

# Essays on international trade

Inaugural-Dissertation

zur Erlangung des akademischen Grades eines Doktors.

der Wirtschafts- und Sozialwissenschaften

der Wirtschafts- und Sozialwissenschaftlichen Fakultät

der Christian-Albrechts-Universität zu Kiel

vorgelegt von

Federico Merchán, M.Sc,

aus Bogotá, Kolumbien.

Kiel, 2024

Gedruckt mit Genehmigung der Wirtschafts- und Sozialwissenschaftlichen Fakultät der Christian-Albrechts-Universität zu Kiel.

Erstbegutachtung: Prof, Holger Gorg, PhD.

Zweitbegutachtung: Prof, Alexander Sandkamp, PhD.

Drittbegutachtung: Prof, Horst Raff, PhD.

Tag der Abgabe der Arbeit: 18. April 2024.

Tag der mündlichen Prüfung: 15. Juli 2024.

Erteilung der Druckerlaubnis: 16. Juli 2024.

# Contents

<b>1</b>	<b>International managerial skill and big Colombian exporting firms' performance, 2006-2014</b>	<b>10</b>
1.1	Introduction . . . . .	11
1.2	Theoretical framework . . . . .	13
1.3	Data . . . . .	15
1.4	Methodology . . . . .	17
1.4.1	Product classification (price or quality competition) . . . . .	18
1.4.2	International managerial quality calculation . . . . .	20
1.4.3	International firm performance regression . . . . .	28
1.5	Results . . . . .	30
1.6	Conclusion . . . . .	35
1.7	References . . . . .	36
1.8	Appendix . . . . .	40
<b>2</b>	<b>Export impact on dividend policy for big Colombian exporting firms, 2006-2014</b>	<b>47</b>
2.1	Introduction . . . . .	48
2.2	Colombian dividend payment regulation . . . . .	49
2.3	Theoretical framework . . . . .	50
2.4	Descriptive statistics . . . . .	53
2.5	Methodology . . . . .	59

2.6	Results . . . . .	63
2.7	Conclusion . . . . .	69
2.8	References . . . . .	70
2.9	Appendix A: Tables . . . . .	75
2.10	Appendix B: Exports and cash flow volatility . . . . .	85
2.11	Appendix C: Overinvestment calculation . . . . .	88
<b>3</b>	<b>Natural resource dependence and monopolized imports</b>	<b>89</b>
3.1	Introduction . . . . .	90
3.2	Data and measurement . . . . .	92
3.3	Main result . . . . .	94
3.4	Trade policy mechanisms for import monopolization . . . . .	96
3.5	Import monopolization and domestic prices . . . . .	99
3.6	Concluding remarks . . . . .	100
3.7	Exhibits . . . . .	101
3.8	Bibliography . . . . .	105
3.9	Online Supplement to Arezki, Fernandes, Merchán, Nguyen, and Reed "Natural Resource Dependence and Monopolized Imports" . . . . .	107
3.10	Coauthors' approval . . . . .	111

# List of Tables

- 1.1 Product classification (price or quality competition) . . . . . 19
- 1.2 Export unit value regression . . . . . 24
- 1.3 Quantity regression . . . . . 25
- 1.4 International managerial quality impact on international firms’ performance . . . . . 32
- 1.5 International managerial quality impact on international firms’ performance (bootstrap standard errors) . . . . . 34
- 1.6 Literature review – 16 most influential business export empirical research . . . . . 40
- 1.7 Annual average descriptive statistics – big exporting firms and other exporting firms (2006 -2014) . . . . . 41
- 1.8 Annual average descriptive statistics – big exporting firms and big non-exporting firms . . 41
- 1.9 TFP estimation . . . . . 42
- 1.10 Managerial quality estimation (traditional firm efficiency methodology) . . . . . 42
- 1.11 Firm-level variables descriptive statistics (baseline regression sample) . . . . . 43
- 1.12 International managerial quality impact on international firms’ performance . . . . . 44
- 1.13 International managerial quality impact on international firms’ performance (modified residuals’ median) . . . . . 45
- 1.14 International managerial quality impact on international firms’ performance (modified residuals’ average, standardized EUV and Q residuals) . . . . . 46
  
- 2.1 Descriptive statistics – variables in levels (simple average by firm type) . . . . . 57
- 2.2 First stage – firm specific real exchange rate effect on export value . . . . . 65
- 2.3 Export effect on firms’ dividend policy . . . . . 66

2.4	Heterogeneous export effect on firms' dividend policy – IV estimation . . . . .	67
2.5	Export effect on firms' dividend policy (amount decreed) – heckman and 2SLS estimation	68
2.6	Descriptive statistics – two year differences . . . . .	75
2.7	Descriptive statistics – three year differences . . . . .	76
2.8	Descriptive statistics – four year differences . . . . .	77
2.9	TFP estimation . . . . .	78
2.10	Export and import effect on firms' dividend policy – three year differences . . . . .	79
2.11	Export effect on firms' dividend policy - two year differences . . . . .	80
2.12	Export effect on firms' dividend policy - four year differences . . . . .	81
2.13	Selection equation (probit) – heckman estimation . . . . .	82
2.14	IV first stage (sample: censored observations) . . . . .	83
2.15	Number of observations per fixed effects . . . . .	84
2.16	Export share effect on firms' volatility . . . . .	86
2.17	Residual operating income, free cash flow, and cash flow growth rate calculation . . . . .	87
2.18	Export share effect on conditional operating income, free cash flow and cash flow variance	87
2.19	Overinvestment calculation . . . . .	88
3.1	Import market concentration and commodity exports . . . . .	102
3.2	Alternative measures of import market concentration . . . . .	103
3.3	Trade policy mechanisms for import market concentration . . . . .	103
3.4	Import market concentration and domestic prices . . . . .	104
3.5	Import market structure and commodity exports by country . . . . .	108
3.6	Summary statistics of independent variables and controls . . . . .	109
3.7	Natural resource dependence and control of corruption . . . . .	110

# List of Figures

1.1	Colombian export value disaggregated by firm size. . . . .	16
1.2	Shares of big private exporting firms relative to total exporting firms. . . . .	16
1.3	Export value of products that compete by quality relative to total export value. . . . .	20
1.4	Binned scatter plots between international managerial quality and international firm performance measures . . . . .	26
1.5	Binned scatter plots between international managerial quality and international firm performance determinants . . . . .	27
1.6	Binned scatter plot between international managerial quality and exogenous global demand shocks. . . . .	30
1.7	International managerial quality and global demand shocks impact on export value . . . .	33
2.1	Colombian dividend policy: share of firms that decreed dividends, share of amount decreed, and decreeing dividends rates (continuation, initiation and stopping) . . . . .	56
2.2	Real and nominal exchange rates, free cash flow, and decreeing dividends rate disaggregated by international managerial quality . . . . .	58
3.1	Import market concentration in natural resource-dependent countries, trade protection . .	101

# Introduction

This doctoral dissertation presents three papers which contribute to fill three trade literature gaps from a novel methodological perspective:

- **Chapter 1** proposes a two-step methodology to measure managerial skills specific to the international market. This empirical approach presents some advantages over the methodologies implemented so far to measure managerial quality. For example, it could be replicated for other countries without survey collection costs (the paper was calculated with Colombian data), since it just requires to merge customs and financial statement datasets at firm-year level. This paper was published at the *World Economy* journal.
- **Chapter 2** argues that exports could be one of the missing pieces to solve the "*dividend puzzle*" (term implemented in the literature to describe the lack of consensus about why firms pay dividends). The econometric specification allows to evaluate firms' dividend policy adjustment in response to exogenous export demand shocks and test the testable predictions of some dividend theories. The paper presents two novelties: i) it mixes in an innovative way trade and corporate finance literature, and ii) it calculates heterogeneous effect of exports on dividend policy disaggregated by the international managerial quality variable calculated in the first paper, allowing to deep into the agency cost theory.
- **Chapter 3** suggests and provides evidence of an under-explored "import" channel for the resource curse. It analyzes the impact of commodity exports on import concentration. The richness of a unique database (firm level panel customs data for around 50 countries, including Colombia) allows to calculate import concentration measures at the product-year-country level. The findings suggest that monopolization of imports could be a novel channel for the resource curse.

# Acknowledgments

I would like to thank my supervisor, Prof. Holger Görg, for his support from the beginning of the PhD adventure when he accepted to be my supervisor. His guidance and very accurate suggestions were extremely useful to improve and refine the papers and the research quality. I am also grateful to Dr. Robert Gold who provided fruitful discussions about the empirical approach of the papers. Also, I was fortunate to work at the Kiel Institute for the World Economy while writing my doctoral dissertation. I am particularly grateful for the flexibility and autonomy that the Kiel Institute granted to me.

Additionally, I would like to acknowledge my mom Gloria Alvarez, who despite many, many adversities in life still supports me and teaches me resilience with her life example. In the same way, my siblings have always supported me in many aspects. We have overcome many difficulties since many years ago derived by having my father sick, the "caregiver" syndrome, and not belonging to the upper class in Colombia (a highly elitist country).

Finally, Kristen Stevens supported me with optimism and knowledge in pursuing my studies some years ago when I considered just a remote possibility to study doctorate at a university abroad.

# Chapter 1

## International managerial skill and big Colombian exporting firms' performance, 2006-2014.<sup>1</sup>

### Abstract

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 products. The second step results indicate that: i) international managerial quality has a significant and robust positive effect on export value, ii) better managers in the international market do not increase the number of products exported but upgrade export basket' quality, and iii) export value elasticity relative to international managerial quality is around 5 times larger than export value elasticity relative to exogenous global demand shocks.

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

**JEL classification:** F23, F10, M11, M12, L25.

---

<sup>1</sup>Merchán, F. (2024). International managerial skill and big Colombian exporting firms' performance. *The World Economy* 47(7), 3199-3243. [Click here](#). The author thanks Holger Görg, Robert Gold, Victor Gimenez-Perales, Inga Heiland, all participants at the IFW Research Seminars, and one anonymous referee for their helpful comments.

## 1.1 Introduction

The managerial economics literature has faced for many years the methodological challenge of measuring executive talent accurately. Although this challenge has been somewhat addressed in recent decades by a variety of specialized management surveys<sup>2</sup> and econometric methodologies developed for this purpose, there is still a literature gap in international management.

On the one hand, none of management surveys inquire into specific management practices involved in the international market segment; although the World Management Survey (WMS)<sup>3</sup> and the German Management and Organizational Practices Survey (GMOP)<sup>4</sup> ask about export share relative to operating income and obtain basic information about firm activity abroad, these surveys do not distinguish between firms' management practices for selling goods in the international and the local markets. Thus, the papers that relate management quality and firms' trade outcomes with large samples<sup>5</sup> (Bloom et al., 2021; Görg and Hanley, 2017) use scores obtained from the WMS and GMOP, not specific to the international market, as management quality proxy variables. On the other hand, statistical methodologies that measure managerial quality through managers wage's residuals (Johansen, 2013; Meier & O'Toole, 2002) or firm efficiency's residuals (Demerjian et al., 2012) have not been adapted to the international market.

However, international management is a research topic that should be analyzed in more depth, as some economic hypotheses suggest that exporting firms have incentives to export goods that differ from those they sell in the local market. 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 anecdotal evidence for Colombian coffee exports.<sup>6</sup> 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, exporting firms' managers could have incentives to adjust managerial practices to promote selling high-quality goods abroad and low-quality goods in the local market, and could implement different managerial practices for each type of goods.

Also, learning by exporting (LBE) hypothesis indicates that when firms start exporting or rise their export value, their productivity is increased through various mechanisms: learning processes from foreign customers and rivals, improving product's quality, shipment size adjustment (De Loecker, 2013), adopting new technologies, and acquiring important information about foreign markets (Tse et al., 2017).

---

<sup>2</sup>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).

<sup>3</sup>See World Management Survey questionnaire: Survey Instrument

<sup>4</sup>See German Management and Organizational Practices Survey questionnaire: Survey Instrument

<sup>5</sup>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 1.6).

<sup>6</sup>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>

Although literature has shown mixed results about LBE existence,<sup>7</sup> the evidence that favor its existence is not conclusive in two aspects: i) what mechanism drives LBE,<sup>8</sup> and ii) whether the productivity gains and knowledge acquired in the international market through LBE can be implemented in the overall managerial practices and general production processes, 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 products exported 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. To the best of the author's knowledge, Sala and Yalcin (2014) is the only paper that measures managerial skills in the international market, constructing a "*managerial input*" proxy variable based on the firm manager's past experience in exporting firms obtained from Denmark employer-employee database.

This paper contributes to the literature by proposing an additional methodology for estimating managerial quality specifically in the international market and for calculating its impact on international firm outcomes. The methodology consists of a two-step procedure, in which export unit value and export quantity are first decomposed into their 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.<sup>9</sup> More specifically, international managerial quality is calculated through the average of a regression residuals group conformed by detailed export unit value residuals for differentiated products (multiplied by -1 for those products that compete internationally by price<sup>10</sup>) and detailed export quantity residuals for homogeneous products.

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 products, which have referenced prices or are traded on organized exchanges, while they are more likely to compete via price for the differentiated products. Also, the residuals computation for the differentiated products differs according to the competition type, since managers attempt to sell cheaper the products that compete by price and upgrade quality (sell more expensive) the products that compete by quality.

This empirical approach adds two innovations to the management literature that measure managerial quality through regression residuals. First, the first step dependent variables are export unit value and export quantity, not firm efficiency or manager's wage as in the traditional academic literature, since the aim of the paper is to measure managerial skills in the international market (section 1.2 provides the

---

<sup>7</sup>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.

<sup>8</sup>De Loecker (2013) identifies strategic decisions that are pertinent to innovativeness, production capability, and human capital, while Hovhannisyann and Mendez (2019) focus on workers' training aspect.

<sup>9</sup>Chen et al. (2017) provide a literature review of the two-step procedure implementation in the empirical accounting and finance research.

<sup>10</sup>An expanded version of Baldwin and Ito's (2011) methodology to classify products that compete in the international market by price and quality is explained and calculated.

theoretical framework and section 1.4 discusses the methodology). Second, the disaggregated residual computation according to the product and competition type is novel in the empirical literature.

In addition, this methodology presents two advantages in relation to the management surveys: it could be replicated for other countries without survey collection costs because it just requires to merge customs and financial statements databases, and the results are not self reported by the managers. Also, it presents two advantages in relation to Sala and Yalcin (2014): i) it is calculated based on firms' outcome data (export prices and export quantity) not manager's international experience, considering that an experienced manager could lead that one firm start exporting (Sala and Yalcin, 2014) but inefficiently, and ii) the number of second step dependent variables is larger, permitting to analyze the international managerial quality impact on several international firm performance variables. Additionally, the second step covariates include a firm specific external market conditions variable, allowing to evaluate international firm performance at both levels (external environment and the internal level) contributing to fill another export performance literature gap.<sup>11</sup>

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 some error degree (although several methodological attempts are made to reduce it). Also, the international managerial quality refers to the managerial skills related to exporting not importing.

This paper proceeds as follows. The next section includes the theoretical framework, section 1.3 describes the data, section 1.4 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 1.5 presents the results, and section 1.6 concludes.

## 1.2 Theoretical framework

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

---

<sup>11</sup>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)

$$p_{ij}^* = \frac{\tau_j (\varphi \lambda_i)^{\theta - \delta}}{\alpha} \quad (1.1)$$

$$x_{ij}^* = R_j P_j^{\sigma - 1} \left( \frac{\alpha}{\tau_j} \right)^{\tau_j} (\varphi \lambda_i)^{\delta \sigma - \theta} \quad (1.2)$$

where  $\tau_j$  is country  $j$ 's iceberg trade cost,  $R_j$  is country  $j$ 's aggregate expenditure,  $P_j$  is country  $j$ 's quality-adjusted ideal price index and  $\sigma$  is the elasticity of substitution across products ( $1/1-\alpha$ ). The difference between  $\theta$  and  $\delta$  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  $p_{ij}^*$  will decrease. If  $\theta > 0$  and  $\delta = 0$ , management improves only product quality and the optimal price  $p_{ij}^*$  will increase.

Examples of management policies that increase production efficiency ( $\delta$ ) 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 ( $\theta$ ) 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 as organizational capital, a non-traditional intangible asset that has been broadly defined.<sup>12</sup>

The methodology of this paper does not estimate any Bloom et al. (2021) endogenous parameter ( $p_{ij}^*, x_{ij}^*$ ), but it incorporates the production efficiency and quality capacity theoretical concepts into the international managerial quality calculation. This paper assumes that, first, efficient managerial teams: i) identify if products exported are homogeneous or differentiated according to Rauch (1999) product classification, and ii) identify if differentiated products compete in the international market by price or quality (see Baldwin and Ito, 2011). Then, efficient managerial teams: iii) expand firms' export proficiency implementing *production efficiency* policies that lead to minimize the export 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 export price) of the differentiated products that compete by quality, via organizational capital improvements.

It is made an additional assumption to analyze homogeneous products' patterns: v) managerial team focus in rising homogeneous products' export quantity, instead of export 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 operates for these type of goods ( $\theta = 0, \delta > 0$ ). According to equation 1.2, the larger the production efficiency ( $\delta$ ), the larger the export quantity ( $x_{ij}^*$ ).

<sup>12</sup>On the 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).

These assumptions follows the sign of the correlation between the three parameters  $(p_{ij}^*, \theta, \delta)$  described in the optimal price equation 1.1 and the sign of the correlation between the three parameters  $(x_{ij}^*, \theta, \delta)$  described in the optimal quantity equation 1.2, but they differ from the original Bloom et al. (2021) approach, who considered and estimated  $\delta$  and  $\theta$  as exogenous firm-invariant structural parameters. It is suggested for future research to extend Bloom et al. (2021) theoretical model assuming that firm-product specific expertise level vector  $\lambda_i \in (0, \infty)$  is an endogenous factor that could be enhanced due to organizational capital investment by the managerial team.

### 1.3 Data

The sample used in this paper is a merge of the next two public Colombian datasets:<sup>13</sup>

- **Customs data:** Export (import) information disaggregated at product [Colombian external tariff subheading 10 digit<sup>14</sup> - country destination (origin) - firm id level]. Data includes traded value (FOB for exports and CIF for imports) and traded quantity (units<sup>15</sup> and kilograms). The information is provided by the Colombian National Administrative Statistics Department (DANE by its acronym in Spanish). Import and export values 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 the firms supervised by the Colombian Companies Superintendence. The principal criterion to supervise a firm is that its total assets or operating income exceeds 30,000 current legal Colombian minimum wages. The reported financial statements are validated by tax auditors, according to articles 37, 38 and 39 from law 222 of 1995. The limitation of this dataset is that it does not include number of employees, so operating expenses is used as proxy variable.<sup>16</sup> 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).

Figure 1.1 and figure 1.2 show the historical participation of big private Colombian exporting firms relative to total exporting firms. On annual average, big private exporting firms represent 43% of total exporting firms (around 3,434 of 7,920 firms<sup>17</sup> per year) and 61%<sup>18</sup> of total export value (around US\$28,322 million

<sup>13</sup>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)

<sup>14</sup>From the common nomenclature classification system of the Andean Community. See: [ForeignTradeCorrelatives\\_DANE\\_03.pdf](#)

<sup>15</sup>The unit of measurement varies according to the product: number of items (55%), kilogram (38%), squared meters (4%), pairs (1%), cubic meters (0.7%), liters (0.4%), thousands (0.16%), carats (0.16%), among others.

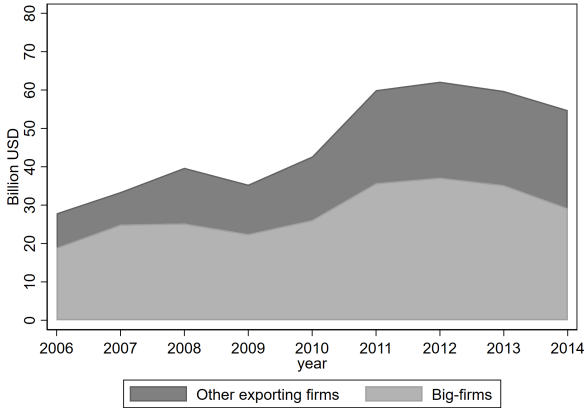
<sup>16</sup>The Colombian government shared the Colombian employer-employee dataset (PILA, by its acronym in Spanish) for the big private Colombian exporting firms included in this paper with an anonymous firm-id to guarantee anonymization. Therefore, it was not possible to merge it with the databases 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).

<sup>17</sup>Exporting ID's which identify low magnitude transactions made by individuals (not firms) were excluded from the customs dataset. These observations were identified with the next criteria: i) observations whose export's id had less than 9 digits, consequently, it is not a firm id (NIT), or ii) export's id whose first three digits does not belong to the next interval [800, 900]. None of the big private exporting firms classify in these criteria (per year)

<sup>18</sup>81% excluding the largest Colombian exporting firm (Ecopetrol). The financial statements dataset does not include

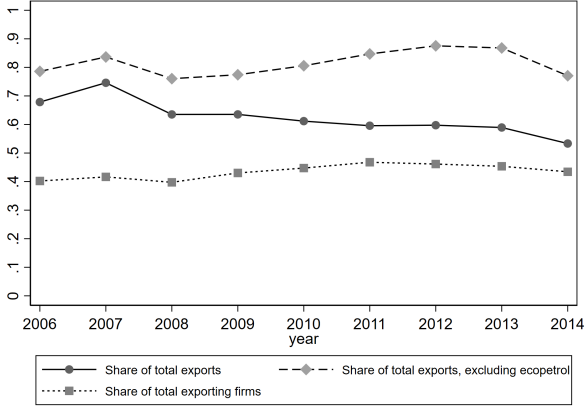
of US\$46,211 million per year). Also, big private Colombian exporting firms export higher values, export more products, export more products to more countries, and report lower export concentration than other exporting firms (see appendix table 1.7). Additionally, big private exporting firms have larger fixed assets, greater operating income, more non-tangible assets, and higher TFP than big private non-exporting firms (see appendix table 1.8).

Figure 1.1: Colombian export value disaggregated by firm size.



Source: Colombian National Administrative Statistics Department (DANE by its acronym in Spanish), Colombian Companies Superintendence and authorial calculations.

Figure 1.2: 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.

---

Ecopetrol’s information because its ownership has public and private participation.

## 1.4 Methodology

In general, three methodological approaches have been implemented in the academic literature to measure managerial quality. In the first place, it is assigned one numerical value to each questionnaire's answer from specialized management surveys like WMS and GMOP, and then, the results are aggregated - unweighted average of the responses- obtaining total and/or disaggregated (monitoring, incentives and targets components) management scores (Bloom et al., 2021; Görg and Hanley, 2017). In the second place, two step methodologies calculate the managerial quality in the first step using managers' wage residuals (Johansen, 2013; Meier & O'Toole, 2002) or firm efficiency's residuals (Demerjian et al., 2012), and then, it is included as explanatory variable in a second step regression, in which the range of dependent variables cover return on assets, stock returns, profit rate, among others. This two-step methodological approach has been widely implemented in the literature: *“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).

A third group could be defined just for Sala and Yalcin (2014), who calculate the international managerial quality based on the manager's past experience in exporting firms obtained from detailed manufacturing Denmark employer-employee database. They track if the external promoted managers (new workers in the first 5 places in the firms' wage distribution) have ever held a similar position in an exporting firm in the past, creating an *“externally promoted managers with exporting experience”* dummy variable. They hypothesize that this international experience is related to the *“embedded tacit knowledge that companies are interested in acquiring.”* (Sala and Yalcin, 2014, p.1072). Their findings indicate that managerial resources are as important as productivity and fixed costs on the likelihood that firms start exporting.

This paper could be classified as a hybrid between the second group (two-step empirical approach) and the third group (the methodology aims to measure managerial quality in the international market). As it was explained in the theoretical framework (section 1.2), the key assumption is that efficient managerial teams categorize products exported in three groups and implement distinct managerial policies for each group in order to maximize firms' export proficiency: i) production efficiency policies focused on exporting cheaper differentiated products that compete internationally on price, ii) quality capacity policies focused on rising quality (ergo, the export price) of differentiated products that compete internationally on quality, and iii) production efficiency policies focused on exporting larger homogeneous products' quantity.

Under this theoretical assumption, the international managerial quality is empirically computed as the average of a regression residuals group conformed by export unit value's differentiated products (multiplied by -1 for products that compete internationally on price) and export quantity residuals for homogeneous products. This residual set measures the export unit value and export quantity fractions not attributable to a set of explanatory variables and detailed fixed effects, which plausibly works as an accurate proxy variable of the managerial team's organizational capital contribution to increase firms' export proficiency. The international managerial quality obtained from this residual set is firm-specific not manager-specific, consequently, it does not measure the organizational capital contribution to rise export proficiency 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, international firm performance regressions (second-step) 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 and minimized.

### 1.4.1 Product classification (price or quality competition)

Baldwin and Ito (2011) classifies products based on an export unit value (EUV) regression for each HS 6-digit product, 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 COMTRADE, CEPII, and World Development Indicators 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 relies on the traditional heterogeneous firm trade models, which hold that firms with higher productivity produce cheaper goods (Melitz, 2003), and on the qualitative heterogeneous firm trade models, which predict that firms with higher productivity sell more expensive goods. As it is profitable to serve more remote destinations for the more productive firms, the distance will indicate if the good is competing by price (negative distance coefficient) or by quality (positive distance coefficient).

Initially, it is estimated the next export unit value regression for each product as in Baldwin and Ito (2011):

$$\ln(EUV)_{pkt} = \beta_0 + \beta_1 \ln distance_{kt} + \beta_2 \ln GDP_{kt} + \beta_3 \ln GDPpc_{kt} + \partial_t + \epsilon_{pkt} \quad (1.3)$$

where subscript  $p$  denotes Colombian external tariff subheading 10-digit,  $t$  the year,  $k$  the destination country, and  $\partial_t$  the year fixed effects. Export unit value (EUV) is defined as the total export value expressed in real f.o.b dollars divided by total units of physical quantity.<sup>19</sup> (Harrigan et al., 2015, p.103). 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 improves the classification accuracy because the product category does not bundle price and quality products. However, it also raises the challenge of sample size: the median sample per regression is just 20 observations<sup>20</sup> and the sample is insufficient to run the regressions for 10% of the products.

Therefore, an innovative classification product algorithm was implemented to categorize those products which could not be classified with the initial criterion (products whose distance coefficient was not statistically significant at 10% or the sample was insufficient to run the regression). First, equation 1.3 is estimated for broader product aggregation (when  $p$  denotes *Nandina* subheading 8-digit and  $p$  denotes HS subheading 6-digit),<sup>21</sup> and then, the products are classified according to the regression of the respective narrower product aggregation in which the distance coefficient was statistically significant. If null

<sup>19</sup>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"

<sup>20</sup>The median number of destination countries per product exported per year is just 4.

<sup>21</sup>A very small percentage of the definitions of units is not consistent within broader market aggregation: *Nandina* 8 digit (n=1, 0.015%), HS 6 subheading digit (n=15, 0.30%)

distance coefficient's statistically significance or insufficient sample persists, it is assigned the competition mode of the products that 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 product exported "*thermal coal*". Initially, it is estimated equation 1.3 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 1.3 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 1.3 in which  $p$  denotes HS subheading 6-digit (270112 "*Bituminous coal*"). If the product is still 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, 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.

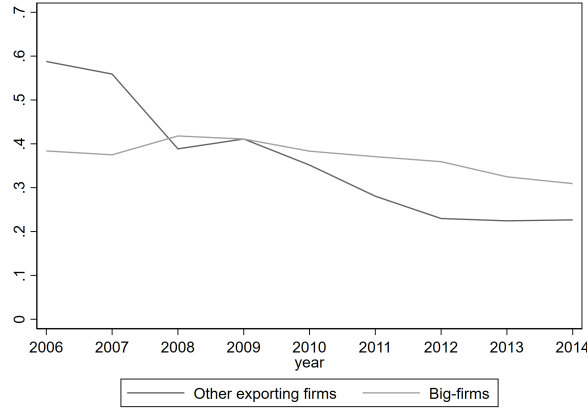
Table 1.1: Product classification (price or quality competition)

Classification method (first option)		
Aggrupation level per regression	Number of products classified <sup>1</sup>	Percentage of products classified (%)
Colombian external tariff subheading 10-digit	1,175	16.63
Nandina* subheading 8-digit	71	1
HS subheading 6-digit	643	9.10
Classification method (second option)		
Aggrupation level to calculate mode competition	Number of products classified	Percentage of products classified (%)
HS heading 4-digit	2,821	39.93
HS chapter 2-digit	1,972	27.91
Whole sample	383	5.42
Product classification		
Classification	Number of products classified	Percentage of products classified (%)
Price competition	2,831	40.07
Quality competition	4,234	59.93
Total	7,065	100

Notes: <sup>1</sup> The products classified as price (quality) competition are those whose distance coefficient is negative (positive) and statistically significant ( $p < 0.1$ ) in equation 1.3. \* Common nomenclature classification system of the Andean community.

In total, 17% of the products were classified at the most disaggregated regression 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, 28% the competition mode of their respective HS chapter 2-digit, and 5% the competition mode of all products (see table 1.1). The consolidated results indicate that 60% of the products compete by quality and 40% by price. Under this classification, the annual average percentage of the export value of products that compete by quality relative to total export value is 37% for the big private Colombian exporting firms (36% for the rest of exporting firms), and the trend decreased during the analyzed time horizon (2006-2014) for both types of firms (figure 1.3).<sup>22</sup>

Figure 1.3: Export value of products that compete by quality relative to total export 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 1.4.1.

