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ABSTRACT

INTERNATIONAL MANAGERIAL SKILL AND BIG COLOMBIAN EXPORTING FIRMS' PERFORMANCE, 2006-2014*

Federico Alberto Merchan Alvarez

This paper uses a sample of the biggest private Colombian exporting firms to propose and estimate a two-step methodology for measuring international managerial skill and calculating its impact on international firm performance. The first step quantifies the managerial team's organizational capital contribution to rise firms' export proficiency through the average of a regression residuals group conformed by export unit value residuals for differentiated products (multiplying by -1 the price competition products' residuals) and export quantity residuals for homogeneous goods. The second step results indicate that: i) international managerial quality has a significant and robust positive effect on exported value, ii) better managers in the international market do not increase the number of exported products but upgrade export basket's quality, and iii) exported value elasticity relative to international managerial quality is around 5 times larger than exported value elasticity relative to exogenous global demand shocks.

Keywords: management practices, exporting, firm's performance, quality vs price competition.

JEL classification: F16, F10, M11, M12, L25

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I. Introduction

One of the principal methodological challenges that the managerial economics literature has faced for many years is how to measure executive talent accurately. Although this has been somewhat addressed in recent decades by a variety of specialized management surveys[1] and econometric methodologies developed for this purpose, there is a literature gap about international management. On one hand, none of management surveys inquire into specific management practices involved in the international market segment; although the World Management Survey (WMS)[2] and the German Management and Organizational Practices Survey (GMOP)[3] ask about export share relative to operating income and obtain basic information about firm activity abroad, they do not distinguish between firms' management practices for selling goods in the international versus the local markets. On the other hand, statistical methodologies that measure managerial quality through wage (Johansen, 2013; Meier & O'Toole, 2002) or firm efficiency (Demerjian et al., 2012) regressions residuals have not focused in the international market.

However, export management is a research topic that should be analyzed in more depth, as some economic hypotheses suggest that big exporting firms have incentives to export goods that differ from those they sell in the local market, and that they implement different managerial practices for each type of goods. For example, the *Alchian–Allen* theorem states that the demand for high-quality goods relative to low-quality substitutes will rise if the transaction costs per unit are constant because the high-quality goods become relatively cheaper. Miljkovic and Gomez (2019) found this theorem to be valid for Brazilian coffee exports, and there is also anecdotical evidence for Colombian coffee exports.[4] On a larger scale, Hummels and Skiba (2004) proved the Alchian–Allen theorem's validity with disaggregated bilateral trade data for six importing countries with all exporters. Therefore, firms' managers would have incentives to adjust managerial practices to promote selling high-quality goods abroad and low-quality goods in the local market.

Also*, learning by exporting* (LBE) hypothesis indicates that when firms start exporting or rise their exported value, their productivity is increased through various mechanisms: learning processes from foreign customers and rivals, improving product quality, shipment size adjustment (De Loecker, 2013), adopting new technologies, acquiring important information about foreign markets, and upgrading product design (Tse et al., 2017). Although literature has shown mixed results about LBE existence,[5] the evidence that favor its existence is not conclusive in two aspects: i) what mechanism drives LBE,[6] and ii) whether the productivity gains and knowledge acquired in the international market

[1] Including the World Management Survey, which is the biggest survey around the globe to measure managerial practices in a consistent way for 20,000 manufacturing firms in 34 countries (Bloom & Van Reenen, 2007), the Management and Organizational Practices Survey by the US Census Bureau (Buffington et al., 2017), the German Management and Organizational Practices Survey (Broszeit et al., 2019), and the National Survey on Productivity and Competitiveness of Micro, Small, and Medium-size Enterprises in Mexico (Bloom et al., 2022).

[2] See World Management Survey questionnaire: Manufacturing Survey Instrument (worldmanagementsurvey.org)

[3] See German Management and Organizational Practices Survey questionnaire: infas_Fragebogen_Morg_5078_20141020_.indd (iab.de)

[4] Colombia is the third-largest exporting coffee country in the world; however, the majority of the high-quality Colombian coffee is exported such that Colombian inhabitants drink low-quality coffee: https://www.bbc.com/mundo/noticias-america-latina-51622198.

[5] Wagner (2007) indicates that empirical evidence underlines self-selection into exporting market mechanisms (i.e., only the more productive firms are able to export), but there is no conclusive proof that exports enhance productivity. Nevertheless, later studies like De Loecker (2013) for Slovenia, Tse et al. (2017) for China, and Fernandez and Isgut (2015) for Colombia report LBE existence.

[6] De Loecker (2013) identifies strategic decisions that are pertinent to innovativeness, production capability, and human capital, while Hovhannisyan and Mendez (2019) focus on workers' training.

through LBE can be implemented in the overall production process, or if the upgrade occurs only in the firms' international market segment.

Additionally, managers who excel in the local market do not necessarily export efficiently because exporting requires further skills and knowledge. In this sense, the managerial practices involved in the production and distribution of exported goods could differ from the managerial practices for selling goods in the local market. However, the current repertoire of specialized management surveys do not measure these differences and econometric methodologies are similarly scarce. Thus, this paper contributes to the literature by proposing a methodology for estimating managerial quality specifically in the international market and for calculating its impact on different international firm outcomes.

The methodology consists in a two-step procedure, in which export unit value and export quantity are first decomposed into its predicted and residual components. The second step uses a sophisticated aggregation of these residuals at firm-year level as the main independent variable in international firm performance regressions.[7] More specifically, international managerial quality is calculated through the average of a regression residuals group conformed by detailed export unit value residuals for differentiated goods (multiplied by -1 for those products that compete internationally by price[8]) and detailed export quantity residuals for homogeneous goods. The metric to identify international managerial quality differs according to Rauch's (1999) product classification because firms are more likely to compete via quantity for the homogeneous goods, which have 'referenced prices' or are 'traded on organized exchanges', while they are more likely to compete via price for the differentiated products.

This methodology adds three novelties to the academic literature which measure managerial skill through regression residuals. In first place, export unit value and export quantity are the first step dependent variables from which the residuals are obtained, not wage or firm efficiency as in the traditional management literature (Johansen, 2013; Meier & O'Toole, 2002; Demerjian et al., 2012), since the aim is to measure managerial quality in the international market. In second place, residuals included in the international managerial quality calculation depends on the exported good type (export unit value's residuals for differentiated products and export quantity's residuals for homogeneous goods), and within the differentiated products, the residuals value is modified based on the market in which each exported product competes (price or quality competition). In third place, first-step data disaggregation level (firm-year-destination country- exported product) is higher than second-step data disaggregation level (firm-year), which allows to refine the international managerial quality calculation because it could include intrinsic information about multiple exported products. A similar methodological approach has not been implemented in the three academic papers that relate trade and management with large samples.[9]

First, Bloom et al. (2021), using a merged sample of the WMS and the customs and financial statements for a set of American and Chinese firms, prove through a cross-section econometric analysis that better managed firms have a higher probability of exporting. They export at higher value and a higher number of products, and they import higher quality inputs. The authors also calculate that management has greater explanatory power than total factor productivity (TFP) on different trade outcomes. Second, Görg and Hanley (2017) explore firm management and trade outcome relationship from the opposite causality direction using the GMOP. They find that switching into exporting between 2008 and 2013 impacts German management performance positively. Third, Sala and Yalcin (2014)

[7] Chen et al. (2017) provide a literature review of the two-step procedure implementation in the empirical accounting and finance research.

[8] An expanded version of Baldwin and Ito's (2011) methodology for classifying products that compete in the international market by price and quality is explained and calculated.

[9] Export management has been analyzed with case studies whose sample size tend to be small; the median sample of the 16 most influential empirical articles about this subject is 202 firms, based on Leonidou et al.'s (2010) classification (see appendix table 1A).

construct a "*managerial input*" proxy variable based on the firm manager's international experience (obtained from a rich Denmark employer-employee matched database), finding that managerial input is as important as productivity and fixed costs of a firm's selection into the international market.

In relative terms, the methodology of this paper could be akin to Sala and Yalcin (2014) because it proposes to create a managerial skill measure specific for the international market, without using scores calculated from the GMOP and WMS as in Görg and Hanley (2017) and Bloom et al. (2021), however, the second step dependent variables cover a larger set of international firm performance variables for exporting firms, not only export status for exporting and non-exporting firms.

In addition, the methodology of this paper presents some advantages: it could be replicated for other countries without survey collection costs (it just requires to merge customs and financial statements databases), and the second step explanatory variables include an external market conditions variable allowing to evaluate international firm performance at both levels (external environment and the internal level).[10] Nevertheless, the disadvantages of this methodology are that it is not possible to calculate international managerial quality for non-exporting firms (therefore, this paper does not contribute to the self-selecting into exporting literature) and that the international managerial quality is calculated based on regression residuals, consequently, it is measured with error (although several attempts are made to reduce it).

This paper proceeds as follows. The next section includes the theoretical framework, section III describes the data, section IV defines the international managerial quality calculation and the two-step econometric specification (explaining how the potential model misspecification, measurement error, and sampling error derived from this methodology are minimized), section V presents the results, and section VI concludes.

II. Theoretical framework

Bloom et al. (2021) proposes the most recent theoretical approach to describing trade and management dynamics. Their baseline model makes some standard assumptions about representative consumers' demand for variety and foreign countries' expenditure for each good. Also, the model assumes that firms produce differentiated goods which sell in local markets and potentially export abroad, that each firm receives an exogenous managerial ability $\varphi \epsilon (0, \infty)$ - which is assumed to be equivalent to TFP- from distribution $g(\varphi)$ and an i.i.d firm-product specific expertise level vector $\lambda_i \epsilon (0, \infty)$ from distribution $z(\lambda)$. In addition, the parameter δ measures the degree to which good management lowers input requirements *(production efficiency)* and θ reflects the management's magnitude of skill to enhance firms' capacity to produce higher-quality goods *(quality capacity)*. The firms' profit maximization leads to the next optimal exported price p_{ij} and optimal exported quantity x_{ij} of each exported differentiated good *i* to destination country *j:*

$$p_{ij}(\varphi, \lambda_i)^* = \frac{\tau_j (\varphi \lambda_i)^{\theta - \delta}}{\alpha} \qquad (1)$$

$$x_{ij}(\varphi, \lambda_i)^* = R_j P_j^{\sigma - 1} \left(\frac{\alpha}{\tau_j}\right)^{\tau_j} (\varphi \lambda_i)^{\delta \sigma - \theta} \qquad (2)$$

[10] Following the literature recommendation: "*Export performance should be assessed at two broad levels – the external environment level and the internal level. However, there is a lack of agreement on the domains and measurement of the determinants of export performance.*" (Coelho et al., 2008, p.363)

where τ_j is country *j*'s iceberg trade cost, α is the CES exponent of the consumer utility function, R_j is aggregate expenditure, P_j is price index and σ is the elasticity of substitution across products. The difference between θ and δ will determine the optimal export price charged by the firm. If $\theta = 0$ and $\delta > 0$, effective management improves the firm's efficiency but not product quality, and the optimal price will decrease. If $\theta > 0$ and $\delta = 0$, management improves only product quality and the optimal price will increase. When $\theta > 0$ and $\delta > 0$ both management mechanisms are active, and the export price will vary according to which parameter is larger. Finally, firms sell higher quantities if $\delta\sigma > \theta$.

Examples of management policies that increase production efficiency (δ) include "*optimizing inventory control, synchronizing and monitoring production targets across manufacturing stages, reducing wastage, incentivizing workers, and so on*." (Bloom et al., 2021, p.447). The strategies that upgrade quality capacity (θ) cover "*tighten quality control, ensure the compatibility of specialized inputs, facilitate complex assembly, and minimize costly mistakes*." (Bloom et al., 2021, p.447). Intuitively, the managerial knowledge stock that enables the successful implementation of these strategies is what the academic literature has referred to as organizational capital, a non-traditional intangible asset that has been broadly defined.[11]

The methodological section of this paper does not directly estimate any Bloom et al. (2021) parameter, but it incorporates the production efficiency and quality capacity theoretical concepts into the international managerial quality calculation. This paper assumes that efficient managerial teams: i) identify if exported products are homogeneous or differentiated, according to Rauch (1999) product classification, ii) identify if differentiated products compete in the international market by price or quality (see Baldwin and Ito, 2011), iii) expand firms' export proficiency implementing *production efficiency* policies that lead to minimize exported price of the differentiated products that compete by price, and iv) expand firms' export proficiency implementing *quality capacity* policies that lead to maximize the quality (ergo, the exported price) of the differentiated products that compete by quality, via improvements in organizational capital. These assumptions follows the sign of the correlation between the three parameters (p_{ji}, θ, δ) described in the optimal price equation 1, but it differs from the original Bloom et al. (2021) approach, which considered and estimated δ and θ as firm-invariant structural parameters.

