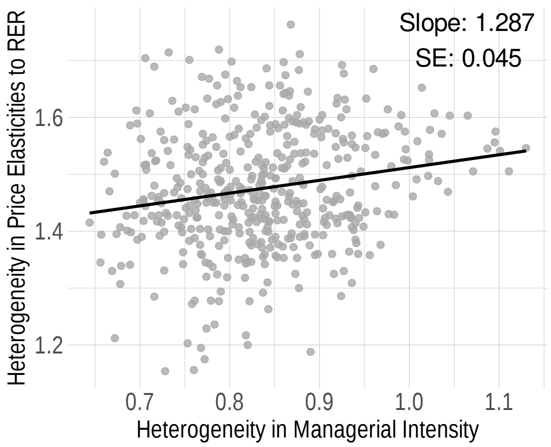
This section provides a first illustration of the relationship between firms' managerial intensity and firms' export price elasticities. Figure 1 shows two interesting pieces of evidence. First, panel (a) shows that the heterogeneity of firms' export price elasticities and that of firms' managerial intensity correlates positively. In this panel, each data point represents a unique export destination-year combination. We use the coefficient of variation (CV) to quantify the degree of heterogeneity among firms within a given destination-year. The horizontal axis of the plot captures the CV in managerial intensity for firms exporting to a specific destination in a given year. In the vertical axis we report the CV in firm's price elasticity; defined as the annual percentage change in firms' export prices for that destination-year, relative to the yearly percentage change in the real exchange rate of that destination country. To avoid composition effects (and improve the readability of the figure) in the scatter plot in Figure 1 panel (a), we select the top-40 non-Eurozone destinations for France in terms of export value over the sample period.

The positive slope of the linear fit suggests that The greater the heterogeneity of firms' managerial intensity, the greater the heterogeneity in the response of firms' export prices to RER variations. This descriptive evidence suggests that there is a link between the variability of firms' reactions to real exchange rate changes and the variability in the managerial intensity of firms.

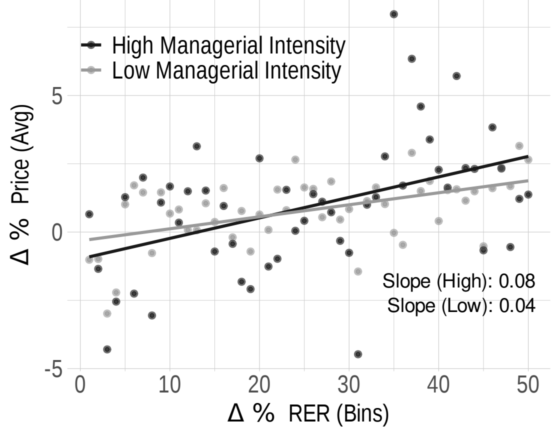
Panel (b) of Figure 1 shows the heterogeneous reaction of firms' export price to RER variations based on their managerial intensity. Namely, we split the sample of destination-year combinations into 50 bins based on RER variation (horizontal axis) and calculate the price variation of firms (vertical axis) belonging to each bin. We do so for firms with high vs. low managerial intensity. Figure 1 panel (b) shows that firms having high (low) managerial intensity are more (less) sensitive in their export price setting to changes in RER, i.e. all firms increase their export price in presence of a positive change in RER (depreciation), and the more so for managerial intensive firms. We explore more systematically these stylised facts in Section 4.

In the theoretical setting presented above, a firm's managerial intensity influences the firm's export price elasticity by enhancing market power and increasing profits. To empirically validate this relationship, we analyze the correlation between managerial intensity and firm profitability, as shown in Appendix Figure A1. We divide the sample into 50 bins based on firms' gross operating profits and plot the average managerial intensity for each bin. The figure clearly illustrates that firms with higher managerial intensity also exhibit higher profits.

Figure 1: Heterogeneity in Trade Elasticities and Managerial Intensity



(a) Price elasticity to RER and managerial intensity.



(b) Change in price and RER: high *vs* low managerial intensity.

Notes. In Panel (a), we plot the coefficient of variation in firms' managerial intensity in a destination-year (horizontal axis) against the coefficient of variation in firms' elasticities to RER computed as firms' percentage price change over RER changes in the same export destination-year (vertical axis). This analysis is limited to the top 40 non-Eurozone export destinations. For Panel (b), we divide the variation in market's RER into 50 distinct bins. Then, we plot the average percentage change in firms' prices (vertical axis) for each bin of RER variation (horizontal axis). We execute this for firms with both high and low managerial intensity, i.e., firms with a share of managers above or below the sector's average at the NACE 2-digit level.

4 Identification strategy and results

In this section, we discuss the identification strategy adopted to test the effect of firms' managerial intensity on their pricing-to-market and present the baseline results.

4.1 Identification strategy

This section tests whether firms with larger share of managers in total employment have larger exporter price elasticity to RER shocks. To avoid the concern of endogenous adjustment of firm's managerial composition to export behavior, we use the managerial intensity of firms in the initial year, 1995. Importantly, in all specifications we control for the heterogeneous effect of RER based on firm's total factor productivity (TFP), used here as a proxy for the empirical counterpart of the production input efficiency (i.e. φ_i in the theoretical framework). This, along with a very demanding set of fixed effects and the plausibly exogenous nature of RER variations, reduces considerably the omitted variable bias and allows us to conclude on the *causal* effect of real exchange rate movements on firms' pricing-to-market behavior depending on their managerial intensity. We estimate the following specification:

$$\ln p_{ipjt} = \alpha_1 \ln RER_{jt} + \alpha_2 \ln RER_{jt} \times M_{i,95} + X_{ipjt} + \theta_{ipj} + \mu_t + \nu_{ipjt} \quad (7)$$

where firms are indexed by i, products by p, destination country by j, time by t. The main outcome variable, $\ln p_{ipjt}$, is the logarithm of firm-product-destination export unit values; and $M_{i,95}$ is our proxy of firm's managerial intensity in the initial year 1995. RER_{jt} is the real exchange rate between France and the destination country in year t defined as the price of the euro (domestic currency) in units of the destination country' foreign currency.[12] We expect a positive sign of the coefficient of the real exchange rate on prices (α_1), as a result of incomplete pass-through: exporting firms increase their prices in euro when the real exchange rate depreciates. According to our theoretical framework, firms with higher managerial intensity are able to adjust their markups to exchange rate shocks more than firms with a small share of managers. Thus, we also expect a positive sign of the interaction term between the real exchange rate and firms' managerial intensity (α_2). We normalize our measures of managerial intensity to have zero mean and standard deviation equal to 1 to simplify the interpretation of results and the quantification of the effect of managerial intensity. So, the parameter α_1 attached to the real exchange rate variable indicates the impact of RER shocks on firms having sample-average level of managerial intensity.

The set of control variables X_{ipjt} includes: (i) the interaction between RER_{jt} and firm TFP in 1995 ($TFP_{i,95}$), and (ii) the product rank variable ($Rank_{ipjt}$). The interaction between RER_{jt} and the initial TFP of the firm controls for the heterogeneous effect of RER variations on pricing-to-market based on firm's productivity – a specific mechanism already showed in Berman et al. (2012). The firm TFP is computed as a residual of a Cobb-Douglas production function estimation using labor and materials as variable inputs, capital as state variable, and relying on the methodology developed by Wooldridge (2009). Managers are excluded from the calculation of firms' TFP in order to reflect the efficiency of variable inputs in the production process, and to differentiate the effect of managerial intensity from that of production inputs efficiency. As a robustness check, we also show results using value added per worker as the empirical counterpart of φ_i in Section 2.