## 1.4.2 International managerial quality calculation

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

$$\ln(EUV)_{pfmt} = \beta_o + \beta_1 \ln GDP_{kt} + \beta_2 \ln GDPpc_{kt} + \beta_3 t f_{p*kt} + \Gamma X_{ft} + \theta New_{pfmt} + \partial_p + \partial_f + \partial_k + \partial_t + \epsilon_{pfmt} \quad (1.4)$$

$$\ln(Q)_{pfmt} = \beta_o + \beta_1 \ln GDP_{kt} + \beta_2 \ln GDPpc_{kt} + \beta_3 t f_{p*kt} + \Gamma X_{ft} + \theta New_{pfmt} + \partial_p + \partial_f + \partial_k + \partial_t + w_{pfmt} \quad (1.5)$$

<sup>22</sup>As Comtrade does not report information disaggregated at 10-digit, it is not possible to replicate this methodology for other countries and compare results.

where subscript  $p$  denotes Colombian external tariff subheading product 10-digit,  $p^*$  is the HS subheading product 6-digit,  $f$  the firm,  $k$  the destination country, and  $t$  the year. Export unit value (EUV) is defined as export 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),  $Tariff_{p^*kt}$ <sup>23</sup> is the ad-valorem import tariff imposed by destination country  $k$  on product  $p^*$ . The vector of firm level covariates  $X_{ft}$  includes log fixed assets, log operating expenses, log non-tangible assets,<sup>24</sup> mark-up, and TFP calculated based on Levinsohn and Petrin's (2003) methodology.<sup>25</sup>  $New_{ftkp}$  includes three mutually exclusive dummies which adjust the learning cost of extensive margin expansions in year  $t$  relative to t-1: 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,  $\partial_k$  is the destination country fixed effects,  $\partial_p$  the product fixed effects,  $\partial_f$  the firm fixed effects, and  $\partial_t$  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 1.2 and table 1.3.

Then, a modified residuals' vector  $\hat{v}_{pkft}$  is defined in equation 1.6, based on the residuals from export unit value (equation 1.4) and quantity (equation 1.5) regressions, so that its scale is positive correlated with the international managerial quality (the larger  $\hat{v}_{pkft}$ , the larger the international managerial quality). For the differentiated products that compete internationally by price (p1), the lower the export unit value residuals  $\hat{e}_{p1fkt}$ , the better the managerial team's production efficiency policies to export cheaper those products, consequently, those residuals are multiplied by -1 ( $\hat{e}_{p1fkt} * -1$ ). For the differentiated products that compete internationally by quality (p2), the higher the residuals  $\hat{e}_{p2fkt}$ , the better the managerial team's quality capacity policies to upgrade the quality (ergo, the export price) of those products, consequently, those residuals  $\hat{e}_{p2fkt}$  are not modified.

On the other hand, firms that export homogeneous goods (p3) could face challenges in differentiating the export price because the product either has a 'reference price' or it is 'traded in an organized exchange' (see Rauch, 1999). Assuming that the international market for the homogeneous products is highly competitive and exporters are price takers, managerial team can encourage the export quantity not export price. Thus, quantity regression residuals from equation 1.5 are included in the modified residuals' vector; the higher the residuals  $\hat{w}_{p3kft}$ , the better the managerial team production efficiency policies to export larger homogeneous products' quantity, consequently, those residuals  $\hat{w}_{p3kft}$  are not modified.

In this order of ideas, the international managerial quality is calculated as the simple average of the modified residuals  $\hat{v}_{pkft}$  for each exporting firm  $f$  in year  $t$  (equation 1.7):

$$\hat{v}_{pkft} = \begin{cases} \hat{e}_{p1fkt} * -1 & , \text{ where } p1 \text{ are differentiated products that compete by price} \\ \hat{e}_{p2fkt} & , \text{ where } p2 \text{ are differentiated products that compete by quality} \\ \hat{w}_{p3kft} & , \text{ where } p3 \text{ are homogeneous products} \end{cases} \quad (1.6)$$

<sup>23</sup>Source of tariff dataset is Feodora Teti's Global Tariff database (Teti, 2020). Product level aggregation is HS 6-digit.

<sup>24</sup>Firm level variables were calculated as  $\text{Log}(x+1)$  in order to include firms that report \$0 in some variables, particularly, non-tangible assets.

<sup>25</sup>TFP was calculated with `prodest` Stata command (Mollisi & Rovigatti, 2018). See appendix table 1.9 for results.

$$\text{International\_managerial\_quality\_}(IMQ)_{ft} = \frac{\sum_{pk=1}^n \hat{v}_{pkft}}{n} \quad (1.7)$$

where  $n$  is the number of products exported-destination country pairs of each exporting firm  $f$  in each year  $t$ .

For modified residuals  $\hat{v}_{pkft}$  to be a suitable international managerial quality proxy variable, export unit value and quantity's (EUV-Q) regressions should be well specified for this purpose, which is fulfilled if: i) irrelevant explanatory variables are not included, ii) all relevant variables are included, and iii) no explanatory variable contains any international managerial quality component because it would create a bias in  $\hat{v}_{pkft}$  as IMQ proxy variable.

For this reason, column 2 in table 1.2 and 1.3 add double fixed effects (FE) interactions between destination country, product, year, and firm FE to the EUV-Q regressions, and column 3 has the triple FE interactions. These double and triple FE account for the unobserved characteristics of combinations between product, year, destination country, and firm, which are orthogonal from managerial team's control and impact on export unit value and export quantity. However, these FE do not absorb the international managerial quality variation because neither are defined as the combination of firm FE with a time-changing variable FE.

For example, product-year FE in column 2 are included because of large unit value and quantities differences between products: *"they take out all observed and unobserved global factors that might change the relative unit values [and quantities] over time. For instance, if the relative price [and quantity] of computers to pencils goes down [up] 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's unit differences across products. As another example, the firm-product-destination country FE in column 3 controls for the firms' capabilities in exporting product  $p$  to destination country  $k$  (Bao, Blonigen, & Zhi, 2021). In general, the specification error of the EUV Q regressions due to omission of relevant explanatory variables is reduced in column 2 and 3.

Column 4 in table 1.2 and 1.3 keeps the fixed effects of column 3 but omits TFP. As briefly explained above, one of the disadvantages of this methodology is that the inclusion of variables that could contain international managerial quality components in the EUV-Q regressions, like TFP, raises a trade-off. On the one hand, TFP inclusion could make the EUV-Q regressions' residuals an underestimated IMQ proxy variable because TFP could contain an unknown IMQ fraction. On the other hand, TFP exclusion could make the EUV-Q regressions' residuals an overestimated IMQ proxy variable because EUV-Q regressions' residuals would capture other TFP components non-related with IMQ. The same trade-off occurs with firm efficiency<sup>26</sup> in column 5 and with managerial quality -calculated based on traditional firm efficiency residual methodology (Demerjian et al., 2012) (see table 1.10 in the appendix)- in column 6. Since TFP, firm efficiency and managerial quality components cannot be split, none EUV-Q column reduces the

<sup>26</sup>It was calculated based on Data Envelopment Analysis (DEA), which is an optimization procedure which allows to measure firms' efficiency when 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 1.11 in the appendix for descriptive statistics.

model misspecification to zero. The feasible methodological solution is to calculate one international managerial quality variable for each EUV-Q column and then estimating different second step regressions for each international managerial quality.<sup>27</sup>

As robustness checks, the international managerial quality is also calculated as the modified residuals' median, so that its calculation is less sensitive to outliers (products exported in which the managerial team contributed in a very high or very low proportion to rise firms' export proficiency). Also, the international managerial quality is calculated as the modified residuals' average but standardizing  $\hat{\epsilon}_{pfmt}$  and  $\hat{w}_{pfmt}$  in order to increase the residual sets' comparability. In the baseline specification, both residuals sets' mean is 0 and both residuals sets are measured in natural logarithm units. The limitation is that higher log export quantity residuals dispersion<sup>28</sup> could lead that IMQ weights in higher proportion the effective managerial team policies to export higher homogeneous products' quantity than effective managerial team policies to modify the differentiated products' unit value. Nevertheless, section 1.5 shows that second step results are robust across different ways to compute the international managerial quality (modified residuals' simple average, modified residuals' median, and modified residuals' simple average standardizing EUV-Q residuals).

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 specifications include TFP, which is one of the most relevant EUV-Q explanatory variables even if it contains an unknown IMQ fraction. Therefore, IMQ3 is the baseline IMQ from now on. Figure 1.4 shows binned scatter plots between IMQ in the x-axis and eleven firms' outcomes in the y-axis. Statistical significance of IMQ coefficients in simple regressions show that IMQ has a positive and significant correlation with export value, quality exports share in value (export value of products that compete in the international market by quality relative to total differentiated products' export value) and quality exports share in number (number of products that compete in the international market by quality exported relative to total number of differentiated products exported).

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

Surprisingly, figure 1.5 shows that IMQ is not statistically correlated with most of the explanatory variables included in its calculation (operating expenses, fixed assets, non-tangible assets, TFP and firm efficiency). This null correlation between IMQ and firm size's measures indicates that the metric developed in this paper does not increase simply because the firm is bigger. On the contrary, the metric identifies that, compared with bigger firms, smaller firms could have better international managerial quality.

<sup>27</sup>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).

<sup>28</sup>SD of UV residuals=0.6, SD of Q residuals=1.01. Range of UV residuals=16.22, Range of Q residuals=17.73.

Table 1.2: 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	-0.00203* (0.00104)	0.000893 (0.00148)				
Log real stock non-tangible assets (USD)	0.00115 (0.00108)	0.000642 (0.000869)	0.000349 (0.000847)	0.000271 (0.000841)	0.000239 (0.000959)	0.000283 (0.000960)
Log real stock property, plant and equipment (USD)	-0.000513 (0.00998)	-0.00168 (0.00695)	0.00392 (0.00666)	0.00215 (0.00256)	0.00779 (0.00774)	0.00706 (0.00769)
Log real operating expenses (USD)	-0.0304* (0.0176)	-0.0253* (0.0131)	-0.0125 (0.0133)	0.00110 (0.00810)	-0.0187 (0.0157)	-0.0194 (0.0159)
Mark-up (operating income/sales cost)	0.00114 (0.000747)	0.00189 (0.00424)	-0.000443 (0.000629)	-0.000414 (0.000620)	4.20e-05 (0.000333)	5.24e-05 (0.000334)
Dummy new product in t	-0.0194 (0.0126)	0.00974 (0.0124)	-0.000299 (0.0131)	-0.00181 (0.0131)	0.00328 (0.0143)	0.00349 (0.0143)
Dummy new destination in t	0.0961*** (0.0135)	0.0560*** (0.0148)	0.0116 (0.0191)	0.0129 (0.0189)	0.00358 (0.0197)	0.00373 (0.0197)
Dummy new product-destination in t	0.0585** (0.0269)	0.0273 (0.0309)	0.0516 (0.0364)	0.0506 (0.0364)	0.0508 (0.0368)	0.0515 (0.0368)
TFP <sup>1</sup>	0.189** (0.0880)	0.0907 (0.0753)	0.0741 (0.0622)		0.0373 (0.0768)	0.0264 (0.0758)
Firm efficiency <sup>2</sup>					-0.0635 (0.0829)	
Managerial quality <sup>3</sup>						-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 <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>
Product fixed effects	Yes	No	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>
Year fixed effects	Yes	No	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>
Firm fixed effects	Yes	No	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>
Product-firm fixed effects	No	Yes	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>
Product-country destination fixed effects	No	Yes	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>
Product-year fixed effects	No	Yes	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>
Country destination-year fixed effects	No	Yes	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>
Firm-country destination fixed effects	No	Yes	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>
Product-firm-country destination fixed effects	No	No	Yes	Yes	Yes	Yes
Product-year-country destination fixed effects	No	No	Yes	Yes	Yes	Yes

Notes: Export unit value is defined as export 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<sup>r</sup>: redundant fixed effects.

<sup>1</sup> Calculated based on Levinsohn & Petrin (2003) methodology (table 1.9 in the appendix).

<sup>2</sup> Relative to the most efficient firm in each industry-year. It was calculated assuming decreasing returns to scale based on Demerjian et al. (2012).

<sup>3</sup> Residual of a Tobit regression of firm efficiency on a set of firm level explanatory variables (Demerjian et al., 2012) (table 1.10 in the appendix).

Table 1.3: Quantity regression

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Log export quantity					
Log GDP	-0.538 (0.449)					
Log GDPpc	0.828* (0.493)					
Applied tariff	-0.009*** (0.00222)	-0.000605 (0.00196)				
Log real stock non-tangible assets (USD)	-0.005*** (0.00179)	-0.00100 (0.00170)	0.000683 (0.00182)	0.000653 (0.00187)	0.00125 (0.00206)	0.00122 (0.00206)
Log real stock property, plant and equipment (USD)	0.117*** (0.0168)	0.114*** (0.0110)	0.123*** (0.0119)	0.0135** (0.00648)	0.119*** (0.0147)	0.120*** (0.0149)
Log real operating expenses (USD)	-0.0275 (0.0258)	0.138*** (0.0217)	0.180*** (0.0228)	0.193*** (0.0300)	0.209*** (0.0278)	0.210*** (0.0277)
Mark up (operating income/sales cost)	0.00158 (0.00211)	-0.033*** (0.00914)	-0.00118 (0.00105)	-0.000170 (0.000875)	-0.00128 (0.00111)	-0.00129 (0.00111)
Dummy new product in t	-1.373*** (0.0259)	-0.251*** (0.0243)	-0.273*** (0.0257)	-0.273*** (0.0256)	-0.328*** (0.0268)	-0.329*** (0.0268)
Dummy new destination in t	-0.819*** (0.0275)	-0.336*** (0.0286)	-0.419*** (0.0356)	-0.427*** (0.0353)	-0.436*** (0.0355)	-0.436*** (0.0356)
Dummy new product-destination in t	-1.183*** (0.0437)	-0.313*** (0.0541)	-0.623*** (0.0729)	-0.628*** (0.0727)	-0.683*** (0.0806)	-0.683*** (0.0807)
TFP <sup>1</sup>	1.741*** (0.226)	1.893*** (0.142)	2.053*** (0.151)		1.944*** (0.194)	1.960*** (0.195)
Firm efficiency <sup>2</sup>					0.162 (0.177)	
Managerial quality <sup>3</sup>						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 <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>
Product fixed effects	Yes	No	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>
Year fixed effects	Yes	No	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>
Firm fixed effects	Yes	No	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>
Product-firm fixed effects	No	Yes	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>
Product-country destination fixed effects	No	Yes	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>
Product-year fixed effects	No	Yes	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>
Country destination-year fixed effects	No	Yes	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>
Firm-country destination fixed effects	No	Yes	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>	No <sup>r</sup>
Product-firm-country destination fixed effects	No	No	Yes	Yes	Yes	Yes
Product-year-country destination fixed effects	No	No	Yes	Yes	Yes	Yes

Notes: 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.

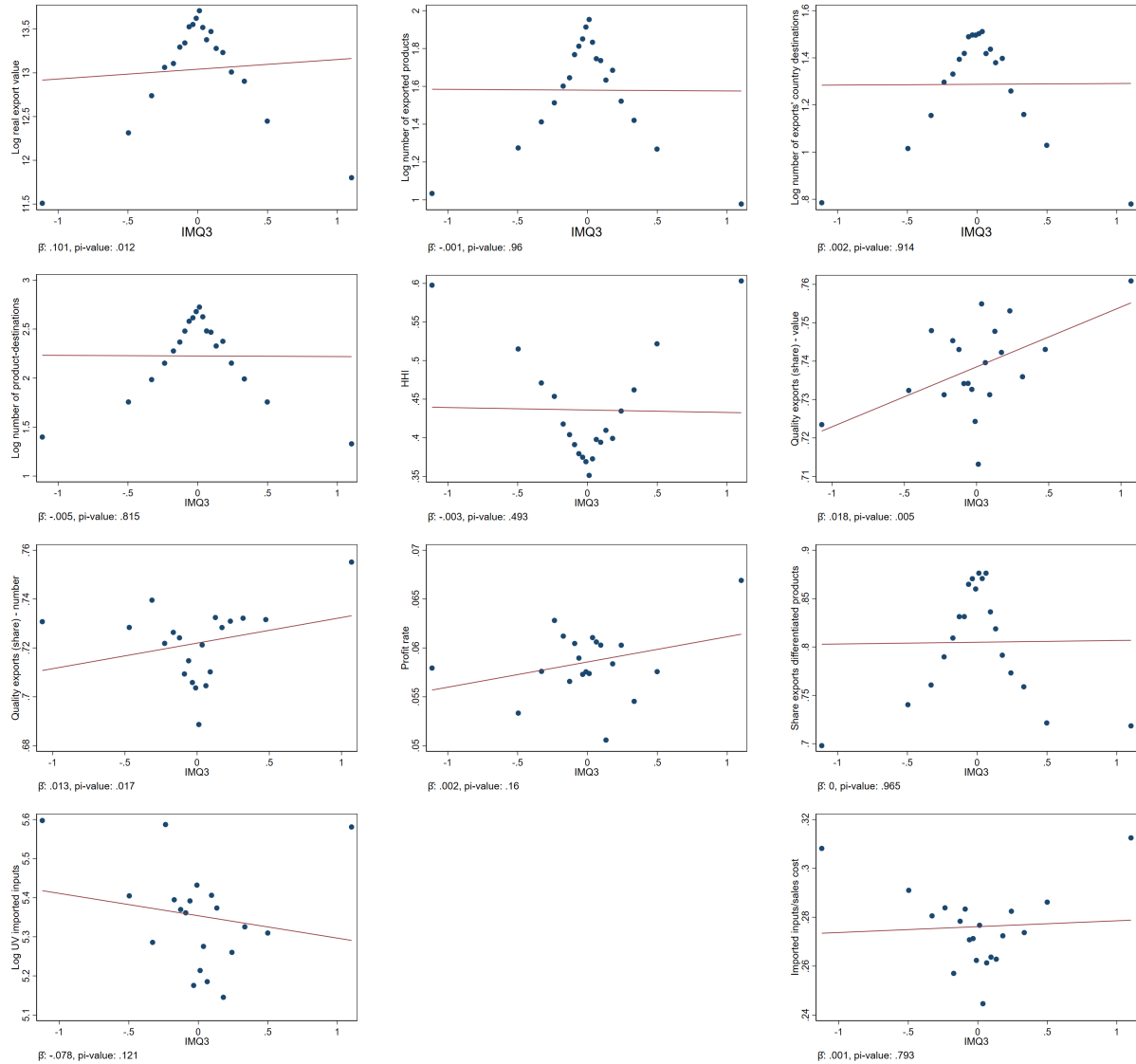
No<sup>r</sup>: redundant fixed effects.

<sup>1</sup> Calculated based on Levinsohn & Petrin (2003) methodology (table 1.9 in the appendix).

<sup>2</sup> Relative to the most efficient firm in each industry-year. It was calculated assuming decreasing returns to scale based on Demerjian et al. (2012).

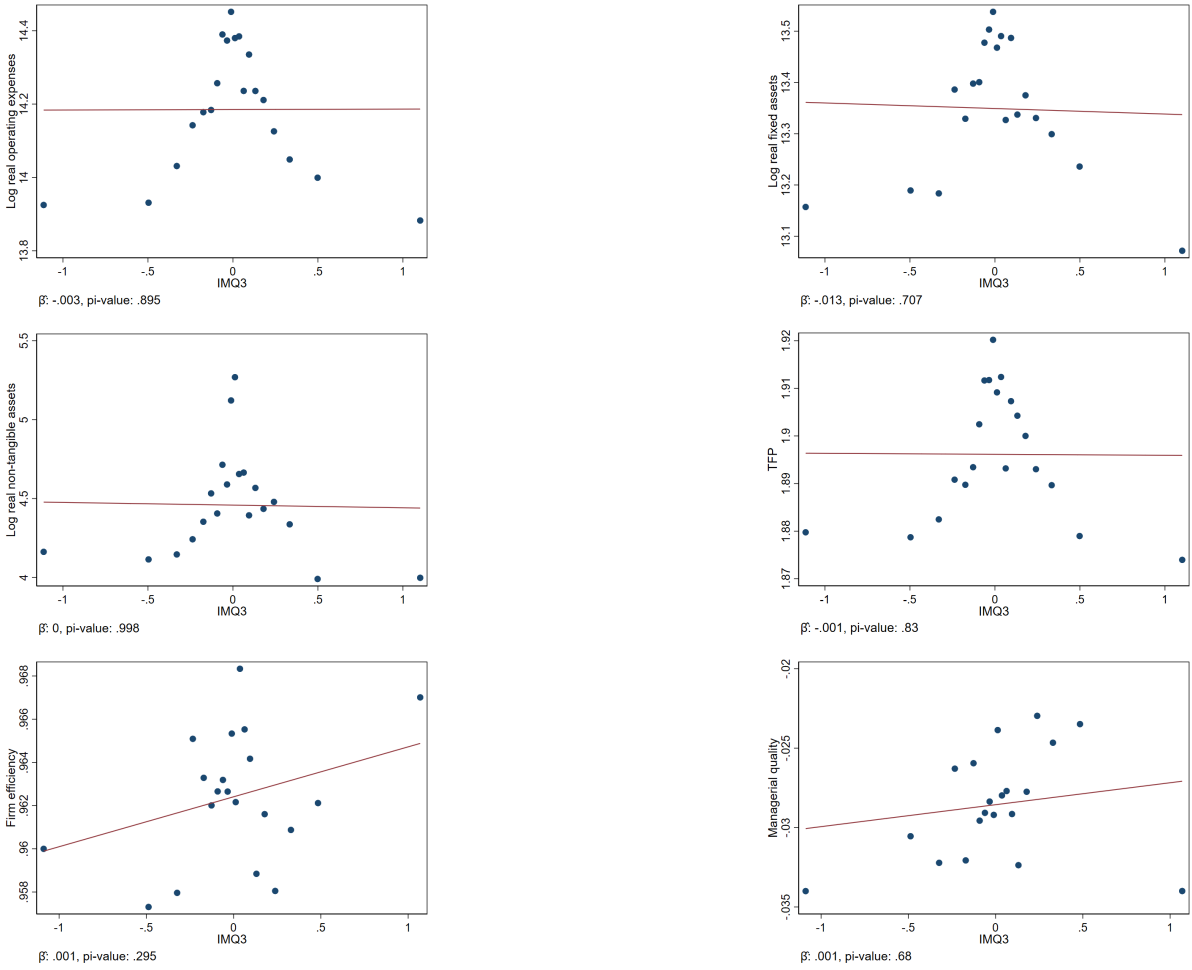
<sup>3</sup> Residual of a Tobit regression of firm efficiency on a set of firm level explanatory variables (Demerjian et al., 2012) (table 1.10 in the appendix).

Figure 1.4: Binned scatter plots between international managerial quality and international firm performance measures



Notes: *Profit rate* is defined as operating profit relative to operating income. *Quality exports (share) - value* is defined as export value of goods that compete in the international market by quality relative to total differentiated products' export value. *Quality exports (share) - number* is defined as number of products that compete in the international market by quality exported relative to total number of differentiated products exported. The Herfindahl-Hirschman Index (HHI) is calculated by squaring the share of each product-destination country observation in total annual firms' exports and then summing the obtained numbers. The number of the international managerial quality (IMQ3) denotes the column of the unit value and quantity regressions from which the residuals to calculate IMQ are obtained (see tables 1.2 and 1.3, and equation 1.4, 1.5, 1.6 and 1.7).

Figure 1.5: Binned scatter plots between international managerial quality and international firm performance determinants



*Notes:* The number of the international managerial quality (IMQ3) denotes the column of the unit value and quantity regressions from which the residuals to calculate IMQ are obtained (see tables 1.2 and 1.3, and equation 1.4, 1.5, 1.6 and 1.7). TFP is calculated based on Levinsohn & Petrin (2003) methodology (appendix table 1.9). Firm efficiency is 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 is calculated as the residual of a Tobit regression of firm efficiency on a set of firm level explanatory variables (Demerjian et al., 2012) (appendix table 1.10).

### 1.4.3 International firm performance regression

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

$$Y_{ft} = \beta_o + \beta_1 IMQ_{ft} + \beta_2 GD_{ft} + \Gamma X_{ft} + \partial_f + \partial_{st} + u_{ft} \quad (1.8)$$

where firm outcomes  $Y$  cover the eleven dependent variables as previously defined and graphed: i) log real export value, ii) log number of products exported, iii) log number of export's destination countries, iv) log number of products exported-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.  $IMQ_{ft}$  is the international managerial quality described in equation 1.7 calculated with the residuals from the third EUV-Q regressions (column 3 of table 1.2 and 1.3).  $X_{ft}$  is a vector of firm-level characteristics including log fixed assets, log non-tangible assets, log operating expenses<sup>29</sup>, and TFP clean of the international management component.<sup>30</sup>

$GD_{ft}$  measures the magnitude that the global market demands the products exported by each firm. 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 ( $t=0$ ), and  $ID_{kpt}$  is the total import value from country  $k$  of product  $p$  in year  $t$  excluding Colombian exports.<sup>31</sup> By construction, it is exogenous from manager decision. The inclusion of this objective international market condition variable defined at firm level permits to estimate international firm performance sensitivity to international market conditions of the products that firms export.  $\partial_f$  are firm fixed effects and  $\partial_{st}$  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. Table 1.11 (appendix) presents descriptive statistics for all dependent and independent variables included in the regressions.

The main coefficient of interest  $\hat{\beta}_1$  is consistent if IMQ is strictly exogenous (IMQ at a given time period is uncorrelated with the error term at any given time period). That is, IMQ should capture a resilient international managerial quality component not affected by present or past shocks in non-observables international firm performance determinants  $u_{ft}$ . Although it is difficult to fully satisfy this condition since there is no an exogenous IMQ variation, the Wooldridge test does not reject the null hypothesis of IMQ strict exogeneity<sup>32</sup> for all eleven dependent variables (pi-values $>0.1$ <sup>33</sup>) and figure 1.6 shows that IMQ is non-statistically correlated with observable international demand shocks  $GD_{ft}$ . Therefore,  $\hat{\beta}_1$  identifies a strong correlation between IMQ and the dependent variables (not necessarily causal claims) in the worst scenario.

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 1.8) includes IMQ3, which is the international managerial quality variable calculated with the EUV-Q regressions that, as previously explained, could have the lowest specification

<sup>29</sup>As it was explained above, firm level variables were calculated as  $\text{Log}(x+1)$  in order to include firms that report 0 in any variable, particularly non-tangible assets

<sup>30</sup>It is calculated as the residual of a regression of TFP on international managerial quality as in Bloom et al. (2021).

<sup>31</sup>The results are robust when  $GD_{ft} = \sum_{kp} \ln(ID_{kpt}) * share\_exp_{fpk,t=0}$

<sup>32</sup>It is added  $\delta IMQ_{ft+1}$  to equation 1.8 and then it is tested under the null hypothesis  $H_0: \delta = 0$ .

<sup>33</sup>Pi-value of the Wooldridge test for strict exogeneity for the eleven dependent variables as cited and ordered above are: 0.27, 0.10, 0.57, 0.34, 0.17, 0.46, 0.29, 0.92, 0.87, 0.51, 0.99.

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<sup>34</sup> could distort inferences (falsely rejecting a true null hypothesis). As absorption rate of fixed effects described in equation 1.8 with the international managerial qualities is on average 10%<sup>35</sup> - way below the 90% threshold identified by Jennings et al. (2023)-, the IMQ coefficient's statistical significance is reliable. Also, Jennings et al. (2023) show that the attenuation effect could vanish or even flip to a positive bias if the IMQ's measurement error is correlated with the explanatory variables X. As it is non-possible to determine empirically the existence of this correlation, the IMQ coefficient is interpreted assuming null attenuation effect.

Second, the standard errors could be understated because the independent variable of interest (IMQ) is a generated regressor and is, therefore, subject to sampling error. Although Chen et al. (2023) proves that the 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 which varies according to the product's type and competition's type, as it was explained before. Consequently,  $\hat{\beta}_1$ 's standard error 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 the first and second step regressions.<sup>36</sup> These standard errors act as a robustness check of the baseline standard errors clustered at firm level.

Additionally, firm's equity was added as an additional dependent variable in order to check that IMQ does not have a statistically significant effect on variables that theoretically should not affect (placebo).

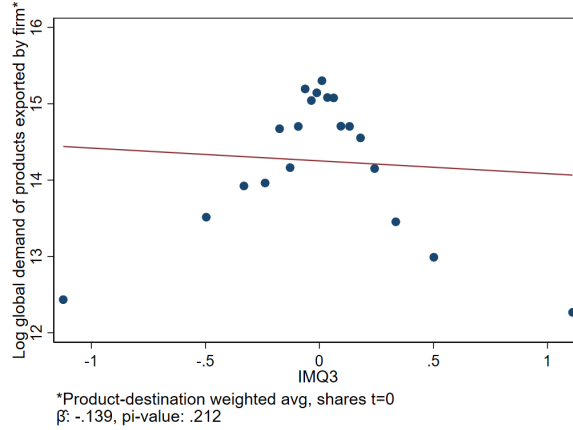
---

<sup>34</sup>The absorption rate is defined as the R-squared from a regression of the independent variable of interest on fixed effects. In this case, international managerial quality on firm and industry-year fixed effects.

<sup>35</sup>All absorption rates of the fixed effects described in equation 1.8 with the international managerial qualities are below 30% (29.5%, 6.2%, 6%, 6.2%, 6.5%, 6.5%).

<sup>36</sup>"(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)

Figure 1.6: Binned scatter plot between international managerial quality and exogenous global demand shocks.