Although Bloom et al. (2021) theoretical model describes only differentiated products dynamics, it is made an additional assumption to analyze homogeneous goods: v) managerial team focus in rising homogeneous goods' exported quantity, instead of exported price, since the international market for those goods behave in a more competitive way (either because the good has a 'referenced price' or is 'traded on an organized exchange'). For this reason, production efficiency would be the mechanism that operate for these type of goods $(\theta = 0, \delta > 0)$. According to equation 2, the larger the production efficiency (δ), the larger the exported quantity (x_{ij}).

[11] On one hand, Dessein and Prat (2022) define organizational capital as an intangible productive asset that can be produced only with input from the firm's top management leadership, including: i) relational contracts, ii) corporate culture, iii) firm-specific human capital, or iv) firm capabilities. On the other hand, Black and Lynch (2005) define organizational capital as the firm's organizational structure that contributes to its productive capacity, including work force training, employee voice, and work design (including the use of cross-functional processes).

III. Data

The sample used in this paper is a merge of the next two public Colombian datasets:[12]

- Customs data: Export (import) information disaggregated at product [Colombian external tariff subheading -10 digits][13] -country destination (origin)- firm id level. Data include traded value (FOB for exports and CIF for imports) and traded quantity (units[14] and kilograms). The information is provided by the Colombian National Administrative Statistics Department (DANE by its acronym in Spanish). The imported and exported value were deflated based on the US GDP deflator (2014 is the base year).
- *Big private firms' financial statements*: The Corporate Information Integrated System (SIIS by its acronym in Spanish) reports the financial statements (balance sheet, income statement, and cash flow) for firms supervised by the Colombian Companies Superintendence. The principal criterion for supervising a firm is that its total assets or operating income exceed 30,000 current legal Colombian minimum wages. The financial statements are validated by tax auditors, according to articles 37, 38 and 39 from law 222 of 1995. One limitation of this dataset is that it does not include number of employees, so operating expenses is used as a proxy variable.[15] The information used in this dataset was deflated using an industry-specific annual Producer Price Index (PPI) reported by the Colombian Central Bank (2014 is the base year).

Figures 1 and 2 show the historical participation of big private Colombian exporting firms relative to total exporting firms. On annual average, big private exporting firms represent 41% of total exporting firms with valid firm ID's[16] (around 3,434 of 8,338 firms per year) and 61%[17] of total exported value (around US$28,322 million of US$46,256 million per year). Also, big private Colombian exporting firms export higher values, export more products, export more products to more countries, and report lower export concentration than other exporting firms (see appendix table 2A). Additionally, big private exporting firms have larger fixed assets, greater operating income, more non-tangible assets, and higher TFP than big private non-exporting firms (see appendix table 3A).

[12] Data was downloaded in February 2021. It was deleted from the sample firms close to bankruptcy (firms whose equity was smaller than 0, or whose debt ratio (liabilities/assets) is larger than 1, or whose return on assets (profit/assets) is smaller than -1).

[13] From the common nomenclature classification system of the Andean Community. See: ForeignTradeCorrelatives_DANE_03.pdf

[14] The unit of measurement depends on the product: kilogram (48% of the products), number of items (42%), squared meters (6%), cubic meters (2%), liters (0.9%), pairs (0.89%), carat (0.10%), thousands (0.14%), kilowatt hour (0.01%), cubic centimeter (0.01%).

[15] The Colombian government shared the Colombian payroll data (PILA, by its acronym in Spanish) for the big private Colombian exporting firms included in this paper with an anonymous firm-id to guarantee anonymization. Therefore, it was not possible to merge it with the databases described above. The payroll database would allow for remuneration and supply labor data to be included into the analysis (e.g., wages and worked/vacation days).

[16] The valid firm ID ("NIT") is composed of a 9-digit random number plus a verification digit. The way in which firms report the NIT in the custom database is not homogenous: only some firms report the verification digit. For the financial statement's dataset, all firms do not report the verification digit. For the customs data, exported IDs with fewer than 9 digits were excluded because these are low magnitude export transactions made by individuals (not firms).

[17] 80% excluding the largest Colombian exporting firm (Ecopetrol), which on annual average accounts for 22,7% of the Colombian exported value. The financial statements dataset does not include information about that firm because its ownership has public and private participation.

Figure 1. *Total Colombian exported value disaggregated by firm size*

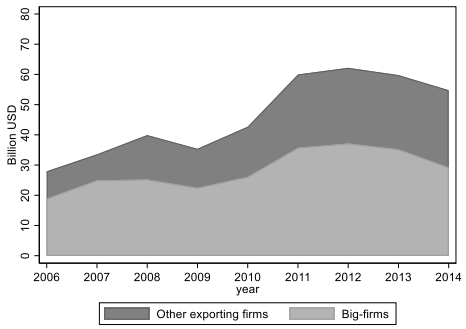
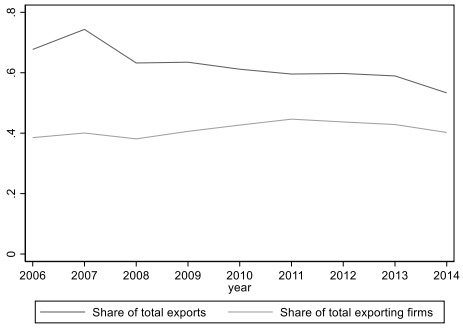


Figure 2. *Shares of big private exporting firms relative to total exporting firms*



Source: *Colombian National Administrative Statistics Department (DANE by its acronym in Spanish), Colombian Companies Superintendence and authorial calculations.* ***Note:*** *Total exporting firms exclude firm ID's (NIT) with fewer than 9 digits, which are low magnitude transactions made by individuals (not firms).*

IV. Methodology

Empirical accounting and finance papers have measured relevant unknown variables based on regressions residuals, and some studies include them as independent variables in a second step regression: *"For example, residuals or transformed residuals, proxying for constructs such as accrual quality, discretionary accruals, managerial ability, etc. are commonly used as independent variables of interest in regression models"* (Chen et al., 2017, p.8). This paper belongs to this two-step literature group; international managerial skill is calculated in the first-step and its impact on international firm performance in the second-step.

Section II provides the theoretical foundation for the first step calculation. The key assumption is that efficient managerial teams categorize exported products in three groups and implement distinct managerial policies in each group with the purpose to maximize firms' export proficiency: i) *production efficiency* policies focused on exporting cheaper differentiated products competing internationally on price, ii) *quality capacity* policies focused on rising quality (ergo, the exported price) of differentiated products competing internationally on quality, and iii) *production efficiency* policies focused on exporting larger homogeneous goods' quantity.

Under this assumption, the international managerial quality is empirically computed as the average of a regression residuals group conformed by export unit value residuals for differentiated goods (multiplied by -1 for products competing internationally on price) and export quantity residuals for homogeneous goods. Essentially, the average of the export unit value and export quantity fractions not attributable to a set of firm characteristics and detailed fixed effects (regression residuals) calculated as described before is used as a proxy variable of the managerial team's organizational capital contribution to maximize firms' export proficiency. This international managerial quality is firm-specific not manager-specific, consequently, it does not measure the organizational capital contribution quality by one manager (e.g., CEO) but the whole managerial team.

The empirical methodology steps are described as follows. First, the markets are classified as price or quality competition based on an expanded version of Baldwin and Ito (2011) methodology. Secondly, it is explained the international managerial quality calculation. Third, second-step international firm performance regressions are defined and it is described how the potential econometric issues derived from this two-step approach (model misspecification, measurement error, and sampling error) are addressed.

a. Classifying products as price or quality competition

Baldwin and Ito (2011) classify products based on an export unit value (EUV) regression for each HS 6-digit, in which the destination country's GDP, GDP per capita, the distance between exporter and importer, and year fixed effects are included as explanatory variables, using customs data for each of the world's top 8 exporters plus Australia. The distance coefficient will indicate if the product competes internationally by price or quality. The theoretical foundation of using distance as the key determinant variable is that traditional heterogeneous firm trade models, as in Melitz (2003), hold that higher productivity firms produce cheaper goods. The qualitative heterogeneous firm trade model predicts that more productive firms sell more expensive goods. As only the more productive firms find it profitable to serve more remote destinations, the trading distance will indicate if the good is competing internationally by price (negative distance coefficient) or by quality (positive distance coefficient).

Initially, this paper estimates the next export unit value regression for each product as in Baldwin and Ito (2011):

$$ln(EUV)_{pkt} = \beta_o + \beta_1 ln\, distance_{kt} + \beta_2 ln\, GDP_{kt} + \beta_3 ln\, GDPpc_{kt} + \partial_t + \in_{pkt} \qquad (3)$$

where subscript *p* denotes Colombian external tariff subheading (10 digit), *t* the year, *k* the destination country, and ∂_t the year fixed effects. Export unit value (EUV) is defined as the total exported value expressed in real f.o.b dollars divided by total units of physical quantity.[18] Colombian data characteristics allows that the unit of observation for each regression (Colombian external tariff subheading (10 digit) - destination country- year) has a higher disaggregation level than Baldwin and Ito's (2011) aggregation (HS 6 digit -destination country-year), which could increase classification accuracy because product category does not bundle together price and quality products. However, this higher accuracy raises the challenge of sample size per regression: the median sample per regression is just 20[19] and the sample is insufficient to run the regressions for 10% of the products.

Thus, an innovative classification product algorithm was implemented to categorize those products which could not be classified with the initial criteria (products whose distance coefficient was not statistically significative at 10% or the sample was insufficient to run the regression). First, equation 3 is estimated for broader product aggrupation (when *p* denotes *Nandina* subheading 8 digit and *p* denotes HS subheading 6 digit),[20] and then, the products are classified according to the regression of the respective narrower product aggrupation in which the distance coefficient was statistically significant. If null distance coefficient's statistically significance or insufficient sample persists, it is assigned the competition mode of the products which belong to their HS heading (4 digit) or their HS chapter (2 digit). As a last resort, it is assigned the competition mode of all products.

For example, the classification product algorithm works in the next way for the second most important Colombian exported product *"thermal coal".* Initially, it is estimated equation 3 in which *p* denotes Colombian external tariff subheading 10 digit (2701120010 "*thermal coal*"). If distance coefficient is not statistically significant or the sample is insufficient to run the regression, it is estimated equation 3 in which p denotes *Nandina* 8 digit (27011200 "*Bituminous coal*"). If distance coefficient is still not statistically significant or the sample is still insufficient to run the regression, then, it is estimated equation 3 in which *p* denotes HS 6 subheading digit (270112 "*Bituminous coal*"). If the product is still

[18] It is used the natural units of the products instead of kilograms: "*Consider the example of HS 8802.40.00.40, Airplanes weighing at least 15,000 kg. Larger airplanes are more expensive, but might not be more expensive per kilogram, so it is more meaningful to define the unit value of an airplane as "dollars per plane" rather than "dollars per kilogram of plane*". (Harrigan et al., 2015, p.103).

[19] The median number of destination countries per product per year is just 4.

[20] A very small percentage of the definitions of units is not consistent within broader market aggrupation: Nandina 8 digit (n=1, 0.015%), HS 6 subheading digit (n=15, 0.30%).

not classified, it is assigned the product competition mode of the HS 4-digit 2701 heading "*Coal, briquettes, ovoids and similar solid fuels manufactured from coal*". If there are missing values in the HS 4-digit product competition mode, it is assigned the product competition mode of the HS 2-digit 27 chapter "*Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes*". Finally, it is assigned the competition mode of all products if none of the previous steps allowed to classify the product.

https://www.htshub.com/us-hs/head/2701In total, 17% of the products were classified at the initial regression disaggregated at Colombian external tariff subheading (10 digit), 1% at *Nandina* 8 digit, and 9% at the HS subheading 6 digit. Then, 40% of the products were assigned the competition mode of their HS heading (4 digit), 29% the competition mode of their respective HS chapter (2 digit), and 5% the competition mode of all products (table 1). The aggregate results indicate that 59% of the products compete by quality and 41% by price. Under this classification, the annual average percentage of quality competition products' exported value relative to total exported value for the big private Colombian exporting firms is 37% (for the other exporting firms it is 36%), and the trend slightly decreased during the analyzed time horizon for both types of firms (figure 3).[21]

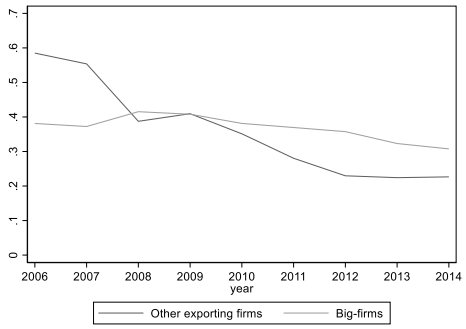
Table 1. *Product classification (price or quality competition)*

Classification method (first option)		
Aggrupation level per regression	***Number of products classified[1]***	***Percentage of products classified relative to total products***
Colombian external tariff subheading (10 digit)	1,177	16.64%
*Nandina** subheading (8 digit)	76	1.07%
HS subheading (6 digit)	629	8.89%
Classification method (second option)		
Aggrupation level to calculate mode competition	***Number of products classified***	***Percentage of products classified relative to total products***
HS heading (4 digits)	2,834	40.06%
HS chapter (2 digits)	2,026	28.64%
Whole sample	332	4.69%
Product classification		
Classification	***Number of products***	***Percentage of products***
Price competition	2,902	41.02%
Quality competition	4,172	58.98%
Total	*7,074*	*100.00%*

*[1]The markets classified as price (quality) competition are those whose distance coefficient is statistically significant and negative (positive) in equation 3. * Common nomenclature classification system of the Andean Community.*

[21] As Comtrade does not report information disaggregated at 10 digits, it is not possible to replicate this methodology for other countries and compare results.