The product rank $Rank_{ipjt}$ controls for time-varying performance of a given product in a given market for a given firm. We follow the literature (Mayer et al., 2014 and Bernard et al., 2011)

[12] An increase in the RER_{jt} accordingly means a depreciation of the real exchange rate.

and compute the product rank within a given firm-destination-year combination, as the rank of a product p exported by firm i in a given destination j at time t on the total exports of the firm into that destination and year. The product rank variable, $Rank_{ipjt}$ is defined so that the product with the highest export value (this is the core product exported by a firm to a destination) has rank 0 and the subsequent products receive progressively higher rank values.[13] We expect a negative coefficient on the rank product indicating that products with higher performance have higher prices. In some specifications we also add the interaction term between the product rank and the real exchange rate to control for the heterogeneous pricing-to-market behavior of products performing differently for a given firm in a given destination. This measure allows us to control for the performance of the firm-product-destination, in addition to a firm's TFP, highlighted in the previous literature to explain the heterogeneous pricing-to-market strategies of firms (Chatterjee et al., 2013 and Chen and Juvenal, 2016).

All estimations include firm-product-destination fixed effects, θ_{ipj}, capturing all the unobservable time-invariant characteristics of the firm, product, and destination that may affect the pricing behaviour of firms. Namely, θ_{ipj} fixed effects capture differences across destination markets in terms of average import demand (size of destination country and total expenditure) and distribution costs, as well as differences across firm-product pairs in terms of unobserved product quality and efficiency level. Importantly, fixed effects θ_{ipj} capture any firm-specific characteristics that may potentially affect the pricing strategy of the firm (i.e. average productivity, size, managerial capability, etc).[14] Also, any unobserved firm-product-destination characteristics, such as the *average* demand of a country for a given variety, is captured by fixed effects. Year fixed effects μ_t capture aggregate business cycle factors affecting the pricing strategy of firms and any France-wide policies affecting the hiring strategy of firms. We therefore exploit the pure *within* variation in explaining the pricing strategy of firms: how *changes* in RER_{jt} affect *changes* in the pricing behaviour of a firm with given managerial intensity.

The large sets of fixed effects considerably reduce the omitted variable concern, and the plausibly exogenous *changes* in RER eliminate any reverse causality concern. We can therefore conclude on the causal effect of RER shocks on the export pricing strategy of firms with different managerial intensity. Finally, in a set of robustness checks, we explicitly control for the destination-product-

[13]Products ranked second receive a rank value of 1; those ranked third receive a value of 2, and so on.

[14]Firm fixed effects capture the initial productivity and managerial intensity of the firm, this is the reason why $M_{i,95}$ and $TFP_{i,95}$ are included in the estimations only in the interaction terms.

specific demand shocks by including destination-HS2-year fixed effects, and for firm-specific factors (such as time-varying firm productivity) by including firm-year fixed effects. We cluster standard errors at the destination-year level as this is the actual variation in the RER shock.

4.2 Baseline results

This section presents the main findings on how exchange rate movements affect French exporters in their pricing-to-market behavior, with a focus on the role of the within-firm managerial intensity. Since we aim to disentangle the effect of production workers from that of managers (captured by our managerial intensity variable), in all estimations we approximate the efficiency of firm's variable inputs by TFP. Our results remain robust when approximating firm productivity using labor productivity, calculated as the ratio of value added to total non-managerial employees (see Appendix Table A2).

Table 2 presents the baseline estimation results of equation (7) using the logarithm of firm-product-destination unit values as a dependent variable. Table 2 shows strong evidence of the positive effect of RER movement on the pricing of exporters. In line with expectations, French exporting firms increase their price after a real exchange rate depreciation. In our baseline specification in column (1), abstracting from the role of managerial intensity, we find a large pass-through of real exchange rate changes to export price (implying a low level of pricing-to-market): a 10% exchange rate depreciation leads the average exporter to raise its export price (in euro) by 0.5% so that the average pass-through is 95%. This finding is similar to the ones of Berman et al. (2012) who rely on a similar sample of French exporting firms between 1995-2005, and of Fontagné et al. (2018) for the period 1995-2010.

Next, we look at the heterogeneous effect of RER depending on firms' managerial intensity on firm-product-destination export prices. Our results in column (2) of Table 2 show that the export price elasticity to real exchange rate is higher for managerial intensive firms. In columns (3) to (5), we focus on the role of productivity and managerial intensity in shaping the pricing-to-market behavior of firms. We firstly observe that the interaction term between real exchange rate and initial firm TFP has a positive and significant effect on export prices (column 3). This confirms the findings obtained in the previous literature, showing that more productive firms react to a real exchange rate depreciation by increasing their export prices relatively more (Berman et al., 2012). On the other hand, when we control for the specific effect of firm TFP highlighted in the literature, our coefficient of interest remains statistically unchanged (compare column 2 and 3 in Table 2), confirming that the heterogeneous effect of the real exchange rate according to firms' managerial intensity (our contribution) does not boil down to differences in productivity.

In columns (4) and (5) we control respectively for the firm-product-destination rank variable ($Rank_{ipjt}$) and its interaction with the RER. This allows us to take into account the role of the within-firm product performance emphasized by Chatterjee et al. (2013) and Bernini and Tomasi (2015). Importantly, our coefficient of interest remains positive and significant, suggesting that conditional on total factor productivity and product performance, firms with larger managerial intensity have larger pricing-to-market. As explained above, we compute the product rank within a given firm-destination-year combination based on export *revenues* as the rank of a product p exported by firm i in a given destination j at time t on the total exports of the firm into that destination and year. Our results are robust if instead we compute the product rank based on export *quantity*.[15] These results are available in the Appendix Table A3. Finally, in the Appendix Table A4, rather than using the managerial intensity of firms in 1995, we use the first year in which the firm appears in the estimation sample, and the results hold.

In the middle part of Table 2 we propose a quantification of our findings, and report the percentage change in the export price (i.e. export price elasticity) due to a 10 percent RER depreciation for respectively firms having average and one standard deviation above the average managerial intensity. The export price elasticity increases from 5.6% in column (4) to 8.2% in column (5) for firms with average managerial intensity. Instead, for managerial intensive firms, i.e. firms one standard deviation above the mean, the elasticity increases respectively from 9.7% to 12.4%, suggesting a 51% (column 5) to 73% (column 4) increase in the export price elasticity with respect to the average firm for a 10 percent RER depreciation.[16]

[15] In that case, the coefficient on *Rankipjt* is positive, consistent with the notion that products sold in smaller quantities, i.e., those with a high $Rank_{ipjt}$ value, tend to have higher prices due to lower production efficiency.

[16] In this paper we focus on pricing-to-market strategies of exporting firms, however for the interested reader, in the Appendix Table A5 we present the results for the estimates of real exchange variations on the logarithm of firm-product-destination export volumes and export values that corroborated previous findings in the literature. As expected, after a depreciation of the real exchange rate at destination, exporting firms increase their export volumes. This effect is lower for firms with a higher managerial intensity. This finding indicates that firms with a larger share of managers adjust their volumes less but increase their markups (export prices) more in response to real exchange rate shocks.

Table 2: RER and the export price of firms.