Notes: The y-axis variable 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 ( $t=0$ ), and  $ID_{kpt}$  is the total import value from country  $k$  of product  $p$  in year  $t$  excluding Colombian exports. International managerial quality in x-axis is defined as in equation 1.7.

## 1.5 Results

Table 1.4 shows the international firms' performance regression results (equation 1.8). Column 1 indicates that 1% increase in international managerial quality (IMQ3) raises the firm's export value by 0.1193%. This magnitude is economic considerable; the back-in-the-envelope calculation indicates that one standard deviation increase in the international managerial quality (0.4484) would boost the firms' exports annual growth rate 1.73 times (0.045 relative to 0.0260).<sup>37</sup> On the contrary, international managerial quality does not impact significantly 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 (export value and number, see columns 6 and 7), implying exports' replacement (products that compete by quality over products that compete by price). In terms of magnitude, column 6 coefficient (0.0125) indicates that one standard deviation increase in the international managerial quality of firms that export differentiated goods (0.4354) would boost the firms' quality export share (value) annual growth 5.6 times (0.004499 relative to 0.0008033)<sup>38</sup>. This considerable magnitude points out managers as a fundamental pillar to boost high quality products' exports, which could foster long-run economic growth: “countries that latch on to higher productivity goods will perform better” (Hausmann et al., 2007, p.3). Also, this finding is suggesting evidence in favor of the Alchian–Allen theorem described in the introduction.<sup>39</sup>

<sup>37</sup>  $1.73 = (((1+0.4484)^{0.119} - 1)/0.0260)$

<sup>38</sup>  $5.62 = (0.0125 * \ln(1+0.4354))/ 0.0008033$

<sup>39</sup> However, its formal proof would require collecting detailed freight data and performing specific econometric analysis.

International managerial quality has also a positive and significant effect on profit rate (column 8). Its magnitude (0.0025) indicates that one standard deviation increase in the international managerial quality (0.4480) would boost the firms' profit rate in 0.00095<sup>40</sup>, which is around one fifth of the average annual profit rate's downward trend (-0.0044). This result is consistent since exports accounts on average for 20% of the operating income. Besides, IMQ impacts negatively and statistically significantly the imported inputs' unit value and does not affect the import input share (column 10 and 11), which could be explained by better international managed firms importing more quantity of cheaper substitutes inputs.

Most of the results described so far hold up different robustness checks relative to the IMQ calculation: i) IMQ calculated with residuals  $\hat{\epsilon}_{pkft}$  and  $\hat{w}_{pkft}$  obtained from different export unit value and quantity regressions (IMQ1, IMQ2, IMQ4, IMQ5 and IMQ6<sup>41</sup>, see table 1.4), ii) IMQ calculated based on the median, instead of the simple average, of the modified residuals (see table 1.13), iii) IMQ calculated based on the modified residuals' simple average in which  $\hat{\epsilon}_{pkft}$  and  $\hat{w}_{pkft}$  are standardized (see table 1.14). The statistical significance of the coefficients is also robust when standard errors are calculated based on the pairs cluster bootstrapping procedure for both steps described by Chen et al. (2023); table 1.5 shows the results with 2,500 replications. Finally, none IMQ has a significant effect on firms' equity (placebo) as expected.

In comparative terms, non-tangible assets is the variable that determines in lower proportion the international firm performance among those included in the vector X (table 1.12), suggesting 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 intangible asset effect because of the limitations in their measurement (Crouzet et al., 2022). In fact, 59% of the big private Colombian exporting firms report null intangible assets.

Also, figure 1.7 shows that IMQ coefficients are statistically five (5) times larger than the coefficients that measure the magnitude that the global market demands the products exported by the firm. This result indicates that endogenous international managerial quality improvements can boost export value in higher magnitude than exogenous improvements in the international market conditions. This finding is robust to different international managerial quality definitions.

Future research could incorporate a managerial team objective function into theoretical models which optimize organizational capital investment depending on the product exported type (differentiated and homogeneous) and competition type (quality and price); this would allow optimal managerial team behavior to be derived. One first step could be to extend Bloom et al. (2021) theoretical model endogenizing the firm-product specific expertise level vector  $\lambda_i \in (0, \infty)$ . In addition, it is suggested to include imports in the theoretical analysis in order to analyze the transmission mechanisms driven the counter intuitive negative IMQ effect on imported inputs quality.

---

<sup>40</sup>  $0.00095 = 0.00259 * \ln(1+0.4480)$

<sup>41</sup> The number of the international managerial quality (IMQ) denotes the column of the unit value and quantity regressions from which the residuals to calculate IMQ are obtained (see tables 1.2 and 1.3, and equation 1.4, 1.5, 1.6 and 1.7)

Table 1.4: International managerial quality impact on international firms' performance

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Log export value	Log No. products exported	Log No. destination countries	Log No. products-destination	HHI <sup>1</sup>	Quality exports (share) value <sup>2</sup>	Quality exports (share) number <sup>3</sup>	Profit rate <sup>4</sup>	Share export differentiated commodities <sup>5</sup>	Log average UV imported inputs	Import value share <sup>6</sup>	Equity (P*)
IMQ1	0.170*** (0.0153)	-0.038*** (0.00578)	-0.00266 (0.00354)	-0.036*** (0.00613)	-9.12e-05 (0.00193)	0.0125*** (0.00230)	0.00843*** (0.00215)	0.00127* (0.000710)	-0.006*** (0.00185)	0.0132 (0.0143)	-0.00181* (0.00102)	0.00361 (0.00329)
Observations	23,738	23,738	23,738	23,738	23,738	21,550	21,550	23,642	23,738	19,377	19,377	23,738
IMQ2	0.142*** (0.0222)	-0.0202** (0.00829)	0.00574 (0.00634)	-0.0180* (0.00926)	0.00110 (0.00313)	0.0104*** (0.00327)	0.00475 (0.00295)	0.00200* (0.00117)	-0.00222 (0.00218)	-0.0446 (0.0290)	0.000765 (0.00180)	0.000707 (0.00552)
Observations	20,361	20,361	20,361	20,361	20,361	18,644	18,644	20,299	20,361	16,563	16,563	20,361
IMQ3	0.119*** (0.0219)	-0.00388 (0.00877)	0.0115 (0.00719)	-0.00144 (0.00978)	-0.00241 (0.00348)	0.0125*** (0.00385)	0.00781** (0.00331)	0.00259* (0.00133)	-0.00322 (0.00232)	-0.0794** (0.0342)	0.00158 (0.00196)	0.00152 (0.00643)
Observations	18,931	18,931	18,931	18,931	18,931	17,474	17,474	18,879	18,931	15,378	15,378	18,931
IMQ4	0.127*** (0.0217)	-0.00316 (0.00875)	0.0143** (0.00726)	0.00173 (0.00980)	-0.00264 (0.00346)	0.0121*** (0.00385)	0.00789** (0.00330)	0.00292** (0.00135)	-0.00291 (0.00233)	-0.0784** (0.0343)	0.00130 (0.00198)	0.00399 (0.00648)
Observations	18,941	18,941	18,941	18,941	18,941	17,482	17,482	18,889	18,941	15,387	15,387	18,941
IMQ5	0.113*** (0.0227)	-0.00271 (0.00984)	0.0114 (0.00772)	-2.27e-05 (0.0109)	-0.00350 (0.00393)	0.0147*** (0.00438)	0.00929** (0.00372)	0.00185 (0.00144)	-0.00275 (0.00253)	-0.0778** (0.0384)	0.00186 (0.00214)	-0.000842 (0.00640)
Observations	15,604	15,604	15,604	15,604	15,604	14,450	14,450	15,561	15,604	12,873	12,873	15,604
IMQ6	0.113*** (0.0227)	-0.00264 (0.00984)	0.0114 (0.00772)	4.08e-05 (0.0109)	-0.00350 (0.00393)	0.0147*** (0.00438)	0.00926** (0.00371)	0.00189 (0.00144)	-0.00274 (0.00253)	-0.0779** (0.0384)	0.00186 (0.00213)	-0.000860 (0.00640)
Observations	15,604	15,604	15,604	15,604	15,604	14,450	14,450	15,561	15,604	12,873	12,873	15,604
X	GD, log fixed assets, log non-tangible assets, log operating expenses, and TFP clean of IMQ <sup>a</sup>											
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

Notes: Robust standard errors clustered at firm level in parentheses. The number of the international managerial quality (IMQ) denotes the column of the unit value and quantity regressions from which the residuals to calculate IMQ are obtained (see tables 1.2 and 1.3, and equation 1.4, 1.5, 1.6 and 1.7). \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. P\*: placebo test. UV: Unit value.

<sup>a</sup> Residual of a regression of TFP on international managerial quality.

<sup>1</sup> Calculated by squaring the share of each product-destination country observation in total firms' exports by year and then summing the obtained numbers.

<sup>2</sup> Export value of products that compete in the international market by quality relative to total differentiated products' export value.

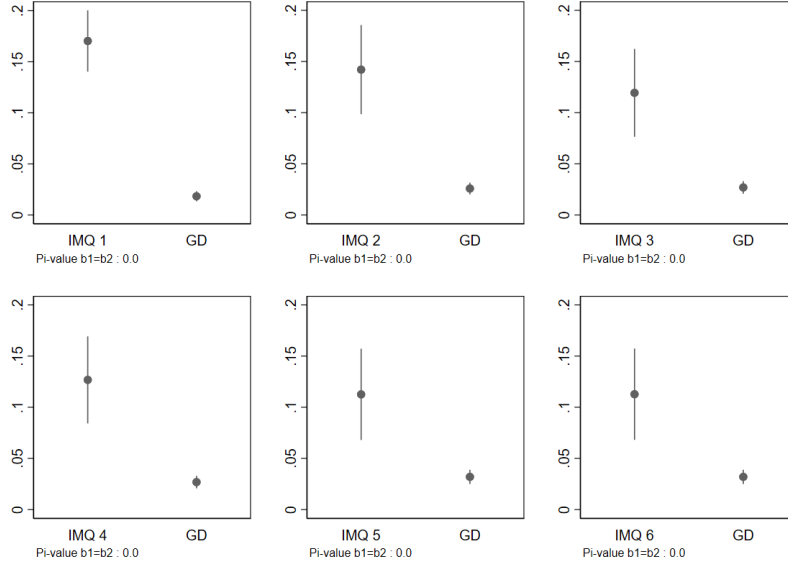
<sup>3</sup> Number of products that compete in the international market by quality exported relative to total number of differentiated products' exported.

<sup>4</sup> Operating profit relative to operating income.

<sup>5</sup> Differentiated products' export value relative to total export value.

<sup>6</sup> Imported inputs relative to sales cost.

Figure 1.7: International managerial quality and global demand shocks impact on export value



*Note 1:* This figure shows the 95% confidence intervals of the international managerial quality coefficient  $\hat{\beta}_1$  and global demand (GD) of products exported by the firm coefficient  $\hat{\beta}_2$  on log real export value.  $\Gamma X_{ft} + \partial_f + \partial_{st} + u_{ft}$  are included as other explanatory variables in the regressions (see equation 1.8).

*Note 2:* Global demand of products exported by firm (GD) 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 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.

*Note 3:* The number of the international managerial quality (IMQ) denotes the column of the unit value and quantity regressions from which the residuals to calculate IMQ are obtained (see tables 1.2 and 1.3, and equation 1.4, 1.5, 1.6 and 1.7).

Table 1.5: International managerial quality impact on international firms' performance (bootstrap standard errors)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Log export value	Log No. products exported	Log No. destination countries	Log No. products-destination	HHI <sup>1</sup>	Quality exports (share) value <sup>2</sup>
IMQ3	0.113*** (0.0237)	-0.004 (0.0097)	0.008 (0.0078)	-0.003 (0.0108)	-0.003 (0.0037)	0.011*** (0.0041)
X	GD, log fixed assets, log non-tangible assets log operating expenses, and TFP <sup>a</sup>					
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	440,652	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
	(7)	(8)	(9)	(10)	(11)	(12)
	Quality exports (share) number <sup>3</sup>	Profit rate <sup>4</sup>	Share export differentiated commodities <sup>5</sup>	Log average UV imported inputs	Import value share <sup>6</sup>	Equity (P*)
IMQ3	0.007** (0.0034)	0.003** (0.0015)	-0.003 (0.0026)	-0.081** (0.0369)	0.001 (0.0022)	0.003 (0.0070)
X	GD, log fixed assets, log non-tangible assets log operating expenses, and TFP <sup>a</sup>					
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	11,945	12,980	13,025	10,592	10,592	13,025
• Share number of observations relative to the baseline sample size	0.68	0.69	0.69	0.69	0.69	0.69
Average number of observations first step	440,652	440,652	440,652	440,652	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

Notes: 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. P\*: placebo test. UV: Unit value.

<sup>a</sup> Residual of a regression of TFP on international managerial quality.

<sup>1</sup> Calculated by squaring the share of each product-destination country observation in total firms' exports by year and then summing the obtained numbers.

<sup>2</sup> Export value of products that compete in the international market by quality relative to total differentiated products' export value.

<sup>3</sup> Number of products that compete in the international market by quality exported relative to total number of differentiated products' exported.

<sup>4</sup> Operating profit relative to operating income.

<sup>5</sup> Differentiated products' export value relative to total export value.

<sup>6</sup> Imported inputs relative to sales cost.

## 1.6 Conclusion

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

Based on some theoretical elements from Bloom et al. (2021), the Rauch (1999) product classification and an extended Baldwin & Ito (2011) methodology to classify international products' competition type (price or quality), it is assumed that managerial teams categorize products exported in three groups and implement different managerial practices on each group in order to rise firms' export proficiency: i) quality capacity policies aimed at upgrading the quality (ergo, the export price) of the differentiated products that compete on quality, ii) production efficiency policies aimed at exporting cheaper the differentiated products that compete on price, and iii) production efficiency policies aimed at exporting higher homogeneous products' quantity.

Under this theoretical assumption, 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, the international managerial quality is included as explanatory variable in international firms' performance regressions. 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 export value and profit rate. Second, better managerial team in the international market do not increase the number of products exported but rise both quality export shares (number and value), indicating that they upgrade export basket' quality replacing products that compete on price by products that compete on quality. These results challenge traditional policy recommendations of increasing exports' extensive margin but support traditional policy recommendations of upgrading exports' quality. Finally, endogenous international managerial quality improvement is around 5 times more relevant than exogenous favorable international shocks to boost firms' exports. In conclusion, the managerial team constitutes a fundamental pillar to lift 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 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.

## 1.7 References

- Artigue, H., & Smith, G. (2019). The principal problem with principal components regression. *Cogen Mathematics & Statistics*, 6(1), 1-11.
- Baldwin, R., & Ito, T. (2011). Quality competition versus price competition goods: an empirical classification. *Journal of Economic Integration*, 26(1), 110-135.
- Bao, X., Blonigen, B., & Zhi, Y. (2021). Cross-product and cross-market adjustments within multi-product firms: evidence from antidumping actions. *NBER Working Paper Series*, 29521.
- Bello, D., & Gilliland, D. (1997). The effect of output controls, process controls, and flexibility on export channel performance. *Journal of marketing*, 61(1), 22-38.
- Bilwey, W., & Tesar, G. (1977). The export behavior of smaller-sized Wisconsin manufacturing firms. *Journal of international business studies*, 8(1), 93-98.
- Black, S., & Lynch, L. (2005). Measuring organizational capital in the new economy. *IZA Discussion papers 1524*, Institute for the Study of Labor (IZA), Bonn.
- Bloom, N., & Van Reenen, J. (2007). Measuring and explaining management practices across firms and countries. *The Quarterly Journal of Economics*, 122(4), 1351-1408.
- Bloom, N., Iavococone, L., Pereira, M., & Van Reenen, J. (2022). Management misallocation in Mexico. *CEPR Discussion Paper No. DP16979*.
- Bloom, N., Manova, K., Van Reenen, J., Teng, S., & Yu, Z. (2021). Trade and management. *The Review of Economics and Statistics*, 103(3), 443-460.
- Bonaccorsi, A. (1992). On the relationship between firm size and export intensity. *Journal of International Business Studies*, 23(4), 605-635.
- Broszeit, S., Fritsch, U., Görg, H., & Laible, M. (2019). Management practices and productivity in Germany. *German Economic Review*, 20(4), 657-705.
- Buffington, C., Foster, L., Jarmin, R., & Ohlmacher, S. (2017). The management and organizational practices survey (MOPS): an overview. *Journal of Economic and Social Measurement*, 42(1), 1-26.
- Cavusgil, S. (1984). Organizational characteristics associated with export activity. *Journal of management studies*, 21(1), 3-22.
- Cavusgil, S. (1984). Differences among exporting firms based on their degree of internationalization. *Journal of Business Research*, 12(2), 195-208.
- Cavusgil, S., & Naor, J. (1987). Firm and management characteristics as discriminators of export marketing activity. *Journal of Business Research*, 15(3), 221-235.
- Cavusgil, S., Naidu, G., & Zou, S. (1993). Product and promotion adaptation in export ventures - an empirical investigation. *Journal of International Business Studies*, 24(3), 479-506.

- Cavusgil, S., & Nevin, J. (1981). Internal determinants of export marketing behavior - an empirical investigation. *Journal of Marketing Research*, 18(1), 114-119.
- Chen, W., Hribar, P., & Melessa, S. (2017). Incorrect inferences when using residuals as dependent variables. Available at SSRN: <https://ssrn.com/abstract=2597429>.
- Chen, W., Hribar, P., & Melessa, S. (2023). Standard error biases when using generated regressors in accounting research. *Journal of accounting research*, 61(2), 531-569.
- Coelho, F., Martinez, F., & Sousa, C. (2008). The determinants of export performance: a review of the research in the literature between 1998 and 2005. *International Journal of Management Review*, 10(4), 343-374.
- Cooper, R., & Kleinschmidt, E. (1985). The impact of export strategy on export sales performance. *Journal of International Business Studies*, 16(1), 37-55.
- Crouzet, N., Eberly, J., Einfeldt, A., & Papanikolaou, D. (2022). The economics of intangible capital. *Journal of Economic Perspectives*, 36(3), 29-52.
- De Loecker, J. (2013). Detecting learning by exporting. *American Economic Journal*, 5(3), 1-21.
- Demerjian, P., Lev, B., & McVay, S. (2012). Quantifying managerial ability: a new measure and validity tests. *Management Science*, 58(7), 1229-1248.
- Denis, J., & Depelteau, D. (1985). Market knowledge diversification and export expansion. *Journal of International Business Studies*, 16(3), 77-89.
- Dessein, W., & Prat, A. (2022). Organizational capital, corporate leadership, and firm dynamics. *The Journal of Political Economy*, 130(6), 1477-1536.
- Dichtl, E., Köglmayr, H., & Müller, S. (1990). International orientation as a precondition for export success. *Journal of International Business Studies*, 21(1), 23-40.
- Fernandes, A., & Isgut, A. (2015). Learning-by-exporting effects: are they for real? *Emerging markets finance and trade*, 51(1), 65-69.
- Görg, H., & Hanley, A. (2017). Firms' global engagement and management practices. *Economic Letters*, 155, 80-83.
- Hadi, A., & Ling, R. (1998). Some cautionary notes on the use of principal components regression. *The American Statistician*, 52(1), 15-19.
- Harding, T., & Javorcik, B. (2012). Foreign direct investment and export upgrading. *The Review of Economics and Statistics*, 94(4), 964-980.
- Harrigan, J., Ma, X., & Shlychkov, V. (2015). Export prices of US firms. *Journal of International Economics*, 97(1), 100-111.
- Hausmann, R., Hwang, J., & Rodrick, D. (2007). What you export matters. *Journal of Economic Growth*, 12, 1-25.

Hovhannisyanyan, H., & Mendez, F. (2019). Learning by exporting: evidence of learning from American manufacturing industries. *FREIT (Forum for research in empirical international trade) Working Paper 1565*.

Hummels, D., & Skiba, A. (2004). Shipping the goods apples out? An empirical confirmation of the Alchian-Allen conjecture. *Journal of Political Economy*, *112*(6), 1384-1402.

Jennings, J., Kim, J., Lee, J., & Taylor, D. (2023). Measurement error, fixed effects, and false positives in accounting research. *Review of Accounting Studies (2023)*. doi: <https://doi.org/10.1007/s11142-023-09754-z>

Johansen, M. (2013). The impact of managerial quality on employee turnover. *Public management review*, *15*(6), 858-877.

Keller, W., & Olney, W. (2021). Globalization and executive compensation. *Journal of International Economics*, *129*, 103408.

Kujawa, D., & Simpson, C. (1974). The export decision process: an empirical inquiry. *Journal of International Business Studies*, *5*(1), 107-117.

Leonidou, L., Katsikeas, C., & Coudounaris, D. (2010). Five decades of business research into exporting: a bibliographic analysis. *Journal of International Management*, *16*(1), 78-91.

Levinsohn, J., & Petrin, A. (2003). Estimating production function using inputs to control for unobservables. *The Review of Economic Studies*, *70*(2), 317-341.

Madsen, T. (1989). Successful export marketing management: some empirical evidence. *International marketing review*, *6*(4), 41-57.

Meier, K., & O'Toole, L. (2002). Public management and organizational performance: the effect of managerial quality. *Journal of policy analysis and management*, *21*(4), 629-643.

Melitz, M. (2003). The impact of trade on intra-industry reallocation and aggregate industry productivity. *Econometrica*, *71*(6), 1695-1725.

Miljkovic, D., & Gomez, M. (2019). Shipping the good coffee out: the Alchian-Allen theorem and relative demand for Brazilian arabica and robusta coffees. *European Review of Agricultural Economics*, *46*(4), 697-712.

Mollisi, V., & Rovigatti, G. (2018). Theory and practice of Total-Factor Productivity estimation: the control function approach using stata. *The Stata Journal*, *18*(3), 618-662.

Rauch, J. (1999). Network versus markets in international trade. *Journal of International Economics*, *48*(1), 7-35.

Reid, S. (1984). Information acquisition and export entry decision in small firms. *Journal of business research*, *12*(2), 141-157.

Reuber, A., & Fischer, E. (1997). The influence of management team's international experience on internationalization behaviors of SMEs. *Journal of International Business Studies*, *28*(4), 807-825.

Sala, D., & Yalcin, E. (2014). Export experience of managers and the internationalization of firms. *The world economy*, 38(7), 1064-1089.

Teti, F. (2020). 30 years of trade policy: evidence from 5.7 billion tariffs. *Ifo working paper No. 334*.

Tse, C., Yu, L., & Zhu, J. (2017). A multimediation model of learning by exporting: analysis of export-induced productivity gains. *Journal of management*, 43(7), 2118-2146.

Wagner, J. (2007). Exports and productivity: a survey of the evidence from firm-level data. *World Economy*, 30, 60-82.

Wiedersheim, F., Olson, H., & Welch, L. (1978). Pre-export activity: the first step in internationalization. *Journal of International Business Studies*, 9(1), 47-58.

## 1.8 Appendix

Table 1.6: 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). *Notes:* The “sample” column was added by the author.

Table 1.7: Annual average descriptive statistics – big exporting firms and other exporting firms (2006-2014)

Variable	Big exporting firms	Other export-ing firms	Pi-value coefficient <sup>a</sup>
Simple average export value per firm (real USD Dollars)	8,233,714	4,115,623	0.000
Median export value per firm (real USD Dollars)	201,658	40,700	
Average HHI per firm	0.535	0.677	0.000
Median HHI per firm	0.481	0.711	
Average number of products exported per firm	7.7	4.4	0.000
Median number of products exported per firm	3.1	2.0	
Average number of exports' country destinations per firm	4.6	2.2	0.000
Median number of exports' country destinations per firm	2	1	
Average number of products - country destinations per firm	17.96	7.22	0.000
Median number of products - country destinations per firm	5	2.1	
Average number of firms	3,434	4,487	

*Source:* Colombian National Administrative Statistics Department (DANE by its acronym in Spanish), Colombian Companies Superintendence, and authorial calculations.

*Notes:* <sup>a</sup> 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.

The export value was deflated based on the US GDP deflator.

Table 1.8: Annual average descriptive statistics – big exporting firms and big non-exporting firms

Variable	Big exporting firms	Big non-exporting firms	Pi-value coefficient <sup>a</sup>
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. *Notes:* <sup>a</sup> 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.

TFP calculated with Levinsohn & Petrin (2003) methodology using “prodest” Stata command (table 1.9 in the appendix).

The variables used in this dataset were deflated using an industry-specific annual Producer Price Index (PPI) reported by the Colombian Central Bank.

Table 1.9: TFP estimation

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

*Notes:* 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 1.10: Managerial quality estimation (traditional firm efficiency methodology)

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

*Notes:* 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. Managerial quality is the residual of this regression.

<sup>1</sup> Firm efficiency is measured with Data Envelopment Analysis (DEA), which is an optimization procedure which allows to measure firms' efficiency when 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 1.11 in the appendix for descriptive statistics.

<sup>2</sup> Firm operating income/industry operating income.

<sup>3</sup> Free Cash Flow = Operating income – CAPEX – Debt payment.

Table 1.11: Firm-level variables descriptive statistics (baseline regression sample)

Variables	Mean	p50	SD	Min	Max	N
International managerial quality 1	0.028	0.004	0.794	-7.026	7.359	18,882
International managerial quality 2	0.001	0.000	0.476	-5.836	5.786	18,594
International managerial quality 3	0.000	0.000	0.448	-4.986	5.043	18,931
International managerial quality 4	0.000	0.000	0.450	-4.979	5.076	18,931
International managerial quality 5	0.000	0.000	0.433	-4.342	5.046	15,641
International managerial quality 6	0.000	0.000	0.433	-4.342	5.046	15,641
ln (unit value)	3.347	2.837	2.769	-5.080	13.218	18,931
ln (export quantity)	8.759	8.775	3.239	-1.204	20.542	18,931
Log real export value (USD)	13.030	12.943	2.485	1.566	21.929	18,931
Log No. products exported	1.674	1.609	1.134	0.000	5.889	18,931
Log No. exports' country destinations	1.320	1.386	0.963	0.000	4.025	18,931
Log No. products-country destinations	2.306	2.303	1.342	0.000	7.030	18,931
HHI exports	0.418	0.336	0.288	0.014	1.000	18,931
Quality exports (share) - value	0.727	0.978	0.379	0.000	1.000	17,560
Quality exports (share) - number	0.710	0.778	0.307	0.000	1.000	17,560
Export value/operating income	0.202	0.081	0.266	0.000	1.000	18,931
Import value/sales cost	0.413	0.307	0.361	0.000	1.000	18,931
Profit rate	0.064	0.066	0.103	-0.989	0.854	18,885
Log global demand of products exported by firm (GD)	14.305	16.083	6.859	-6.420	26.696	18,931
Log real stock property, plant and equipment (USD)	13.411	13.362	2.145	3.527	22.898	18,931
Log real stock non-tangible assets (USD)	4.660	0.000	5.854	0.000	19.710	18,931
Log real operating expenses (USD)	14.283	14.126	1.591	6.490	19.946	18,931
Share "differentiated goods" exports	0.794	1.000	0.361	0.000	1.000	18,931
Share "referenced price" goods exports	0.130	0.000	0.296	0.000	1.000	18,931
Share "organized trade exchange" goods exports	0.043	0.000	0.190	0.000	1.000	18,931
Share "non-classified" goods exports	0.034	0.000	0.146	0.000	1.000	18,931
Firm efficiency	0.972	0.985	0.047	0.498	1.000	16,109
Managerial quality	-0.026	-0.013	0.085	-1.036	0.203	16,109
TFP	1.900	1.860	0.196	1.627	3.461	18,931
TFP 1 (excluding int management component)	0.008	-0.033	0.195	-0.277	1.569	18,882
TFP 2 (excluding int management component)	0.003	-0.037	0.194	-0.271	1.564	18,594
TFP 3 (excluding int management component)	0.004	-0.036	0.196	-0.270	1.565	18,931
TFP 4 (excluding int management component)	0.004	-0.036	0.196	-0.271	1.564	18,931
TFP 5 (excluding int management component)	0.004	-0.036	0.195	-0.275	1.560	15,641
TFP 6 (excluding int management component)	0.004	-0.036	0.195	-0.275	1.560	15,641

Note 1: Global demand of products exported by firm (GD) 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 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.

Note 2: The number of the international managerial quality (IMQ) denotes the column of the unit value and quantity regressions from which the residuals to calculate IMQ are obtained (see tables 1.2 and 1.3, and equation 1.4, 1.5, 1.6 and 1.7).

Note 3: Methodology to classify products that compete in the international market by price or quality is explained in section 1.4.1

Note 4: TFP calculation based on Levinsohn & Petrin (2003) methodology and the `prodest` Stata command (Mollisi & Rovigatti, 2018). See table 1.9.

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) in order to include firms that report 0 in some variables, particularly, non-tangible assets.