Figure 3. *Exported value of products that compete by quality relative to total exported value*



Source: *Colombian National Administrative Statistics Department (DANE by its acronym in Spanish), Colombian Companies Superintendence, and authorial calculations. The product classification follows the methodology explained in section IV.a.*

b. International managerial quality calculation

In first place, the baseline export unit value (EUV) and quantity (Q) regressions are estimated as follows:

$$ln(EUV)_{pfkt} = \beta_o + \beta_1 ln\, GDP_{kt} + \beta_2 ln\, GDPpc_{kt} + \beta_3 tf_{p*kt} + \Gamma X_{ft} + \theta New_{pfkt} + \partial_p + \partial_f + \partial_k + \partial_t + \in_{pfkt} \quad (4)$$

$$ln(Q)_{pfkt} = \beta_o + \beta_1 ln\, GDP_{kt} + \beta_2 ln\, GDPpc_{kt} + \beta_3 tf_{p*kt} + \Gamma X_{ft} + \theta New_{pfkt} + \partial_p + \partial_f + \partial_k + \partial_t + w_{pfkt} \quad (5)$$

where subscript *p* denotes Colombian external tariff subheading product (10 digit), p* is the HS 6 digit subheading product, *f* the firm, *k* the destination country, and *t* the year. Export unit value (EUV) is defined as the exported value expressed in real f.o.b dollars divided by units of physical quantity (Q). $ln\, GDP_{kt}$ and $ln\, GDPpc_{kt}$ are GDP and GDP per capita of destination country *k* in year *t* (in logarithm). $Tariff_{p*kt}$[22] is the ad-valorem import tariff imposed by destination country *k* on product p*. The vector of firm level covariates X_{ft} include log fixed assets, log operating expenses, log non-tangible assets,[23] mark-up, and TFP calculated based on Levinsohn and Petrin's (2003) methodology.[24] New_{ftkp} includes three mutually exclusive dummies that identify new export decisions made by firm *f* in year *t* relative to t-1 in order to control for the adjustment cost of innovating: i) if it is a new product *p* exported to an "old" country destination *k*, ii) if it is an "old" product *p* exported to a new country destination *k,* or iii) if it is a new product *p* exported to a new country destination *k*. Finally, ∂_k is the destination country fixed effects, ∂_p the product fixed effects, ∂_f the firm fixed effects, and ∂_t the year fixed effects. Robust standard errors are clustered at country destination-year level. The results of these regressions are shown in column 1 of table 2 and table 3.

A vector of modified residuals $\hat{v}_{pkft}$ is defined in equation 6 based on residuals from the export unit value (equation 4) and quantity (equation 5) regressions. First, export unit value residuals ($\hat{\in}_{pkft}$) are computed for the differentiated products depending on their competition type. As it was explained before, the lower the residual $\hat{\in}_{pkft}$, the better the managerial team production efficiency policies to export cheaper the products that compete internationally by price, consequently, those residuals are multiplied by -1 ($\hat{\in}_{pkft} * -1$). For the quality competition products, the higher the residuals $\hat{\in}_{pkft}$, the better the managerial team quality capacity policies to export more expensive (higher quality) the

[22] Source of tariff dataset is Feodora Teti's Global Tariff database (Teti, 2020). Product level aggregation is HS 6-digit.

[23] Firm level variables were calculated as Log(x+1) in order to include firms that report $0 in some variables, particularly, non-tangible assets.

[24] TFP was calculated with *prodest* Stata command (Mollisi & Rovigatti, 2018). See appendix table 4A for results.

products that compete internationally by quality, consequently, the original residuals sign are kept ($\hat{\epsilon}_{pkft}$).

Second, managers of firms that export homogeneous goods could face challenges in differentiating the export price because the good either has a 'reference price' or it is traded in an organized exchange (see Rauch, 1999). Assuming that the international market for the homogeneous goods is highly competitive and that exporters are price takers; managerial team can encourage the export quantity not the price. Thus, quantity regression residuals $\hat{w}_{pkft}$ from equation 5 would be a better proxy variable of the managerial team organizational capital contribution to boost firm's export efficiency relative to homogeneous goods; the higher the residuals $\hat{w}_{pkft}$, the better the managerial team production efficiency policies to export higher homogeneous goods' quantity.

Then, the international managerial quality is calculated as the simple average of the modified residuals ($\hat{v}_{pkft}$) (equation 7) so that the metric is sensitive to outliers (products in which the managerial team contributed in a very big or very low proportion to the firms' export proficiency):

$$\hat{v}_{pkft} = \begin{cases} \hat{\epsilon}_{p1kft} * (-1), where\ p1\ are\ differentiated\ products\ that\ compete\ by\ price\ exported\ by\ firm\ f\ in\ year\ t \\ \hat{\epsilon}_{p2kft}, where\ p2\ are\ differentiatied\ products\ that\ compete\ by\ quality\ exported\ by\ firm\ f\ in\ year\ t \\ \hat{w}_{p3kft}, where\ \ p3\ are\ homogeneous\ products\ exported\ by\ firm\ f\ in\ year\ t \end{cases} \quad (6)$$

$$International\ managerial\ quality\ (IMQ)_{ft} = \frac{\sum_{pk}^{PK} \hat{v}_{pkft}}{n} \quad (7)$$

where *n* is the number of export products-destination country pairs of each firm *f* in each year *t*.

The IMQ exactness depends on whether the EUV-Q residuals constitute an accurate international managerial quality proxy variable. For this purpose, the EUV-Q econometric models should be well specified, which in this context, imply that: i) irrelevant EUV-Q explanatory variables are not included, ii) all relevant EUV-Q determinants are included, and iii) no explanatory variable should contain any international managerial quality component because the residuals would be a biased proxy variable.

For this reason, column 2 in table 2 and 3 add double fixed effects (FEs) interactions between destination country, product, year, and firm fixed effects to the EUV-Q regressions, and column 3 has the triple FEs interactions. As the international managerial quality variable is intended to measure the managerial team's organizational capital contribution to improve production efficiency and quality capacity policies involved in the exported products, the double and triple FEs interactions added in columns 2 and 3 do not absorb this variation because neither are defined as the combination of firm FE with a time-changing variable FE. These additional FEs control for the unobserved characteristics of combinations of product, year, destination country, and firm, which are orthogonal from the managerial team's control and impact on export unit value and export quantity.

For example, product-year FEs in column 2 are included because of large unit value differences between products: "*they take out all observed and unobserved global factors that might change the relative unit values over time. For instance, if the relative price of computers to pencils goes down in year t due to technological progress or changes in demand, this effect will be absorbed by the product-year fixed effect*" (Harding & Javorcik, 2012, p.970). Besides, it controls for the quantity differences and quantity's unit differences between products. As another example, the product-firm-country destination FE controls for the average unit value and quantity of each product sold by each firm to each country destination across years. The specification error of the EUV-Q regressions due to omission of relevant explanatory variables is reduced in column 2 and 3 because the double and triple FEs interactions are relevant EUV-Q determinants.

Column 4 in table 2 and 3 keeps the fixed effects of column 3 but excludes TFP. As briefly explained above, one of the disadvantages of this methodology is that inclusion of variables that could

contain international managerial quality components, like TFP, in the EUV-Q regressions raises a trade-off. On one hand, TFP inclusion is partly irrelevant because TFP could contain an unknown fraction of the international managerial quality, therefore, the residuals could be an underestimated proxy variable. On the other hand, it is partly relevant because TFP inclusion allows that equation 4 and 5 residuals do not capture non-international managerial TFP components, which could make the residuals an overestimated proxy variable. Similar situation occurs in column 5 which includes *firm efficiency*[25] and in column 6 which adds *managerial quality* calculated based on traditional firm efficiency residual methodology (Demerjian et al., 2012) (see table 5A). Since TFP, firm efficiency and managerial quality components cannot be split, none EUV-Q column reduces the model misspecification to zero. The feasible solution is to calculate one international managerial quality variable for each EUV-Q column and analyze robustness across results (see section V).[26] From the author's point of view, international managerial quality obtained from the third EUV-Q regressions (IMQ3) is the most accurate IMQ since EUV-Q econometric specification include TFP, which is a relevant EUV-Q determinant and could contain less IMQ components than firm efficiency and managerial quality, generating the most accurate residuals. Thus, figure 4 shows binned scatter plots between IMQ3 in the x-axis and eleven international firms' outcomes in the y-axis. Exported value, profit rate, quality exports share in value (exported value of goods that compete in the international market by quality relative to total exported value of differentiated products) and quality exports share in number (number of exported goods that compete in the international market by quality relative to total exported differentiated products) have a positive visible correlation with IMQ3, suggesting that better international managed firms export more, are more profitable and increase their quality export shares. Most of these visual correlations are confirmed by statistical significance of the IMQ coefficients on exported value and both export quality shares.

The other flat fit lines indicate null simple correlation between IMQ3 and number of exported products, number of destination countries' exports, number of export products-destination countries, Herfindahl-Hirschman Index (HHI) (squaring the share of each product-destination country observation in total firms' exports and then summing the obtained numbers), and the export share of differentiated products. Also, there is null correlation between IMQ and imported related variables (simple average of the imported inputs' unit value and imported inputs share relative to sales cost).

Additionally, figure 5 shows that IMQ3 is not statistically correlated with most of the variables included in its calculation (operating expenses, fixed assets, non-tangible assets, and TFP). This null correlation between firm size measures and international managerial quality indicates that the metric described in this paper does not increase simply because the firm is bigger. On the contrary, the metric identifies that, compared with bigger exporting firms, smaller exporting firms could have better international managerial quality, which could also lead to higher firm efficiency (as the positive statistically significant correlation between IMQ3 and firm efficiency indicates).

Finally, the international managerial quality is calculated as the median of the modified residuals described in equation 6 -so that outliers do not affect the calculation- as a robustness check. Also, the international managerial quality is calculated as the average of the modified residuals described in equation 6 but standardizing $\hat{\epsilon}_{pkft}$ and $\hat{w}_{pkft}$ to make these residual sets more comparable. In the baseline specification, both residuals sets are partly comparable because both have mean 0 and their units are log regressions residuals. The limitation is that the higher dispersion (in terms of standard

[25] It was calculated based on Data Envelopment Analysis (DEA), which is an optimization procedure which allows to measure firms' efficiency in converting inputs into outputs (Demerjian et al., 2012). For this calculation, it was assumed decreasing returns to scale. The inputs included were sales cost, operating expenses, change in property, plant, equipment, and change in non-tangible assets. The output was operating income. The calculation was done for each industry (ISIC 3 digit)-year. See table 6A for descriptive statistics.

[26] Dimensionality reduction techniques, like principal components, are not implemented because principal component regression's coefficients could present biases since the eigenvector's weights depend on X and not on the dependent variable, among other reasons (Hadi & Ling, 1998; Artigue & Smith, 2019).

deviation and range) of the log exported quantity residuals relative to log export unit value residuals[27] could lead that IMQ weights in higher (lower) proportion the effective (or non-effective) managerial team policies to exporting higher homogeneous goods' quantity than effective (or non-effective) managerial team policies to modify the differentiated goods' unit value. Nonetheless, section V shows that second step results are robust across different ways to calculate the international managerial quality (simple average of the modified residuals, median of the modified residuals, and simple average of the modified residuals standardizing EUV-Q residuals).