Dep var:	Ln(export price)				
	(1)	(2)	(3)	(4)	(5)
RER_{jt} (ln)	0.054***	0.053***	0.051***	0.056***	0.082***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.012)
RER_{jt} (ln) × $M_{i,95}$		0.046***	0.043***	0.041***	0.042***
		(0.009)	(0.009)	(0.009)	(0.009)
RER_{jt} (ln) × $TFP_{i,95}$			0.013**	0.015**	0.016***
			(0.006)	(0.006)	(0.006)
$Rank_{ipjt}$				-0.004***	-0.003***
				(0.000)	(0.000)
RER_{jt} (ln) × $Rank_{ipjt}$					-0.005***
					(0.001)
	Quantification				
	Price elasticity to 10% RER ↑ for firms:				
Average Firm	0.54	0.53	0.51	0.56	0.82
with one s.d. $M_{i,95}$ above avg $M_{i,95}$	-	0.99	0.94	0.97	1.24
with one s.d. $TFP_{i,95}$ above avg $TFP_{i,95}$	-	-	0.64	0.71	0.98
with one s.d. $Rank_{ipjt}$ larger above top product	-	-	-	-	0.10
Firm-Product-Destination FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	2231071	2231071	2231071	2231071	2231071
R^2	0.911	0.911	0.911	0.911	0.911
Adj. R^2	0.884	0.884	0.884	0.885	0.885
Cluster	jt	jt	jt	jt	jt

Notes: The dependent variable is the logarithm of the firm-product-destination export unit value (value over volume) in year t. In column (2) to (4) firm managerial intensity and TFP are normalised to have zero mean and standard deviation of one. The rank product variables are computed by firm-destination-year, and normalized such that the core product has rank 0. Consequently, the average firm in columns (4) to (6) reflects the behavior of a firm with average values of $M_{i,95}$ and $TFP_{i,95}$ for its top exported product in that destination. Robust standard errors clustered by destination country-year. ***p<0.1; **p<0.05; *p<0.01.

4.3 Alternative explanations and complementarity in price setting

This section tests the robustness of our baseline results to three other alternative mechanisms (i.e., confounding factors) that may explain the heterogeneous pricing-to-market behavior of firms.

First, we investigate the role of firm level output quality in the heterogeneous response of firms to RER movements. Since we are interested in disentangling the different responses of exporting firms to RER variations based on within-firm managerial intensity, relative to the quality channel highlighted by Chen and Juvenal (2016), we control for the heterogeneous reaction to RER changes using the average quality of all products exported by firms to a destination in the initial year of export. We measure firm-destination level output quality by relying on the methodology proposed by Khandelwal et al. (2013). Namely, we estimate quality as a demand shifter that corresponds to the residual of an OLS estimation of the quantity and unit value (multiplied by the elasticity of substitution) on country-time fixed effects (to control for price index and income at destination) and product fixed effects (to control for variation across products since prices and quantities are not comparable across products). The estimated quality is a function of the residual of such estimation re-scaled by the elasticity of substitution (minus one).[17] We estimate firm-product-destination quality of exported products by 2-digit sectors computed using French trade flows and the elasticity of substitution estimated in Broda et al. (2006). Next, we take the average of output quality across all products to a destination reached by the firm in the initial year and interact this measure with the RER. Our results are robust when using alternative trade elasticities computed by Fontagné et al. (2022).

Table 3 presents the results. The estimation sample, which includes firm-destination-level quality controls, is slightly smaller than our baseline sample. Therefore, to facilitate coefficient comparison, we first replicate the baseline estimation in column (1) without additional controls for alternative explanations. The coefficients of interest on the RER and the interaction term between the RER and firms' managerial intensity are of the same magnitude as the ones presented in column (5) of Table 2. Next, we include in column (2) the interaction term between real exchange rate and the initial level of firm-destination quality, the positive sign confirms the findings obtained in the previous literature: firms producing high-quality products react to a real exchange rate depreciation by increasing relatively more their export prices (Bernini and Tomasi, 2015 and Chen and Juvenal, 2016). Our results on the interaction between RER and initial firm-level managerial intensity, $RERjt \times M_{i,95}$, remain robust and stable. Coefficients are of a similar magnitude to those presented in our baseline specification in Table 2 suggesting that the within-firm managerial intensity channel we highlight is not driven by an output quality channel. Since managerial intensity and TFP are computed at the firm level, in the last column, we provide an alternative quality measure, defined as the average quality across all products and destinations at the firm level in the initial year. Results are similar to the ones using the quality measure at the firm-destination level.

Second, we examine whether our previous results are influenced by heterogeneous changes in the marginal costs of imported inputs that firms might experience due to fluctuations in the RER. This mechanism is highlighted in Amiti et al. (2014). To capture this effect, we construct

[17] See Khandelwal et al. (2013) section C for more details on quality measure estimations.

Table 3: Controlling for the role of quality

Dependent variable:	Ln(export price)		
	(1)	(2)	(3)
RER_{jt} (ln)	0.091***	0.091***	0.092***
	(0.014)	(0.014)	(0.014)
RER_{jt} (ln) × $M_{i,95}$	0.042***	0.040***	0.040***
	(0.010)	(0.010)	(0.010)
RER_{jt} (ln) × $TFP_{i,95}$	0.017**	0.017**	0.017**
	(0.007)	(0.007)	(0.007)
$Rank_{ipjt}$	-0.003***	-0.003***	-0.003***
	(0.000)	(0.000)	(0.000)
RER_{jt} (ln) × $Rank_{ipjt}$	-0.005***	-0.005***	-0.005***
	(0.001)	(0.001)	(0.001)
RER_{jt} (ln) × $Quality_{ij,tmin}$		0.032***	
		(0.004)	
RER_{jt} (ln) × $Quality_{i,tmin}$			0.024***
			(0.004)
	Quantification		
	Price elasticity to 10% RER ↑ for firms:		
Average Firm	0.91	0.91	0.92
with one s.d. $M_{i,95}$ above avg $M_{i,95}$	1.33	1.31	1.32
with one s.d. $TFP_{i,95}$ above avg $TFP_{i,95}$	1.08	1.08	1.09
with one s.d. $Quality_{ij,tmin}$ above avg. $Quality_{ij,tmin}$	-	1.23	-
with one s.d. $Quality_{i,tmin}$ above avg. $Quality_{i,tmin}$	-	-	1.16
Firm-Product-Destination FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	1,998,168	1,998,168	1,998,168
R^2	0.907	0.907	0.907
Adjusted R^2	0.881	0.881	0.881
Cluster	jt	jt	jt

Notes: The dependent variable is the logarithm of the firm-product-destination export unit value. In column (1) to (3) firm managerial intensity, TFP and quality measures are normalised to have zero mean and standard deviation of one. The rank product variables are computed by firm-destination-year, and normalized such that the core product has rank 0. Consequently, the average firm in columns (1) to (3) reflects the behavior of a firm with average values of $M_{i,95}$, $TFP_{i,95}$ and $Quality_{ij,tmin}$ (or $Quality_{i,tmin}$) for its top exported product in that destination. Standard errors are clustered at the country of destination-year level. ***p<0.01; **p<0.05; *p<0.1.

an import-specific RER variable at the 2-digit industry level (NACE Rev. 1.1). Specifically, we calculate the weighted average of RER across all import sources for a given industry s at time t. The weights reflect each sourcing country's share of the industry's total imports, aggregated over all years. To mitigate endogeneity concerns related to firms' sourcing decisions, these weights are computed by excluding the firm in question, making *de facto* the variable to be firm-sector-time specific.[18]

The import RER has been constructed such that an increase of the industry level import RER means an appreciation of the euro, and thereby imports become less costly. We expect then a negative sign of the import RER on firm level export prices. Firms operating in industries that experience an appreciation (increase in import RER) gain access to cheaper intermediate goods and, consequently, reduce their export prices. Results are presented in Table 4. The first column just shows the effect of import RER (the imported inputs channel) on export prices. Results suggest that firms that faced reductions in their marginal costs associated to cheaper imported inputs (increase in import RER) reduce their export prices. The second column shows the effect of import RER on export prices depending on the managerial intensity of the firm. Our estimates suggest that firms with higher managerial intensity adjust more their export prices when facing imported inputs shocks related to variations of RER affecting the sourcing country of imported inputs. The last column includes our variable of interest, the interaction term between RER affecting the exported products in a certain destination and the managerial intensity of the firm. Reassuringly, our coefficient of interest remains robust.

Third, recent literature on strategic price complementarity suggests that firms adjust their prices based on their competitors' pricing decisions. Relying on micro-level dataset for the Belgian manufacturing sector on domestic prices, Amiti et al. (2019) analyze firms' price responses to changes in competitor prices and show strategic complementarities in price setting across firms. Their findings suggest that, holding their marginal costs constant, firms increased their prices in response to an increase in the prices of their competitors. We take into account this mechanism by including in our export price estimation the price of firm i's competitors in each market, $Price_{ipjt}$.