Table 1.12: International managerial quality impact on international firms' performance

VARIABLES	(1) Log export value	(2) Log No. products exported	(3) Log No. desti- nation countries	(4) Log No. products- destination	(5) HHI <sup>1</sup>	(6) Quality exports (share) value <sup>2</sup>	(7) Quality exports (share) number <sup>3</sup>	(8) Profit rate <sup>4</sup>	(9) Share export differ- entiated commodities <sup>5</sup>	(10) Log aver- age UV imported inputs	(11) Import value share <sup>6</sup>	(12) Equity (P*)
IMQ3	0.119*** (0.0219)	-0.00388 (0.00877)	0.0115 (0.00719)	-0.00144 (0.00978)	-0.00241 (0.00348)	0.0125*** (0.00385)	0.00781** (0.00331)	0.00259* (0.00133)	-0.00322 (0.00232)	-0.0794** (0.0342)	0.00158 (0.00196)	0.00152 (0.00643)
GD	0.0269*** (0.00311)	0.0167*** (0.00156)	0.0162*** (0.00126)	0.0242*** (0.00171)	-0.005*** (0.00052)	-0.00075 (0.000540)	-3.97e-06 (0.000510)	1.19e-05 (0.000174)	-0.00011 (0.000437)	0.0076* (0.00455)	-0.00045 (0.000288)	-0.000645 (0.00104)
Log real stock property, plant and equipment (USD)	0.221*** (0.0242)	0.0499*** (0.0124)	0.0545*** (0.00976)	0.0832*** (0.0137)	-0.0082** (0.0036)	-0.00344 (0.00344)	-0.00117 (0.00310)	0.0123*** (0.00220)	-0.00387 (0.00271)	0.322*** (0.0434)	-0.00575* (0.00342)	0.191*** (0.0126)
Log real stock non-tangible assets (USD)	0.00663** (0.00264)	0.00392*** (0.00151)	0.00305*** (0.00113)	0.00408** (0.00162)	-0.00079* (0.00043)	6.77e-05 (0.000470)	-3.07e-05 (0.000450)	0.000132 (0.000180)	-0.000118 (0.000391)	0.00425 (0.00448)	-0.000150 (0.000302)	0.00622*** (0.00115)
Log real operat- ing expenses (USD)	0.346*** (0.0423)	0.132*** (0.0207)	0.104*** (0.0168)	0.171*** (0.0240)	-0.021*** (0.00630)	-0.00288 (0.00552)	0.00372 (0.00532)	-0.016*** (0.00561)	0.00654 (0.00451)	0.251*** (0.0803)	0.0293*** (0.00723)	0.169*** (0.0243)
TFP <sup>a</sup>	3.529*** (0.289)	0.753*** (0.129)	0.608*** (0.105)	1.108*** (0.150)	-0.0677* (0.0402)	-0.0114 (0.0438)	-0.0285 (0.0362)	0.179*** (0.0299)	-0.0551 (0.0356)	1.389*** (0.467)	-0.188*** (0.0482)	1.141*** (0.142)
Observations	18,931	18,931	18,931	18,931	18,931	17,474	17,474	18,879	18,931	15,378	15,378	18,931
R-squared	0.913	0.864	0.886	0.893	0.763	0.871	0.807	0.630	0.914	0.699	0.898	0.970
Firm fixed ef- fects	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

Notes: Robust standard errors clustered at firm level in parentheses. The number of the international managerial quality (IMQ) denotes the column of the unit value and quantity regressions from which the residuals to calculate IMQ are obtained (see tables 1.2 and 1.3, and equation 1.4, 1.5, 1.6 and 1.7). \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. P\*: placebo test. UV: Unit value.

<sup>a</sup> Residual of a regression of TFP on international managerial quality.

<sup>1</sup> Calculated by squaring the share of each product-destination country observation in total firms' exports by year and then summing the obtained numbers.

<sup>2</sup> Export value of products that compete in the international market by quality relative to total differentiated products' export value.

<sup>3</sup> Number of products that compete in the international market by quality exported relative to total number of differentiated products' exported.

<sup>4</sup> Operating profit relative to operating income.

<sup>5</sup> Differentiated products' export value relative to total export value.

<sup>6</sup> Imported inputs relative to sales cost.

Table 1.13: International managerial quality impact on international firms' performance (modified residuals' median)

VARIABLES	(1) Log export value	(2) Log No. products exported	(3) Log No. desti- nation countries	(4) Log No. products- destination	(5) HHI <sup>1</sup>	(6) Quality exports (share) value <sup>2</sup>	(7) Quality exports (share) number <sup>3</sup>	(8) Profit rate <sup>4</sup>	(9) Share export differ- entiated commodities <sup>5</sup>	(10) Log aver- age UV imported inputs	(11) Import value share <sup>6</sup>	(12) Equity (P*)
IMQ1	0.164*** (0.0151)	-0.031*** (0.00564)	-0.00132 (0.00353)	-0.03*** (0.00600)	-0.000512 (0.00191)	0.0122*** (0.00224)	0.00800*** (0.00207)	0.00150** (0.000702)	-0.0045** (0.00181)	0.00574 (0.0141)	-0.00163* (0.000985)	0.00518 (0.00331)
Observations	23,738	23,738	23,738	23,738	23,738	21,550	21,550	23,642	23,738	19,377	19,377	23,738
IMQ2	0.153*** (0.0232)	-0.0181** (0.00865)	0.00748 (0.00650)	-0.0132 (0.00959)	0.00108 (0.00325)	0.0119*** (0.00343)	0.00505* (0.00305)	0.00242** (0.00121)	-0.000892 (0.00222)	-0.0540* (0.0291)	0.000774 (0.00182)	0.00578 (0.00560)
Observations	20,361	20,361	20,361	20,361	20,361	18,644	18,644	20,299	20,361	16,563	16,563	20,361
IMQ3	0.135*** (0.0232)	-0.00304 (0.00926)	0.0162** (0.00753)	0.00365 (0.0103)	-0.00282 (0.00369)	0.0124*** (0.00416)	0.00688** (0.00350)	0.00308** (0.00139)	-0.00293 (0.00239)	-0.0771** (0.0342)	0.00151 (0.00201)	0.00539 (0.00680)
Observations	18,931	18,931	18,931	18,931	18,931	17,474	17,474	18,879	18,931	15,378	15,378	18,931
IMQ4	0.141*** (0.0230)	-0.00296 (0.00924)	0.0187** (0.00760)	0.00621 (0.0103)	-0.00298 (0.00367)	0.0122*** (0.00415)	0.00716** (0.00349)	0.00334** (0.00142)	-0.00261 (0.00239)	-0.0769** (0.0341)	0.00122 (0.00204)	0.00747 (0.00682)
Observations	18,941	18,941	18,941	18,941	18,941	17,482	17,482	18,889	18,941	15,387	15,387	18,941
IMQ5	0.126*** (0.0244)	-0.00351 (0.0104)	0.0132 (0.00811)	0.00239 (0.0116)	-0.00326 (0.00421)	0.0157*** (0.00474)	0.00899** (0.00393)	0.00237 (0.00153)	-0.00227 (0.00255)	-0.0780** (0.0386)	0.00187 (0.00216)	0.00270 (0.00682)
Observations	15,604	15,604	15,604	15,604	15,604	14,450	14,450	15,561	15,604	12,873	12,873	15,604
IMQ6	0.126*** (0.0244)	-0.00343 (0.0104)	0.0131 (0.00810)	0.00245 (0.0116)	-0.00325 (0.00421)	0.0157*** (0.00474)	0.00895** (0.00392)	0.00239 (0.00153)	-0.00227 (0.00255)	-0.0780** (0.0387)	0.00188 (0.00216)	0.00268 (0.00682)
Observations	15,604	15,604	15,604	15,604	15,604	14,450	14,450	15,561	15,604	12,873	12,873	15,604
X	GD, log fixed assets, log non-tangible assets, log operating expenses, and TFP <sup>a</sup>											
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

Notes: Robust standard errors clustered at firm level in parentheses. The number of the international managerial quality (IMQ) denotes the column of the unit value and quantity regressions from which the residuals to calculate IMQ are obtained (see tables 1.2 and 1.3, and equation 1.4, 1.5, 1.6 and 1.7). \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. P\*: placebo test. UV: Unit value.

<sup>a</sup> Residual of a regression of TFP on international managerial quality.

<sup>1</sup> Calculated by squaring the share of each product-destination country observation in total firms' exports by year and then summing the obtained numbers.

<sup>2</sup> Export value of products that compete in the international market by quality relative to total differentiated products' export value.

<sup>3</sup> Number of products that compete in the international market by quality exported relative to total number of differentiated products' exported.

<sup>4</sup> Operating profit relative to operating income.

<sup>5</sup> Differentiated products' export value relative to total export value.

<sup>6</sup> Imported inputs relative to sales cost.

Table 1.14: International managerial quality impact on international firms' performance (modified residuals' average, standardized EUV and Q residuals)

VARIABLES	(1) Log export value	(2) Log No. products exported	(3) Log No. desti- nation countries	(4) Log No. products- destination	(5) HHI <sup>1</sup>	(6) Quality exports (share) value <sup>2</sup>	(7) Quality exports (share) number <sup>3</sup>	(8) Profit rate <sup>4</sup>	(9) Share export differ- entiated commodities <sup>5</sup>	(10) Log aver- age UV imported inputs	(11) Import value share <sup>6</sup>	(12) Equity (P*)
IMQ1	0.203*** (0.0219)	-0.051*** (0.00856)	-0.00391 (0.00515)	-0.05*** (0.00906)	0.000721 (0.00283)	0.0178*** (0.00320)	0.0116*** (0.00297)	0.00161 (0.00103)	-0.00257 (0.00246)	0.0155 (0.0201)	-0.00219 (0.00153)	0.00450 (0.00478)
Observations	23,738	23,738	23,738	23,738	23,738	21,550	21,550	23,642	23,738	19,377	19,377	23,738
IMQ2	0.0845*** (0.0177)	-0.021*** (0.00679)	0.00192 (0.00508)	-0.02*** (0.00756)	0.00205 (0.00254)	0.00822*** (0.00237)	0.00347 (0.00217)	0.00151 (0.000937)	0.000328 (0.00169)	-0.0385* (0.0233)	0.000415 (0.00145)	-0.000480 (0.00426)
Observations	20,361	20,361	20,361	20,361	20,361	18,644	18,644	20,299	20,361	16,563	16,563	20,361
IMQ3	0.0535*** (0.0138)	-0.00648 (0.00571)	0.00460 (0.00462)	-0.00612 (0.00634)	-0.000917 (0.00225)	0.00728*** (0.00227)	0.00423** (0.00194)	0.00163* (0.000851)	-0.000801 (0.00141)	-0.0561** (0.0219)	0.00105 (0.00125)	0.000495 (0.00403)
Observations	18,931	18,931	18,931	18,931	18,931	17,474	17,474	18,879	18,931	15,378	15,378	18,931
IMQ4	0.0563*** (0.0137)	-0.00636 (0.00570)	0.00576 (0.00464)	-0.00500 (0.00635)	-0.000980 (0.00225)	0.00716*** (0.00226)	0.00431** (0.00193)	0.00178** (0.000856)	-0.000705 (0.00141)	-0.0557** (0.0220)	0.000916 (0.00125)	0.00133 (0.00405)
Observations	18,941	18,941	18,941	18,941	18,941	17,482	17,482	18,889	18,941	15,387	15,387	18,941
IMQ5	0.0507*** (0.0143)	-0.00646 (0.00640)	0.00484 (0.00493)	-0.00625 (0.00709)	-0.00125 (0.00254)	0.00861*** (0.00254)	0.00525** (0.00212)	0.00121 (0.000930)	-0.000400 (0.00151)	-0.0550** (0.0243)	0.000959 (0.00135)	-0.00121 (0.00416)
Observations	15,604	15,604	15,604	15,604	15,604	14,450	14,450	15,561	15,604	12,873	12,873	15,604
IMQ6	0.0508*** (0.0143)	-0.00641 (0.00640)	0.00485 (0.00493)	-0.00620 (0.00709)	-0.00126 (0.00254)	0.00861*** (0.00254)	0.00524** (0.00212)	0.00123 (0.000930)	-0.000394 (0.00151)	-0.0551** (0.0243)	0.000965 (0.00135)	-0.00123 (0.00415)
Observations	15,604	15,604	15,604	15,604	15,604	14,450	14,450	15,561	15,604	12,873	12,873	15,604
X	GD, log fixed assets, log non-tangible assets, log operating expenses, and TFP <sup>a</sup>											
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

Notes: Robust standard errors clustered at firm level in parentheses. The number of the international managerial quality (IMQ) denotes the column of the unit value and quantity regressions from which the residuals to calculate IMQ are obtained (see tables 1.2 and 1.3, and equation 1.4, 1.5, 1.6 and 1.7). \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. P\*: placebo test. UV: Unit value.

<sup>a</sup> Residual of a regression of TFP on international managerial quality.

<sup>1</sup> Calculated by squaring the share of each product-destination country observation in total firms' exports by year and then summing the obtained numbers.

<sup>2</sup> Export value of products that compete in the international market by quality relative to total differentiated products' export value.

<sup>3</sup> Number of products that compete in the international market by quality exported relative to total number of differentiated products' exported.

<sup>4</sup> Operating profit relative to operating income.

<sup>5</sup> Differentiated products' export value relative to total export value.

<sup>6</sup> Imported inputs relative to sales cost.

## Chapter 2

# Export impact on dividend policy for big Colombian exporting firms, 2006-2014<sup>1</sup>

### Abstract

This paper studies the impact of exogenous export demand shocks on firms' dividend policy using firm specific real exchange rate variation as instrumental variable. The exclusion restriction is plausibly satisfied because real exchange rate shocks were unanticipated -partly explained because of international oil price fluctuation-, and first stage statistics confirm relevance condition fulfillment. The results indicate that big private Colombian exporting firms initiated to decrease effectively paid dividends as a way to mitigate the *agency cost* generated by exogenous exports via higher free cash flow and higher cash flow volatility. Heterogeneous specifications support the 'outcome model' within the agency cost theory.

**Keywords:** dividends, exports, agency cost, volatility, management.

**JEL classification:** F14, F10, G30, G32, G14, G35.

---

<sup>1</sup>The author thanks the valuable comments by Holger Görg, Robert Gold and all participants at Aarhus – Kiel workshop 2022, IFW Research Seminar 2023, and 25th Gottingen Workshop International Economics 2024

## 2.1 Introduction

The lack of consensus about why firms pay dividends despite extensive academic research is known as the “dividend puzzle”<sup>2</sup>. In order to solve this puzzle, Allen et al. (2010)<sup>3</sup> suggest: “instead of inquiring whether dividends are good or bad, perhaps we should be asking when it makes sense to pay high or low dividends” (Allen et al., 2010, p.873), and two literature review papers (Al-Najjar & Kilincarslan, 2019; El Attar & Jabbouri, 2018) recommend to develop new perspectives and to conduct more studies for developing countries. Although more recent studies have brought new elements into the debate, like managers’ career concerns (Dang et al., 2020)<sup>4</sup>, the international trade topic is conspicuous by its absence. To the best of the author’s knowledge, only two papers relate international trade and dividend payout.

From the import perspective, Booth et al. (2013) estimates the sectoral import penetration impact on the probability that firms pay dividends, finding that between 33% and 40% of the “disappearing dividends” phenomenon occurred in US<sup>5</sup> between 1978 and 1999 could be attributed to import competition rise. They suggest that competition from imports rise uncertainty in future performance preventing firms to pay dividends. From the export perspective, Goldman & Viswanath (2015) found that cashflow diversification through exports (due to the low correlation between domestic and international demand shocks) increased the dividend payout in India between 2000 and 2009. However, from the author’s point of view, the potential endogeneity of the main independent variables in these papers (sectoral import penetration ratio and sales diversification<sup>6</sup>) is not addressed, hence, it is not possible to infer robust causality.

For this reason, the main novelty of this paper is to estimate export value effect on dividend policy through two-stage least squares (2SLS), which allows to address export value’s endogeneity generated by non-observable variables that influence export value and dividend policy. This methodology is framed within the recommendations for future research mentioned before; the *new methodological perspective* to analyze dividend payout is implemented for Colombia<sup>7</sup>, a *developing country* where exogenous international demand shocks provide a proper natural experiment, which allow to evaluate firms’ dividend policy adjustment and help to reply the *when* question.<sup>8</sup>

The instrumental variable is firm specific real exchange rate weighted by export destination countries shares in total firms’ exports in its first sample year, which plausibly satisfy the exclusion restriction

---

<sup>2</sup>“The harder we look at the dividend picture, the more it seems like a puzzle, with pieces that just don’t fit together” (Black, 1976, p.5)

<sup>3</sup>Also, they list the dividend payout as one of the most important unresolved topics in the corporate finance literature.

<sup>4</sup>They suggest that managers career concerns could explain that S&P1500 firms either maintained or increased dividend payment during COVID-19 crisis.

<sup>5</sup>The proportion listed US firms that pay dividends decreased from 66.5% in 1978 to 20.8% in 1999. This reduction can be explained for a mix of new publicly firms with typical non-paying dividends characteristics (small size, low earnings, and high growth) and a lower probability to pay dividends of existing firms (Fama & French, 2001).

<sup>6</sup> $ExpIntenRel = 1 - 2|expintensity - 0.5|$  is used as a proxy variable for sales diversification.

<sup>7</sup>Jaramillo (2021) also explores Colombian dividend payment determinants with the same financial statement dataset used in this paper. However, Jaramillo (2021)’s main focus is not international trade (although one of the explanatory variables included in the regression is the aggregate nominal exchange rate between Colombia and USA, whose coefficient is not statistically significant).

<sup>8</sup>Some stylized facts allow to infer that international demand shocks are more appropriate than local demand shocks to study firm’s dividend policy adjustment. For example, export share is positive and statistically correlated with cash flow volatility (see appendix 2.10), which is an important dividend policy determinant (see section 2.3). Also, public information (e.g. customs data) allow to measure exogenous export demand shocks precisely.

because real exchange rate variation occurred during 2006-2014 was partly driven by oil price fluctuation and Colombian trading partners' macroeconomic conditions oscillation. As the export shares are fixed at initial year, the instrument does not oscillate due to endogenous manager decisions. This instrumental variable follows the methodology implemented by Jiang et al. (2010), who analyzes how export demand shocks associated with the Asian financial crisis impacted Chinese exporters (in terms of productivity, workers, capital, among others variables) through similar firm-specific exchange rate shocks constructed with the precrisis export destination's shares.

This empirical approach permits to verify accurately the testable predictions of the agency cost and signaling dividend theories. Unfortunately, dividend theories that discuss capital gains will not be empirically address because of data limitations.<sup>9</sup> This paper proceeds as follows. Section 2.2 describes the Colombian dividend payment regulation, section 2.3 presents the theoretical framework and the potential links between exports and dividend payout, section 2.4 shows the descriptive statistics, section 2.5 details the empirical methodology, section 2.6 analyzes the results, and section 2.7 concludes.

## 2.2 Colombian dividend payment regulation

In Colombia, dividend payment approval follows three steps described in the Colombian Commercial Code (CCC from now on). First, the board of directors and/or the firms' legal representative (which usually is the manager) expose the project of profits to be distributed in dividends to the shareholders' assembly (Article 446, CCC). Secondly, the shareholders' assembly discusses the project and set the amount to be paid in dividends (Article 420, CCC).

As a way to protect the minority shareholders, it is established a *special majority system*<sup>10</sup> in which it is required the favorable vote of a plural number of shareholders representing minimum 78% of the shares or participative quotas to distribute less than 50% of profits or not distribute profits in dividends.<sup>11</sup> Otherwise, the firms have to decree minimum 50% of profits (Article 155, CCC). Equation 2.1 summarizes the special majority system.

Stylized facts indicate that it is very frequent for the shareholders' assembly to reach the agreement established in the special majority system; 81.53% of the biggest private Colombian firms<sup>12</sup> between 2006 and 2014 did not distribute profits or distribute less than 50% of profits in dividends. Therefore, Colombia should not be classified as a mandatory dividend rule country as some studies state (La Porta et al., 2000; Saens & Tigero, 2021), because, on average, firms are not distributing the minimum 50% of profits. Finally, the dividends must be paid within the year following the date on which are decreed (Article 156, CCC).

---

<sup>9</sup>Information about the quantity and the nominal value of the shares (or participative quotas) issued when firms not listed at the stock market were founded and the private transactions of these shares carried out by the shareholders is not public. Also, stock market information would reduce the sample substantially as only 15 firms (37%) with stock market capitalization produce goods. In the same way, it is not possible to assess alternative ways in which firms remunerate their shareholders, like stock repurchases, which are widely implemented in developed countries (Grullon & Ikeneberry, 2000) because of data limitations.

<sup>10</sup>One exception to this rule applies to the firms created upon the "SAS" (Simplified joint-stock) legal form, which could stipulate in its bylaws another majority system to approve the profit distribution in dividends (Article 38, law 1258 of 2008).

<sup>11</sup>See Document 220-074017 from the Colombian Companies Superintendence and Sentence C-707/05 from the Colombian Constitutional Court.

<sup>12</sup>See section 2.4 for dataset description

$$Dividends = \begin{cases} \geq 50\% \text{ profits,} & \text{By default} \\ 0, & \text{minimum 78\% shares approval.} \\ < 50\% \text{ profits,} & \text{minimum 78\% shares approval.} \end{cases} \quad (2.1)$$

## 2.3 Theoretical framework

Although numerous dividend theories have been established across several decades of corporate finance research (Al-Najjar & Kilincarslan (2019) and El Attar & Jabbouri (2018) provide an extensive literature review of each theory), the trade impact on dividend policy has not been neither defined nor theoretically modeled. This section describes the theories that can be empirically evaluated with the dataset of this paper (those that do not mention capital gains),<sup>13</sup> <sup>14</sup> and then, it is discussed how exports could impact dividend policy according to each theory.

In the first place, agency cost theory establishes that firms pay dividends as a mechanism to mitigate the agency cost between managers (agent) and shareholders (principal) associated with free cash flow (FCF)<sup>15</sup> subject to manager discretion (Jensen, 1986; Easterbrook, 1984). Dividend payment would avoid manager overinvestment in projects with negative net present value or that do not represent the shareholders' interest. In addition, cash flow volatility could also generate agency cost: *"when cash flows are variable, it is difficult for investors to accurately attribute deviations in cash flows to the actions of corporate managers or to factors beyond management's control. Thus, the higher the expected variance in cash flows, the greater the potential agency cost, and the greater the reliance on dividend distributions"* (Bradley et al., 1998, p.556).<sup>16</sup> Therefore, higher FCF and higher cash flow volatility could create agency

<sup>13</sup>In the group of dividend theories that address capital gains topics, *catering* theory states that firms offer the dividend policy that investors want; firms initiate to pay dividends when investors put a higher stock price on firms that pay dividends (Baker & Wurgler, 2004). *Bird in the hand* theory follows the popular saying that one bird in the hand is better than two in the bush, which in this context means that investors prefer dividends than capital gains because dividends are less risky. Therefore, firms that pay more frequent and higher dividends would reduce investors' cash flow uncertainty and would increase firm's value. The usual criticism to this theory is that firm's risk is more determined by its investment projects than by the way it distributes profits.

*Tax preference theory* emphasizes that differential taxes between dividends and capital gains would spur investors to prefer firms with specific dividend policy due to fiscal benefits (Litzenberger & Ramaswamy, 1979). In the same way, *tax dividend clientele hypothesis* highlights that tax heterogeneity between dividends and capital gains would create dividend clienteles because of investors looking for the highest after-tax return on their portfolios. As in most of countries dividend tax rate is higher than capital gains tax rate (Allen et al., 2000), stocks with higher dividend yields would attract investors with lower marginal tax rate. There is evidence of the validity of this theory for US (Kawano, 2014) and Sweden (Dahlquist et al. 2014).

<sup>14</sup>A third dividend literature group could be defined related with the impact evaluation of changes in dividend taxes regulation on firms' outcomes. For example, Chetty & Saez (2005) found a positive response of dividend payment to 2003 tax dividend cut in US. Also, Jacob (2021) found that firms with limited internal funds increased wages and TFP due to dividend tax cut in Sweden. Although these studies are not directly related with the topic of this paper, they are relevant for future research on Colombian dividend policy given that different dividend tax reforms have been recently approved (law 1819 of 2016, law 1943 of 2018 and law 2277 of 2022).

<sup>15</sup>*"Free cash flow is cash flow in excess of that required to fund all projects that have positive net present value when discounted at the relevant cost of capital"* (Jensen, 1986, p.323).

<sup>16</sup>Cash flow volatility could be also classified as an independent dividend theory, in which its correlation with dividend payment is negative: *"Cash flow volatility theory suggest that more stable firms should be able to pay higher dividends. Shareholders prefer predictability in their dividends and cash flow stability means that firms will not need to cut dividends because of lower profits"* (Goldman & Viswanath, 2015, p.359)

cost between manager and shareholders that would incentive firms to pay dividends.

These transmission mechanisms could operate in higher proportion for firms with agency cost characteristics. For instance, Kulchania (2023) uses lower debt as an agency cost proxy variable based on the seminal Jensen (1986)'s paper, which suggests that debt could be a mechanism to alleviate agency cost as the capital market scrutiny could monitor efficiently that managers behave according to the shareholder's aim.

Some papers identify low managerial quality as another characteristic of firms with agency issues. Bhattacharyya (2007) develops a principal-agent theoretical model in which dividend policy is a component of a screening contract offered by the principal to the agent in the presence of hidden information (unknown agent productivity) and moral hazard (unknown agent effort). The equilibrium contract motivates low-quality managers to pay more dividends and invest less (conditioned on cash availability). It is predicted a negative relation between managerial quality and dividend payment.

Firms' opacity (information asymmetry between insiders and outsiders) could be an additional agency cost determinant. Morris & Roseman (2014) developed an agency cost multi-period theoretical model as a function of how opaque is the firm to its shareholders. The theoretical prediction - owners will remove free cash flow through dividends when opaqueness is high - is confirmed by an econometric estimation, which uses some variables related with the quantity of analyst that cover a firm and their forecasts accuracy as low opaque firm proxy variable for US from 1993 to 2010. In conclusion, lower debt, lower managerial quality, and higher firms' opacity could exacerbate the agency cost between managers and shareholders that would boost dividend payment.

The agency cost theoretical framework becomes more complex when the shareholders are differentiated (majority vs minority), since the *agent* could be the manager and/or majority shareholder(s) and the *principal* the minority shareholder(s). In a seminal paper, La Porta et al. (2000) raises two models to describe the dividend policy in this context: the "*outcome model*", in which dividends are an outcome of an effective system which allows the minority shareholder(s) to force firms to pay dividends, avoiding that managers' and/or majority shareholder(s) divert corporate assets or free cash flow to themselves, and the "*substitute model*", in which dividends are a substitute for shareholders' legal protection, and firms pay dividends to establish a reputation to expropriate moderately shareholders allowing them to raise funds in the capital market. *Ceteris paribus*, the outcome model would predict a positive relationship between dividend payout and minority shareholders rights, while the substitute model a negative one.

The Colombian studies about minority shareholders rights or other corporate governance items usually cover subsamples of firms listed in the stock market (Benavides & Mongrut, 2010; Gaitan, 2009; Lagos & Vecino, 2011; Pombo & Gutierrez, 2007; Ramirez & Usma, 2010), whereby it is not possible to extrapolate those findings to the firms of this paper (see section 2.4). However, the *Good Business Practices Report* from the Colombian Companies Superintendence (Superintendencia de Sociedades, 2020), which cover the biggest private Colombian firms,<sup>17</sup> provides valuable inputs: i) the number of shareholders is low: 70% of the biggest private firms have 5 or less shareholders, ii) the manager is appointed by the shareholder's assembly in 61% of the firms, and iii) only 58% of these firms have board of directors.

According to La Porta et al. (2000), the majority shareholder could become a controlling shareholder, who can determine the manager's decisions, in this potential highly concentrated context. Nevertheless, the special majority system generates a counterbalance regarding dividend payment (see section 2.2).

---

<sup>17</sup>Colombian Companies Superintendence did not share the micro-data information because of confidentiality reasons.

It would be necessary to carry out micro data studies about corporate governance for Colombian firms non-listed in the stock market to deepen this aspect.

In the second place, *signaling theory* states that under asymmetric information between managers and the market, managers use dividends to communicate private information about current and future firms' performance. Managers increase dividend payments if they expect positive and low volatile earnings (Farre et al., 2014) and avoid cutting or making volatile dividend payments since it could be interpreted by investors as a negative sign about firms' performance. Lintner (1956) developed the pioneering partial dividend adjustment model, which explains a dynamic in which firms smooth dividend payments across time converging to a target dividend payout ratio, rather than adjusting immediately to earnings, in order to signal firms' stability.

Which is the export role on firms' dividend policy? According to the agency cost theory, dividend policy could be modified if exports increase (decrease) FCF, ergo, exacerbate (calm) priorities differences between managers and shareholders, in consequence, firms pay (not pay) dividends to mitigate this agency cost. Assuming  $FCF = \text{cash flow from operating activities} - \text{capital expenditure} - \text{debt payment}$ ,<sup>18</sup> export net effect on FCF will depend if cash flow from operating activities increases in higher magnitude than capital expenditures and debt payment because of exports variation. Although academic literature has studied export effect on capital expenditures (Campa & Myles (2002) found that under liquidity constrains, Spanish exporters' capital investments are higher than non-exporters because of more stable cash flow associated with negative correlation of destination countries' business cycles), it would be necessary to consider export effect on the other FCF components to determine its aggregate impact.

Also, the empirical evidence about exports effect on cash flow volatility, another agency cost source, is non-conclusive; while some papers found that exporting has a negative effect on cash flow volatility (see Goldman & Viswanath (2015) for India and Campa & Myles (2002) for Spain), there is evidence in the opposite direction for sales volatility (see Vannoorenbergue (2012) for France and Riaño (2011) for Colombia). Appendix 2.10 indicates that export share is positive correlated with cash flow volatility and conditional cash flow volatility, supporting to some extent the second group of papers. One potential explanation for this pattern is provided by Riaño (2011), who calibrated a dynamic model with Colombian manufacturing firms finding that, an adjustment in total sales associated with foreign markets increases the exporting firms' volatility. Riaño (2011) also finds that despite firm risk aversion, the correlation between domestic and international demand shocks is not an important exporting determinant when idiosyncratic firm productivity is highly persistent.