[27] *SD of the UV residuals=0.6, SD of the Q residuals=1.01. Range of the UV residuals=16.22, Range of the Q residuals=17.73.*

Table 2. Export unit value regression

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
			Log (export unit value)			
Log GDP	-0.112					
	(0.212)					
Log GDPpc	0.161					
	(0.227)					
Applied tariff (ad-valorem component)	-0.00203*	0.000893				
	(0.00104)	(0.00148)				
Log real stock non-tangible assets (USD)	0.00115	0.000642	0.000349	0.000271	0.000239	0.000283
	(0.00108)	(0.000869)	(0.000847)	(0.000841)	(0.000959)	(0.000960)
Log real stock property, plant and equipment (USD)	-0.000513	-0.00168	0.00392	0.00215	0.00779	0.00706
	(0.00998)	(0.00695)	(0.00666)	(0.00256)	(0.00774)	(0.00769)
Log real operating expenses (USD)	-0.0304*	-0.0253*	-0.0125	0.00110	-0.0187	-0.0194
	(0.0176)	(0.0131)	(0.0133)	(0.00810)	(0.0157)	(0.0159)
Mark-up (operating income / sales cost)	0.00114	0.00189	-0.000443	-0.000414	4.20e-05	5.24e-05
	(0.000747)	(0.00424)	(0.000629)	(0.000620)	(0.000333)	(0.000334)
Dummy new product in t	-0.0194	0.00974	-0.000299	-0.00181	0.00328	0.00349
	(0.0126)	(0.0124)	(0.0131)	(0.0131)	(0.0143)	(0.0143)
Dummy new destination in t	0.0961***	0.0560***	0.0116	0.0129	0.00358	0.00373
	(0.0135)	(0.0148)	(0.0191)	(0.0189)	(0.0197)	(0.0197)
Dummy new product-destination in t	0.0585**	0.0273	0.0516	0.0506	0.0508	0.0515
	(0.0269)	(0.0309)	(0.0364)	(0.0364)	(0.0368)	(0.0368)
TFP[1]	0.189**	0.0907	0.0741		0.0373	0.0264
	(0.0880)	(0.0753)	(0.0622)		(0.0768)	(0.0758)
Firm efficiency[2]					-0.0635	
					(0.0829)	
Managerial quality[3]						-0.167**
						(0.0830)
Observations	438,937	367,970	276,462	279,755	233,646	233,646
R-squared	0.732	0.904	0.938	0.938	0.941	0.941
Country destination fixed effects	Yes	No	No[r]	No[r]	No[r]	No[r]
Product fixed effects	Yes	No	No[r]	No[r]	No[r]	No[r]
Year fixed effects	Yes	No	No[r]	No[r]	No[r]	No[r]
Firm fixed effects	Yes	No	No[r]	No[r]	No[r]	No[r]
Product-firm fixed effects	No	Yes	No[r]	No[r]	No[r]	No[r]
Product-country destination fixed effects	No	Yes	No[r]	No[r]	No[r]	No[r]
Product-year fixed effects	No	Yes	No[r]	No[r]	No[r]	No[r]
Country destination-year fixed effects	No	Yes	No[r]	No[r]	No[r]	No[r]
Firm-destination fixed effects	No	Yes	No[r]	No[r]	No[r]	No[r]
Product-firm-country destination fixed effects	No	No	Yes	Yes	Yes	Yes
Product-year-country destination fixed effects	No	No	Yes	Yes	Yes	Yes

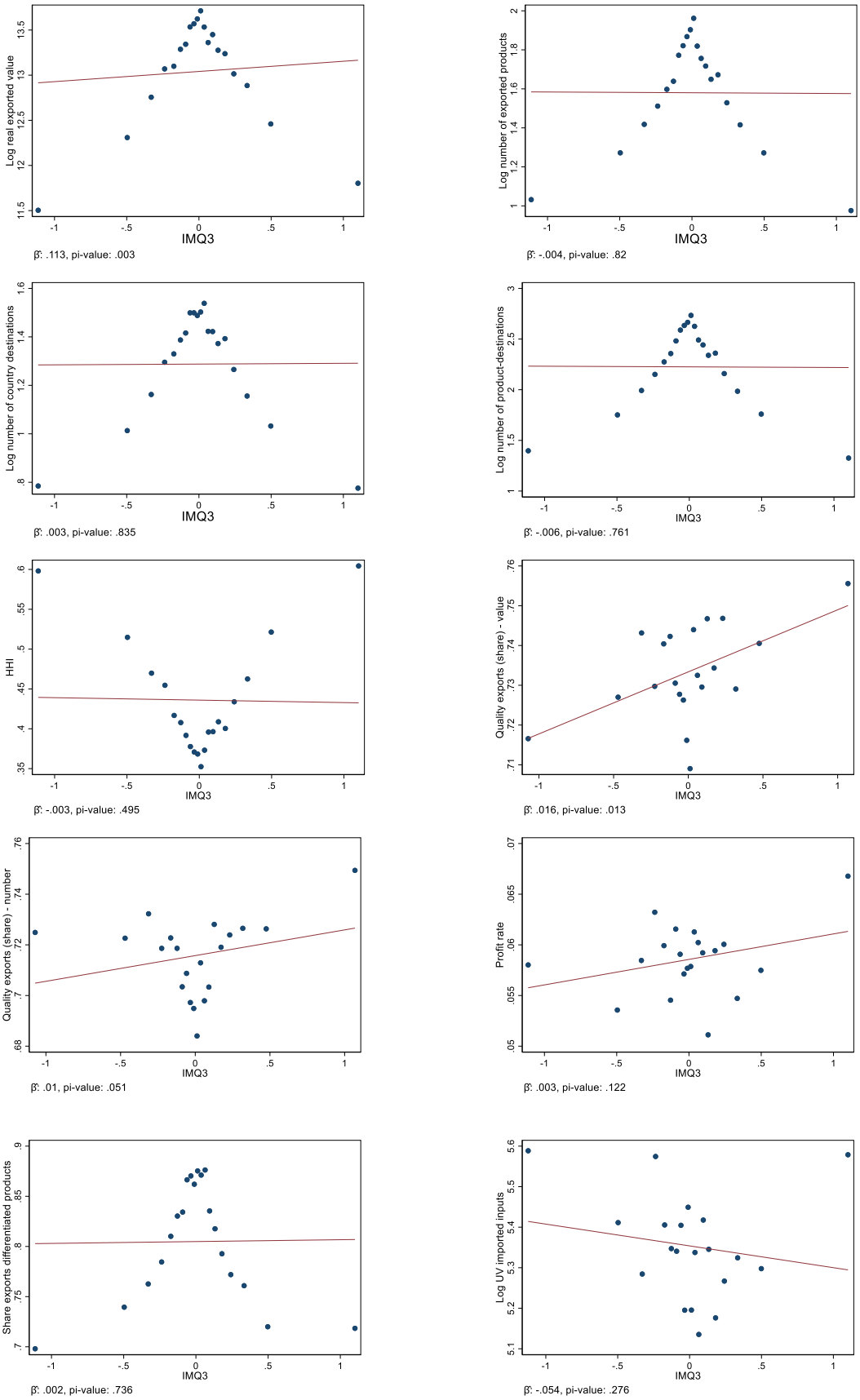
Export unit value is defined as exported value expressed in real f.o.b dollars divided by units of physical quantity. Robust standard errors clustered at country-year level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. No[r]: redundant fixed effects. [1] Calculated based on Levinsohn & Petrin (2003) methodology (appendix table A4). [2] Relative to the most efficient firm in each industry-year. It was calculated assuming decreasing returns to scale based on Demerjian et al. (2012). [3] Residual of a Tobit regression of firm efficiency on a set of firm level explanatory variables (Demerjian et al., 2012) (table 5A).

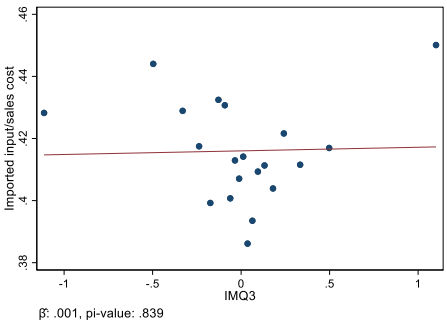
Table 3. *Quantity regression*

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	ln (exported quantity)					
Log GDP	-0.538					
	(0.449)					
Log GDPpc	0.828*					
	(0.493)					
Applied tariff (ad-valorem component)	-0.00917***	-0.000605				
	(0.00222)	(0.00196)				
Log real stock non-tangible assets (USD)	-0.00480***	-0.00100	0.000683	0.000653	0.00125	0.00122
	(0.00179)	(0.00170)	(0.00182)	(0.00187)	(0.00206)	(0.00206)
Log real stock property, plant and equipment (USD)	0.117***	0.114***	0.123***	0.0135**	0.119***	0.120***
	(0.0168)	(0.0110)	(0.0119)	(0.00648)	(0.0147)	(0.0149)
Log real operating expenses (USD)	-0.0275	0.138***	0.180***	0.193***	0.209***	0.210***
	(0.0258)	(0.0217)	(0.0228)	(0.0300)	(0.0278)	(0.0277)
Mark-up (operating income / sales cost)	0.00158	-0.0328***	-0.00118	-0.000170	-0.00128	-0.00129
	(0.00211)	(0.00914)	(0.00105)	(0.000875)	(0.00111)	(0.00111)
Dummy new product in t	-1.373***	-0.251***	-0.273***	-0.273***	-0.328***	-0.329***
	(0.0259)	(0.0243)	(0.0257)	(0.0256)	(0.0268)	(0.0268)
Dummy new destination in t	-0.819***	-0.336***	-0.419***	-0.427***	-0.436***	-0.436***
	(0.0275)	(0.0286)	(0.0356)	(0.0353)	(0.0355)	(0.0356)
Dummy new product-destination in t	-1.183***	-0.313***	-0.623***	-0.628***	-0.683***	-0.683***
	(0.0437)	(0.0541)	(0.0729)	(0.0727)	(0.0806)	(0.0807)
TFP[1]	1.741***	1.893***	2.053***		1.944***	1.960***
	(0.226)	(0.142)	(0.151)		(0.194)	(0.195)
Firm efficiency[2]					0.162	
					(0.177)	
Managerial quality[3]						0.209
						(0.165)
Observations	438,937	367,970	276,462	279,755	233,646	233,646
R-squared	0.640	0.886	0.927	0.927	0.931	0.931
Country destination fixed effects	Yes	No	No[r]	No[r]	No[r]	No[r]
Product fixed effects	Yes	No	No[r]	No[r]	No[r]	No[r]
Year fixed effects	Yes	No	No[r]	No[r]	No[r]	No[r]
Firm fixed effects	Yes	No	No[r]	No[r]	No[r]	No[r]
Product-firm fixed effects	No	Yes	No[r]	No[r]	No[r]	No[r]
Product-destination fixed effects	No	Yes	No[r]	No[r]	No[r]	No[r]
Product-year fixed effects	No	Yes	No[r]	No[r]	No[r]	No[r]
Destination-year fixed effects	No	Yes	No[r]	No[r]	No[r]	No[r]
Firm-destination fixed effects	No	Yes	No[r]	No[r]	No[r]	No[r]
Product-firm-destination fixed effects	No	No	Yes	Yes	Yes	Yes
Product-year-destination fixed effects	No	No	Yes	Yes	Yes	Yes

Quantity refers to units of physical quantity. Robust standard errors clustered at country-year level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. No[r]: redundant fixed effects.[1] Calculated based on Levinsohn & Petrin (2003) methodology (appendix table A4). [2] Relative to the most efficient firm in each industry-year. It was calculated assuming decreasing returns to scale based on Demerjian et al. (2012). [3] Residual of a Tobit regression of firm efficiency on a set of firm level explanatory variables (Demerjian et al., 2012) (table 5A).