[18] For example, when calculating the import RER for sector s, we exclude the imports of firm i within that sector. This is the formula used to calculate the import RER:

$$\text{ImportRER}_{ist} = \sum_j \left[RER_{jt} \times \left(\frac{\sum_t \sum_{f \neq i} Imports_{fsjt}}{\sum_t \sum_j \sum_{f \neq i} Imports_{fsjt}} \right) \right] \tag{8}$$

where $Imports_{fsjt}$ are the imports of a given firm f, form origin j in the 2-digit NACE sector s in year t.

Table 4: Controlling for changes in marginal costs due to RER Import Shocks

Dep var:	Ln(export price)		
	(1)	(2)	(3)
ImportRER$_{ist}$	-0.223***	-0.224***	-0.213***
	(0.078)	(0.071)	(0.072)
ImportRER$_{ist}$ × $M_{i,95}$		-0.109***	-0.073***
		(0.022)	(0.027)
ImportRER$_{ist}$ × $TFP_{i,95}$		-0.017	-0.016
		(0.023)	(0.023)
RER_{jt} (ln)			0.053***
			(0.013)
RER_{jt} (ln) × $M_{i,95}$			0.025**
			(0.012)
Firm-Product-Destination FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	2225429	2225429	2225429
R^2	0.911	0.911	0.911
Adj. R^2	0.884	0.884	0.884
Cluster	jt	jt	jt

The dependent variable is the log of the firm-product-destination export unit value. $ImportRER_{ist}$ is the weighted average real exchange rate across all import origins—excluding the firm's own imports—using each origin's share of industry imports as weights. A higher $ImportRER_{ist}$ indicates an appreciation of the euro and thus cheaper imports. In columns (2) and (3), managerial intensity and TFP are standardized to have mean zero and standard deviation one. Standard errors are clustered at the country of destination-year level. ***p<0.01; **p<0.05; *p<0.1.

This price is computed as the average price of all firms exporting the same product (HS 6-digit) to a given destination and year excluding the export price of the specific firm i. Results are presented in Table 5. Our findings show that French exporting firms react by increasing their prices when their competitors raised their prices - as in Amiti et al. (2019) for Belgian firms. Our variable of interest is robust and stable to this control, and our results are not driven by systematic differences across firms on their competitors price strategy.

Table 5: RER and Export Pricing – Controlling for Competitor Prices.

Dep var:	Ln(export price)			
	(1)	(2)	(3)	(4)
RER_{jt} (ln)	0.057***	0.055***	0.053***	0.085***
	(0.015)	(0.015)	(0.015)	(0.014)
$Price_{ipjt}$ (ln)	0.016***	0.016***	0.016***	0.016***
	(0.002)	(0.002)	(0.002)	(0.002)
RER_{jt} (ln) × $M_{i,95}$		0.049***	0.047***	0.046***
		(0.010)	(0.010)	(0.010)
RER_{jt} (ln) × $TFP_{i,95}$			0.012	0.017*
			(0.009)	(0.010)
$Rank_{ipjt}$				-0.003***
				(0.000)
RER_{jt} (ln) × $Rank_{ipjt}$				-0.004***
				(0.001)
Firm-Product-Destination FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	2020040	2020040	2020040	2020040
R^2	0.906	0.906	0.906	0.906
Adj. R^2	0.878	0.878	0.878	0.878
Cluster	jt	jt	jt	jt

Notes: The dependent variable is the logarithm of the firm-product-destination export unit value (value over volume) in year t. In column (2) to (4) firm managerial intensity and productivity are normalised to have zero mean and a standard deviation of one. $Price_{ipjt}$ is computed as the average price of all firms exporting the same HS6 to a destination and year excluding the export price of firm i. Standard errors are clustered at the country of destination-year level. ***p<0.1; **p<0.05; *p<0.01

5 Robustness tests

This section carries out some sensitivity tests to check the robustness of our baseline results to: (i) alternative ways of defining our proxies of firm managerial intensity, (ii) symmetry in RER movement, (iii) controlling for firm size effect, (iv) dynamic effect of RER, (v) type of exported product and (vi) alternative set of fixed effects and sensitivity to destination regions.

Alternative proxies of managerial skills. First, we approximate the ability of managers with their residual wage from Mincerian wage regression. The idea is getting closer to the theoretical framework and use a (coarse) proxy of the ability of managers in the firm rather that the simple (but precisely measured) measure of firm managerial intensity used so far. Namely, we first estimate a worker-level Mincerian wage regression using the workers' gender, age, age squared as controls, as well as firm, occupation and sector fixed effects. The residual of this Mincerian wage regression captures the wage component based on *unobservable* workers' characteristics, here used as a proxy for their *ability*. Then, we calculate the average residual wage (i.e. ability) of top-1, top-2 and top-5 manager workers in each firm-year. Finally, we interact the ability of the top-1, top-2 and top-5 manager workers in each firm in the initial year with the RER variable. Managerial tasks are typically sub-modular, so what really matters for the overall quality of the managerial team's production is the quality of the top-managers.[19] For this reason we use the average ability of top-n managers as a proxy for the managerial ability of the firm. Results in Table 6 show that our results are robust and stable when using such an alternative measure of firms' managerial ability. The similarity between point estimates in Table 6 and 2 suggests that our baseline proxy for λ_i (i.e. managerial intensity) is isomorphic with the proxy for managerial ability in Table 6.[20]

To further assess the robustness of our findings, we draw on alternative definitions of managerial personnel using O*NET's skill-based classifications. First, we link each worker's PCS occupation code to the corresponding O*NET classification, and identify as managerial positions those O*NET Classification titles labeled as "Chief", "Manager" or "Executive". As shown in Table 7, this alternative approach confirms that our primary results remain robust. Next, we use the O*NET Classification of STEM (Science, Technology, Engineering, and Mathematics) occupations to differentiate among skilled positions—specifically those relating to managerial tasks, R&D activities, engineering, and sales. We express each of these categories as a share of the firm's total workforce in 1995 and analyze how RER fluctuations affect export prices based on different intensities of these skill groups. The estimates from Table 8 show that a higher share of managers (as well as R&D workers) drive more pronounced heterogeneous pricing-to-market

[19] Managerial tasks are problem-solving intensive, sub-modular in nature, and therefore what matters is the presence of high-quality managers in the team. In problem-solving tasks what matters is the presence of a good worker (manager) that solves the problem, no matter whether other employers work on the same issue.

[20] In column (4) of Table 6 we show results using the average ability of all managers in the firms. While the sign of the coefficient of interest is in line with our baseline results, it is imprecisely estimated. This supports our argument on the importance of Top-n managers for the overall quality of the management of the firm.

behavior compared to engineers, technicians, and sales staff. This suggests that, in line with our baseline results, firms with stronger managerial expertise are better positioned to buffer cost shocks through export price adjustments, likely due to their higher markups.

Finally, Table A6 shows a robustness check omitting Chief Technical Officers (PCS code 37 in the French classification) from the managerial intensity measure, thus focusing solely on Chief Executive Officers (PCS code 38). These results again support the robustness of our conclusions under an alternative definition of managerial intensity.

Depreciation *vs* Appreciation. So far, we have assumed that firms' pricing-to-market responses to RER movements are symmetric in cases of appreciation and depreciation. In Table A7 we explicitly test whether this is verified in the data. We disentangle RER movement into depreciation (i.e. dummy equal to one if $\Delta RER > 0$) and appreciation (i.e. dummy equal to one if $\Delta RER < 0$), and interact our RER variable with these dummies. By doing so, we are able to estimate the effect of RER movements on the pricing-to-market of firms in case of appreciation or depreciation of the real exchange rate. We also interact the two RER movements by our baseline managerial intensity variable. Results in Table A7 show that the pricing-to-market reaction to RER movement are symmetric: appreciation and depreciation have the same elasticity both on average and by managerial intensity of firms.