In addition, exporting could make the managerial practices more structured (Görg & Hanley (2017) provides evidence for Germany), which could have opposing effects on dividend policy. On the one hand, improving managerial quality could reduce the agency cost and the dividend payment according to Bhattacharyya (2007). On other hand, better managers could work in firms with better corporate governance, which protect the minority shareholders rights in a higher proportion and/or implement corporate governance codes, which could rise dividend payment according to the 'outcome model'.<sup>19</sup>

<sup>18</sup>One limitation of the agency cost theory is that there is still no consensus about free cash flow (FCF) definition. Jensen (1986) initially described FCF as: "*Free cash flow is cash flow in excess of that required to fund all projects that have positive net present value when discounted at the relevant cost of capital*" (Jensen, 1986, p.323), but it was not directly measured. In a literature review paper about FCF definitions implemented in the academic literature, Bhandari & Adams (2017) recommend to use  $FCF = CFO$  (Cash flow from operating activities) - CAPEX (Capital expenditures) - Debt payment.

<sup>19</sup>Nonetheless, there is mixed evidence about the sign of the correlation between corporate governance and managerial

On the other hand, *signaling* theory would predict that temporal favorable export demand shocks (generated by, for example, exchange rates or international commodities prices fluctuation) should not increase dividend payment: “*managers perceive that the volatile (unstable) dividend payment streams reflect the volatility in earnings that are not good indicators about their firms’ financial performance to the market*” (Al-Najjar & Kilincarslan, 2019, p.207). Consequently, it could exist a ‘signaling cost’ of stop paying dividends when favorable temporal international market conditions reverse. On the contrary, it is more likely to rise dividend payment in a smoothed way across time (Lintner, 1956) when a structural change in firm’s exports occurs (for example, new product exported encouraged by R&D investment), since those earnings could present lower future volatility.

Finally, exports could also impact dividend policy according to the theories that address capital gains topics. Investors’ choice between firms that pay dividends or firms with higher capital gains could change because of trade exposure; it would be necessary to carry out studies to determine if exports impact is higher on stock returns<sup>20</sup> or dividend payment. However, neither dividend payment<sup>21</sup> nor capital gains<sup>22</sup> were taxed in Colombia during the analyzed period (2006-2014), which would make *tax preference* (Litzenberger & Ramaswamy, 1979) and *dividend clientele* (Kawano, 2014) irrelevant theories in Colombia, independently of firms’ income source (international or domestic market).

## 2.4 Descriptive statistics

The database is composed by the merge of two public Colombian datasets for the 2006-2014 period. The first one is customs data, which cover entire international transactions disaggregated at traded value - product (Colombian external tariff subheading 10 digit) – quantity (units and kilograms) – destination or origin country and firm level, reported by the DANE.<sup>23</sup> The second one is financial statements (balance sheet, income statement, and cash flow) of the biggest private Colombian firms (those whose total assets or operating income value exceeds 30,000 Colombian legal minimum wages), which are validated by tax auditors and reported to the Colombian Companies Superintendence.<sup>24</sup> Both databases are public and were download in February 2021. On annual average, big private exporting firms account 43% of total exporting firms (3,434 of 7,920 firms per year) and 61% of total export value (US\$28,322 million of US\$46,256 million per year).<sup>25</sup>

Initially, all big private Colombian firms (exporters and non-exporters) are included in the descriptive statistics in order to provide a Colombian dividend policy’s general framework. Figure 2.1a indicates that annual average percentage of firms that decreed dividends is significantly higher for exporting (32%)

---

quality (Acharya et al., 2018), ergo, further research about this aspect is needed and suggested.

<sup>20</sup>There is evidence for US that exchange rate movements could increase capital gains: “*stock performance of export-oriented companies tends to move against the dollar*” (Chakraborty et al., 2015, p.1059)

<sup>21</sup>There was not an additional tax to the profits distributed in dividends in Colombia from 1986 to 2016. See Avila-Mahecha (2019).

<sup>22</sup>Article 36-1 from the Colombian tax law indicated that profits from shares sales were exempted from income tax or profit tax. It was modified by article 376 of Law 1819 from 2016.

<sup>23</sup>National Colombian Statistics Agency (DANE, by its acronym in Spanish). Imported and exported value were deflated using Colombian Producer Price Index (2014 is the base year).

<sup>24</sup>The variables from this dataset were deflated using an industrial-specific annual Producer Price Index (PPI) reported by the Colombian Central Bank (2014 is the base year).

<sup>25</sup>See Merchán (2024) for comparative descriptive statistics between big private exporting firms relative to big private non-exporting firms and big private exporting firms relative to non-exporting firms.

than for non-exporting firms (24%), however, the tendency for both type of firms is similar: a flat slope with a rise in 2010.<sup>26</sup>

In terms of the amount decreed,<sup>27 28</sup> figure 2.1b illustrates that annual average percentage of decreed dividends relative to assets is very similar for exporting (7.5%) than for non-exporting firms (9.1%) - restricting the sample to firms that decreed dividends-. Also, the probability that exporting firms pay those decreed dividends according to times established in law (one year after decreeing them) (76%) is very similar for non-exporting firms (77%) (figure 2.1c). In general, figures 2.1a, 2.1b, 2.1c lead to conclude that exporting is positively correlated with ‘dividend extensive margin’ (probability that firms decree dividends) but neither with ‘dividend intensive margin’ (amount decreed) nor with the probability of paying those dividends according to times established in law.

As the baseline econometric analysis will be performed in three years differences given the 2SLS first stage results (see section 2.6), the next variables are calculated in three years differences. Figure 2.1d shows that exporting firms are more likely to be ‘continuers’ (decreed dividends in t and t-3) than non-exporting firms (20% and 13% annual average, respectively). On the contrary, the probability to initiate to decree dividends (decreed dividends in t but not in t-3) is very similar for exporting and non-exporting firms (14% and 13% annual average, respectively) (figure 2.1e). Also, the probability to stop decreeing dividends (did not decreed dividends in t but decreed them in t-3) is very similar for exporting and non-exporting firms (15% and 13% annual average, respectively) (figure 2.1f). Consequently, the rate of firms that continuously pay dividends is higher for exporting than for non-exporting firms,<sup>29</sup> but initiation and stopping rates is similar for both type of firms.<sup>30</sup>

Figure 2.2a shows that aggregate real exchange rate (instrumental variable) diminished (appreciated) between 2006 and 2014, indicating an aggregate Colombian competitiveness loss in the international market, which is highly correlated with oil price surge occurred during those years (Acero, 2017). Nevertheless, this trend did not occur with all principal exports’ destination countries; bilateral real exchange rates show an appreciation with US, Ecuador and Netherlands, but depreciation with China and Venezuela (see figure 2.2b). The opposite tendency with China and Venezuela arose because of the Colombian pesos depreciation with the yuan -contrary to the nominal revaluation trend with the other trading partners’ currencies (figure 2.2c)-, and the unprecedented high inflation rate in Venezuela.

Lastly, table 2.1 shows the simple average of the main variables included in the econometric analysis disaggregated by four firm types, according if firms exported and/or decreed dividends. Some interesting patterns emerge from the descriptive statistics. First, ranking firm types from the largest to the smallest

<sup>26</sup>The same countercyclical dividend payout pattern experienced during the recent COVID crisis in America (Dang et al., 2020) occurred post 2008 global financial crisis in Colombia, in which the percentage of firms that decreed dividends increased during low economic growth years.

<sup>27</sup>The amount decreed in dividends is not directly reported in the financial statements, but it was calculated as follows:  $Amount\_Decreed\_Div_t = Amount\_Paid\_Div_t + Non\_Paid\_Div_t - Non\_Paid\_Div_{t-1}$ , where  $Amount\_Paid\_Div_t$  is the amount paid in dividends in t and  $Non\_Paid\_Div_t$  is the amount of payable dividends in t (liabilities)

<sup>28</sup>It was identified and dynamically corrected some non-sense observations: i) a decrease in the amount of payable dividends (liabilities) between t and t-1 ( $Non\_Paid\_Div_t - Non\_Paid\_Div_{t-1} < 0$ ) with zero amount paid in dividends in t:  $Amount\_Paid\_Div_t = 0$ , and ii) decrease in the amount of payable dividends between t and t-1 larger in absolute value than the amount paid in dividends:  $|Non\_Paid\_Div_t - Non\_Paid\_Div_{t-1}| > Amount\_Paid\_Div_t$ . For those observations, it was dynamically replaced  $Non\_Paid\_Div_t$ , so that the next equation is satisfied:  $|Non\_Paid\_Div_t - Non\_Paid\_Div_{t-1}| = Amount\_Paid\_Div_t$

<sup>29</sup>On the contrary, the rate of firms that continuously did not pay dividends (they did not pay neither in t nor in t-3) is higher for non-exporting (61%) than for exporting firms (51%).

<sup>30</sup>The sum of the continuers rate plus initiation rate plus stopping rate plus non-continuers firms is 1 (100%).

in terms of total assets and TFP indicates that exporting firms that decreed dividends are the biggest, followed by exporting firms that did not decreed dividends, non-exporting firms that decreed dividends, and non-exporting firms that did not decreed dividends. This implies that firms' size and productivity are statistically correlated in higher proportion with the probability of exporting than with the probability of decreeing dividends.

Secondly, firms that decree dividends have statistically higher profit rate (operating profit/operating income), financial investment rate (financial investment/assets) and lower debt rate (debt/assets) than firms that did not decree dividends, independently if they exported or not. Basically, higher profits incentivize firms to decree dividends (as international evidence suggests), firms are more likely to decree dividends when have met their investment needs, and the negative correlation with debt rate could support the agency cost theory explained in the previous section. Third, exporting firms have lower free cash flow (FCF)<sup>31</sup> and lower overinvestment rate<sup>32</sup> than non-exporting firms (independently if they decreed dividends or not), suggesting that overinvesting less and reducing FCF could be two self-selection into exporting determinants.

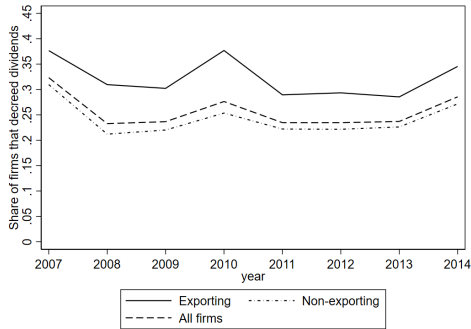
Finally, table 2.6, 2.7, and 2.8 show the descriptive statistics for the same variables in two-, three-, and four-year differences specification disaggregated by the same four firm types. Also, the next section describes the econometric methodology, which restricts the sample to the big private Colombian exporting firms because the instrumental variable can be calculated just for exporting firms.

---

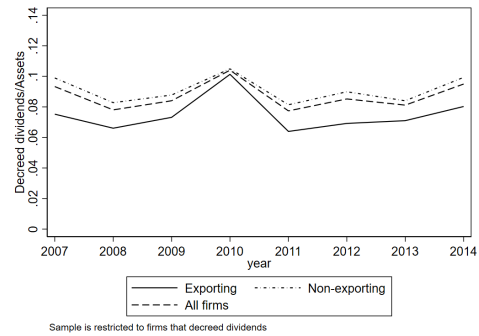
<sup>31</sup>Initially, free cash flow (FCF) was calculated with the recommended definition provided by Bhandari & Adams (2017):  $FCF = CFO$  (Cash flow from operating activities)  $- CAPEX - Debt$  payment. However, 43% of the observations reported negative values because CFO was negative (firms reported losses or the capital expenditures plus debt payment magnitude was higher than CFO). Consequently, it was used an alternative FCF definition to avoid high negative values percentage, which makes it difficult to compute differentiated calculations:  $FCF = OI$  (Operating Income)  $- CAPEX - Debt$  payment.

<sup>32</sup>Overinvestment calculation follows Richardson (2006) methodology (see appendix 2.11).

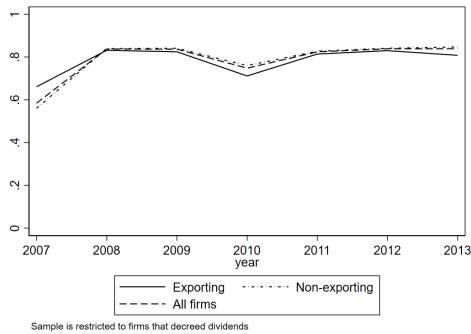
Figure 2.1: Colombian dividend policy: share of firms that decreed dividends, share of amount decreed, and decreeing dividends rates (continuation, initiation and stopping)



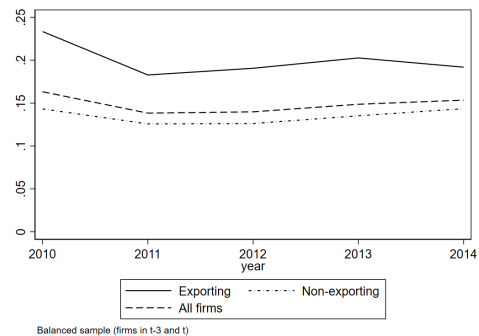
(a) Share of big private Colombian firms that decreed dividends, 2007 – 2014



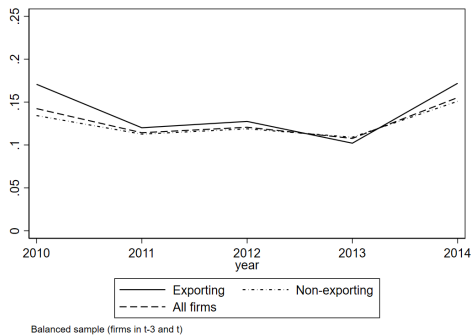
(b) Share decreed dividends relative to assets, 2007-2014



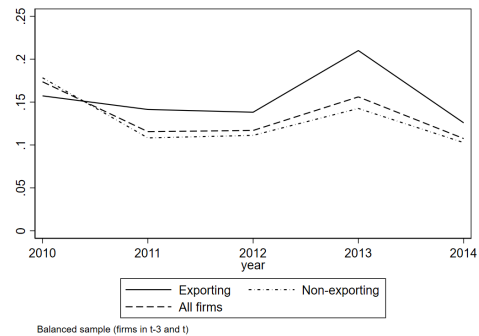
(c) Share of big private Colombian firms that decreed dividends and paid them according to times established in law\*, 2007 – 2013



(d) Share of continuers firms (decreed dividends in t and t-3), 2010-2014



(e) Share of firms that initiated to decree dividends (decreed dividends in t but not in t-3), 2010-2014



(f) Share of firms that stopped to decree dividends (decreed dividends in t-3 but not in t), 2010-2014

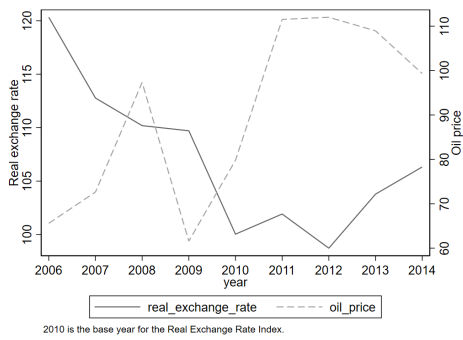
Source: Own calculations based on Colombian Companies Superintendence (biggest private Colombian firms' financial statements) and National Colombian Statistics Agency (customs data). \*Decreed dividends should be paid within the next year they are decreed (Article 156, Colombian Code of Commerce).

Table 2.1: Descriptive statistics – variables in levels (simple average by firm type)

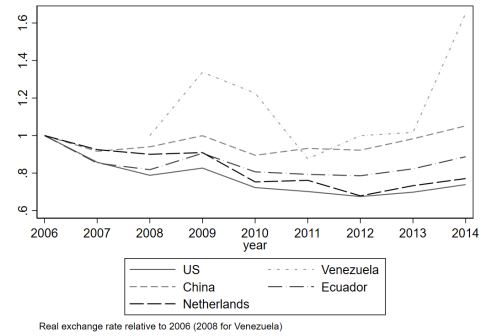
Variable	Firm type					Number of observations
	Non-exporting, non-decreed dividends	Non-exporting, decreed dividends	Exporting, non-decreed dividends	Exporting, decreed dividends	Pi-value coefficient (diff across groups) <sup>1</sup>	
Log real export value (COP)			19.783	19.929	0.000	21,301
Log firm specific real exchange rate <sup>2</sup>			5.513	5.456	0.977	21,301
Export value/operating income			0.200	0.128	0.000	21,301
HHI exports			0.713	0.665	0.000	21,301
International managerial quality <sup>3</sup>			0.000	0.001	0.850	15,732
Log real import value (COP)	19.706	20.078	20.916	21.668	0.000	47,016
Log firm specific real exchange rate (imports) <sup>4</sup>	5.685	5.847	6.044	6.344	0.000	47,016
Imported value/sales cost	0.315	0.291	0.307	0.324	0.000	47,016
Log real decreed dividends (COP)		19.089		20.196	0.000	27,866
Decreed dividends/equity		0.251		0.185	0.001	27,866
Decreed dividends/assets		0.091		0.075	0.000	27,866
Share of big private firms that decreed dividends in t and paid them in t		0.642		0.555	0.000	27,866
Share of big private firms that decreed dividends in t and paid them between t and t+1		0.146		0.230	0.000	23,329
Share of big private firms that decreed dividends in t and did not pay them between t and t+1		0.212		0.217	0.020	23,329
Log real total assets (COP)	21.889	22.312	23.010	23.559	0.000	112,224
ROA (Profit before taxes/assets)	0.052	0.110	0.044	0.103	0.000	112,224
Profit rate	0.041	0.082	0.045	0.090	0.000	110,788
Total investment/assets	0.021	0.029	0.016	0.028	0.000	112,224
Debt/assets	0.217	0.183	0.257	0.190	0.000	112,224
Cash flow/ assets	0.071	0.084	0.053	0.062	0.000	112,224
TFP <sup>5</sup>	1.815	1.856	1.879	1.924	0.000	112,224
Free Cash Flow <sup>6</sup> / Assets	1.643	1.668	1.246	1.271	0.000	112,224
Overinvestment <sup>7</sup> /assets	0.006	0.006	-0.001	-0.003	0.012	112,224

Note: Simple average by year. <sup>1</sup> A regression of each dependent variable on dummy variable(s) for each firm type group(s) plus state, year, and industry fixed effects was estimated. Then, it was jointly tested that the coefficient(s) of the dummy variable(s) was(were) different than 0 through a F-test. <sup>2</sup>  $\Delta \text{Log\_real\_export\_exchange\_rate}_{ft} = \ln[\sum_k (RER_{kt} * \text{share\_exp}_{fk,t=0}) + 1]$ , where  $RER_{kt}$  is the real exchange rate between Colombia and destination country  $k$ , and  $\text{share\_exp}_{fk,t=0}$  is the share of export value to destination country  $k$  in total exports of firm  $f$  in its first sample year. <sup>3</sup> International managerial quality variable is obtained from Merchán (2024). <sup>4</sup>  $\Delta \text{Log\_real\_import\_exchange\_rate}_{ft} = \ln[\sum_k (RER_{kt} * \text{share\_imp}_{fj,t=0}) + 1]$ , where  $RER_{jt}$  is the real exchange rate between Colombia and origin country  $j$ , and  $\text{share\_imp}_{jt}$  is the import value share from origin country  $j$  in total imports of firm  $f$  in its first sample year. <sup>5</sup> TFP calculation based on Levinsohn & Petrin (2003) methodology and *prodest* Stata command (Mollisi & Rovigatti, 2018) (table 2.9). <sup>6</sup> FCF (Free Cash Flow) = Operating Income - CAPEX (Capital expenditures) - Debt payment. <sup>7</sup> Overinvestment calculation follows Richardson (2006) methodology (see appendix 2.11).

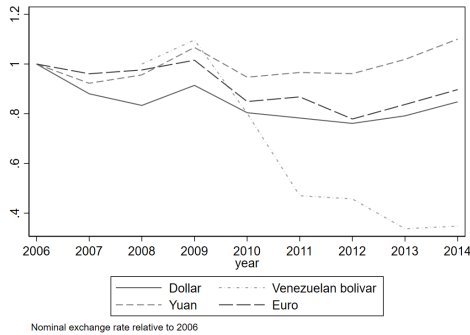
Figure 2.2: Real and nominal exchange rates, free cash flow, and decreasing dividends rate disaggregated by international managerial quality



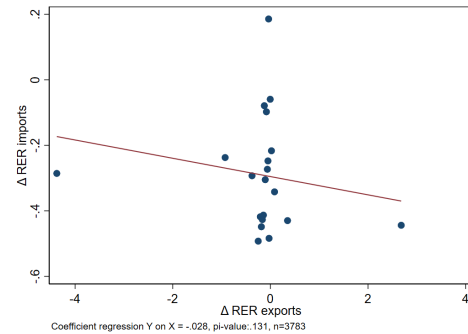
(a) Real exchange rate index and oil price



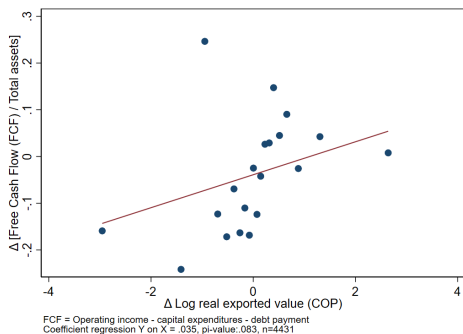
(b) Bilateral real exchange rate, 2006-2014, principal trading partners (2006=1)



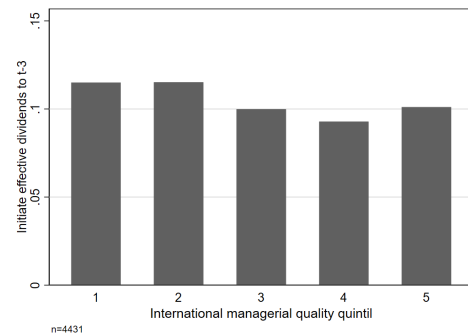
(c) Bilateral nominal exchange rate, 2006-2014, principal trading partners (2006=1)



(d) Binned scatter plot between firms specific real exchange rate from exports and imports (3 years differences)



(e) Binned scatter plot, export value and FCF (3 years differences)



(f) Share of firms that initiated to decree (effectively paid\*) dividends relative to t-3 by international managerial quality quintiles

Source: Own calculations based on i) Colombian Companies Superintendence (biggest private Colombian firms' financial statements), ii) National Colombian Statistics Agency (customs data), iii) IMF (prices and bilateral nominal exchanges rates), iv) Colombian Central Bank (methodology to calculate real exchange rate, Banco de la Republica (2021)), v) FRED - Federal Reserve Bank of St. Louis (oil price), and vi) international managerial quality obtained from Merchán (2024). \*Decreed dividends should be paid within the next year they are decreed (Article 156, Colombian Code of Commerce).

## 2.5 Methodology

The calculation of exports effect on dividend policy through OLS could produce biased estimators since firms' exports could be correlated with unobservable dividend policy determinants like: "*corporate strategy, anticipated competitive pressures, expected revenue growth, etc*" (Roberts & Whited, 2013, p.509). In fact, the omitted variable bias is particularly severe in the corporate finance literature: "*a number of factors relevant for corporate behavior are unobservable to econometricians.*" (Roberts & Whited, 2013, p.498) <sup>33</sup>. The OLS estimates' bias direction (upward or downward) would depend on the product of the correlation between export value and omitted variable with the sign of the omitted variable's impact on dividend policy. For instance, anticipated competitive pressures could be positive correlated with export value (firms could boost exports in order to face competition) and impact negatively dividend policy (competition could rise future uncertainty discouraging firms to pay dividends), which would produce a downward bias in the OLS export value's coefficient.

For this reason, a 2SLS methodology is implemented following Jiang et al. (2010)'s methodology, which studied how export demand shocks impacted Chinese exporters performance during the Asian financial crisis in 1997 using a shock index (firm specific real exchange rate variation) as instrumental variable.<sup>34</sup> They ran a 2SLS differentiated econometric specification including province-industry fixed effects and a vector of firms' pre-shock characteristics in order to control for initial differences. Also, they add a vector of the interaction of firms' pre-shock characteristics with the shock index in the first stage: "*because the impact of the exchange rate shocks on changes in firms' exports may vary across firms with differing initial characteristics*" (Jiang et al., 2010, p. 825).

Equation 2.2 shows the first stage estimation in which  $f$  denotes firm,  $i$  industry (ISIC 3 digit),  $s$  state, and  $t$  year. The dependent variable  $\Delta \text{Log\_exp}_{ft}$  is the change of log real export value measured in real Colombian Pesos (COP). The instrumental variable is  $\Delta \text{Log\_RER}_{ft} = \ln[\sum_k (\text{RER}_{kt} * \text{share\_exp}_{fk,t=0}) + 1]$ , where  $\text{RER}_{ft}$  is the real exchange rate between Colombia and destination country  $k$ , and  $\text{share\_exp}_{fk,t=0}$  is the export value share to destination country  $k$  in total exports of firm  $f$  in its first sample year.  $\text{RER}_{kt}$  is calculated following Banco de la Republica (2021) - Colombian Central Bank methodological guide to calculate real exchange rate-, in which  $\text{RER}_{kt} = (S/S^*) * (P^*/P)$ , where  $P^*$  is the external price level,  $P$  is the Colombian price level,  $S$  is the nominal exchange rate between Colombia and US, and  $S^*$  is the nominal exchange rate between country  $k$  and US.<sup>35</sup> One is added (+1) to the firm specific real exchange in order to include zeros for the observations in which firms exported to destination countries where they did not export the initial year ( $t=0$ ).  $\text{RER}_{kt}$  growth implies real exchange depreciation, indicating that Colombian goods become relatively cheaper in the international market.

Theoretically, relevance condition is fulfilled because firms that export to countries where a real exchange rate depreciation with Colombia occurred are more likely to increase their exports than similar exporting firms that export to other countries, since their products become internationally cheaper encouraging external demand. For instance, two similar exporting firms in observable characteristics faced different exogenous export demand shocks if one firm exported to US (exogenous fall in external de-

<sup>33</sup>Roberts & Whited (2013) provides a deep analysis of endogeneity issue in empirical corporate finance literature.

<sup>34</sup>In a similar approach, Bastos et al. (2018) calculated real exchange rate changes interacted with exports destination country dummies at the initial year to study the effect of exports destination on input prices.

<sup>35</sup>Consumer prices index and nominal exchanges rates were obtained from International Monetary Fund, International Financial Statistics.

mand) and the other firm exported to China (exogenous rise in external demand) (see figure 2.2b)<sup>36</sup>. As expected, first stage statistics confirm that firm specific real exchange rate impacts positively and significantly the export value (see section 2.6).

In addition, two elements allow to infer that exclusion restriction is plausibly satisfied. First, real exchange rate variation occurred between 2006 and 2014 was unpredictable and highly correlated with international oil price increase (Acero, 2017), reducing the probability that unobservable dividend policy determinants variables are correlated with the instrumental variable. Also, Venezuela inflation rate and Colombian pesos devaluation with the yuan provide other exogenous real exchange rate variation sources. Second, export shares of firm specific real exchange rates are fixed at initial year, guaranteeing that the instrumental variable variation is not generated by endogenous manager decisions.

$X$  includes a set of firm-level dividend policy determinants: log total assets, profit rate (operating profit/operating income), debt (financial debt/assets), financial investments/assets, cash flow (cash flow/assets) and TFP.<sup>37</sup> These variables were selected based on the most common explanatory variables included in five empirical published papers about dividend policy (Chay & Suh, 2009; DeAngelo et al., 2006; Gugler & Yurtoglu, 2003; Kulchania, 2023; Michaely & Moin, 2022).<sup>38</sup> As the focus of this paper is international trade,  $X$  also covers export value/operating income ratio, import value/sales cost ratio and the international managerial quality calculated in Merchán (2024).<sup>39</sup>

For ease of coefficients interpretation,  $X$  are normalized per year to have mean 0 and standard deviation 1.  $\delta_i$  are industry fixed effects,  $\delta_s$  state fixed effects, and  $\delta_t$  year fixed effects. Robust standard errors are clustered at firm level.  $\Delta_l$  describes the differences operator between  $t$  and  $t-1$ . Finally, equation 2.3 shows the second stage regression:

$$\Delta_l \ln(Exp)_{fist} = \beta_0 + \beta_1 \Delta_l \ln(RER)_{fist} + \Phi \Delta_l \ln(RER)_{fist} * X_{fist-l} + \Gamma X_{fist-l} + \delta_i + \delta_s + \delta_t + \Delta_l \epsilon_{fist} \quad (2.2)$$

$$\Delta_l Y_{fist} = \beta_0 + \beta_1 \Delta_l \ln(\hat{Exp})_{fist} + \Gamma X_{fist-l} + \delta_i + \delta_s + \delta_t + \Delta_l v_{fist} \quad (2.3)$$

where the main dependent variable  $\Delta_l Y_{fist}$  is a dummy indicating if firms initiated to decree effectively paid dividends (the firm decreed dividends in  $t$  – effectively paid according to times established in law – but not in  $t-1$ ). Equation 2.3 is estimated through a simple linear probability model because, to the best of the author’s knowledge, none methodology fixes simultaneously: i) the ‘incidental parameter problem’ of fixed effects in non-linear models (Greene, 2002; Stammann, 2021) generated by the fixed effects included in equation 2.3, ii) the disadvantages of each binary choice models with endogenous variables (Dong et

<sup>36</sup>Nevertheless, both firms are likely to absorb nominal exchange variation because most of the Colombian firms are not financially covered by currency risk; the percentage of the 5000 biggest Colombian firms that contracted exports exchange rate forwards increased from 3% in 2006 to 6.5% in 2014 (Alfonso, 2018).