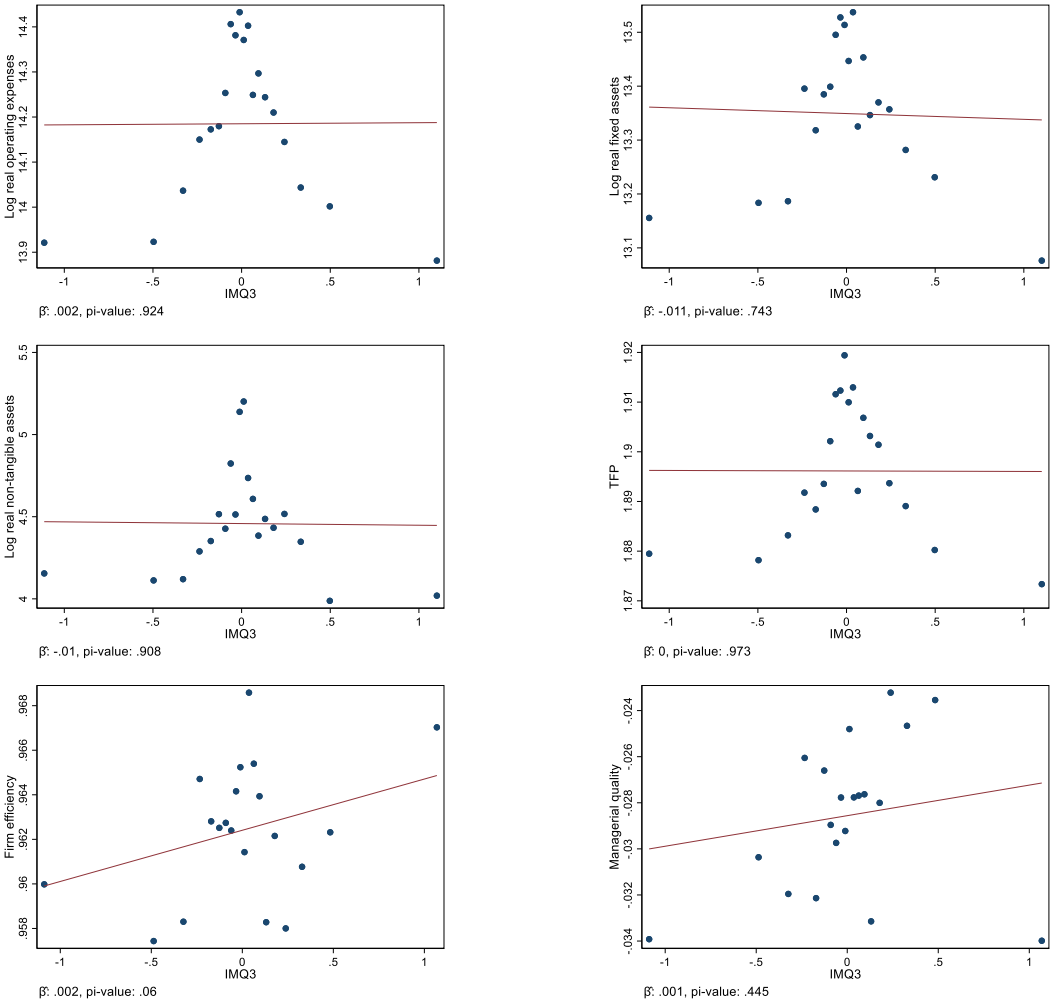
***Figure 4**. Binned scatter plots between international managerial quality and international firm performance measures*





Note: *Profit rate* is defined as operating profit relative to operating income. *Quality exports (share) - value* is defined as exported value of goods that compete in the international market by quality relative to total differentiated products' exported value. *Quality exports (share) – number* is defined as number of exported goods that compete in the international market by quality relative to total number of exported differentiated products. The *Herfindahl-Hirschman Index (HHI)* is calculated by squaring the share of each product-destination country observation in total firms' exports and then summing the obtained numbers.

Figure 5. *Binned scatter plots between international managerial quality and explanatory variables*



Note: *TFP calculation based on Levinsohn & Petrin (2003) methodology (appendix A4). Firm efficiency calculated based on Demerjian et al. (2012); the variable is measured relative to the most efficient firm in each industry (ISIC 3 digit) for each year, and it was calculated assuming decreasing returns to scale. Managerial quality calculated as the residual of a Tobit regression of firm efficiency on a set of firm level explanatory variables (Demerjian et al., 2012) (table A5).*

c. International firm performance regression

The international firms' performance baseline regression is defined as follows:

$$Y_{ft} = \beta_o + \beta_1 IMQ3_{ft} + \beta_2 GD_{ft} + \Gamma X_{ft} + \partial_f + \partial_{st} + v_{ft} \qquad (8)$$

where firm outcomes (Y) include the dependent variables as previously defined and graphed: i) log real exported value, ii) log number of exported products, iii) log number of export destination countries, iv) log number of exported products-destination countries pairs, v) Herfindahl-Hirschman Index (HHI) for exports, vi) quality exports share (value), vii) quality exports share (number), viii) profit rate, ix) differentiated commodities export share, x) log simple average of imported inputs' unit value, and xi) imported inputs share relative to sales cost. $IMQ3_{ft}$ is the international managerial quality described in equation 7 and calculated with the residuals from the third EUV-Q regressions (column 3 of table 2 and 3). X_{ft} is a vector of firm-level characteristics including log fixed assets, log non-tangible assets, log operating expenses[28], and TFP clean of the international management component.[29] ∂_f are firm fixed effects and ∂_{ts} are industry (ISIC 3 digit) -year fixed effects, which absorb annual industry shocks allowing comparisons within industry-year. Robust standard errors are clustered at firm level. Since there is no an exogeneous source of IMQ variation, it is not possible to interpret the coefficient of interest (β_1) as totally causal.

GD_{ft} measures the degree to which the global market demands the products exported by the firm. It is exogeneous from manager decision by construction; it is defined as $GD_{ft} = \ln(\sum_{kp} ID_{kpt} * share\_exp_{fpk,t=0})$, where $share\_exp_{fpk,t=0}$ is the share of product p (HS 6-digit) exported to country k in total exports of firm f in its first sample year, and ID_{kpt} is the imported value from country k of product p in year t excluding Colombian exports.[30] The inclusion of an objective international market condition variable defined at firm level permits to compare international firm performance sensitivity to managerial quality improvements and upsurge in favorable external conditions. Figure 6 shows that international managerial quality is not statistically correlated with GD, highlighting that IMQ measures resilient international manager quality uninfluenced by external conditions. Table 6A (appendix) presents descriptive statistics for the dependent and independent variables included in the regressions.

Two econometric issues emerge from this specification. First, IMQ could be measured with error because it is a proxy variable constructed from regression residuals. For this reason, baseline firm performance regression (equation 8) includes IMQ3, which is the international managerial quality variable calculated with the EUV-Q regressions that, as previously explained, could have the lowest specification error. In terms of IMQ coefficient's statistical significance and magnitude, Jennings et al. (2023) found that a combination of one variable with measurement error and fixed effects with higher absorption level[31] could distort inferences (falsely rejecting a true null hypothesis). As absorption rate of fixed effects described in equation 8 with the international managerial qualities is on average 10%[32], which is way below the 90% threshold identified by Jennings et al. (2023), the IMQ coefficient statistical significance would be reliable. Also, Jennings et al. (2023) show that the attenuation effect could vanish or even flip to a positive bias if the IMQ measurement error is correlated with the control variables. As

[28] As explained above, firm level variables were calculated as Log(x+1) in order to include firms that report $0 in any variable, particularly non-tangible assets.

[29] It is calculated as the residual of a regression of TFP on international managerial quality as in Bloom et al. (2021).

[30] The results are robust when $Log\ global\ demand\ exp_{ft} = \sum_{kp}(ln(ID_{kpt}) * share\_exp_{fpk,t=0})$

[31] The absorption rate is defined as the R-squared from a regression of the independent variable of interest on fixed effects. In this case, the R-squared from a regression of international managerial quality on firm and industry–year fixed effects.

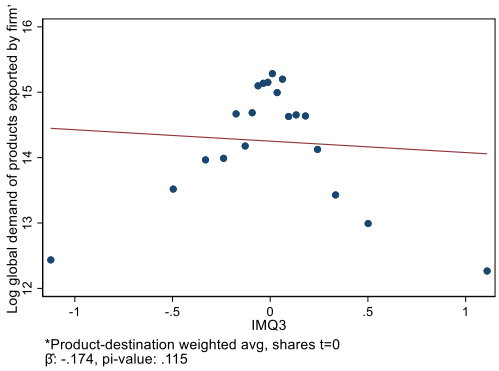
[32] All absorption rates of the fixed effects described in equation 8 with the international managerial qualities are below 30% (29.4%, 6.2%, 6%, 6.2%, 6.6%, 6.6%).

it is non-possible to determine empirically the existence of this correlation, the IMQ coefficients are interpreted assuming null attenuation effect.

Secondly, the standard errors could be understated because the independent variable of interest (IMQ) is a generated regressor (i.e., produced by estimates) and is, therefore, subject to sampling error. Although Chen et al. (2023) prove that standard error bias does not occur when the generated regressor is calculated based on residuals and absolute residuals, IMQ is generated based on a particular residuals' calculation depending on the product and competition type as it was explained before. Consequently, the standard error for β_1 coefficient is calculated through pairs cluster bootstrapping in order to correct the potential standard error bias, following the procedure explained by Chen et al. (2023) covering both the first and second steps regressions.[33] These standard errors act as a robustness check of the baseline standard errors clustered at firm level.

Additionally, one placebo tests was included; firm' equity was added as an additional dependent variable in order to check that IMQ does not have a statistically significant effect on the variables theoretically should not be affected.

Figure 6. *Binned scatter plot between international managerial quality and exogenous global demand for products exported by firms*



Note: *The y-axis variable is defined as* $GD_{ft} = ln(\sum_{kp} ID_{kpt} * share\_exp_{fkp,t=0})$*, where* $share\_exp_{fkp,t=0}$ *is the share of product p (HS 6-digit) exported to country k in total exports of firm f in its first sample year, and* ID_{kpt} *is the imported value of country k of product p in year t excluding Colombian exports. International managerial quality in x-axis is defined as in equation 7.*

[33] *"(1) create a bootstrap sample by randomly drawing with replacement K clusters from the original sample (….) ; (2) estimate the first-step regression using the bootstrap sample; (3) use the first-step regression output to obtain the generated regressor; (4) estimate the second-step regression using the bootstrap sample and the generated regressor, and store all the coefficient estimates; (5) repeat this process a large number of times; (6) record the variance of the collected coefficient estimates"* (Chen et al., 2023, p.545)

V. Results

Table 4 shows the international firms' performance regression results (equation 8). Column 1 indicates that 1% increase in international managerial quality (IMQ3) raises the firm's exported value by 0.1184%. This magnitude is economic considerable given the amount of explanatory variables and fixed effects included in the estimation; a back-in-the-envelope calculation indicates that average annual increase in the international managerial quality (0.00015) accounts for 6.8% of the average annual increase in the real exported value (0.0260).[34] On the contrary, international managerial quality does not impact any extensive margin measure (columns 2–5), contradicting previous empirical findings (Bloom et al., 2021).

This null IMQ3 effect on extensive margin measures should be interpreted within a framework in which better managed firms do not export more quantity of products but rise both quality export shares (exported value and number, see columns 6 and 7), implying replacement of products that compete by price over products that compete by quality. In terms of magnitude, column 6 coefficient (0.0123) indicates that annual average increase in the international managerial quality (0.00252) of firms that export differentiated products[35] accounts for 18.07% of the average annual increase in the quality export share (0.0001677)[36]. This considerable magnitude points out managers as a fundamental pillar in exporting high quality products, which could foster long-run economic growth: "*countries that latch on to higher productivity goods will perform better*" (Hausmman et al., 2007, p.3). Also, this finding is suggesting evidence in favor of the Alchian–Allen theorem described in the introduction.[37]

International managerial quality has also a positive and significative effect on profit rate (column 8), however, its magnitude is not economically considerable; an average annual increase in the international managerial quality (0.00058) of the firms with data about this variable accounts for 0.53% of the average annual increase in the profit rate (0.000327).[38] This relative low importance may occur because the profit rate depends on the aggregate, not international, firm performance; on average (median) exports account only for 20% (8%) of the operating income. Besides, IMQ impacts negative and statistically significative the imported inputs' unit value and does not affect the imported input share (column 10 and 11), which could be explained by better managed firms importing cheaper substitutes inputs.

Most of the results described so far hold up to different robustness exercises relative to the IMQ estimation. First, when IMQ is calculated with residuals $\hat{\epsilon}_{pkft}, \hat{w}_{pkft}$ from different export unit value and quantity regressions (IMQ1, IMQ2, IMQ4, IMQ5 and IMQ6, see table 4). Second, when IMQ is calculated based on the median, instead of the simple average, of the modified residuals (table 8A). Third, when IMQ is calculated based on the simple average of the standardized modified residuals (table 9A). The standard errors are also robust when they are calculated based on the pairs cluster bootstrapping for both steps procedure described by Chen et al. (2023) (table 5 shows the results with 2,500 replications).[39] Finally, none IMQ has significative effect on firms' equity, as expected.

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[34] 0.068 = ((1+0.00015)^0.1184-1)*100))/0.0260

[35] It was excluded from this estimation firms that export homogeneous goods' exports, since those products compete internationally by quantity.

[36] 0.1807 = (0.01231 * ln(1+0.00252))/0.0001677

[37] Its formal proof would require collecting detailed freight data and performing specific econometric analysis.

[38] 0.0053 = (0.00268 * ln(1+0.00058))/0.0003327

[39] The limitation of this calculation is that average second stage sample size is, on average, 69% of the baseline specification's sample size, because some firms' observations are not selected when the clustered bootstrapped samples with replacement are generated in the first step, which leads to a lower number of firms in the second step.

In comparative terms, non-tangible assets is the variable that determines the international firm performance in lower proportion among the explanatory variables (table 7A); this indicates that non-traditional intangible assets, such as the organizational capital measured in IMQ, is a more relevant international firms' performance determinant than traditional non-tangible assets measured in the financial statements. Nonetheless, this result could be underestimating the traditional intangible asset effect because of limitations in the way it is measured (Crouzet et al., 2022). In fact, 59% of the big private Colombian exporting firms report null intangible assets.