The role of firm size. We now disentangle the effect of managerial intensity from firm size by extending our main analysis and adding interaction terms between RER and the three quartiles of initial size of the firm. Table A8 presents the results. In columns (1) to (3) firm initial size is measured by initial firm' sales and in columns (4) to (6) by initial firm' employment, where the first quartile (corresponding to the group of smallest firms) is used as the benchmark. Our estimates suggest that bigger firms have larger exporter price elasticity to RER variations, while small firms show full pass-through behaviour. More importantly, our coefficients of interest on the heterogeneous effects of RER depending on managerial intensity are robust and stable and of a similar magnitude relative to the baseline estimation in Table 2.

Dynamic effects. Our previous results show the contemporaneous adjustment of firms' export price to RER variations. However, if prices are sluggish/difficult to adjust, the response may come with some delay. In Table A9, we explore the possible dynamic effects by looking at the lagged effect of RER changes on firm' export prices. Our findings suggest that the average firm adjusts to pass-though shocks up to the second year, while firms with higher managerial skills tend to respond for longer periods.

The role of the type of exported product. Firms producing and exporting final consumption goods, as opposed to intermediate goods, may find it easier to implement pricing-to-market strategies. We explore this channel in Table A10 that presents the results of the baseline estimation splitting the sample between firms exporting intermediate goods in columns (1) to (3), and firms exporting final goods in columns (4) to (6). We follow the United Nations classification of products according to Broad Economic Categories (BEC) to classify final *vs* intermediate products. Our findings show that the heterogeneous export-price elasticity depending on both managerial intensity and TFP are significant only for firms exporting final goods.

Alternative set of fixed effects and sensitivity to destination regions. The omission of (unobserved) destination-product demand shocks, affecting the export of French firms, may raise an omitted variable concern. In Table A11 column (1), we include destination-HS2-year fixed effects to account for any shocks specific to a destination and sector.[21] Column (2) adds firm-year fixed effects to control for any firm-time specific factor, and for any demand/supply shocks affecting a firm's exports across different markets. Finally, column (3) includes HS6 product-year fixed effects to capture both unobserved demand shocks across all markets and product cycles. The coefficient of interest remains positive and statistically significant across all these specifications.

Notwithstanding the presence of firm-product-destination fixed effects in our estimations, one may also be concerned that our results are driven by unobserved shocks specific to a sub-set of destination countries. Omitting these countries would invalidate our findings. To address this concern, in Table A12 we replicate our baseline estimation as in eq. (7), sequentially excluding one destination region at a time. Reassuringly, our key coefficients remain robust in both sign and magnitude across all specifications.

[21]Note that the RER variable is absorbed by the destination-HS2-year fixed effects, allowing identification only through its interaction with managerial intensity.

Table 6: RER and the export price of firms - Managerial Ability.

Dep var:	Ln(export price)			
	(1)	(2)	(3)	(4)
RER_{jt} (ln)	0.083***	0.082***	0.082***	0.086***
	(0.012)	(0.012)	(0.012)	(0.012)
RER_{jt} (ln) × $TFP_{i,95}$	0.019***	0.019***	0.018***	0.022***
	(0.006)	(0.006)	(0.006)	(0.006)
RER_{jt} (ln) × $MAbility\ TOP1_{i,95}$	0.029***			
	(0.007)			
RER_{jt} (ln) × $MAbility\ TOP3_{i,95}$		0.033***		
		(0.008)		
RER_{jt} (ln) × $MAbility\ TOP5_{i,95}$			0.034***	
			(0.008)	
RER_{jt} (ln) × $MAbility\ Avg_{i,95}$				0.005
				(0.003)
$Rank_{ipjt}$	-0.003***	-0.003***	-0.003***	-0.003***
	(0.000)	(0.000)	(0.000)	(0.000)
RER_{jt} (ln) × $Rank_{ipjt}$	-0.005***	-0.005***	-0.005***	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)
Observations	2099095	2099095	2099095	2099095
R^2	0.910	0.910	0.910	0.910
Adj. R^2	0.884	0.884	0.884	0.884
Cluster	jt	jt	jt	jt

Notes: The dependent variable is the logarithm of the firm-product-destination export unit value (value over volume) in year t. Managerial Ability is measured as the average residual from a Mincer equation, where workers' hourly wages are regressed on individual characteristics (occupation type, gender, age, and age squared) and firm characteristics (department, industry, and all time-invariant factors through firm fixed effects). The metric is computed for the top 1, top 3, and top 5 managers (PCS 37 and 38) based on their managerial ability in 1995 and is normalized to have a mean of zero and a standard deviation of one. Standard errors are clustered at the country of destination-year level. ***p<0.1; **p<0.05; *p<0.01.

Table 7: RER and the export price of firms - Definition of Managers using ONET.

	(1)	(2)	(3)	(4)	(5)
	Ln(export price)				
RER_{jt} (ln)	0.055***	0.062***	0.058***	0.062***	0.086***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
RER_{jt} (ln) × ONET Manag. $sh_{i,95}$		0.027***	0.029***	0.027***	0.019**
		(0.007)	(0.007)	(0.007)	(0.007)
RER_{jt} (ln) × TFP$_{i,95}$			0.023***	0.024**	0.026**
			(0.006)	(0.006)	(0.006)
$Rank_{ipjt}$				-0.004**	-0.002**
				(0.000)	(0.000)
RER_{jt} (ln) × $Rank_{ipjt}$					-0.004***
					(0.001)
Observations	1549636	1549636	1549636	1549636	1549636
R^2	0.911	0.911	0.911	0.911	0.911
Adj. R^2	0.884	0.884	0.884	0.885	0.885
Cluster	jt	jt	jt	jt	jt

Notes: The dependent variable is the logarithm of the firm-product-destination export unit value (value over volume) in year t. ONET Manag.$sh_{i,95}$ represents the initial share of managers in the workforce, defined as occupations with job titles containing "Manager," "Chief," or "Executive" in the O*NET Task Classification. Both *ONET Manag.* $sh_{i,95}$ and TFP are normalized to have a mean of zero and a standard deviation of one. Standard errors are clustered at the country of destination-year level. ***p<0.1; **p<0.05; *p<0.01.

Table 8: RER and the export price of firms - Decomposing STEM workforce.

Dep var:	Ln(export price)			
	(1)	(2)	(3)	(4)
RER_{jt} (ln)	0.062***	0.059***	0.063***	0.086***
	(0.012)	(0.012)	(0.012)	(0.012)
RER_{jt} (ln) × Manag. $sh_{i,95}$	0.045***	0.045***	0.044***	0.039***
	(0.008)	(0.008)	(0.008)	(0.007)
RER_{jt} (ln) × R&D $sh_{i,95}$	0.038**	0.039**	0.036**	0.027*
	(0.015)	(0.015)	(0.015)	(0.015)
RER_{jt} (ln) × Engin. $sh_{i,95}$	0.009	0.006	0.009	0.020**
	(0.009)	(0.009)	(0.009)	(0.010)
RER_{jt} (ln) × Sales Rep. $sh_{i,95}$	0.001	-0.002	-0.002	-0.001
	(0.016)	(0.015)	(0.016)	(0.015)
RER_{jt} (ln) × $TFP_{i,95}$		0.021***	0.022***	0.023***
		(0.006)	(0.006)	(0.006)
$Rank_{ipjt}$			-0.004***	-0.002***
			(0.000)	(0.000)
RER_{jt} (ln) × $Rank_{ipjt}$				-0.004***
				(0.001)
Firm-Product-Destination FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	1549636	1549636	1549636	1549636
R^2	0.911	0.911	0.911	0.911
Adj. R^2	0.884	0.884	0.885	0.885
Cluster	jt	jt	jt	jt