<sup>37</sup>TFP calculation based on Levinsohn & Petrin (2003) methodology and prodest Stata command (Mollisi & Rovigatti, 2018). See appendix table 2.9

<sup>38</sup>Firm size (total assets or total assets growth) is included as explanatory variable in 4 of them, profitability in 3, Tobin’s  $q$  in 3, debt in 2 and liquidity (cash flow over assets) in 1. As there is no public information of firms’ market value to calculate Tobin’s  $q$ , financial investment ratio relative to assets variable is added. TFP is also included due to a recent paper by Kulchania (2023), who fills the gap to study TFP impact on dividend policy, finding that firms with higher productivity are more likely to initiate, maintain, and increase dividend payouts.

<sup>39</sup>International managerial quality is calculated as “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) and detailed export quantity residuals for homogeneous goods” (Merchán, 2024, p.3201)

al., 2012) due to export value endogeneity, and iii) the interpretation of interactions terms in non-linear models (Drichoutis, 2011) in the heterogeneous effect specifications explained later.

$Y_{fist}$  also covers variables that allow to verify the potential transmission mechanisms from exports on dividend policy described by the agency cost theory (see section 2.3). In the first place,  $Y_{fist}$  includes free cash flow (FCF) relative to assets. Ideally, this transmission mechanism should be proved modeling exports effect on FCF and then, in a second step, the FCF effect on dividends ( $EXP \rightarrow \hat{FCF} \rightarrow DIV$ ). Nevertheless, this methodological approach would not allow to correct export value endogeneity. In the second place,  $Y_{fist}$  covers overinvestment rate relative to assets (see appendix 2.11 for its calculation details) in order to verify if dividend payment avoid overinvestment. Finally, appendix 2.10 analyzes export value impact on cash flow volatility with different methodological approaches.

One potential issue of this econometric analysis is that real exchange rate effect on dividend policy via exports could be reversed via imports (Jiang et al., 2010), which is more likely to occur in particular firms like the ones with parent companies abroad.<sup>40</sup> Nonetheless, stylized facts indicate that, on average, big private Colombian exporting firms tend to export to different countries where they import from (coefficient of firm specific real exchange rate from imports<sup>41</sup> on firm specific real exchange rate from exports is just -2.8% and non-statistically significant, see figure 2.2d), and equation 2.2 and 2.3 already includes import value/sales cost ratio as explanatory variable in order to control for this potential “reverse” effect. As another robustness check, equation 2.4 adds import value as endogenous variable to the baseline specification and firm specific real exchange rate from imports as an additional instrumental variable:<sup>42</sup>

$$\Delta_l Y_{fist} = \beta_0 + \beta_1 \Delta_l \ln(Exp)_{fist} + \beta_2 \Delta_l \ln(Imp)_{fist} + \Gamma X_{fist-l} + \delta_i + \delta_s + \delta_t + \Delta_l \epsilon_{fist} \quad (2.4)$$

In addition, heterogeneous export effects on dividend policy disaggregated by international managerial quality quintiles are calculated as shown in equation 2.5 in order to: test the Bhattacharyya (2007) theoretical predictions and the different agency cost sub- hypothesis: ‘outcome’ and ‘substitute’ models (see section 2.3):

$$\Delta_l Y_{fist} = \beta_0 + \beta_1 \Delta_l \ln(Exp)_{fist} + \sum_{q=2}^5 \beta_q * \{D(1 = if\ q = Q_{fist-l}) * \Delta_l \ln(Exp)_{fist}\} + \Gamma X_{fist-l} + \delta_i + \delta_s + \delta_t + \Delta_l \epsilon_{fist} \quad (2.5)$$

where X are the set of explanatory variables defined previously for equation 2.2 and 2.3, and  $D(1 = if\ q = Q_{fist-l})$  is a dummy variable which takes the value of 1 if firms’ international managerial quality (IMQ) belongs to quintile  $q$  in year  $t-l$ . Export shock effect on dividend policy for the first international managerial quality quintile firms is measured by  $\hat{\beta}_1$ , and the effect on the second, third, fourth and fifth

<sup>40</sup>For example, Chinese firms may import intermediate inputs from parent companies overseas, assemble these inputs into finished products, and then send them back to their parent companies in the same locations. For such firms, exchange rate appreciation in a firm’s overseas export locations also makes intermediate inputs more expensive. The firm’s exports should rise, while the prices of intermediate inputs (in Chinese yuan) should also rise.” (Jiang et al. 2010, p.837)

<sup>41</sup> $\Delta \text{Log\_real\_import\_exchange\_rate}_{ft} = \ln[(\sum_k RER_{kt} * share\_imp_{fj,t=0}) + 1]$ , where  $RER_{jt}$  is the real exchange rate between Colombia and origin country  $j$ , and  $share\_imp_{jt}$  is the share of import value from origin country  $j$  in total imports of firm  $f$  in its first sample year

<sup>42</sup>The estimation sample is smaller given that it is not possible to calculate real exchange rate from imports for the big private exporting firms that did not import.

quintile is given by  $\hat{\beta}_1 + \hat{\beta}_2$ ,  $\hat{\beta}_1 + \hat{\beta}_3$ ,  $\hat{\beta}_1 + \hat{\beta}_4$ , and  $\hat{\beta}_1 + \hat{\beta}_5$ , respectively. It was added four new instruments:  $\{D(1 = if\ q = Q_{fist-l}) * \Delta_l \ln(RER)_{fist} \mid q \in [2, 5]\}$  in order to improve the first stage estimation accuracy of the four new endogenous variables:  $\{D(1 = if\ q = Q_{fist-l}) * \Delta_l \ln(Exp)_{fist} \mid q \in [2, 5]\}$ .

As a way to test the outcome and the substitute model, it was estimated an additional heterogeneous effect specification including a dummy variable  $SAS_{fis}$ , which indicates if firm  $f$  is currently legally registered as SAS (Simplified joint stock). As the dividend payment rules for SAS firms could protect the minority shareholders in lower proportion (the special majority system to distribute less than 50% of profits in dividends or not distribute dividends is not mandatory, see section 2.2), a null export value effect on dividend policy for SAS firms (and positive for non-SAS firms) could provide evidence in favor of the ‘outcome model’. The methodological limitation is that available data contains only the current firms’ legal status, ergo, SAS dummy is time invariant. As a way to deal with this imprecision, the estimation sample will be balanced (firms that exported all years from 2006 to 2014) in order to include comparable firms which were created under another legal form and had the possibility to transform to SAS from 2008.<sup>43</sup>

$$\Delta_l Y_{fist} = \beta_0 + \beta_1 \Delta_l \ln(Exp)_{fist} + \beta_2 SAS_{fis} * \Delta_l \ln(Exp)_{fist} + \beta_3 SAS_{fis} + \Gamma X_{fist-l} + \delta_i + \delta_s + \delta_t + \Delta_l \epsilon_{fist} \quad (2.6)$$

in which  $\hat{\beta}_1$  is the export effect on dividend policy for firms which were legally constituted as another legal form and did not transform to SAS, and  $\hat{\beta}_1 + \hat{\beta}_2$  would indicate the export effect on dividend policy for firms that were legally constituted as another legal form and transformed to SAS at some point in time. It is added a new endogenous variable  $SAS_{fis} * \Delta_l \ln(Exp)_{fist}$  and a new instrumental variable  $SAS_{fist} * \Delta_l \ln(RER)_{fist}$  to the 2SLS estimation.

In terms of the export effect on amount decreed in dividends, it is implemented the methodological procedure 19.2 described in Wooldridge (2010) -which is a combination of Heckman (1979) two-step procedure and 2SLS-, in order to verify the potential selectivity bias of the big private exporting firms that initiated to decree effectively paid dividends. This problem would generate incorrect standard errors in the IV coefficients that should be corrected through bootstrapping. Equation 2.7 shows the selection equation (probit) from which the inverse mill ratio (probability density function/ standard normal cumulative distribution) is calculated and, then, it is included as one explanatory variable in the 2SLS estimation restricting the sample to those firm-year observations in which firms initiated to decree effectively paid dividends (equation 2.8):

$$Initiate\_Eff\_Div_{fist}(1 = Yes, 0 = No) = \vartheta(\Delta_l H_{fist}, X_{fist-l}) \quad (2.7)$$

$$\Delta_l P_{fist} = \beta_0 + \beta_1 \Delta_l \ln(Exp)_{fist} + \beta_2 IMR_{fist} + \Gamma X_{fist-l} + \delta_f + \delta_s + \delta_t + \Delta_l \epsilon_{fist} \quad (2.8)$$

where  $P$  is the amount decreed in dividends relative to assets,  $X$  the set of explanatory variables defined before, and  $H$  includes the instrumental variable  $\Delta_l \ln(RER)_{fist}$  and minimum one variable that should explain selection (why firms initiated to decree effectively paid dividends) but not the outcome (amount decreed in dividends relative to assets).<sup>44</sup> These variables contribute to get precise estimates and avoid issues specifications (Sartori, 2003). Two recent dividend policy papers used the next selection variables

<sup>43</sup>It was a widely implemented practice: around 54% of the firms transformed to SAS legal form at some point in time.

<sup>44</sup>Year fixed effects are included. Industry and state fixed effects are excluded because some fixed effects have very low number of observations (2 and 4, respectively) which could exacerbate the incidental parameter problem. See table 2.15.

to identify dividend payers firms: i) a dummy if the return on assets was above the first sample quartile in the previous period (Driver et al., 2020)<sup>45</sup>, and ii) industry dividend payers percentage (Bazil et al., 2022)<sup>46</sup>. As the main dependent variable of this paper is defined in relation to a previous period, the selection equation is calculated with the two selection variables mentioned before but differentiated in a similar way: i) a dummy variable if the return on assets was above the first sample quartile in t but not in t-1  $\Delta_l \text{QuartileROA}_{fist} > 1$ , and ii) change in the industry dividend payers percentage between t and t-1 ( $\Delta_l \text{percentage\_industry\_dividend\_payers}_{fist}$ ).  $\hat{\beta}_2$  statistical significance in equation 2.8 would determine if sample selection exists and if it is necessary to correct standard errors in the IV estimation.

## 2.6 Results

Table 2.2 shows the first stage results (equation 2.2) estimated in two (l=2), three (l=3) and four (l=4) years differences. Firm specific real exchange rate has a positive and statistically significant effect on export value in all specifications, indicating that real exchange rate devaluation (products exported by the firm become relatively cheaper in the international market) boosts export value, as suggested by the economic theory.

There is a trade-off between instruments' coherency and strength as to whether the correct specification should include  $\Delta_l \ln(RER)_{fist} * X_{fist-l}$  or not. On the one hand, no rejection of Hansen's J tests of over identifying restrictions in column 2 (l=2), column 4 (l=3) and column 6 (l=4) suggest that interactions  $\Delta_l \ln(RER)_{fist} * X_{fist-l}$  are coherent instruments that identify the same parameters (Parente & Santos, 2011). On the other hand, first stage is stronger without those interactions, according to larger F test and effective F statistics. Consequently, second stage results are calculated with both first stage econometric specifications as robustness check.

In terms of the instrument's strength, all specifications except column 6 (l=4) present F test joint significance larger than the 'rule of thumb' of 10 and effective F statistics -which are robust to heteroscedasticity, autocorrelation, and clustering (Montiel & Pflueger, 2013) - larger than 20% weak instrument threshold ( $\tau$ ). Therefore, the instrumental variable is stronger in the two- and three-years differences specification. Three years differences is preferred as the baseline since strength F tests in the specification without interactions  $\Delta_l \ln(RER)_{fist} * X_{fist-l}$  (column 3) and Hansen's J test pi-value in the specification with interactions (column 4) are larger than the same tests in the two-year differences specifications (column 1 and 2, respectively), indicating stronger and more coherent instruments.

Table 2.3 illustrates the second stage results (equation 2.3) in the baseline specification (l=3). The findings seem to validate the agency cost theory; firms initiated to decree effectively paid dividends in response to exogenous exports shocks (column 1 and 2), which could be a way to mitigate the agency cost generated by FCF because of exports variation (column 3 and 4) (figure 2.2e). As appendix 2.10 shows that export share is positively correlated with cash flow volatility and conditional cash flow volatility<sup>47</sup>, the econometric results suggest that export value impacts dividend policy through the two agency cost

<sup>45</sup>"Commencing dividends entails an assumption that they will be continued... initiation of dividends thus depends on some threshold criterion being exceeded... This [variable in the selection equation] is justified by the anticipated damage from having to cease dividend payments in the future, so that a threshold effect is expected." (Driver et al., 2020, p.568)

<sup>46</sup>"Proportion of dividend payers in an industry tends to have positive impact on the decision to pay dividends" (Bazil et al., 2022, p. 304).

<sup>47</sup>Probably, it is required a longer sample to prove a causal effect from exports on cash flow volatility.

transmission mechanisms explained in the theoretical section: FCF and cash flow volatility. Interestingly, dividend payment could be insufficient to avoid over investment (export value coefficient is not significant in column 6 but it is significant in column 5).

These findings are robust when it is assumed that import value is endogenous, confirming that real exchange rate variation effect on dividend policy via exports is not reversed via imports (table 2.10) (equation 2.4). Additionally, the positive export shocks effect on the probability to initiate to decree effectively paid dividends is not robust in the two-year differences specification (table 2.11) but in the four-year differences (table 2.12), suggesting that minimum three years must pass for the international market conditions fluctuation becomes relevant into the shareholders' assembly decision about dividend policy.

Table 2.4 indicates that positive impact of exports on the probability to initiate to decree effectively paid dividends is driven by the highest international managerial quality quintiles firms<sup>48</sup> (equation 2.5).<sup>49</sup> Also, the positive exports impact on the probability to initiate to decree effectively paid dividends is driven by firms which did not change their legal form to SAS (equation 2.6), which are more likely to protect the minority shareholders because of the mandatory special majority system (see section 2.2). These results support the 'outcome' model and suggest that firms with better international managerial quality have better minority shareholders rights and corporate governance.<sup>50</sup>

In general, econometric results support that big private Colombian exporting firms started to decree effectively paid dividends as a mechanism to mitigate the agency cost generated by exogenous export shocks in an effective system that protect minority shareholders (outcome model). This pattern follows Floyd et al. (2015)'s findings for US, in which agency cost of free cash flow explains the industrial dividend payouts.<sup>51</sup> On the contrary, the findings contradict signaling theory because firms adapt their dividend policy to temporary profit variation caused by international market conditions fluctuation.

A back-of-the-envelope calculation presents two limitations. First, 2SLS's coefficients are consistent but not unbiased, and secondly, econometric specification was calculated with linear probability model because of the reasons mentioned before. Since these limitations cannot be resolved, 0.0357 coefficient (column 2 in table 2.3) implies that 1 standard deviation change in log real export value (1.15) accounts for around 26%<sup>52</sup> of the firms which started to decree effectively paid dividends (10.3% from the estimation sample). As a point of reference, the same calculation with OLS coefficient (0.0136) would indicate that 1 standard deviation change in log real export value (1.15) accounts for around 10% of firms which started to decree effectively paid dividends.

Finally, table 2.13 shows the selection equation's results described in equation 2.7. As expected, the instrumental variable (firms specific real exchange rate:  $\Delta_l \text{Log\_RER}_{ft}$ ) and the selection variables ( $\Delta_l \text{Quartile\_ROA} > 1_{fist}$ ,  $\Delta_l \text{perc\_indpayers}_{fist}$ ) coefficients are positive and statistically significant on the probability that firms initiated to decree effectively paid dividends. Then, null statistical significance of the inverse mills' ratio coefficient in the IV estimation (table 2.5) (equation 2.8) indicates that there is no selection bias according to the selection equation described before (equation 2.7); exporting

<sup>48</sup>On average, highest managerial quintile firms do not start to decree effectively paid dividends in a larger proportion (figure 2.2f), they are just more prone to do it facing exogeneous export shocks.

<sup>49</sup>In contradiction to Bhattacharyya (2007), whose theoretical model do not differentiate majority and minority shareholders.

<sup>50</sup>Detailed micro data is necessary to state conclusively.

<sup>51</sup>They found that agency cost theory explains industrial payouts but signaling theory the financial sector payouts.

<sup>52</sup> $0.26 = 0.0357 * \ln(1+1.15) / 0.103$

firms that initiated to decree effectively paid dividends could be a random sample from the big private exporting firms. Also, null statistically significance of export value coefficient indicates that export value does not impact the amount decreed in dividends. These results show that exogenous exports shocks increase the frequency in which firms initiated to decree effectively paid dividends, but not the amount that firms usually decree. Furthermore, the econometric results are aligned with the patterns described in the descriptive statistics: exporting impact ‘dividend extensive margin’ (probability to initiate to decree effectively paid dividends) but not ‘dividend intensive margin’ (amount decreed).

Table 2.2: First stage – firm specific real exchange rate effect on export value

Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)
Difference (l)	$\Delta$ Log real export value COP					
	Second difference		Third difference		Fourth difference	
$\Delta$ Log firm-specific real exchange rate (share destination country t=0)	0.222*** (0.0266)	0.203*** (0.0251)	0.226*** (0.0263)	0.237*** (0.0308)	0.231*** (0.0309)	0.255*** (0.0429)
Observations	5,545	5,545	4,431	4,431	3,322	3,322
$X_{t-l} * \Delta RER$	No	Yes	No	Yes	No	Yes
$X_{t-l}$	Yes	Yes	Yes	Yes	Yes	Yes
Effective F statistic	69.81	12.29	74.33	10.59	55.74	7.12
Critical value $\tau = 5\%$	37.42	25.67	37.42	26.46	37.42	26.50
Critical value $\tau = 10\%$	23.11	14.72	23.11	15.25	23.11	15.38
Critical value $\tau = 20\%$	15.06	8.90	15.06	9.27	15.06	9.41
F-joint significance of the instrument(s)	69.81	11.04	74.33	10.35	55.74	7.26
Under identification test p-value	0.00	0.00	0.00	0.00	0.00	0.00
Pi-value Hansen J-statistic		0.12		0.19		0.76

Notes: Effective F statistic reports Montiel & Pflueger (2013) weak instrument test, which is robust to heteroscedasticity, autocorrelation, and clustering, with its critical values. Hansen J statistic tests under the null hypothesis that the instruments are coherent (Parente & Santos, 2011) in an overidentified model ( $\#$  instruments  $>$   $\#$  endogenous variables). The null hypothesis of the under-identification test is that the model is not identified (the matrix is not full column rank). X controls variables are: log total assets, profit rate, debt/assets, financial investments/assets, cash flow/assets, TFP (calculation based on Levinsohn and Petrin (2003) methodology and *prodest* Stata command (Mollisi and Rovigatti, 2018) -see appendix table 2.9-), export value/operating income, international managerial quality (Merchán, 2024), and import value/sales cost. X variables are normalized to have mean 0 and standard deviation 1 (per year).

Table 2.3: Export effect on firms' dividend policy

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	<i>Initiate effective dividends</i> (the firm decreed dividends in t - effectively paid <sup>1</sup> - and did not decree them in t-3)		$\Delta_3$ [Free Cash flow <sup>2</sup> / assets]		$\Delta_3$ [Over-investment <sup>3</sup> / assets]	
Method	IV	IV	IV	IV	IV	IV
$\Delta_3$ Log real export value COP	0.0465*** (0.0167)	0.0357** (0.0144)	0.120* (0.0717)	0.119* (0.0619)	0.00928** (0.00471)	0.00692 (0.00421)
Observations	4,431	4,431	4,431	4,431	4,431	4,431
Fixed effects			State, year, industry			
$X_{t-3}$	Yes	Yes	Yes	Yes	Yes	Yes
First stage	Column 3, table 2.2	Column 4, table 2.2	Column 3, table 2.2	Column 4, table 2.2	Column 3, table 2.2	Column 4, table 2.2
Method	OLS		OLS		OLS	
$\Delta_3$ Log real export value COP	0.0136*** (0.00397)		0.0455** (0.0216)		0.000744 (0.00132)	
Observations	4,431		4,431		4,431	
Fixed effects			State, year, industry			
$X_{t-3}$	Yes	Yes	Yes	Yes	Yes	Yes

*Notes:* Robust standard errors clustered at firm level. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Balanced sample comprises big private Colombian exporting firms that exported all years from 2006 to 2014. X controls variables are: log total assets, profit rate, debt/assets, financial investments/assets, cash flow/assets, TFP (calculation based on Levinsohn and Petrin (2003) methodology and prodest Stata command (Mollisi and Rovigatti, 2018) -see appendix table 2.9-), export value/operating income, international managerial quality (Merchán, 2024), and import value/sales cost. X are normalized to have mean 0 and standard deviation 1.

<sup>1</sup> Effectively paid according to times established in law: one year after decreeing them (Article 156 – Colombian Code of Commerce).

<sup>2</sup> FCF = Operating Income – Capital expenditures (CAPEX) – Debt payment.

<sup>3</sup> Overinvestment calculation follows Richardson (2006) methodology, see appendix 2.11.

Table 2.4: Heterogeneous export effect on firms' dividend policy – IV estimation

		(1)	(2)	(3)
	Coefficient	<i>Initiate effective dividends</i> (the firm decreed dividends in t -effectively paid <sup>1</sup> - and did not decree them in t-3)	$\Delta_3$ [Free Cash flow <sup>2</sup> / assets]	$\Delta_3$ [Over investment <sup>3</sup> / assets]
Heterogeneous effect by international managerial quality quintiles - equation 2.5				
Q1	b1=	0.0160	0.118**	0.00485
	Pi-value b1=0	0.5301	0.0122	0.5451
Q2	b1+b2=	0.0452	0.0486	0.0047
	Pi-value b1+b2=0	0.3418	0.5723	0.7356
Q3	b1+b3=	0.0625**	-0.0646	0.0166
	Pi-value b1+b3=0	0.0314	0.2859	0.1226
Q4	b1+b4=	0.0126	0.0739	-0.0039
	Pi-value b1+b4=0	0.6061	0.4014	0.8002
Q5	b1+b5=	0.0570*	0.3371	0.0089
	Pi-value b1+b5=0	0.0892	0.1584	0.1826
Heterogeneous effect by legal firm type - equation 2.6				
No SAS	b1=	0.0348**	0.1129**	0.0071
	Pi-value b1=0	0.0433	0.0384	0.2708
SAS	b1+b2=	0.0367	0.1513	0.0063
	Pi-value b1+b2=0	0.1372	0.1711	0.2781

Notes: Robust standard errors clustered at firm level. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Balanced sample comprises all big private Colombian firms that exported all years from 2006 to 2014. SAS: Simplified joint-stock company.

<sup>1</sup> Effectively paid relative to times established in law: one year after decreeing them (Article 156 – Colombian Code of Commerce).

<sup>2</sup> FCF = Operating Income – Capital expenditures (CAPEX) – Debt payment.

<sup>3</sup> Overinvestment calculation follows Richardson (2006) methodology, see appendix 2.11. Equation 2.5 and 2.6 describe the IV econometric specification.

Table 2.5: Export effect on firms' dividend policy (amount decreed) – heckman and 2SLS estimation

	(1)	(2)	(3)	(4)
Dependent variable	$\Delta_3$ [Decreed dividends/Assets]			
Method	IV	IV	IV	IV
$\Delta_3$ Log real export value COP	0.00534 (0.0131)	0.00872 (0.0109)	0.00340 (0.0131)	0.00806 (0.0108)
Inverse Mills Ratio			-0.00943 (0.0277)	-0.00433 (0.0274)
Censored observations	449	449	449	449
$X_{t-3}$	Yes	Yes	Yes	Yes
Fixed effects			State, year, industry	
		First stage		
Pi-value Hansen J statistic	.	0.39	.	0.39
Under identification test pi-value	0.00	0.01	0.00	0.00
F joint significance of the instrument(s)	23.05	11.42	28.42	11.59
Effective F statistic (first stage)	23.05	5.52	28.42	4.91
Critical value $\tau = 20\%$	15.06	10.16	15.06	10.00
Critical value $\tau = 10\%$	23.11	16.58	23.11	16.36
$X_{t-3} * \Delta_3 RER$	No	Yes	No	Yes
$X_{t-3}$	Yes	Yes	Yes	Yes
First stage	Column 1 - Table 2.14	Column 2 - Table 2.14	Column 3 - Table 2.14	Column 4 - Table 2.14
Method		OLS		OLS
$\Delta_3$ Log real export value COP		-0.00855** (0.00426)		-0.00901** (0.00416)
Inverse Mills Ratio				-0.0230 (0.0281)
Censored observations		449		449
$X_{t-3}$		Yes		Yes
Fixed effects			State, year, industry	

Notes: Robust standard errors clustered at firm level. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . The estimation follows procedure 19.2 described in Wooldridge (2010): Heckman (1979) two-step procedure with 2SLS. Balanced sample comprises all big private Colombian firms that exported from 2006 to 2014 and initiated to decree effectively paid dividends. Inverse Mills Ratio is calculated based on selection equation (table 2.13). X controls variables are: log total assets, profit rate, debt/assets, financial investments/assets, cash flow/assets, TFP (calculation based on Levinsohn and Petrin (2003) methodology and prodest Stata command (Mollisi and Rovigatti, 2018) - see appendix table 2.9-), export value/operating income, international managerial quality variable (Merchán, 2024), and import value/sales cost. X are normalized to have mean 0 and standard deviation 1.

## 2.7 Conclusion

The international trade role on dividend policy is surprisingly insufficient explored in the academic literature. This paper argues that exports could be one of the missing pieces to put together the “*dividend puzzle*”. Exogenous export demand shocks arose between from 2006 and 2014 in Colombia provide a proper natural experiment to evaluate exporting firms’ dividend policy adjustment and assess the principal dividend theories’ testable predictions. For this purpose, a 2SLS empirical approach is implemented in which firm specific real exchange rates (weighted by destination countries’ export shares at initial year) is used as export value instrumental variable, following Jiang et al. (2010) methodology. The exogeneity condition is plausibly satisfied since the real exchange rate fluctuation occurred was mainly driven by international oil price variation and unprecedented inflation rate in trading partners. Fulfillment of relevance condition is empirically supported.

The main results indicate that exogenous export shocks impact positively and statistically significant the probability that firms initiate to decree effectively paid dividends, the free cash flow, and the cash flow volatility. This finding contradicts signaling theory because firms modify their dividend policy because of temporal international income variation. On the contrary, agency cost theory is supported; dividend payment mitigate the priorities differences between manager(s) and shareholder(s) generated by exports shocks via higher free cash flow and cash flow volatility. Although positive export shocks impact on the probability to decree dividends is statistically significant and its magnitude is relevant (the back-of-the-envelope calculation indicates that exports account for a significant 26% of the firms that initiated to decree effectively paid dividends), they do not affect the amount that firms usually decree in dividends.

From a policy perspective, econometric results support the ‘outcome model’ within the agency cost theory: firms which did not transform to SAS (Simplified Joint- stock) legal form – which are more likely to have better minority shareholders protection – and firms with better international managerial quality - which could have better corporate governance - are more likely to start to decree effectively paid dividends in response to exogenous export shocks. Also, econometric results indicate that dividend payment could be insufficient to avoid firms’ over investment. As a final remark, it is expected that this paper become a point of reference that incentives to generate more research about international trade impact on dividend policy.

## 2.8 References

- Aceró, G. (2017). Los precios del petróleo como fuente de inestabilidad del tipo de cambio real 1998-2017. [Master's thesis]. *Facultad de Ciencias Económicas, Universidad Nacional de Colombia*.
- Acharya, V., Gabarro, M., & Volpin, P. (2018). Competition for managers and corporate governance. *CEPR Discussion paper. CEPR Press, Paris & London, DP8936*.
- Alfonso, V. (2018). El uso de forwards peso dólar en las empresas colombianas del sector real. *Banco de la República, Borradores de Economía, 1058*.
- Allen, F., Bernardo, A., & Welch, I. (2000). A theory of dividends based on tax clienteles. *The Journal of Finance, 55*(6), 2499-2536.
- Allen, F., Brealey, R., & Myers, S. (2010). *Principles of Corporate Finance (10th ed.)*. New York: McGraw-Hill/Irwin.
- Al-Najjar, B., & Kilincarslan, E. (2019). What do we know about the dividend puzzle? - A literature survey. *International Journal of Managerial Finance, 15*(2), 205-235.
- Avila-Mahecha, J. (2019). Impacto redistributivo de la tributación a los dividendos en Colombia. *Investigaciones y Productos CID, Facultad de Ciencias Económicas, Universidad Nacional de Colombia, 20*.
- Baker, M., & Wurgler, J. (2004). A catering theory of dividends. *The Journal of Finance, 59*(3), 1125-1165.
- Banco de la República. (2021). Índice de tasa de cambio real (ITCR) - Guía metodológica. *Banco de la República, Colombia*.
- Bastos, P., Silva, J., & Verhoogen, E. (2018). Export destinations and input prices. *American Economic Review, 108*(2), 353-392.
- Bazil, M., Bhutta, A., Hassan, A., Rehman, B., & Sheikh, M. (2022). Corporate social responsibility and dividend policy: a strategic choice in family firms. *Journal of family business management, 12*(2), 296-315.
- Benavides, J., & Mongrut, S. (2010). Governance codes: facts or fictions? A study of governance codes in Colombia. *Universidad ICESI - Estudios Gerenciales, 26*(117), 85-102.
- Bhandari, S., & Adams, M. (2017). On the definition, measurement, and use of the free cash flow concept in financial reporting and analysis: a review and recommendations. *Journal of Accounting and Finance, 17*(1), 11-19.
- Bhattacharya, N. (2007). Good managers invest more and pay less dividends: a model of dividend policy. In M. Hirschey, K. John, & A. Makhija, *Issues in corporate governance and finance* (Vols. Advances in Financial Economics, 12, pp. 91-117).
- Black, F. (1976). The dividend puzzle. *Journal of Portfolio Management, 2*(2), 5-8.