Also, figure 7 shows that IMQ coefficients are statistically larger (around 5 times) than the coefficients that measure the magnitude that global market demands the products exported by the firm, when exported value is the dependent variable. This suggests that endogenous improvements in international managerial quality can boost the exported value to a higher magnitude than when exogenous improvements occur in international market conditions. These findings are also robust to different international managerial quality definitions.

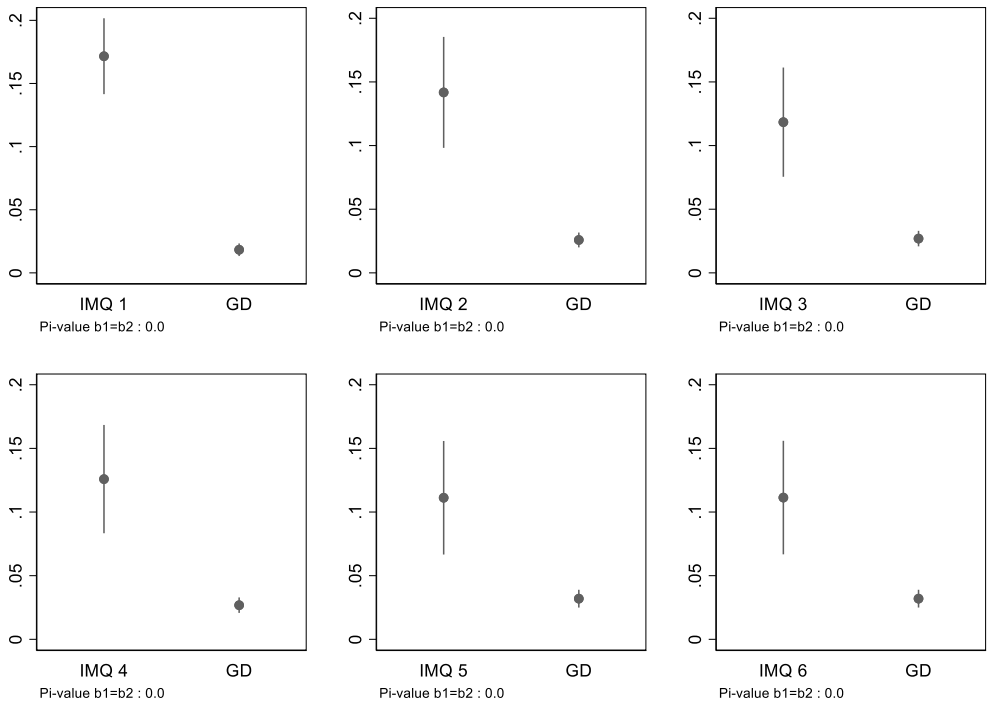
Future research could incorporate a managerial team objective function into theoretical models based on the product type (differentiated and homogeneous) and competition type (quality and price); this would allow optimal managerial team behavior to be derived. Also, some empirical results could be theoretically analyzed. For instance, the managerial team's organizational capital investment prioritization of exporting new differentiated products that compete by quality over expanding the exports of differentiated products that compete by price. In addition, the negative IMQ effect on imported inputs quality could require to develop an international managerial quality from the import perspective.

Table 4. *International managerial quality impact on international firms' performance*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	Log real exported value	Log No. exported products	Log No. destination countries	Log No. products-destination	HHI Exports[1]	Quality exports (share) – value[2]	Quality exports (share) – number[3]	Profit rate[4]	Share export differentiated goods[5]	Log average UV imported inputs	Imported value share[6]	Equity (P*)
IMQ1	0.172***	-0.0372***	-0.00296	-0.0356***	3.08e-05	0.0130***	0.00891***	0.00121*	-0.00571***	0.0102	-0.00243	0.00365
	(0.0153)	(0.00578)	(0.00354)	(0.00613)	(0.00193)	(0.00230)	(0.00215)	(0.000710)	(0.00185)	(0.0143)	(0.00175)	(0.00330)
Observations	*23,738*	*23,738*	*23,738*	*23,738*	*23,738*	*21,550*	*21,550*	*23,642*	*23,738*	*19,377*	23,738	*23,738*
IMQ2	0.142***	-0.0197**	0.00525	-0.0175*	0.00110	0.0103***	0.00423	0.00204*	-0.00244	-0.0420	0.000289	-0.000296
	(0.0222)	(0.00828)	(0.00634)	(0.00925)	(0.00313)	(0.00328)	(0.00296)	(0.00117)	(0.00218)	(0.0290)	(0.00373)	(0.00553)
Observations	*20,361*	*20,361*	*20,361*	*20,361*	*20,361*	*18,644*	*18,644*	*20,299*	*20,361*	*16,563*	20,361	*20,361*
IMQ3	0.118***	-0.00411	0.0110	-0.00198	-0.00239	0.0123***	0.00694**	0.00268**	-0.00329	-0.0804**	-0.00107	0.00146
	(0.0219)	(0.00877)	(0.00719)	(0.00978)	(0.00348)	(0.00386)	(0.00330)	(0.00133)	(0.00232)	(0.0342)	(0.00417)	(0.00644)
Observations	*18,931*	*18,931*	*18,931*	*18,931*	*18,931*	*17,474*	*17,474*	*18,879*	*18,931*	*15,378*	18,931	*18,931*
IMQ4	0.126***	-0.00338	0.0139*	0.00120	-0.00262	0.0120***	0.00700**	0.00302**	-0.00298	-0.0794**	-0.00128	0.00392
	(0.0217)	(0.00875)	(0.00726)	(0.00980)	(0.00346)	(0.00386)	(0.00329)	(0.00135)	(0.00233)	(0.0342)	(0.00416)	(0.00648)
Observations	*18,941*	*18,941*	*18,941*	*18,941*	*18,941*	*17,482*	*17,482*	*18,889*	*18,941*	*15,387*	18,941	*18,941*
IMQ5	0.111***	-0.00355	0.0108	-0.00132	-0.00343	0.0145***	0.00842**	0.00202	-0.00277	-0.0781**	-0.00414	-0.000906
	(0.0227)	(0.00984)	(0.00772)	(0.0109)	(0.00394)	(0.00439)	(0.00371)	(0.00144)	(0.00253)	(0.0383)	(0.00431)	(0.00641)
Observations	*15,604*	*15,604*	*15,604*	*15,604*	*15,604*	*14,450*	*14,450*	*15,561*	*15,604*	*12,873*	15,604	*15,604*
IMQ6	0.111***	-0.00347	0.0108	-0.00126	-0.00343	0.0145***	0.00839**	0.00205	-0.00276	-0.0782**	-0.00415	-0.000926
	(0.0227)	(0.00984)	(0.00772)	(0.0109)	(0.00394)	(0.00439)	(0.00371)	(0.00144)	(0.00253)	(0.0383)	(0.00431)	(0.00641)
Observations	*15,604*	*15,604*	*15,604*	*15,604*	*15,604*	*14,450*	*14,450*	*15,561*	*15,604*	*12,873*	15,604	*15,604*
X	Log GD (global demand of products exported by firm - product-destination weighted avg, shares t=0), log fixed assets, log non-tangible assets, log operating expenses, and TFP clean of the international management component [a]											
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors clustered at firm level in parentheses.*** p<0.01, ** p<0.05, * p<0.1. P*: placebo test. UV: Unit value. [a] TFP (excluding int management component) is the residual of a regression of TFP on international managerial quality. [1] Calculated by squaring the share of each product-destination country observation in total firms' exports and then summing the obtained numbers. [2] Exported value of goods that compete in the international market by quality relative to total differentiated products' exported value.[3] Number of exported goods that compete in the international market by quality relative to total number of exported differentiated products. [4] Operating profit relative to operating income. [5] Exported value of differentiated goods relative to total exported value. [6] Imported inputs relative to sales cost.

***Figure 7**. International managerial quality and global demand shocks impact on export performance (dependent variable: log real exported value)*



***Note 1:** This graph shows the 95% confidence intervals of the international managerial quality and global demand (GD) of products exported by firm coefficients on log real exported value. $\Gamma X_{ft} + \partial_f + \partial_{st}$ are included as other explanatory variables in the regressions (see equation 8).*

***Note 2:** Global demand of products exported by firm (GD) is defined as: $Log\ global\ demand\ (GD)_{ft} = ln(\sum_{kp} ID_{kpt} * share\_exp_{fpk,t=0})$, where $share\_exp_{fpk,t=0}$ is the share of product p exported to country k in total exports of firm f in its first sample year, and ID_{kpt} is the imported value of country k of product p in year t excluding Colombian exports.*

***Note 3:** The number of the international managerial quality (IMQ) denotes the column of the unit value and quantity regression from which the residuals to calculate IMQ are obtained (see tables 2 and 3, and equation 4, 5, 6 and 7).*

***Table 5**. International managerial quality impact on international firms' performance (bootstrap standard errors)*

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Log real exported value	Log No. exported products	Log No. destination countries	Log No. products-destination countries	HHI exports[1]	Quality exports (share) – value[2]
IMQ3	0.112***	-0.004	0.007	-0.003	-0.002	0.011***
	(0.0237)	(0.0097)	(0.0077)	(0.0108)	(0.0037)	(0.0041)
X	Log GD (global demand of products exported by firm - product-destination weighted avg, shares t=0), log fixed assets, log non-tangible assets, log operating expenses, and TFP clean of the international management component [a]					
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Average number of observations second step	13,025	13,025	13,025	13,025	13,025	11,945
➢ *Share number of observations relative to the baseline sample size*	0.69	0.69	0.69	0.69	0.69	0.68
Average number of observations first step	440,652	440,652	440,652	440,652	440,648	440,652
➢ *Share number of observations relative to the baseline sample size*	1.59	1.59	1.59	1.59	1.59	1.59
Number of replications	2,500	2,500	2,500	2,500	2,500	2,500
	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	Quality exports (share) – number[3]	Profit rate[4]	Share export differentiated goods[5]	Log average UV imported inputs	Imported value share[6]	Equity (P*)
IMQ3	0.006*	0.003**	-0.003	-0.082**	-0.001	0.003
	(0.0034)	(0.0015)	(0.0026)	(0.0369)	(0.0043)	(0.0070)
X	Log GD (global demand of products exported by firm - product-destination weighted avg, shares t=0), log fixed assets, log non-tangible assets, log operating expenses, and TFP clean of the international management component [a]					
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Average number of observations second step		12,980	13,025	10,592	13,025	13,025
➢ *Share number of observations relative to the baseline sample size*		0.69	0.69	0.69	0.69	0.69
Average number of observations first step		440,642	440,644	440,667	440,652	440,652
➢ *Share number of observations relative to the baseline sample size*	1.59	1.59	1.59	1.59	1.59	1.59
Number of replications	2,500	2,500	2,500	2,500	2,500	2,500

Bootstrap standard error in parentheses calculated based on the pairs cluster bootstrap procedure for both steps described by Chen et al. (2023). Cluster: firm level. *** p<0.01, ** p<0.05, * p<0.1. [a] TFP (excluding int management component) is the residual of a regression of TFP on international managerial quality. [1] Calculated by squaring the share of each product-destination country observation in total firms' exports and then summing the obtained numbers. [2] Exported value of goods that compete in the international market by quality relative to total differentiated products' exported value.[3] Number of exported goods that compete in the international market by quality relative to total number of exported differentiated products. [4] Operating profit relative to operating income. [5] Exported value of differentiated goods relative to total exported value. [6] Imported inputs relative to sales cost.

VI. Conclusion

Big exporting firms have incentives to implement different managerial practices when selling goods in the international versus the local markets. Despite this, specialized management surveys do not include questions about those differences and statistical methodologies to measure international managerial skill are similarly scarce. In order to fill this literature gap, this paper proposes a two-step methodology to measure firm managerial practices quality specifically geared to the international market and to calculate its impact on international firm performance.

Under the theoretical assumption that managerial teams categorize exported products in three groups (differentiated competing on price, differentiated competing on quality, and homogeneous) and implement distinct managerial policies in each group in order to rise firms' export proficiency, international managerial quality is empirically calculated as the average of a residuals group conformed by export unit value regressions residuals for differentiated products (multiplied by -1 for products that compete on price) and quantity regression residuals for homogeneous goods. In a second step, international managerial quality is included as an explanatory variable in international firms' performance regression. Specific econometric issues associated with two-step estimations (model misspecification, measurement error, and sampling error) are discussed and minimized.