Notes: The dependent variable is the logarithm of the firm-product-destination export unit value (value over volume) in year t. All skills shares and TFP are normalised to have zero mean and a standard deviation of one. The grouping of the STEM occupations has been carried out using the ONET Classification, and performing a matching with French occupations. Standard errors are clustered at the country of destination-year level. ***p<0.1; **p<0.05; *p<0.01

6 Conclusion

This paper sheds light on a new and unexplored mechanism through which firm performance affects the heterogeneous reaction of exporters to real exchange rate changes. We examine the specific effect of firms' managerial intensity in shaping heterogeneous pricing-to-market decisions of exporting firms. Relying on detailed firm-product-destination-level export data from France, matched with specific information on firms' skill composition by occupation for the period 1995–2007, we find that firms with greater managerial intensity react to a depreciation of the real exchange rate by increasing their export prices (markups) more, even after accounting for differences in firms' TFP, product performance, quality, and marginal costs. These findings support the predictions of a simple theoretical framework with firm heterogeneity and variable markups, which posits that firms with higher managerial intensity are able to secure higher profits, larger market shares, and greater markups, thereby adjusting their export prices more when faced with a real exchange rate shock. Our analysis does not lack policy implications. In anticipating how a given sector would react to foreign RER shocks, policymakers should also consider the managerial composition of firms.

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A Appendix tables (For Online Publication)

Table A1: Estimating Sample

Year	# Obs	Exports (bln)	# Firms	# HS6	# Countries
1995	236,511	41.17	9,819	4,465	164
1996	267,231	43.62	10,232	4,506	164
1997	266,292	49.20	9,825	4,527	164
1998	278,764	51.16	10,173	4,496	164
1999	275,945	44.93	9,956	4,522	163
2000	291,150	52.99	10,286	4,510	163
2001	287,556	47.82	10,275	4,523	165
2002	321,391	53.36	10,576	4,541	165
2003	285,493	43.64	10,213	4,523	165
2004	300,239	47.79	10,120	4,530	163
2005	335,620	51.29	10,677	4,521	164
2006	354,569	58.63	10,719	4,538	164
2007	399,835	60.43	10,459	4,619	165

Notes: Authors' computations from French customs data, 1995–2007. Export values are in billions of euros. The sample includes only transactions to non-Eurozone countries.

Table A2: Defining productivity as value added per non-manager worker.

Dep var:	Ln(export price)			
	(1)	(2)	(3)	(4)
RER_{jt} (ln)	0.043***	0.048***	0.052***	0.077***
	(0.014)	(0.013)	(0.013)	(0.012)
RER_{jt} (ln) $\times$ $M_{i,95}$		0.023***	0.022***	0.023***
		(0.008)	(0.008)	(0.008)
RER_{jt} (ln) $\times$ $LaborProd_{i,95}$		0.017**	0.018**	0.019**
		(0.008)	(0.008)	(0.008)
$Rank_{ipjt}$			-0.004***	-0.003***
			(0.000)	(0.000)
RER_{jt} (ln) $\times$ $Rank_{ipjt}$				-0.004***
				(0.001)
Firm-Product-Destination FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	3,592,581	3,592,581	3,592,581	3,592,581
R^2	0.908	0.908	0.908	0.908
Adj. R^2	0.880	0.880	0.880	0.880
Cluster	jt	jt	jt	jt

Notes: The dependent variable is the logarithm of the firm-product-destination export unit value (value over volume) in year t. Firm managerial intensity and productivity are normalized to have zero mean and a standard deviation of one. The rank product variables are computed by firm-destination-year and normalized such that the core product has rank 0. Standard errors are clustered at the country of destination-year level. ***p<0.01; **p<0.05; *p<0.1.

Table A3: Defining product rank based on quantity.

Dep var:	Ln(export price)				
	(1)	(2)	(3)	(4)	(5)
RER_{jt} (ln)	0.054***	0.053***	0.051***	0.034**	0.181***
	(0.013)	(0.013)	(0.013)	(0.014)	(0.016)
RER_{jt} (ln) $\times$ $M_{i,95}$		0.046***	0.043***	0.050***	0.056***
		(0.009)	(0.009)	(0.010)	(0.010)
RER_{jt} (ln) $\times$ $TFP_{i,95}$			0.013**	0.008	0.018***
			(0.006)	(0.006)	(0.006)
$Rank\_Quantity_{ipjt}$				0.015***	0.020***
				(0.001)	(0.001)
RER_{jt} (ln) $\times$ $Rank\_Quantity_{ipjt}$					-0.025***
					(0.001)
Firm-Product-Destination FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	2231071	2231071	2231071	2231071	2231071
R^2	0.911	0.911	0.911	0.913	0.914
Adj. R^2	0.884	0.884	0.884	0.887	0.888
Cluster	jt	jt	jt	jt	jt

Notes: The dependent variable is the logarithm of the firm-product-destination export unit value (value over volume) in year t. In column (2) to (4) firm managerial intensity and productivity are normalised to have zero mean and a standard deviation of one. The rank product variables are computed by firm-destination-year, and normalized such that the core product has rank 0. Standard errors are clustered at the country of destination-year level. ***p<0.01; **p<0.05; *p<0.1.

Table A4: RER and the export price of firms. Managerial intensity based on the first year in which the firm is active

Dep var:	Ln(export price)				
	(1)	(2)	(3)	(4)	(5)
RER_{jt} (ln)	0.052***	0.050***	0.049***	0.052***	0.076***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.011)
RER_{jt} (ln) $\times$ $M_{i,FirstYear}$		0.045***	0.043***	0.042***	0.042***
		(0.007)	(0.007)	(0.007)	(0.007)
RER_{jt} (ln) $\times$ $TFP_{i,FirstYear}$			0.009*	0.011*	0.008
			(0.005)	(0.006)	(0.005)
$Rank_{ipjt}$				-0.004***	-0.003***
				(0.000)	(0.000)
RER_{jt} (ln) $\times$ $Rank_{ipjt}$					-0.004***
					(0.001)
Firm-Product-Destination FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	3375562	3375562	3375562	3375562	3375562
R^2	0.914	0.914	0.914	0.914	0.914
Adj. R^2	0.886	0.886	0.886	0.886	0.886
Cluster	jt	jt	jt	jt	jt

Notes: The dependent variable is the logarithm of the firm-product-destination export unit value (value over volume) in year t. $M_{i,FirstYear}$ denotes the firm's managerial intensity in its first year of presence in the sample. In columns (2) to (4), both managerial intensity and productivity are normalized to have a mean of zero and a standard deviation of one. The rank product variables are computed by firm-destination-year, and normalized such that the core product has rank 0. Standard errors are clustered at the country of destination-year level. ***p<0.1; **p<0.05; *p<0.01.