- Bloom, N., Manova, K., Sun, S., Van Reenen, J., & Yu, Z. (2021). Trade and management. *The Review of Economics and Statistics*, 103(3), 443-460.
- Booth, L., Chang, B., & Zhou, J. (2013). Import competition and disappearing dividends. *Journal of International Business Studies*, 44(2), 138-154.
- Bradley, M., Capozza, D., & Seguin, P. (1998). Dividend policy and cash-flow uncertainty. *Real estate economics*, 26(4), 555-580.
- Campa, J., & Myles, J. (2002). Exporting and capital investment: on the strategic behavior of exporters. *IESE Business School, University of Navarra, Research Papers*, 469.
- Chakraborty, S., Tang, Y., & Wu, L. (2015). Imports, exports, dollar exposures, and stock returns. *Open economies review*, 26, 1059-1079.
- Chay, J., & Suh, J. (2009). Payout policy and cash-flow uncertainty. *Journal of Financial Economics*, 93(1), 88-107.
- Chetty, R., & Saez, E. (2005). Dividend taxes and corporate behavior: evidence from the 2003 dividend tax cut. *The Quarterly Journal of Economics*, 120(3), 791-833.
- Dahlquist, M., Robertsson, G., & Rydqvist, K. (2014). Direct evidence of dividend tax clienteles. *Journal of Empirical Finance*, 28, 1-12.
- Dang, M., Mazur, M., & Vo, T. (2020). Dividend policy and the COVID-19 crisis. *Munich Personal RePEc Archive (MPRA)*, 108765.
- DeAngelo, H., DeAngelo, L., & Stulz, R. (2006). Dividend policy and the earned/contributed capital mix: a test of the life-cycle theory. *Journal of Financial Economics*, 81(2), 227-254.
- Dong, Y., Lewbel, A., & Yang, T. (2012). Comparing features of convenient estimators for binary choice models with endogenous regressors. *Canadian Journal of Economics*, 45(3), 809-829.
- Drichoutis, A. (2011). Interpreting interaction terms in linear and non-linear models: a cautionary tale. *Munich Personal RePEc Archive (MPRA)*, 3325.
- Driver, C., Grosman, A., & Scaramozzino, P. (2020). Dividend policy and investor pressure. *Economic modelling*, 89, 559-576.
- Easterbrook, F. (1984). Two agency-cost explanations of dividends. *The American Economic Review*, 74(4), 650-659.
- El Attar, A., & Jabbouri, I. (2018). The dividend paradox: a literature review. *International Journal of Markets and Business Systems*, 3(3), 197-221.
- Fama, E., & French, K. (2001). Disappearing dividends changing firm characteristics or lower propensity to pay? *Journal of Financial Economics*, 60(1), 3-43.
- Farre, J., Michaely, R., & Schmalz, M. (2014). Payout policy. *Annual review of financial economics*, 6, 75-134.

- Floyd, E., Li, N., & Skinner, D. (2015). Payout policy through the financial crisis: the growth of repurchases and the resilience of dividends. *Journal of Financial Economics*, 118(2), 299-316.
- Gaitan, S. (2009). Gobierno corporativo en Colombia. Tendencia actuales. *Universidad EAFIT Administrator*, 15, 137-153.
- Goldman, E., & Viswanath, P. (2015). Export intensity and dividend policy of Indian firms. In P. Agrawal, *Reviving Growth in India* (pp. 358-386). Cambridge: Cambridge University Press.
- Görg, H., & Hanley, A. (2017). Firms' global engagement and management practices. *Economic Letters*, 155, 80-83.
- Greene, W. (2002). The bias of the fixed effects estimator in non-linear models. *Department of Economics - Stern School of Business, New York University*.
- Grullon, G., & Ikenberry, D. (2000). What do we know about stock repurchases? *Journal of Applied Corporate Finance*, 13(1), 31-51.
- Gugler, K., & Yurtoglu, B. (2003). Corporate governance and dividend pay-out policy in Germany. *European Economic Review*, 47(4), 731-758.
- Heckman, J. (1979). Sample selection bias as a specification error. *Econometrica*, 47(1), 153-161.
- Jacob, M. (2021). Dividend taxes, employment, and firm productivity. *Journal of Corporate Finance*, 69, 102040.
- Jaramillo, J. (2021). Determinantes del pago de dividendos de compañías no listadas en bolsa en Colombia [Master's thesis]. *Universidad EAFIT*.
- Jensen, M. (1986). Agency cost of free cash flow, corporate finance, and takeovers. *The American Economic Review*, 76(2), 323-329.
- Jiang, Y., Park, A., Shi, X., & Yang, D. (2010). Exporting and firm performance: Chinese exporters and the Asian financial crisis. *The Review of Economics and Statistics*, 92(4), 822-842.
- Kawano, L. (2014). The dividend clientele hypothesis: evidence from the 2003 tax act. *American Economic Journal: Economic Policy*, 6(1), 114-136.
- Kulchania, M. (2023). Productivity and payout policy. *European financial management*, 29(2), 588-633.
- La Porta, R., Lopex-de-Silanes, F., Shleifer, A., & Vishny, R. (2000a). Agency problems and dividend policies around the world. *The Journal of Finance*, 55(1), 1-33.
- La Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. (2000b). Investor protection and corporate governance. *Journal of Financial Economics*, 58, 3-27.
- Lagos, D., & Vecino, C. (2011). Medicion de la aplicacion de practicas de gobierno corporativo en Colombia. *Universidad de Nariño, Revista de la Facultad de Ciencias Economicas y Administrativas*, 12(2), 230-253.

- Levinsohn, J., & Petrin, A. (2003). Estimating production functions using inputs to control for unobservables. *The Review of Economic Studies*, 70(2), 317-341.
- Lintner, J. (1956). Distribution of incomes of corporations among dividends, retained earnings and taxes. *The American Economic Review*, 46(2), 97-113.
- Litzenberger, R., & Ramaswamy, K. (1979). The effect of personal taxes and dividend on capital asset prices: theory and empirical evidence. *Journal of Financial Economics*, 7(2), 163-195.
- Merchán, F. (2024). International managerial skill and big Colombian exporting firms' performance. *The World Economy*, 47(7), 3199-3243.
- Michaely, R., & Moin, A. (2022). Disappearing and reappearing dividends. *Journal of Financial Economics*, 143(1), 207-226.
- Mollisi, R., & Rovigatti, G. (2018). Theory and practice of TFP estimation: the control function approach using stata. *The Stata Journal*, 18(3), 618-662.
- Montiel, J., & Pflueger, C. (2013). A robust test for weak instruments. *Journal of Business & Economic Statistics*, 31(3), 358-369.
- Morris, J., & Roseman, B. (2014). Dividends as a solution to agency cost and opaqueness: theory and evidence. *International journal of economics and finance*, 7(1), 24-36.
- Parente, P., & Santos, J. (2011). A cautionary note on tests for overidentifying restrictions. *Discussion Paper Series, University of Essex*, 699.
- Pombo, C., & Gutierrez, L. (2007). Corporate governance and firm valuation in Colombia. *Inter-American Development Bank, Working Paper*, 568.
- Ramirez, C., & Usma, J. (2010). Gobierno corporativo y politica de dividendos: el caso colombiano [Master's thesis]. *Universidad EAFIT*.
- Riaño, A. (2011). Exports, investment and firm-level sales volatility. *Review of World Economics*, 147(4), 643-663.
- Richardson, S. (2006). Over-investment of free cash flow. *Review of Accounting Studies*, 11, 159-189.
- Roberts, M., & Whited, T. (2013). Endogeneity in empirical corporate finance. In G. Constantinides, M. Harris, & R. Stulz, *Handbook of the economics of finance* (Vols. 2, part A, pp. 493-572).
- Saens, R., & Tigero, T. (2021). Mandatory dividend rules and the investment decision: the case of Chile. *The North American Journal of Economics and Finance*, 56, 101373.
- Sartori, A. (2003). An estimator for some binary outcome selection models without exclusion restrictions. *Political Analysis*, 11(2), 111-138.
- Stammann, A. (2021). Nonlinear panel data models with high-dimensional fixed effects [Doctoral dissertation]. *Heinrich Heine Universität Dusseldorf*.
- Superintendencia de Sociedades. (2020). Informe de buenas practicas empresariales 2020. *Superin-*

*tendencia de Sociedades, Colombia.*

Vannoorenbergue, G. (2012). Firm-level volatility and exports. *Journal of International Economics*, 86(1), 57-67.

Wooldridge, J. (2010). *Econometric Analysis of Cross Section and Panel Data* (2nd ed.). Cambridge: Mass.: MIT Press.

## 2.9 Appendix A: Tables

Table 2.6: Descriptive statistics – two year differences

Variable	Firm type					Number of observations (diff across groups) <sup>1</sup>
	Non-exporting, non-decreed dividends	Non-exporting, decreed dividends	Exporting, non-decreed dividends	Exporting, decreed dividends	Pi-coefficient (diff across groups)	
$\Delta_2$ Log real export value (COP)			-0.017	0.068	0.009	12,987
$\Delta_2$ Log firm specific real exchange rate <sup>2</sup>			-0.290	-0.221	0.169	12,987
$\Delta_2$ Export value/operating income			0.003	0.005	0.081	12,987
$\Delta_2$ HHI exports			0.000	-0.005	0.318	12,987
$\Delta_2$ International managerial quality <sup>3</sup>			-0.006	0.017	0.105	10,336
$\Delta_2$ Log real import value (COP)	0.006	0.037	0.028	0.068	0.557	30,311
$\Delta_2$ Log firm specific real exchange rate (imports) <sup>4</sup>	-0.291	-0.279	-0.222	-0.151	0.000	30,311
$\Delta_2$ Import value/sales cost	-0.002	0.003	0.000	0.004	0.525	30,311
$\Delta_2$ Log real decreed dividends (COP)		0.111		0.144	0.007	11,708
$\Delta_2$ Decreed dividends/equity		0.024		0.025	0.111	11,708
$\Delta_2$ Decreed dividends/assets		0.007		0.005	0.294	11,708
$\Delta_2$ Share of firms that continued to decree dividends relative to t-2		0.547		0.623	0.000	20,707
$\Delta_2$ Share of firms that started to decree dividends relative to t-2		0.453		0.377	0.000	20,707
$\Delta_2$ Share of firms that started to decree dividends (effectively paid) relative to t-2		0.359		0.289	0.000	16,432
$\Delta_2$ Share of firms that started to decree dividends (non effectively paid) relative to t-2		0.092		0.083	0.117	16,432
$\Delta_2$ Share of firms that stop to decree dividends	0.157		0.204		0.000	56,902
$\Delta_2$ Log real total assets (COP)	0.118	0.128	0.113	0.115	0.724	77,621
$\Delta_2$ ROA (Profit before taxes/assets)	-0.011	-0.008	-0.014	-0.013	0.032	77,621
$\Delta_2$ Profit rate	-0.004	-0.003	-0.008	-0.008	0.107	76,378
$\Delta_2$ Total investment/assets	0.000	0.000	0.000	0.000	0.514	77,621
$\Delta_2$ Debt/assets	-0.001	0.014	0.012	0.018	0.000	77,621
$\Delta_2$ Cash flow/ assets	-0.001	-0.002	0.000	0.000	0.669	77,621
$\Delta_2$ TFP <sup>5</sup>	0.003	0.009	0.003	0.006	0.001	77,621
$\Delta_2$ [Free Cash Flow <sup>6</sup> /assets]	-0.215	-0.099	-0.100	-0.072	0.000	77,621
$\Delta_2$ [Overinvestment <sup>7</sup> /assets]	0.004	0.005	0.001	0.005	0.083	77,621

Notes: Simple average by year. <sup>1</sup> A regression of each dependent variable on dummy variable(s) for each firm type group(s) plus state, year, and industry fixed effects was estimated. Then, it was jointly tested that the coefficient(s) of the dummy variable(s) was(were) different than 0 through a F-test. <sup>2</sup>  $\Delta \text{Log\_real\_export\_exchange\_rate}_{ft} = \ln[\sum_k (RER_{kt} * \text{share\_exp}_{fk,t=0}) + 1]$ , where  $RER_{kt}$  is the real exchange rate between Colombia and destination country  $k$ , and  $\text{share\_exp}_{fk,t=0}$  is the share of export value to destination country  $k$  in total exports of firm  $f$  in its first sample year. <sup>3</sup> International managerial quality variable is obtained from Merchán (2024). <sup>4</sup>  $\Delta \text{Log\_real\_import\_exchange\_rate}_{ft} = \ln[\sum_k (RER_{kt} * \text{share\_imp}_{fj,t=0}) + 1]$ , where  $RER_{jt}$  is the real exchange rate between Colombia and origin country  $j$ , and  $\text{share\_imp}_{fj,t}$  is the import value share from origin country  $j$  in total imports of firm  $f$  in its first sample year. <sup>5</sup> TFP calculation based on Levinsohn & Petrin (2003) methodology and *prodest* Stata command (Mollisi & Rovigatti, 2018) (table 2.9). <sup>6</sup> FCF (Free Cash Flow) = Operating Income - CAPEX (Capital expenditures) – Debt payment. <sup>7</sup> Overinvestment calculation follows Richardson (2006) methodology (see appendix 2.11).

Table 2.7: Descriptive statistics – three year differences

Variable	Firm type					Number of observations
	Non-exporting, non-decreed dividends	Non-exporting, decreed dividends	Exporting, non-decreed dividends	Exporting, decreed dividends	Pi-value coefficient (diff across groups) <sup>1</sup>	
$\Delta_3$ Log real export value (COP)			-0.029	0.104	0.001	10,161
$\Delta_3$ Log firm specific real exchange rate <sup>2</sup>			-0.447	-0.335	0.045	10,161
$\Delta_3$ Export value/operating income			0.001	0.006	0.003	10,161
$\Delta_3$ HHI exports			-0.001	-0.005	0.602	10,161
$\Delta_3$ International managerial quality <sup>3</sup>			-0.012	0.020	0.100	8,015
$\Delta_3$ Log real import value (COP)	0.033	0.093	0.103	0.159	0.006	23,411
$\Delta_3$ Log firm specific real exchange rate (imports) <sup>4</sup>	-0.444	-0.361	-0.325	-0.223	0.000	23,411
$\Delta_3$ Import value/sales cost	0.003	0.013	0.009	0.015	0.043	23,411
$\Delta_3$ Log real decreed dividends (COP)		0.176		0.193	0.125	8,840
$\Delta_3$ Decreed dividends/equity		0.029		0.009	0.579	8,840
$\Delta_3$ Decreed dividends/assets		0.008		0.001	0.789	8,840
Share of firms that continued to decree dividends relative to t-3		0.520		0.595	0.000	16,444
Share of firms that started to decree dividends relative to t-3		0.480		0.405	0.000	16,444
Share of firms that started to decree dividends (effectively paid) relative to t-3		0.377		0.300	0.000	12,587
Share of firms that started to decree dividends (non effectively paid) relative to t-3		0.095		0.089	0.292	12,587
Share of firms that stop to decree dividends	0.174		0.234		0.000	43,039
$\Delta_3$ Log real total assets (COP)	0.179	0.208	0.178	0.183	0.026	59,497
$\Delta_3$ ROA (Profit before taxes/assets)	-0.014	-0.006	-0.017	-0.010	0.000	59,497
$\Delta_3$ Profit rate	-0.006	0.000	-0.010	-0.006	0.012	58,555
$\Delta_3$ Total investment/assets	0.000	0.001	0.000	0.000	0.716	59,497
$\Delta_3$ Debt/assets	0.005	0.016	0.020	0.021	0.000	59,497
$\Delta_3$ Cash flow/ assets	-0.002	-0.001	-0.001	0.002	0.099	59,497
$\Delta_3$ TFP <sup>5</sup>	0.007	0.016	0.009	0.016	0.000	59,497
$\Delta_3$ [Free Cash Flow <sup>6</sup> / assets]	-0.271	-0.132	-0.142	-0.045	0.000	59,497
$\Delta_3$ [Overinvestment/assets]	0.004	0.005	0.003	0.005	0.507	59,497

Notes: Simple average by year. <sup>1</sup>A regression of each dependent variable on dummy variable(s) for each firm type group(s) plus state, year, and industry fixed effects was estimated. Then, it was jointly tested that the coefficient(s) of the dummy variable(s) was(were) different than 0 through a F-test. <sup>2</sup> $\Delta \text{Log\_real\_export\_exchange\_rate}_{ft} = \ln[\sum_k (RER_{kt} * \text{share\_exp}_{fk,t=0}) + 1]$ , where  $RER_{kt}$  is the real exchange rate between Colombia and destination country  $k$ , and  $\text{share\_exp}_{fk,t=0}$  is the share of export value to destination country  $k$  in total exports of firm  $f$  in its first sample year. <sup>3</sup> International managerial quality variable is obtained from Merchán (2024). <sup>4</sup> $\Delta \text{Log\_real\_import\_exchange\_rate}_{ft} = \ln[\sum_k (RER_{kt} * \text{share\_imp}_{fj,t=0}) + 1]$ , where  $RER_{jt}$  is the real exchange rate between Colombia and origin country  $j$ , and  $\text{share\_imp}_{fj,t}$  is the import value share from origin country  $j$  in total imports of firm  $f$  in its first sample year. <sup>5</sup> TFP calculation based on Levinsohn & Petrin (2003) methodology and *prodest* Stata command (Mollisi & Rovigatti, 2018) (table 2.9). <sup>6</sup> FCF (Free Cash Flow) = Operating Income - CAPEX (Capital expenditures) - Debt payment. <sup>7</sup> Overinvestment calculation follows Richardson (2006) methodology (see appendix 2.11).

Table 2.8: Descriptive statistics – four year differences

Variable	Firm type					Number of observations
	Non-exporting, non-decreed dividends	Non-exporting, decreed dividends	Exporting, non-decreed dividends	Exporting, decreed dividends	Pi-value coefficient (diff across groups) <sup>1</sup>	
$\Delta_4$ Log real export value (COP)			-0.023	0.164	0.000	7,698
$\Delta_4$ Log firm specific real exchange rate <sup>2</sup>			-0.534	-0.433	0.162	7,698
$\Delta_4$ Export value/operating income			0.003	0.007	0.045	7,698
$\Delta_4$ HHI exports			-0.008	-0.005	0.380	7,698
$\Delta_4$ International managerial quality <sup>3</sup>			-0.015	0.009	0.430	6,037
$\Delta_4$ Log real import value (COP)	0.088	0.176	0.199	0.245	0.000	17,716
$\Delta_4$ Log firm specific real exchange rate (imports) <sup>4</sup>	-0.561	-0.443	-0.414	-0.307	0.000	17,716
$\Delta_4$ Import value/sales cost	0.015	0.025	0.022	0.028	0.031	17,716
$\Delta_4$ Log real decreed dividends (COP)		0.184		0.157	0.823	6,539
$\Delta_4$ Decreed dividends/equity		0.011		-0.004	0.519	6,539
$\Delta_4$ Decreed dividends/assets		0.002		-0.003	0.666	6,539
Share of firms that continued to decree dividends relative to t-4		0.511		0.605	0.000	12,205
Share of firms that started to decree dividends relative to t-4		0.489		0.395	0.000	12,205
Share of firms that started to decree dividends (effectively paid) relative to t-4		0.409		0.325	0.000	8,445
Share of firms that started to decree dividends (non effectively paid) relative to t-4		0.085		0.079	0.338	8,445
Share of firms that stop to decree dividends	0.191		0.256		0.000	32,449
$\Delta_4$ Log real total assets (COP)	0.247	0.284	0.242	0.248	0.008	44,667
$\Delta_4$ ROA (Profit before taxes/assets)	-0.017	-0.005	-0.019	-0.009	0.000	44,667
$\Delta_4$ Profit rate	-0.005	0.003	-0.010	-0.004	0.000	43,947
$\Delta_4$ Total investment/assets	0.000	0.000	0.000	-0.001	0.344	44,667
$\Delta_4$ Debt/assets	0.005	0.016	0.022	0.021	0.014	44,667
$\Delta_4$ Cash flow/ assets	-0.003	-0.001	-0.003	0.002	0.098	44,667
$\Delta_4$ TFP <sup>5</sup>	0.012	0.023	0.016	0.025	0.000	44,667
$\Delta_4$ Free Cash Flow <sup>6</sup> / Assets	-0.288	-0.155	-0.144	-0.057	0.000	44,667
$\Delta_4$ Overinvestment <sup>7</sup> /assets	0.006	0.006	0.002	0.006	0.107	44,667

Notes: Simple average by year. <sup>1</sup>A regression of each dependent variable on dummy variable(s) for each firm type group(s) plus state, year, and industry fixed effects was estimated. Then, it was jointly tested that the coefficient(s) of the dummy variable(s) was(were) different than 0 through a F-test. <sup>2</sup>  $\Delta \text{Log\_real\_export\_exchange\_rate}_{ft} = \ln[\sum_k (RER_{kt} * \text{share\_exp}_{fk,t=0}) + 1]$ , where  $RER_{kt}$  is the real exchange rate between Colombia and destination country  $k$ , and  $\text{share\_exp}_{fk,t=0}$  is the share of export value to destination country  $k$  in total exports of firm  $f$  in its first sample year. <sup>3</sup> International managerial quality variable is obtained from Merchán (2024). <sup>4</sup>  $\Delta \text{Log\_real\_import\_exchange\_rate}_{ft} = \ln[\sum_k (RER_{kt} * \text{share\_imp}_{jk,t=0}) + 1]$ , where  $RER_{jt}$  is the real exchange rate between Colombia and origin country  $j$ , and  $\text{share\_imp}_{jt}$  is the import value share from origin country  $j$  in total imports of firm  $f$  in its first sample year. <sup>5</sup> TFP calculation based on Levinsohn & Petrin (2003) methodology and *prodest* Stata command (Mollisi & Rovigatti, 2018) (table 2.9). <sup>6</sup> FCF (Free Cash Flow) = Operating Income - CAPEX (Capital expenditures) – Debt payment. <sup>7</sup> Overinvestment calculation follows Richardson (2006) methodology (see appendix 2.11).

Table 2.9: TFP estimation

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

*Notes:* \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. 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 2.10: Export and import effect on firms' dividend policy – three year differences

	(1) $\Delta_3$ Log ex- port value	(2) $\Delta_3$ Log im- port value	(3) Initiate ef- fective divi- dends <sup>1</sup> rel- ative to t-3	(4) $\Delta_3$ [Free Cash flow <sup>2</sup> /assets]	(5) $\Delta_3$ [Over- investment <sup>3</sup> /assets]
Method	First stage	First stage	IV	IV	IV
$\Delta_3$ Log export value			0.301* (0.0157)	0.0759* (0.0433)	0.00527 (0.00432)
$\Delta_3$ Log import value			0.0403 (0.0257)	0.0265 (0.102)	0.00492 (0.0105)
$\Delta_3$ Log firm specific real ex- change rate	0.226*** (0.0350)	-0.0111 (0.0246)			
$\Delta_3$ Log firm specific real ex- change rate imports	0.0576* (0.0305)	0.217*** (0.0414)			
Observations	3,783	3,783	3,783	3,783	3,783
$X_{t-3} * \Delta RER$	Yes	Yes	-	-	-
$X_{t-3} * \Delta RER\_imports$	Yes	Yes	-	-	-
$X_{t-3}$	Yes	Yes	Yes	Yes	Yes
Fixed effects			State, year, industry		
Under identification test pi- value			0.05	0.05	0.05
F test: joint significance of in- struments (column 1)			7.12	7.12	7.12
F test: joint significance of in- struments (column 2)			3.39	3.39	3.39
Method			OLS	OLS	OLS
$\Delta_3$ Log export value COP			0.0133*** (0.00405)	0.0198 (0.0169)	-0.000182 (0.00137)
$\Delta_3$ Log import value COP			0.00795 (0.00555)	-0.0158 (0.0321)	0.00867*** (0.00168)
Observations			3,783	3,783	3,783
Fixed effects			State, year, industry		
$X_{t-3}$			Yes	Yes	Yes

Notes: Robust standard errors clustered at firm level. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Balanced sample comprises all big private Colombian firms that exported from 2006 to 2014. X controls variables are: log total assets, profit rate, debt/assets, financial investments/assets, cash flow/assets, TFP (calculation based on Levinsohn and Petrin (2003) methodology and prodest Stata command (Mollisi and Rovigatti, 2018) -see appendix table 2.9-), export value/operating income, international managerial quality variable (Merchán, 2024), and import value/sales cost. X are normalized to have mean 0 and standard deviation 1.

<sup>1</sup> Effectively paid relative to times established in law: one year after decreeing them (Article 156 – Colombian Code of Commerce).

<sup>2</sup> FCF (Free Cash Flow) = Operating Income - CAPEX (Capital expenditures) – Debt payment.

<sup>3</sup> Overinvestment calculation follows Richardson (2006) methodology, see appendix 2.11.

Table 2.11: Export effect on firms' dividend policy - two year differences

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	<i>Initiate effective dividends</i> (the firm decreed dividends in t - effectively paid <sup>1</sup> - and did not decree them in t-2)		$\Delta_2$ [Free Cash flow <sup>2</sup> / assets]		$\Delta_2$ [Over-investment <sup>3</sup> / assets]	
Method	IV	IV	IV	IV	IV	IV
$\Delta_2$ Log export value	0.0163 (0.0166)	0.0102 (0.0130)	0.0814 (0.0560)	0.00149 (0.0360)	0.00794* (0.00468)	0.00688 (0.00496)
Observations	5,545	5,545	5,545	5,545	5,545	5,545
Fixed effects			State, year, industry			
$X_{t-2}$	Yes	Yes	Yes	Yes	Yes	Yes
First stage	Column 1, table 2.2	Column 2, table 2.2	Column 1, table 2.2	Column 2, table 2.2	Column 1, table 2.2	Column 2, table 2.2
Method	OLS		OLS		OLS	
$\Delta_2$ Log export value	0.00732* (0.00383)		0.0360* (0.0199)		0.00130 (0.00127)	
Observations	5,545		5,545		5,545	
Fixed effects			State, year, industry			
$X_{t-2}$	Yes	Yes	Yes	Yes	Yes	Yes

*Notes:* Robust standard errors clustered at firm level. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Balanced sample comprises all big private Colombian firms that exported from 2006 to 2014. X controls variables are: log total assets, profit rate, debt/assets, financial investments/assets, cash flow/assets, TFP (calculation based on Levinsohn and Petrin (2003) methodology and *prodest* Stata command (Mollisi and Rovigatti, 2018) -see appendix table 2.9-), export value/operating income, international managerial quality (Merchán, 2024), and import value/sales cost. X are normalized to have mean 0 and standard deviation 1.

<sup>1</sup> Effectively paid relative to times established in law: one year after decreeing them (Article 156 -Colombian Code of Commerce).

<sup>2</sup> FCF = Operating Income - Capital expenditures (CAPEX) - Debt payment.

<sup>3</sup> Overinvestment calculation follows Richardson (2006) methodology, see appendix 2.11.

Table 2.12: Export effect on firms' dividend policy - four year differences

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	<i>Initiate effective dividends</i> (the firm decreed dividends in t - effectively paid <sup>1</sup> - and did not decree them in t-4)		$\Delta_4$ [Free Cash flow <sup>2</sup> / assets]		$\Delta_4$ [Over-investment <sup>3</sup> / assets]	
Method	IV	IV	IV	IV	IV	IV
$\Delta_4$ Log real export value	0.0472*** (0.0177)	0.0406*** (0.0153)	-0.0293 (0.106)	0.0371 (0.0916)	0.00737 (0.00550)	0.00717 (0.00503)
Observations	3,322	3,322	3,322	3,322	3,322	3,322
Fixed effects			State, year, industry			
$X_{t-4}$	Yes	Yes	Yes	Yes	Yes	Yes
First stage	Column 5, table 2.2	Column 6, table 2.2	Column 5, table 2.2	Column 6, table 2.2	Column 5, table 2.2	Column 6, table 2.2
Method	OLS		OLS		OLS	
$\Delta_2$ Log real export value	0.0164*** (0.00438)		0.0584** (0.0242)		0.000844 (0.00157)	
Observations	3,322		3,322		3,322	
Fixed effects			State, year, industry			
$X_{t-2}$	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors clustered at firm level. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Balanced sample comprises all big private Colombian firms that exported from 2006 to 2014. X controls variables are: log total assets, profit rate, debt/assets, financial investments/assets, cash flow/assets, TFP (calculation based on Levinsohn and Petrin (2003) methodology and *prodest* Stata command (Mollisi and Rovigatti, 2018) -see appendix table 2.9-), export value/operating income, international managerial quality (Merchán, 2024), and import value/sales cost. X are normalized to have mean 0 and standard deviation 1.

<sup>1</sup> Effectively paid relative to times established in law: one year after decreeing them (Article 156 -Colombian Code of Commerce).

<sup>2</sup> FCF = Operating Income - Capital expenditures (CAPEX) - Debt payment.

<sup>3</sup> Overinvestment calculation follows Richardson (2006) methodology, see appendix 2.11.