Three conclusions emerge from the research. First, higher international managerial quality impacts positively on the firm's exported value and profit rate, confirming the intuition that better managers in the international market increase the firm's exported value and make the firm more profitable. Second, better managerial team in the international market do not increase the number of exported products but rise both quality export shares (number and value), replacing exports of products that compete by price over exports of products that compete by quality. This result, on one hand, challenges traditional policy recommendations that firms should attempt to increase the extensive margin but, on the other hand, support upgrading exports' quality policies. Finally, international managerial quality is around 5 times more relevant than favorable external conditions to boost firms' exports. In conclusion, the managerial team is a fundamental pillar in the international firm performance.

It is suggested for future research to develop a theoretical model to describe these empirical findings. Also, it is recommended to correlate IMQ with compensation data to assess if better managers—measured under the methodology proposed herein—receive higher remuneration, and to estimate globalization market and non-market returns (see Keller & Olney, 2021). Furthermore, it is suggested to deep into the non-traditional intangible assets' measurement (such as organizational capital and the firm's culture and structure), which according to the findings of this paper, could be more relevant international firm performance determinants than traditional intangible assets measured in the financial statements. Lastly, it is suggested that specialized management quality surveys, like WMS and GMOP, include questions about international managerial practices and whether (and how) firms learn by exporting.

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APPENDIX

Table 1A. Literature review – 16 most influential business export empirical research

Num	Paper	Title	Country	Sample
1	Bilkey & Tesar (1977)	The export behavior of smaller-sized Wisconsin manufacturing firms	US	423 small and medium-sized Wisconsin manufacturing firms
2	Bonaccorsi (1992)	On the relationship between firm size and export intensity	Italy	Nationwide sample of manufacturing firms
3	Cavusgil (1984b)	Differences among exporting firms based on their degree of internationalization	US	70 midwestern manufacturers(personal interviews with the executives)
4	Cavusgil & Nevin (1981)	Internal determinants of export marketing behavior — An empirical investigation	US	A sample of 816 firms was systematically selected from the 4701 manufacturing firms listed in the classified directory of Wisconsin Manufacture
5	Bello & Gilliland (1997)	The effect of output controls, process controls, and flexibility on export channel performance	US	A series of 20 in-depth field interviews were conducted with export executives (n=375)
6	Reuber & Fischer (1997)	The influence of management team's international experience on internationalization behaviors of SMEs	Canada	Firms to be contacted were identified from a directory of Canada's premier software product firms. The directory listed 164 firms
7	Cooper & Kleinschmidt (1985)	The impact of export strategy on export sales performance	Canada	Managers of 142 firms in the Canadian electronics industry were personally interviewed to obtain data on export strategies and performance
8	Wiedersheim et al. (1978)	Pre-export activity — The first step in internationalization	Australia	The investigation involved a survey of 75 Australian manufacturing firms in five different city locations
9	Cavusgil (1984a)	Organizational characteristics associated with export activity	US	A total of 816 companies had been systematically selected from the 4,701 companies listed in the classified directory of manufacturers in Wisconsin, U.S.A.
10	Cavusgil et al. (1993)	Product and promotion adaptation in export ventures — An empirical investigation	US	In-depth personal interviews were conducted in the midwestern United States (Illinois, Indiana, Michigan, Ohio, and Wisconsin) (n=202)
11	Dichtl et al. (1990)	International orientation as a precondition for export success	Germany	104 firms (interviews with managers)
12	Cavusgil & Naor (1987)	Firm and management characteristics as discriminators of export marketing activity	US	The sampling frame consisted of 795 firms listed in the 1978 Maine Marketing Directory
13	Kujawa & Simpson (1974)	The export decision process: An empirical inquiry	UK	The sample was drawn from the 2047 units selected from UK manufacturing firms through a random stratified procedure
14	Denis & Depelteau (1985)	Market knowledge diversification and export expansion	Canada	The researchers had access to a data bank of 331 small and middle-sized manufacturing firms located in Quebec
15	Madsen (1989)	Successful export marketing management: Some empirical evidence	Denmark	82 manufacturing firms participated in the survey
16	Reid (1984)	Information acquisition and export entry decision in small firms	Canada	89 small indigenous enterprises in Ontario

Source: *Leonidou et al. (2010). The "sample" column was added by this paper.*

Table 2A. Annual average descriptive statistics – big exporting firms and other exporting firms (2006 -2014)

Variable	Big-exporting firms	Other exporting firms	Pi-value coefficient [a]
Simple average exported value per firm (real USD Dollars)	8,233,714	3,750,304	0.000
Median exported value per firm (real USD Dollars)	201,658	32,189	
Average exports HHI per firm	0.535	0.700	0.000
Median exports HHI per firm	0.481	0.800	
Average number of exported products per firm	7.7	4.161	0.000
Median number of exported products per firm	3.111	1.556	
Average number of country destinations per firm	4.619	2.143	0.000
Median number of country destinations per firm	2	1	
Average number of product - country destinations per firm	17.960	6.732	0.000
Median number of product - country destinations per firm	5	2	
Average number of firms	3,434	4,904	

Source: *Colombian National Administrative Statistics Department (DANE by its acronym in Spanish), Colombian Companies Superintendence, and authorial calculations. The exported value variable was deflated based on the US GDP deflator. [a] A regression was estimated for each variable on a dummy indicating if the firm is "big exporting" plus year fixed effects. The pi-value of the dummy variable coefficient is reported.*

Table 3A. Annual average descriptive statistics – big exporting firms and big non-exporting firms (2006 -2014)

Variable	Big exporting firms	Big non-exporting firms	Pi-value coefficient [a]
Simple average property plant equipment (real USD dollars) per firm	7,210,654	1,251,854	0.000
Median property plant equipment (real USD dollars) per firm	506,531	155,069	
Simple average non-tangible assets (real USD dollars) per firm	936,579	321,977	0.000
Median non-tangible assets (real USD dollars) per firm	0	0	
Simple average operating expenses (real USD dollars) per firm	5,893,036	1,123,319	0.000
Median operating expenses (real USD dollars) per firm	1,090,400	260,321	
Simple average TFP	1.887	1.824	0.000
Median TFP	1.846	1.765	
Average number of firms	3,434	20,490	

Source: *Colombian Companies Superintendence and authorial calculations. The variables used in this dataset were deflated using an industry-specific annual Producer Price Index (PPI) reported by the Colombian Central Bank. TFP calculated with Levinsohn & Petrin (2003) methodology using "prodest" Stata command (table 4A).[a] A regression was estimated for each variable on a dummy indicating if the firm is "big exporting" plus industry-year fixed effects. The pi-value of the dummy variable coefficient is reported.*

Table 4A. TFP estimation

VARIABLES	(1) Log real operating income (USD)
Log real operating expenses (USD)	0.344***
	(0.00398)
Log real property, plant and equipment (USD)	0.0363***
	(0.00576)
Log real sales cost (USD)	0.556***
	(0.00941)
Observations	159,872
Number of groups	29,656

Note: *TFP calculation based on Levinsohn & Petrin (2003) methodology and prodest Stata command (Mollisi & Rovigatti, 2018). Free variable is operating expenses, state variable is property plant and equipment, and proxy variable is sales cost. Sample includes the biggest private Colombian firms (exporting and non-exporting).*

Table 5A. Managerial quality estimation (traditional *firm efficiency* methodology)

VARIABLES	(1) Firm efficiency (theta)[1]
Log real total assets (USD)	0.00262***
	(0.000398)
Market share[2]	0.689***
	(0.0501)
Free cash flow[3]/assets	0.00442***
	(0.000736)
Industry (ISIC 3 digit) fixed effects	Yes
Year fixed effects	Yes
Observations	24,802

Note: *Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Tobit regression in which the dependent variable (firm efficiency) is left censored in 0 and right censored in 1. [1] Firm efficiency is measured with Data Envelopment Analysis (DEA), which is an optimization procedure which allows to measure firms' efficiency of converting inputs into outputs (Demerjian et al., 2012). It is measured relative to the most efficient firm in each industry (ISIC 3 digit) in each year. For this calculation, it was assumed decreasing return to scale, the inputs included were sales cost, operating expenses, change in property, plant, equipment, and change in non-tangible assets, and the output was operating income. See table 6A for descriptive statistics. [2] Firm operating income/industry operating income. [3] Free Cash Flow = Operating income – CAPEX – Debt payment. Managerial quality is the residual of this regression.*

Table 6A. Firm-level variables descriptive statistics (baseline regression sample)

Variable	Mean	p50	SD	Min	Max	N
International managerial quality 1	0.03	0.00	0.79	-7.03	7.36	18882
International managerial quality 2	0.00	0.00	0.48	-5.84	5.79	18594
International managerial quality 3	0.00	0.00	0.45	-4.99	5.04	18931
International managerial quality 4	0.00	0.00	0.45	-4.98	5.08	18931
International managerial quality 5	0.00	0.00	0.43	-4.34	5.05	15641
International managerial quality 6	0.00	0.00	0.43	-4.34	5.05	15641
Ln (unit value)	3.34	2.83	2.76	-5.08	13.21	18931
Ln (export quantity)	8.75	8.77	3.23	-1.20	20.54	18931
Log real exported value (USD)	13.03	12.94	2.49	1.57	21.93	18931
Log No. exported products	1.67	1.61	1.13	0.00	5.89	18931
Log No. export country destinations	1.32	1.39	0.96	0.00	4.03	18931
Log No. exported product-export country destinations	2.31	2.30	1.34	0.00	7.03	18931
HHI exports	0.42	0.34	0.29	0.01	1.00	18931
Quality exports (share) - value	0.72	0.98	0.38	0.00	1.00	17560
Quality exports (share) - number	0.70	0.77	0.30	0.00	1.00	17560
Exported value/operating income	0.20	0.08	0.27	0.00	1.00	18931
Imported value/sales cost	0.41	0.31	0.36	0.00	1.00	18931
Profit rate	0.06	0.07	0.10	-0.99	0.85	18885
Log global demand of products exported by firm (GD)	14.31	16.08	6.86	-6.42	26.70	18931
Log real stock property, plant and equipment (USD)	13.41	13.36	2.14	3.53	22.90	18931
Log real stock non-tangible assets (USD)	4.66	0.00	5.85	0.00	19.71	18931
Log real operating expenses (USD)	14.28	14.13	1.59	6.49	19.95	18931
Share "differentiated" goods exports	0.79	1.00	0.36	0.00	1.00	18931
Share "referenced price" goods exports	0.13	0.00	0.30	0.00	1.00	18931
Share "organized trade exchange" goods exports	0.04	0.00	0.19	0.00	1.00	18931
Share "non-classified" goods exports	0.03	0.00	0.15	0.00	1.00	18931
Firm efficiency	0.97	0.99	0.05	0.50	1.00	16109
Managerial quality	-0.03	-0.01	0.08	-1.04	0.20	16109
TFP	1.90	1.86	0.20	1.63	3.46	18931
TFP 1 (excluding int management component)	0.01	-0.03	0.20	-0.28	1.57	18882
TFP 2 (excluding int management component)	0.00	-0.04	0.19	-0.27	1.56	18594
TFP 3 (excluding int management component)	0.00	-0.04	0.20	-0.27	1.56	18931
TFP 4 (excluding int management component)	0.00	-0.04	0.20	-0.27	1.56	18931
TFP 5 (excluding int management component)	0.00	-0.04	0.20	-0.27	1.56	15641
TFP 6 (excluding int management component)	0.00	-0.04	0.20	-0.27	1.56	15641

Note 1: Global demand of products exported by firm (GD) is defined as: $Log\ global\ demand\ (GD)_{ft} = \ln(\sum_{kp} ID_{kpt} * share\_exp_{fpk,t=0})$, where $share\_exp_{fpk,t=0}$ is the share of product *p* exported to country *k* in total exports of firm f in its first firm year sample, and ID_{kpt} is the import demand of country *k* of product *p* in year *t* excluding Colombian exports.

Note 2: The number of the international managerial quality (IMQ) denotes the column number of the unit value and quantity regression from which the residuals are obtained to calculate it, see equation 6 and 7.

Note 3: Methodology to classify products that compete in the international market by price/quality is explained in section IV.a.

Note 4: TFP calculation based on Levinsohn & Petrin (2003) methodology and the *prodest* Stata command (Mollisi & Rovigatti, 2018). See table 4A.

Note 5: TFP (excluding int management component) is the residual of a TFP regression on international managerial quality.

Note 6: Firm level variables are defined as Log (x+1) to include firms that report $0 in some variables, particularly, non-tangible assets.