Table A5: RER and the export quantity and value of firms

Dep var:	Ln(export quantity)		Ln(export value)	
	(1)	(2)	(3)	(4)
RER_{jt} (ln)	0.324***	0.325***	0.378***	0.379***
	(0.037)	(0.037)	(0.034)	(0.033)
RER_{jt} (ln) $\times$ $M_{i,95}$		-0.064***		-0.017
		(0.017)		(0.014)
Firm-Product-Destination FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	2231071	2231071	2231071	2231071
R^2	0.863	0.863	0.812	0.812
Adj. R^2	0.823	0.823	0.757	0.757
Cluster	jt	jt	jt	jt

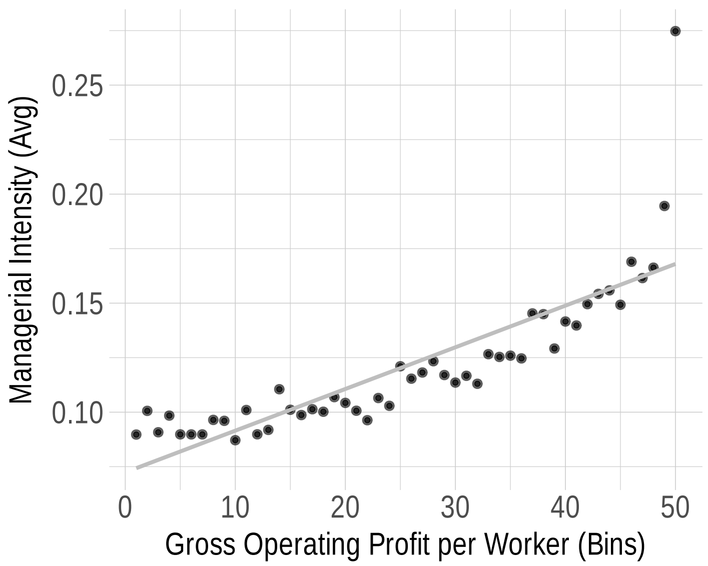
Notes: The dependent variable in columns (1) and (2) is the logarithm of the firm-product-destination export quantity (tons) in year t, while it is the export value (euro) for columns (3) and (4). Firm managerial intensity is normalised to have zero mean and a standard deviation of one. The robust standard errors are clustered by country-destination. ***p<0.01; **p<0.05; *p<0.1.

Table A6: Exclusion of Chief Technical Officers.

Dep var:	Ln(export price)			
	(1)	(2)	(3)	(4)
RER_{jt} (ln)	0.054***	0.050***	0.055***	0.081***
	(0.013)	(0.013)	(0.013)	(0.012)
RER_{jt} (ln) $\times$ $M_{i,95}$		0.029***	0.028***	0.028***
		(0.010)	(0.010)	(0.010)
RER_{jt} (ln) $\times$ $TFP_{i,95}$			0.017***	0.019***
			(0.006)	(0.006)
$Rank_{ipjt}$			-0.004***	-0.003***
			(0.000)	(0.000)
RER_{jt} (ln) $\times$ $Rank_{ipjt}$				-0.004***
				(0.001)
Firm-Product-Destination FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	2231071	2231071	2231071	2231071
R^2	0.911	0.911	0.911	0.911
Adj. R^2	0.884	0.884	0.885	0.885
Cluster	jt	jt	jt	jt

Notes: The dependent variable is the logarithm of the firm-product-destination export unit value (value over volume) in year t. In column (2) to (4) firm managerial intensity and productivity are normalised to have zero mean and a standard deviation of one. The rank product variables are computed by firm-destination-year, and normalized such that the core product has rank 0. Standard errors are clustered at the country of destination-year level. ***p<0.1; **p<0.05; *p<0.01.

Figure A1: Managerial Intensity and Profitability.



Notes: Firms' operating profits per worker are divided into 50 bins. The horizontal axis represents bins of gross operating profits per worker, while the vertical axis shows the average managerial intensity for each bin.

Table A7: Disentangling Appreciation vs Depreciation.

Dep var:	Ln(export price)			
	(1)	(2)	(3)	(4)
RER_{jt} (ln) $\times D^{Appr}$	0.055***			
	(0.014)			
RER_{jt} (ln) $\times D^{Depr}$	0.054***			
	(0.015)			
RER_{jt} (ln) $\times D^{Appr} \times\ M_{i,95}$		0.062***	0.058***	0.060***
		(0.011)	(0.012)	(0.012)
RER_{jt} (ln) $\times D^{Depr} \times\ M_{i,95}$		0.040***	0.036***	0.036***
		(0.010)	(0.010)	(0.010)
RER_{jt} (ln) $\times D^{Appr} \times\ TFP_{i,95}$			0.019***	0.024***
			(0.007)	(0.007)
RER_{jt} (ln) $\times D^{Depr} \times\ TFP_{i,95}$			0.019***	0.026***
			(0.006)	(0.006)
RER_{jt} (ln) $\times D^{Depr} \times\ Rank_{ipjt}$				-0.007***
				(0.001)
RER_{jt} (ln) $\times D^{Appr} \times\ Rank_{ipjt}$				-0.005***
				(0.001)
Firm-Product-Destination FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	2231071	2231071	2231071	2231071
R^2	0.911	0.911	0.911	0.911
Adj. R^2	0.884	0.884	0.884	0.885
Cluster	jt	jt	jt	jt

Notes: The dependent variable is the logarithm of the firm-product-destination export unit value (value over volume) in year t. RER movements are split into appreciation ($D^{Appr} = 1$ if $\Delta RER < 0$) and depreciation ($D^{Depr} = 1$ if $\Delta RER > 0$), which are interacted with RER to capture asymmetric effects. In column (2) to (4) firm managerial intensity and TFP are normalized to have zero mean and a standard deviation of one. The rank product variables are computed by firm-destination-year, and normalized such that the core product has rank 0. Standard errors are clustered at the country of destination-year level. ***p<0.1; **p<0.05; *p<0.01.

Table A8: Controlling for the heterogeneous effects of firm size

Dep var:	Ln(export price)					
	(1)	(2)	(3)	(4)	(5)	(6)
RER_{jt} (ln)	0.008	0.017	0.025	0.029	0.031	0.042**
	(0.025)	(0.025)	(0.024)	(0.021)	(0.022)	(0.021)
RER_{jt} (ln) $\times$ $M_{i,95}$		0.041***	0.037***		0.042***	0.039***
		(0.009)	(0.009)		(0.009)	(0.009)
RER_{jt} (ln) $\times$ $TFP_{i,95}$		0.013**	0.010*		0.012*	0.011*
		(0.006)	(0.006)		(0.006)	(0.006)
$Rank_{ipjt}$			-0.003***			-0.003***
			(0.000)			(0.000)
$Rank_{ipjt}$ $\times$ RER_{jt} (ln)			-0.005***			-0.005***
			(0.001)			(0.001)
$Q2_{i,sales,95}$ $\times$ RER_{jt} (ln)	0.036	0.032	0.035			
	(0.023)	(0.023)	(0.024)			
$Q3_{i,sales,95}$ $\times$ RER_{jt} (ln)	0.058***	0.048**	0.062***			
	(0.021)	(0.020)	(0.022)			
$Q4_{i,sales,95}$ $\times$ RER_{jt} (ln)	0.060**	0.039*	0.095***			
	(0.024)	(0.023)	(0.031)			
$Q2_{i,empl,95}$ $\times$ RER_{jt} (ln)				-0.007	-0.006	-0.007
				(0.017)	(0.017)	(0.017)
$Q3_{i,empl,95}$ $\times$ RER_{jt} (ln)				0.036*	0.035*	0.043**
				(0.019)	(0.019)	(0.020)
$Q4_{i,empl,95}$ $\times$ RER_{jt} (ln)				0.045**	0.033	0.088***
				(0.021)	(0.020)	(0.027)
Firm-Product-Destination FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2231071	2231071	2231071	2231071	2231071	2231071
R^2	0.911	0.911	0.911	0.911	0.911	0.911
Adj. R^2	0.884	0.884	0.885	0.884	0.884	0.885
Cluster	jt	jt	jt	jt	jt	jt

Notes: The dependent variable is the logarithm of the firm-product-destination export unit value (value over volume) in year t. Columns report results for interactions of RER with firm size, measured in quartiles of either sales or employment. $Q2$ to $Q4$ represent the second, third, and fourth quartiles, while $Q1$ (the smallest firms) serves as the omitted reference group. Firm managerial intensity and TFP are normalized to have zero mean and a standard deviation of one. Standard errors are clustered at the country of destination-year level. ***p<0.1; **p<0.05; *p<0.01.

Table A9: Lagged Real Exchange Rate Effects

Dep var:	Ln(export price)			
	(1)	(2)	(3)	(4)
RER_{jt} (ln)	0.082***			
	(0.012)			
RER_{jt} (ln) $\times$ $M_{i,95}$	0.042***			
	(0.009)			
RER_{jt} (ln) $\times$ $TFP_{i,95}$	0.016***			
	(0.006)			
RER_{jt} (ln) $\times$ $Rank_{ipjt}$	-0.005***			
	(0.001)			
RER_{jt-1} (ln)		0.062***		
		(0.012)		
RER_{jt-1} (ln) $\times$ $M_{i,95}$		0.055***		
		(0.010)		
RER_{jt-1} (ln) $\times$ $TFP_{i,95}$		0.008		
		(0.006)		
RER_{jt-1} (ln) $\times$ $Rank_{ipjt}$		-0.003**		
		(0.001)		
RER_{jt-2} (ln)			0.030***	
			(0.011)	
RER_{jt-2} (ln) $\times$ $M_{i,95}$			0.067***	
			(0.010)	
RER_{jt-2} (ln) $\times$ $TFP_{i,95}$			0.006	
			(0.006)	
RER_{jt-2} (ln) $\times$ $Rank_{ipjt}$			-0.001	
			(0.001)	
RER_{jt-3} (ln)				0.004
				(0.012)
RER_{jt-3} (ln) $\times$ $M_{i,95}$				0.036***
				(0.011)
RER_{jt-3} (ln) $\times$ $TFP_{i,95}$				0.013**
				(0.006)
RER_{jt-3} (ln) $\times$ $Rank_{ipjt}$				0.000
				(0.001)
$Rank_{ipjt}$	-0.003***	-0.003***	-0.004***	-0.004***
	(0.000)	(0.000)	(0.000)	(0.000)
Firm-Product-Destination FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	2231071	2043642	1846805	1641635
R^2	0.911	0.913	0.915	0.917
Adj. R^2	0.885	0.886	0.889	0.890
Cluster	jt	jt	jt	jt

Notes: The dependent variable is the logarithm of the firm-product-destination export unit value (value over volume) in year *t*. The columns present results for different yearly lags of the (log) RER, up to three years prior, along with interactions with firm-specific variables. Managerial intensity and TFP are normalised to have a zero mean and a standard deviation of one. Standard errors are clustered at the country of destination-year level. ***p<0.1; **p<0.05; *p<0.01.

Table A10: Effects on Intermediate and Final Products

Sample:	Intermediate Goods			Final Goods		
	(1)	(2)	(3)	(4)	(5)	(6)
RER_{jt} (ln)	0.048***	0.048***	0.098***	0.055***	0.049***	0.065***
	(0.017)	(0.017)	(0.017)	(0.013)	(0.014)	(0.012)
RER_{jt} (ln) × $M_{i,95}$		0.016	0.015		0.050***	0.048***
		(0.013)	(0.013)		(0.011)	(0.011)
RER_{jt} (ln) × $TFP_{i,95}$		-0.001	0.009		0.022***	0.023***
		(0.010)	(0.010)		(0.007)	(0.007)
$Rank_{ipjt}$			-0.001**			-0.003***
			(0.001)			(0.000)
RER_{jt} (ln) × $Rank_{ipjt}$			-0.008***			-0.002*
			(0.002)			(0.001)
Firm-Product-Destination FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	926486	926486	926486	1180269	1180269	1180269
R^2	0.910	0.910	0.910	0.870	0.870	0.870
Adj. R^2	0.884	0.884	0.884	0.831	0.832	0.832
Cluster	jt	jt	jt	jt	jt	jt

Notes: The dependent variable is the logarithm of the firm-product-destination export unit value (value over volume) in year t. Columns (1) to (3) present results for intermediate products, while columns (4) to (6) focus on final products. Managerial intensity and TFP are normalised to have a zero mean and a standard deviation of one. Standard errors are clustered at the country of destination-year level. ***p<0.1; **p<0.05; *p<0.01.

Table A11: Controlling for other sources of shocks

Dep var:	Ln(export price)		
	Demand shock	Firm shock	Product shock
RER_{jt} (ln)		0.071***	0.069***
		(0.011)	(0.011)
RER_{jt} (ln) × $M_{i,95}$	0.042***	0.022**	0.024***
	(0.010)	(0.011)	(0.009)
RER_{jt} (ln) × $TFP_{i,95}$	0.007	0.013**	0.011*
	(0.008)	(0.006)	(0.007)
$Rank_{ipjt}$	-0.003***	-0.003***	-0.003***
	(0.000)	(0.000)	(0.000)
RER_{jt} (ln) × $Rank_{ipjt}$	-0.003***	-0.004***	-0.004***
	(0.001)	(0.001)	(0.001)
Firm-Product-Destination FE	Yes	Yes	Yes
HS2-country-time FE	Yes	No	No
Firm-time FE	No	Yes	No
HS6-time FE	No	No	Yes
Observations	2209817	2219068	2224112
R^2	0.914	0.917	0.914
Adj. R^2	0.885	0.889	0.887
Cluster	jt	jt	jt

Notes: The dependent variable is the logarithm of the firm-product-destination export unit value (value over volume) in year t. Columns summarize the results for demand, firm, and product-time shocks with varying fixed effects. Managerial intensity and TFP are normalised to have a zero mean and a standard deviation of one. Standard errors are clustered at the country of destination-year level. ***p<0.1; **p<0.05; *p<0.01.

Table A12: Exclusion of Regions with Updated Values

Dep var:	Ln(export price)											
Region Excluded:	Australia and New Zealand	Eastern Asia	Eastern Europe	Latin America and the Caribbean	Northern Africa	Northern America	Northern Europe	Southeastern Asia	Southern Asia	Southern Europe	Sub Saharan Africa	Western Asia
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
RER_{jt} (ln)	0.082***	0.090***	0.087***	0.075***	0.087***	0.069***	0.051***	0.088***	0.082***	0.089***	0.086***	0.090***
	(0.013)	(0.014)	(0.014)	(0.014)	(0.013)	(0.011)	(0.009)	(0.013)	(0.012)	(0.012)	(0.013)	(0.014)
RER_{jt} (ln) $\times M_{i,95}$	0.043***	0.031***	0.045***	0.051***	0.048***	0.046***	0.044***	0.039***	0.044***	0.042***	0.042***	0.031***
	(0.009)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.009)	(0.010)	(0.010)	(0.010)	(0.010)
RER_{jt} (ln) $\times TFP_{i,95}$	0.016**	0.019***	0.020***	0.013*	0.015**	0.019***	0.008*	0.016**	0.016**	0.016**	0.014**	0.024***
	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)	(0.005)	(0.007)	(0.006)	(0.006)	(0.007)	(0.008)
$Rank_{ipjt}$	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***	-0.001**	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RER_{jt} (ln) $\times Rank_{ipjt}$	-0.004***	-0.005***	-0.004***	-0.005***	-0.005***	-0.005***	-0.002**	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Firm-Product-Destination FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Destination FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2184455	2043533	1971523	2081791	2051764	2070501	1757557	2131137	2185897	2045869	2019384	2001583
R^2	0.911	0.910	0.911	0.911	0.912	0.911	0.915	0.910	0.910	0.909	0.909	0.909
Adj. R^2	0.884	0.884	0.886	0.885	0.886	0.885	0.889	0.884	0.884	0.883	0.883	0.883
Cluster	jt	jt	jt	jt	jt	jt	jt	jt	jt	jt	jt	jt

Notes: The dependent variable is the logarithm of the firm-product-destination export unit value (value over volume) in year t. From column (1) through (12), we refine our estimating sample by sequentially excluding destinations within a specific region for each analysis. Managerial intensity and TFP are normalised to have a zero mean and a standard deviation of one. The rank product variables are computed by firm-destination-year, and normalized such that the core product has rank 0. Standard errors are clustered at the country of destination-year level. ***p<0.1; **p<0.05; *p<0.01.