Table 7A. International managerial quality 3 impact on international firms' performance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(12)	(11)
VARIABLES	Log real exported value	Log No. exported products	Log No. destination countries	Log No. exported products-destination countries	HHI exports[1]	Quality exports (share)[2] - value	Quality exports (share)[3]- number	Profit rate[4]	Share export differentiated commodities[5]	Log average UV imported inputs	Share imported inputs[6]	Equity (P*)
IMQ3	0.118***	-0.00411	0.0110	-0.00198	-0.00239	0.0123***	0.00694**	0.00268**	-0.00329	-0.0804**	-0.00107	0.00146
	(0.0219)	(0.00877)	(0.00719)	(0.00978)	(0.00348)	(0.00386)	(0.00330)	(0.00133)	(0.00232)	(0.0342)	(0.00417)	(0.00644)
Log global demand of products exported by firm (product-destination weighted avg, shares t=0)	0.0269***	0.0167***	0.0162***	0.0241***	-0.00520***	-0.000703	-4.66e-05	1.21e-05	-0.000108	0.00758*	-0.000132	-0.000645
	(0.00311)	(0.00156)	(0.00126)	(0.00171)	(0.000518)	(0.000542)	(0.000512)	(0.000174)	(0.000437)	(0.00455)	(0.000556)	(0.00104)
Log real stock property, plant and equipment (USD)	0.221***	0.0499***	0.0545***	0.0832***	-0.00824**	-0.00284	-0.000805	0.0123***	-0.00387	0.322***	-0.0178***	0.191***
	(0.0242)	(0.0124)	(0.00976)	(0.0137)	(0.00361)	(0.00346)	(0.00310)	(0.00220)	(0.00271)	(0.0434)	(0.00522)	(0.0126)
Log real stock non-tangible assets (USD)	0.00663**	0.00392***	0.00305***	0.00408**	-0.000795*	9.16e-05	-8.29e-06	0.000132	-0.000118	0.00423	-0.000197	0.00622***
	(0.00264)	(0.00151)	(0.00113)	(0.00162)	(0.000439)	(0.000472)	(0.000451)	(0.000180)	(0.000391)	(0.00448)	(0.000537)	(0.00116)
Log real operating expenses (USD)	0.346***	0.132***	0.104***	0.171***	-0.0207***	-0.00193	0.00502	-0.0157***	0.00654	0.251***	-0.0237**	0.169***
	(0.0423)	(0.0207)	(0.0168)	(0.0240)	(0.00630)	(0.00548)	(0.00535)	(0.00561)	(0.00451)	(0.0803)	(0.0102)	(0.0243)
TFP (excluding int management component)[a]	3.528***	0.753***	0.608***	1.108***	-0.0677*	-0.0120	-0.0273	0.179***	-0.0551	1.389***	-0.221***	1.141***
	(0.289)	(0.129)	(0.105)	(0.150)	(0.0402)	(0.0445)	(0.0366)	(0.0298)	(0.0356)	(0.467)	(0.0767)	(0.142)
Observations	18,931	18,931	18,931	18,931	18,931	17,474	17,474	18,879	18,931	15,378	18,931	18,931
R-squared	0.913	0.864	0.886	0.893	0.763	0.871	0.810	0.630	0.914	0.699	0.711	0.970
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses clustered at firm level. *** p<0.01, ** p<0.05, * p<0.1. P*: placebo test. UV: unit value. [a] TFP (excluding int management component) is the residual of a TFP regression on international managerial quality.[1]Calculated by squaring the share of each product-destination country observation in total firms' exports and then summing the obtained numbers. [2] Exported value of goods that compete in the international market by quality relative to total differentiated products' exported value. [3] Number of exported goods that compete in the international market by quality relative to total differentiated products. [4] Operating profit relative to operating income. [5] Exported value of differentiated goods relative to total exported value. [6] Imported inputs relative to sales cost.

Table 8A. International managerial quality impact on international firms' performance (median of the modified residuals)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	Log real exported value	Log No. exported products	Log No. destination countries	Log No. exported products-destination countries	HHI Exports[1]	Quality exports (share) – value[2]	Quality exports (share) – number[3]	Profit rate[4]	Share export differentiated goods[5]	Log average UV imported inputs	Imported value share[6]	Equity (P*)
IMQ1	0.165***	-0.0309***	-0.00145	-0.0299***	-0.000350	0.0128***	0.00859***	0.00140**	-0.00444**	0.00435	-0.00158	0.00509
	(0.0151)	(0.00564)	(0.00352)	(0.00600)	(0.00191)	(0.00224)	(0.00207)	(0.000702)	(0.00180)	(0.0141)	(0.00169)	(0.00331)
Observations	*23,738*	*23,738*	*23,738*	*23,738*	*23,738*	*21,550*	*21,550*	*23,642*	*23,738*	*19,377*	23,738	*23,738*
IMQ2	0.153***	-0.0173**	0.00726	-0.0125	0.00107	0.0118***	0.00481	0.00240**	-0.00113	-0.0533*	0.000684	0.00473
	(0.0232)	(0.00864)	(0.00650)	(0.00959)	(0.00326)	(0.00344)	(0.00307)	(0.00121)	(0.00222)	(0.0291)	(0.00374)	(0.00561)
Observations	*20,361*	*20,361*	*20,361*	*20,361*	*20,361*	*18,644*	*18,644*	*20,299*	*20,361*	*16,563*	20,361	*20,361*
IMQ3	0.133***	-0.00317	0.0156**	0.00322	-0.00281	0.0124***	0.00631*	0.00309**	-0.00298	-0.0793**	-0.000811	0.00545
	(0.0232)	(0.00926)	(0.00753)	(0.0103)	(0.00369)	(0.00416)	(0.00349)	(0.00138)	(0.00239)	(0.0342)	(0.00436)	(0.00681)
Observations	*18,931*	*18,931*	*18,931*	*18,931*	*18,931*	*17,474*	*17,474*	*18,879*	*18,931*	*15,378*	18,931	*18,931*
IMQ4	0.140***	-0.00303	0.0182**	0.00586	-0.00299	0.0121***	0.00658*	0.00338**	-0.00267	-0.0790**	-0.00111	0.00757
	(0.0230)	(0.00924)	(0.00760)	(0.0103)	(0.00367)	(0.00415)	(0.00349)	(0.00141)	(0.00240)	(0.0341)	(0.00435)	(0.00683)
Observations	*18,941*	*18,941*	*18,941*	*18,941*	*18,941*	*17,482*	*17,482*	*18,889*	*18,941*	*15,387*	18,941	*18,941*
IMQ5	0.124***	-0.00430	0.0124	0.00110	-0.00324	0.0159***	0.00851**	0.00251	-0.00228	-0.0790**	-0.00294	0.00302
	(0.0244)	(0.0104)	(0.00811)	(0.0116)	(0.00422)	(0.00474)	(0.00392)	(0.00153)	(0.00256)	(0.0386)	(0.00443)	(0.00684)
Observations	*15,604*	15,604	*15,604*	*15,604*	*15,604*	*14,450*	*14,450*	*15,561*	*15,604*	*12,873*	15,604	*15,604*
IMQ6	0.125***	-0.00420	0.0124	0.00118	-0.00323	0.0159***	0.00848**	0.00254*	-0.00228	-0.0790**	-0.00295	0.00299
	(0.0244)	(0.0104)	(0.00811)	(0.0116)	(0.00422)	(0.00474)	(0.00392)	(0.00153)	(0.00256)	(0.0386)	(0.00443)	(0.00684)
Observations	*15,604*	*15,604*	*15,604*	*15,604*	*15,604*	*14,450*	*14,450*	*15,561*	*15,604*	*12,873*	15,604	*15,604*
X	Log GD (global demand of products exported by firm - product-destination weighted avg, shares t=0), log fixed assets, log non-tangible assets, log operating expenses, and TFP clean of the international management component [a]											
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes
Industry-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes

Robust standard errors in parentheses clustered at firm level.*** p<0.01, ** p<0.05, * p<0.1. P*: placebo test. UV: Unit value. [a] TFP (excluding int management component) is the residual of a regression of TFP on international managerial quality. [1] Calculated by squaring the share of each product-destination country observation in total firms' exports and then summing the obtained numbers. [2] Exported value of goods that compete in the international market by quality relative to total differentiated products' exported value. [3] Number of exported goods that compete in the international market by quality relative to total number of exported differentiated products. [4] Operating profit relative to operating income. [5] Exported value of differentiated goods relative to total exported value. [6] Imported inputs relative to sales cost.

Table 9A. International managerial quality impact on international firms' performance (average of the modified residuals - standardized EUV and Q residuals)

VARIABLES	(1) Log real exported value	(2) Log No. exported products	(3) Log No. destination countries	(4) Log No. exported products-destination countries	(5) HHI Exports[1]	(6) Quality exports (share) – value[2]	(7) Quality exports (share) – number[3]	(8) Profit rate[4]	(9) Share export differentiated goods[5]	(10) Log average UV imported inputs	(11) Imported value share[6]	(12) Equity (P*)
IMQ1	0.205***	-0.0504***	-0.00440	-0.0494***	0.000917	0.0186***	0.0124***	0.00152	-0.00255	0.0106	-0.00233	0.00458
	(0.0219)	(0.00856)	(0.00515)	(0.00907)	(0.00283)	(0.00320)	(0.00297)	(0.00103)	(0.00245)	(0.0202)	(0.00260)	(0.00479)
Observations	*23,738*	*23,738*	*23,738*	*23,738*	*23,738*	*21,550*	*21,550*	*23,642*	*23,738*	*19,377*	23,738	*23,738*
IMQ2	0.0844***	-0.0207***	0.00149	-0.0200***	0.00206	0.00816***	0.00316	0.00154	0.000122	-0.0362	-0.000334	-0.00132
	(0.0177)	(0.00678)	(0.00508)	(0.00755)	(0.00254)	(0.00238)	(0.00218)	(0.000935)	(0.00169)	(0.0233)	(0.00309)	(0.00426)
Observations	*20,361*	*20,361*	*20,361*	*20,361*	*20,361*	*18,644*	*18,644*	*20,299*	*20,361*	*16,563*	20,361	*20,361*
IMQ3	0.0529***	-0.00664	0.00425	-0.00651	-0.000896	0.00726***	0.00376*	0.00170**	-0.000852	-0.0567***	-0.00124	0.000473
	(0.0138)	(0.00571)	(0.00462)	(0.00634)	(0.00226)	(0.00227)	(0.00193)	(0.000852)	(0.00141)	(0.0219)	(0.00267)	(0.00404)
Observations	*18,931*	*18,931*	*18,931*	*18,931*	*18,931*	*17,474*	*17,474*	*18,879*	*18,931*	*15,378*	18,931	*18,931*
IMQ4	0.0557***	-0.00652	0.00543	-0.00538	-0.000958	0.00711***	0.00382**	0.00185**	-0.000756	-0.0563**	-0.00130	0.00131
	(0.0137)	(0.00570)	(0.00464)	(0.00634)	(0.00225)	(0.00227)	(0.00193)	(0.000857)	(0.00141)	(0.0220)	(0.00267)	(0.00405)
Observations	*18,941*	*18,941*	*18,941*	*18,941*	*18,941*	*17,482*	*17,482*	*18,889*	*18,941*	*15,387*	18,941	*18,941*
IMQ5	0.0498***	-0.00704	0.00437	-0.00718	-0.00120	0.00855***	0.00481**	0.00132	-0.000407	-0.0552**	-0.00333	-0.00125
	(0.0143)	(0.00640)	(0.00494)	(0.00709)	(0.00255)	(0.00254)	(0.00212)	(0.000930)	(0.00151)	(0.0242)	(0.00278)	(0.00417)
Observations	*15,604*	15,604	*15,604*	*15,604*	*15,604*	*14,450*	*14,450*	*15,561*	*15,604*	*12,873*	15,604	*15,604*
IMQ6	0.0498***	-0.00700	0.00438	-0.00713	-0.00120	0.00855***	0.00480**	0.00134	-0.000401	-0.0552**	-0.00333	-0.00127
	(0.0143)	(0.00640)	(0.00493)	(0.00709)	(0.00255)	(0.00254)	(0.00212)	(0.000930)	(0.00151)	(0.0242)	(0.00278)	(0.00417)
Observations	*15,604*	*15,604*	*15,604*	*15,604*	*15,604*	*14,450*	*14,450*	*15,561*	*15,604*	*12,873*	15,604	*15,604*
X	Log GD (global demand of products exported by firm - product-destination weighted avg, shares t=0), log fixed assets, log non-tangible assets, log operating expenses, and TFP clean of the international management component [a]											
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes
Industry-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes

Robust standard errors in parentheses clustered at firm level.*** p<0.01, ** p<0.05, * p<0.1. P*: placebo test. UV: Unit value. [a] TFP (excluding int management component) is the residual of a regression of TFP on international managerial quality. [1] Calculated by squaring the share of each product-destination country observation in total firms' exports and then summing the obtained numbers. [2] Exported value of goods that compete in the international market by quality relative to total differentiated products' exported value. [3] Number of exported goods that compete in the international market by quality relative to total number of exported differentiated products. [4] Operating profit relative to operating income. [5] Exported value of differentiated goods relative to total exported value. [6] Imported inputs relative to sales cost.