Table 2.13: Selection equation (probit) – heckman estimation

Variables	(1)
	The firm initiated to decree effectively paid dividends in t relative to t-3 (1=Yes, 0=No)
$\Delta_3$ Quartile ROA>1	0.0274* (0.0156)
$\Delta_3$ Percentage firms that decreed dividends in the industry	0.286*** (0.0451)
$\Delta_3$ Log firm-specific real exchange rate	0.0112*** (0.00333)
$X_{t-3}$	Yes
Dummy years	Yes
Observations	4,431

*Notes:* Probit - marginal effects reported. Sample is restricted to big private exporting firms that exported all years from 2006 to 2014. X controls variables are: log total assets, profit rate, debt/assets, financial investments/assets, cash flow/assets, TFP (calculation based on Levinsohn and Petrin (2003) methodology and prodest Stata command (Mollisi and Rovigatti, 2018) -see appendix 2.9-), export value/operating income, international managerial quality variable (Merchán, 2024), and import value/sales cost.

Table 2.14: IV first stage (sample: censored observations)

Dependent variable Difference (l)	(1)	(2)	(3)	(4)
		$\Delta_3$ Log real export value		
		Third difference		
$\Delta_3$ Log firm-specific real exchange rate	0.229*** (0.0477)	0.288*** (0.0744)	0.236*** (0.0442)	0.299*** (0.0761)
Inverse Mills Ratio, t			0.144 (0.359)	0.204 (0.367)
Censored observations	449	449	449	449
Fixed effects		State, year, industry		
$X_{t-3}$ $\Delta_3$ RER	No	Yes	No	Yes
$X_{t-3}$	Yes	Yes	Yes	Yes
Effective F statistic	23.05	5.52	28.42	4.91
Critical value $\tau = 5\%$	37.42	28.51	37.42	28.20
Critical value $\tau = 10\%$	23.11	16.58	23.11	16.36
Critical value $\tau = 20\%$	15.06	10.16	15.06	10.00
F joint significance of the instrument	23.05	11.42	28.42	11.59
Under identification test p-value	0.00	0.01	0.00	0.00
Pi-value Hansen J statistic	.	0.39	.	0.39

*Notes:* Effective F statistic reports Montiel & Pflueger (2013) weak instrument test, which is robust to heteroscedasticity, autocorrelation, and clustering, with its critical values. Hansen J statistic tests under the null hypothesis that the instruments are coherent (Parente & Santos, 2011) in an overidentified model (instruments > endogenous variables). The null hypothesis of the under-identification test is that the model is not identified (the matrix is not full column rank). X controls variables are: log total assets, profit rate, debt/assets, financial investments/assets, cash flow/assets, TFP (calculation based on Levinsohn and Petrin (2003) methodology and prodest Stata command (Mollisi and Rovigatti, 2018) -see appendix table 2.9-), export value/operating income, international managerial quality variable (Merchán, 2024), and import value/sales cost. X variables are normalized to have mean 0 and standard deviation 1.

Table 2.15: Number of observations per fixed effects

	Number of fixed effects	Number of observations per fixed effects				
		Mean	Median	Standard deviation	Min	Max
Year	4	1133.25	1135	9.9	1120	1143
State	15	302.20	62	582.9	4	2192
Industry	47	96.45	24	139.8	2	698

## 2.10 Appendix B: Exports and cash flow volatility

Ideally, export effect on cash flow volatility should be estimated including different non-overlapping cash flow's standard deviation observations per firm (e.g, 1985-1989, 1990-1994, 1995-1999, 2000-2004, etc..). As the data of this paper covers only 9 years (2006-2014), one feasible option is to calculate rolling window standard deviation. Thus, column 1 of table 2.16 shows estimation of equation 2.3 including 4-years rolling window standard deviation of cash flow/assets as dependent variable (equivalent to  $l=3$  in equation 2.3)<sup>53</sup>. The results indicate that there is no statistically significant export effect on cash flow volatility neither in the 2SLS (panel A) nor in the OLS estimation (panel B). Results are robust when the dependent variable is calculated 3-years rolling window (equivalent to  $l=2$ ) and 5-years rolling window (equivalent to  $l=4$ ). The null export value effect holds for other volatility measures (rolling window standard deviation of FCF/assets in column 2 and rolling window standard deviation of log operating income in column 3). Probably a sample that covers a longer period of time to calculate different non-overlapping cash flow's standard deviation observations per firm is required to get a more accurate volatility measure as dependent variable in the 2SLS estimation.

Then, two feasible non-2SLS methodological approaches are implemented. First, it is estimated a regression which includes one observation per firm, in which cash flow's standard deviation is the dependent variable and the simple average of the explanatory variables  $X$  by firm plus industry fixed effects are the independent variables. The disadvantage is that it is not possible to solve exports endogeneity. The sample covers all big private exporting firms with 5 or more observations during the 2006-2014 period. The main explanatory variable is export value/operating income, instead of log real export value, following Vannoorenberghe (2012) who uses export value/operating income share as the main export exposure measure. Column 1 - panel C - table 2.16 suggest a positive correlation between export share and cash flow volatility. In the same way, column 2 and 3 illustrate a positive correlation between export share and other volatility measures (FCF/assets' standard deviation and operational income's standard deviation). Although export share is positive correlated with firm volatility, causality cannot be proven in this estimation.

Second, it is replicated -as far as possible- Vannoorenberghe (2012)'s estimation, which calculates a two-step methodology in which variance of disaggregated sales growth residuals per firm is computed in the first stage, and then, included as dependent variable in the second stage. As the sample of this paper does not contain information disaggregated at firm-year-product for the domestic market segment, Vannoorenberghe (2012)'s methodology is replicated but at firm-year level. In the first place, column 1 and 2 of table 2.17 show the operating income growth residuals estimation (replication of table 2 - column 2 and 4 in Vannoorenberghe (2012)). Then, column 1 in table 2.18 indicates that export share has a positive impact on conditional operating income volatility -including Vannoorenberghe (2012)'s explanatory variables-. Results are robust to one and two- years differences. Analogously to the previous estimation, the sample is restricted to exporting firms with 5 or more observations in the 2006-2014 period. Finally, it is replicated this methodology to calculate conditional free cash flow volatility (columns 3 and 4 in table 2.17) and conditional cash flow volatility (columns 5 and 6 in table 2.17). The results show that export share has also a positive impact on conditional cash flow volatility (column 3 in table 2.18).

---

<sup>53</sup>The results are robust excluding cash flow/assets from the explanatory variables  $X$ .

Table 2.16: Export share effect on firms' volatility

Dependent variable	(1) SD [Cash flow/assets] in a 4-year rolling win- dow	(2) SD [FCF/assets] in a 4-year rolling win- dow	(3) SD [Op- erating income] in a 4-year rolling win- dow
Panel A: IV - rolling window			
Method	IV	IV	IV
$\Delta_3$ Log real export value COP	-0.000582 (0.00142)	-0.0429 (0.0312)	-0.0159 (0.0109)
Observations	4,431	4,431	4,431
Fixed effects $X_{t-3}$	Yes	State, year, industry Yes	Yes
Panel B: OLS - rolling window			
Method OLS	OLS	OLS	OLS
$\Delta_3$ Log real export value COP	-0.000516 (0.000410)	-0.000770 (0.00982)	0.00741* (0.00398)
Observations	4,431	4,431	4,431
Fixed effects $X_{t-3}$	Yes	State, year, industry Yes	Yes
Panel C: OLS - cross section			
Dependent variable	SD [Cash flow/assets]	SD [FCF/assets]	SD [Op- erating income]
Mean export share (export value/operating income)	0.00994*** (0.00230)	0.559*** (0.151)	0.130*** (0.0255)
$V_{avg}$	Yes	Yes	Yes
Observations	2,356	2,356	2,356
R-squared	0.638	0.161	0.135
Fixed effects		Industry	

*Notes:* SD: standard deviation. Robust standard errors clustered at firm level in panel A-B. Robust standard errors clustered at industry level in panel C. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. X controls variables are: log total assets, profit rate, debt/assets, financial investments/assets, cash flow/assets, TFP (calculation based on Levinsohn & Petrin (2003) methodology and prodest Stata command (Mollisi & Rovigatti, 2018) -see appendix table 2.9-), export value/operating income, international managerial quality variable (Merchán, 2024), and import value/sales cost. X are normalized to have mean 0 and standard deviation 1. \*V is equal to vector X excluding export value/operating income.

Table 2.17: Residual operating income, free cash flow, and cash flow growth rate calculation

Variables	$\Delta_3$ Log real total operating income		$\Delta_3$ FCF/assets		$\Delta_3$ CF/assets	
$\Delta_3$ Log real property, plant and equipment	0.0865*** (0.0155)		-0.150*** (0.0481)		-0.011*** (0.00262)	
Constant	0.0898*** (0.00656)	0.0912*** (0.00161)	-0.107*** (0.0186)	-0.086*** (0.00499)	0.00034 (0.000815)	0.00174*** (0.000272)
Observations	10,099	9,481	10,099	9,481	10,099	9,481
R-squared	0.135	0.592	0.030	0.400	0.044	0.375
Firm fixed effects	No	Yes	No	Yes	No	Yes
Industry-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors clustered at firm level in parentheses. FCF = Operating Income – Capital expenditures (CAPEX) – Debt payment. CF: Cash flow. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Table 2.18: Export share effect on conditional operating income, free cash flow and cash flow variance

Variables	(1) Variance residuals column 2 table 2.17 [ $\Delta_3$ Log real total operating income USD]	(2) Variance residuals column 4 table 2.17 [ $\Delta_3$ FCF/assets]	(3) Variance residuals - column 6 table 2.17 [ $\Delta_3$ CF/assets]
Mean export share (export value/operating income)	0.324*** (0.0778)	8.736 (8.386)	0.00234* (0.00132)
Mean log real operating income	0.00454 (0.0373)	10.67** (5.349)	0.00177*** (0.000682)
Mean log real property, plant and equipment	0.00628 (0.0174)	-1.675 (1.117)	-0.001*** (0.000263)
Mean log real operating expenses	-0.0503* (0.0268)	-9.363** (1.117)	-0.001*** (4.619)
Mean debt (Debt/assets)	0.102 (0.138)	30.25** (13.69)	-0.028*** (0.00367)
Constant	0.635*** (0.136)	-14.68 (10.04)	0.0120*** (0.00378)
Observations	2,382	2,382	2,382
R-squared	0.076	0.046	0.093
Industry fixed effects	Yes	Yes	Yes

Notes: Robust standard errors in parentheses clustered at industry level \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

## 2.11 Appendix C: Overinvestment calculation

Richardson (2006) calculates overinvestment as the residual of a regression of investment expenditure on the lags of several variables (growth opportunities, leverage, cash, age, size, stock returns, expenditure investment), plus year (t) and industry (s) fixed effects with Compustat database for United States. As the dataset of this paper does not include information that allows to measure growth opportunities, age, and stock returns variable, the feasible regression is the following:

$$I(new)_{fist} = \beta_0 + \beta_1 Debt_{fist-1} + \beta_2 Cash_{fist-1} + \beta_3 Operating\_expenses_{fist-1} + \beta_4 I(new)_{fist-1} + \delta_s + \delta_t + \epsilon_{fist} \quad (2.9)$$

where  $I(new)_{fist}$  is investment expenditure,  $Debt_{fist-1}$  is the lag of liabilities/assets share,  $Cash_{fist-1}$  is the lag of cash/total assets ratio,  $Operating\_expenses_{fist-1}$  is the firm size proxy variable,  $\delta_s$  are industry fixed effects, and  $\delta_t$  are year fixed effects. Results are shown in table 2.19.

Table 2.19: Overinvestment calculation

Variables	(1)	(2)
	Net expenditure investment (total)/assets	Net expenditure investment (fixed assets)/assets
Net expenditure investment (total) (t-1)	-0.000105 (9.96e-05)	
Net expenditure investment (fixed assets) (t-1)		-6.55e-05 (5.37e-05)
Log real operating expenses (USD) (t-1)	0.00597 (0.00420)	0.00164*** (0.000625)
Cash flow/assets (t-1)	0.115*** (0.0331)	0.0396** (0.0160)
Liabilities/Assets (t-1)	-0.00109 (0.00102)	-0.000680 (0.000547)
Observations	175,418	175,418
Year fixed effects	Yes	Yes
Industry fixed effects	Yes	Yes
R squared	0.001	0.002

Notes: Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

## Chapter 3

# Natural resource dependence and monopolized imports

Coauthored with Rabah Arezki (*African Development Bank*), Ana Fernandes (*World Bank*), Ha Nguyen (*IMF*) and Tristan Reed (*World Bank*).

### Abstract

Countries with greater commodity export intensity have more concentrated markets for imported goods. Import market concentration is associated with higher domestic prices, suggesting that markups due to greater concentration outweigh any potential cost efficiency. Tariffs, non-tariff measures, and tariff evasion are mechanisms that concentrate import markets. These results suggest a novel channel for the resource curse stemming from the monopolization of imports.

**Keywords:** imports, market concentration, natural resources, resource curse.

**JEL classification:** O12; O13; F14; F10; L12

Click [HERE](#) (online link) to download the version that was revised and resubmitted to the Review of Economic and Statistics journal.

### 3.1 Introduction

Dependence on natural resources for exports creates a variety of macroeconomic challenges known collectively as ‘the resource curse’ (Sachs and Warner, 2001; Van der Ploeg, 2011; Frankel, 2012; Venables, 2016; Arezki et al., 2017). One challenge is the so-called Dutch disease wherein a natural resource discovery or price appreciation is accompanied by a real exchange rate appreciation, which in turn shrinks the non-resource tradable sector leading to de-industrialization. Such appreciation also leads to an increase in the size of the import market.<sup>1</sup> Another challenge faced by resource-dependent economies is rent-seeking wherein natural resource rents controlled by the state increase the return to state capture, leading to inefficient policy choices in the absence of strong institutions. In principle, both the Dutch disease and rent-seeking challenges could interact to form an under-explored “import” channel for the resource curse. Foreign exchange receipts from natural resources combined with real exchange rate appreciation expand the domestic demand for imports, increasing the domestic import market. By making the import market larger, natural resources raise the return to effort by importers towards capturing the state and using trade or industrial policy to shield them from competition. Yet, existing theoretical models of state capture in natural resource-dependent economies (Tornell and Lane, 1999; Robinson et al., 2014) do not emphasize profits in the import market as a source of rents.

Anecdotal evidence is consistent with this import monopolization effect, as the wealth of many billionaire businesspeople in natural resource-dependent economies is linked to profits in import markets. Prominent billionaires Femi Otedola in Nigeria, Abdul Latif Jameel in Saudi Arabia, and Igor Kesaev in the Russian Federation accumulated their wealth respectively as a fuel importer, an exclusive distributor for a car manufacturer, and an importer of alcohol, cigarettes, and food.<sup>2</sup> This paper moves beyond anecdotes and provides systematic evidence that natural resource dependence is associated with monopolization of imports, and that trade policy is a mechanism behind this association. The term ‘monopolization’ is used to describe a shift in market structure toward one that is more concentrated.

The analysis exploits a novel database of all firm-level import transactions in 53 developing economies. These data reveal that natural resource-dependent economies have more concentrated markets for imported products. This main result is illustrated in Figure 3.1a, which shows a positive association between countries’ commodity exports as a share of total merchandise exports and the weighted average Herfindahl–Hirschman index (HHI) across their imported product markets. The HHI for an imported product market is the sum of the squared market shares of every firm importing that product. Econometric estimates show this relationship is robust to a variety of controls including country-product and product-year fixed effects. An alternative specification shows exogenous increases in world commodity prices also increase import market concentration, suggesting the relationship is causal.

Traditional models of Dutch disease emphasize the increase in the price of non-tradable goods relative to the price of tradable goods hence the appreciation of the real effective exchange rate. Yet, these models ignore elements of market structure and the presence of markups. These elements can affect prices over and above the effect on relative prices stemming from the traditional Dutch disease. Our results suggest that prices are elevated due to higher markups ensuing from monopolistic or oligopolistic pricing by

---

<sup>1</sup>Harding and Venables (2016) document a positive association between resource export revenues and the size of the import market. In our sample, a bivariate regression confirms that a 1 percentage point increase in the share of commodities in total merchandise exports is associated with a 0.6 percent increase in the value of the import market.

<sup>2</sup>See Freund (2016) for an account of the origin of billionaires’ wealth in emerging markets.

importers. Data on import unit values and domestic price levels show that import market concentration can account for higher prices. This result is not obvious ex-ante: if higher market concentration is associated with a higher fixed cost but lower marginal cost of importing, import market concentration could be associated with lower prices, even if it contributes to higher markups. Along these lines, contributions by Edmond et al. (2023) and Aghion et al. (2005) show that increased markups stemming from high market concentration may (though need not) harm welfare. Higher prices associated with concentration could shape firms' international input sourcing decisions, as recently analyzed using United States data (Antràs et al., 2017; Goldberg and Reed, 2023). To the extent that import monopolization raises costs of input procurement in global value chains, it may impede countries' efforts to diversify exports away from natural resources.

We provide evidence suggesting trade policy is a channel for import monopolization in natural resource-dependent economies. Figure 3.1b shows the commodity export share is positively associated with higher import tariffs. We also find the commodity export share is associated with greater use of non-tariff measures (NTMs) such as quotas, that limit entry into imports.

Trade protection increases import market concentration through direct and indirect mechanisms. The direct mechanism is that trade protection, *ceteris paribus*, both reduces demand and raises the cost of importing, which could lead firms to exit and increase concentration. Our evidence is consistent with this mechanism: imported product markets with higher tariffs are more concentrated, conditional on country-year and product-year fixed effects. The country-year fixed effects rule out this evidence being driven by differences in national market size or institutions, and the product-year fixed effects rule out this evidence being driven by differences in the global product market, like technology or the product's share in the import basket of a typical developing country.<sup>3</sup>

The indirect mechanism is tariff avoidance. Certain importers may be able to avoid paying tariffs, either by securing legal exemptions or by illegal tariff evasion. They thus achieve an asymmetric cost advantage that allows them to sell imports more cheaply than firms that cannot avoid tariffs, expanding their market share and increasing market concentration. The seminal literature on rent-seeking suggested as much, arguing tariff avoidance could explain the persistence of high tariffs, as elites that enjoy the advantage of avoidance are a constituency in favor of tariffs remaining high (Tullock, 1967; Krueger, 1974).

Our evidence is also supportive of this indirect mechanism, but only in countries with certain types of commodity exports. Isham et al. (2005) argue rent-seeking associated with the resource curse is greater in fuel exporting economies because fuel extraction is point-based, meaning revenues typically transit directly through government coffers, in contrast with economies exporting commodities with a more diffuse production base. Consistent with this, we find that control of corruption measured by expert surveys is weaker in economies dependent on fuel exports compared to economies specializing in exports of ores and metals or food commodities. In our sample, the association between tariffs and import market concentration is stronger for economies that are dependent on fuel exports than for those that are dependent on ores and metals or food. Using a measure of tariff evasion based on the underinvoicing of imports relative to exports reported by partner countries, we find a positive relationship between the tariff rate and tariff evasion in economies dependent on fuel exports, but not in economies dependent on other commodity exports. This evidence suggests that tariff evasion explains import market concentration

---

<sup>3</sup>Our data, which begin in 1997, succeed major tariff reforms in most countries, so we are unable to exploit within country-product variation in trade policy that would allow inclusion of country-product fixed effects in this analysis.

especially in fuel exporting economies.

Our paper is the first to systematically explore differences across countries in import market structure, contributing to several literatures beyond that about the resource curse. While the export sector has been the traditional focus of the trade and development literature, in developing countries the value of imports is about as large as that of exports, and many exported goods are produced using imported inputs (UNCTAD, 2021). We identify patterns in import market structure that contrast starkly with those in studies examining export market structure. Fernandes et al. (2016) use the same customs transactions data on the export side to document that higher-income economies have more exporting firms, but also more concentrated export markets. The pattern in import markets is the opposite. Higher-income economies have less concentrated import markets, independent of their commodity export intensity.

Our paper provides general insight into differences in market concentration across countries. Leone et al. (2024) describe how concentration leading to high markups has raised prices in Africa’s domestic cement industry, and conclude the reason for concentration is small national market size, rather than entry costs that are higher in Africa. In contrast, the present paper provides evidence of entry costs in importing that are unique to commodity export intensive economies and can account for higher costs in these economies.

The remainder of the paper is organized as follows. Section 3.2 describes the data and measurement of import market concentration. Section 3.3 shows the main result in Figure 3.1a is robust to a battery of controls and alternative regression specifications. Section 3.4 presents evidence that tariffs, non-tariff measures, and tariff evasion are mechanisms that concentrate import markets. Section 3.5 documents the positive association between domestic prices and import market concentration. Section 3.6 concludes.

## 3.2 Data and measurement

**Import Market Concentration.** Import market concentration is measured using a novel database of all firm-level import transactions recorded by customs authorities in 53 countries, geographically and institutionally diverse, and broadly representative of middle-income economies (see Table 3.5). The database has the same source as the World Bank Exporter Dynamics Database described by Fernandes et al. (2016) but includes import rather than export transactions. The sample period covers 1997-2021 but with different year coverage for each country. We eliminate observations in HS27 (oil, petroleum, natural gas, and coal) as their trade is not uniformly reported across countries’ customs data. Country-year total non-oil imports in our data are very similar to the corresponding total non-oil imports reported by COMTRADE (the average difference across country-years is 5.6%). COMTRADE data is accessed through WITS (World Bank, 2024b).

Measuring import market concentration requires defining a relevant market, or the set of products over which the firms in question have market power. While relevant market definition is the object of intense debate in antitrust litigation, a general principle is that it should include the set of goods that are close substitutes for the same set of consumers (Davis and Garcés, 2009). Benkard et al. (2021) note that economic census data, whereby firms are classified into industries, are collected at the point of production rather than consumption, and so may be less useful for analyzing the relation between market concentration and market power. In contrast, the Harmonized System (HS) product categories defined by the United Nations used in trade data classify goods with a similar end-use, and so are conceptually

like the relevant product markets in antitrust analysis. Following Fernandes et al. (2016), we use a time-consistent consolidated classification that concords and harmonizes product codes across the HS revisions present in the raw data.<sup>4</sup>

Our baseline measure of import market concentration is the Herfindahl-Hirschman Index (HHI) or

$$HHI_{c,i,t} = \sum_j^J \left( 100 \times \frac{M_{c,j,i,t}}{M_{c,i,t}} \right)^2$$

where  $M_{c,j,i,t}$  is the import value of firm  $j$  in country  $c$  of product  $i$  in year  $t$ ,  $J$  is the number of firms and  $M_{c,i,t}$  the total import value in the relevant import country, product market, and year. Values are measured including cost of freight and insurance (CIF) in United States dollars. Table 3.5 reports average and median HHI across HS 6-digit products by import country. We consider alternative measures of concentration: the share of the largest importing firm or the largest four importing firms, the number of importing firms, and the number of source countries, all defined by import country, product market and year. We also use unit values defined as the ratio of import value to import weight by country-product-year. Moreover, we measure the import share for a specific set of firms, those that are also exporters of commodities, identified based on a database of all firm-level export transactions recorded by customs authorities in the same 53 countries.

**Natural resource dependence.** We employ two measures capturing natural resource dependence: (i) the share of commodities in total merchandise exports from the World Development Indicators (World Bank, 2024a); and (ii) an index relying only on fluctuations in world commodity prices (Gruss and Kebhaj, 2019).<sup>5</sup> Means and standard deviations of these variables are reported in Table 3.6. Commodities and natural resources are defined broadly to include food (e.g., animal and vegetable oils and fats, beverages, fruits and vegetables, live animals); fuels (e.g., mineral fuels, lubricants, related materials); and ores and metals (e.g., crude fertilizers, metalliferous ores, non-ferrous metals).

Measure (i) captures both price and quantity variation in commodity exports, and is our preferred measure of natural resource dependence. In some specifications we separate this into exports of different types of commodities: food, fuels, and ores and metals. Measure (ii) captures only price variation. The advantage of this measure is that it is plausibly exogenous, since it excludes quantities determined by local production costs and world prices should not be affected by local exports as economies in our sample are small relative to the commodity markets they export to. A disadvantage of this measure is that price variation alone does not capture the dependence of an economy on natural resources for export revenue. In sum, there is a trade-off between "quantity" (export share) and "quality" (price index) of variation in natural resource dependence.

**Prices.** Prices are measured in two ways: (i) import unit values (import value divided by import weight); and (ii) national average prices of products collected by the International Comparison Program

<sup>4</sup>The consolidation incorporates HS revisions 1996 through 2017. A description of the methodology is available upon request.

<sup>5</sup>For country  $c$  in year  $t$  this index is given by  $\sum_{k=1}^K \log(P_{k,t})\omega_{c,k}$  where  $P_{k,t}$  is the world price of commodity  $k$  in year  $t$ , and  $\omega_{c,k}$  is the weight given by the average value of commodity  $k$ 's exports as a share of GDP across the 1980-2020 period. The index is scaled for each country so 100 equals the price index in 2012.

(ICP) (World Bank, 2017). Since import weight is not available for Chile, India, Mexico, and Vietnam, the results for unit values are based on a smaller sample.

**Other variables.** As measures of trade policy, applied tariff rates and NTMs for HS 6-digit products are sourced from TRAINS (UNCTAD, 2024). For tariff rates we use the simple average across origin countries of the applied tariff within an importing country-product-year. For NTMs, we focus on Chapters E “Non-automatic import licensing, quotas, prohibitions, quantity-control measures” and F “Price-control measures, including additional taxes and charges” as defined by UNCTAD (2019). We define an indicator that equals one if any of those NTMs are present within an importing country-product-year and zero otherwise. As controls, in some specifications we include log real GDP per capita at purchasing power parity and the most recent Gini coefficient from the World Development Indicators (World Bank, 2024a), and indexes of control of corruption and regulatory quality (Kaufmann et al., 2010). Means and standard deviations of these variables are reported in Table 3.6.

### 3.3 Main result

Figure 3.1a showed a significant correlation between the commodity export share and import market concentration. We demonstrate that this relationship is robust to a battery of controls, using the following regression:

$$HHI_{c,i,t} = \alpha_{c,i} + \delta_{i,t} + \beta_1 ExpCom_{c,t} + \beta_X X_{c,t} + \epsilon_{c,i,t} \quad (3.1)$$

where  $\alpha_{c,i}$  is a country-product market fixed effect that captures unobserved market characteristics that may explain concentration (e.g., market size, consumer preferences) and  $\delta_{i,t}$  is a product-year fixed effect that controls for global supply and demand factors in the product market that do not vary across countries (e.g., technological fixed costs, per-unit good value, logistics network requirements). The independent variable of interest is  $ExpCom_{c,t}$  defined as either the commodity share of exports or the export commodity price index, measured as differences from the sample median.  $X_{c,t}$  is a vector of country-year controls used in some specifications, also measured as differences from the sample median, and  $\epsilon_{c,i,t}$  is an error.

This specification has several differences compared to Figure 3.1a. First, this specification focuses on the association of commodity exports with the level of HHI rather than the log. This approach is selected so results can be compared to a benchmark of how large an increase in HHI is presumed to increase market power. United States Federal Trade Commission (FTC) and Department of Justice (DOJ) guidelines presume that an increase in the HHI of 100 will increase market power in a highly concentrated market.<sup>6</sup> A market with HHI in excess of 1,800 is considered highly concentrated. Second, compared to Figure 3.1a, the regression weighs product markets equally rather than by value, so as not to focus primarily on highest value products (e.g., autos) and instead characterize the average product market.

---

<sup>6</sup>See United States Federal Trade Commission and Department of Justice (2023). Previous FTC and DOJ guidelines presumed an increase in HHI of 200 would increase market power. Nocke and Whinston (2022) conclude that an increase in HHI between 100 and 200 can reduce consumer welfare given small efficiency gains from a horizontal merger that increases concentration.

**Results for all products.** Table 3.1, Panel A reports estimates of Equation 3.1 on a sample pooling across all imported products. Column 1 reports the raw correlation of the commodity export share (less its median) and HHI, with no fixed effects or controls. The mean dependent variable is 4,219, indicating on average highly concentrated markets according to FTC and DOJ guidelines (which could be problematic in markets in which there are none or few domestic suppliers). Here,  $\beta_1 = 901$  (standard error = 132). At the median, a one standard deviation increase in the commodity export share of 0.24 is associated with an increase in HHI equal to  $901 \times 0.24 = 216$ , more than sufficient to increase market power according to FTC and DOJ guidelines. Column 2 reports results adding product-year fixed effects, where  $\beta_1 = 1,238$  (169). The increase in the coefficient suggests that commodity exporting economies are likely to import products whose markets are less concentrated due to global factors, such as technology with lower fixed costs. Column 3 adds country-product fixed effects, which isolates only variation in HHI due to within-country over-time variation in the commodity export share. Here  $\beta_1 = 438$  (228). The differences between Columns 1, 2, and 3 suggest that some, but not all, of the association between HHI and natural resource dependence is due to differences in product mix.<sup>7</sup>

Column 4 adds several country-year control variables: (i) the log real GDP per capita, a proxy for market size and level of development; (ii) the Gini coefficient, a measure of inequality, which could also shape market size; and experts' perceptions of (iii) control of corruption; and (iv) regulatory quality. The estimate of  $\beta_1$  is robust to their inclusion: it is 358 (170), which is lower than, but not statistically distinguishable from, the coefficient in Column 3 at standard significance levels. The coefficients on the controls are informative. Higher GDP per capita is associated with lower import market concentration. This is consistent with richer countries having larger import markets and therefore being able to sustain more entrants. This result is in contrast to the findings of Fernandes et al. (2016) that exporter concentration within a country rises with GDP per capita and suggests potential scale economies in importing. Higher control of corruption and regulatory quality are also associated with lower import market concentration, suggesting that weak institutions can concentrate markets. Most surprising is the result that greater inequality is associated with lower import market concentration. This may reflect the hypothesis that in middle-income countries imports are consumed by wealthier individuals, whereas domestic production is consumed by the poor and the middle class. Hence, inequality could increase the market size for imports, though we do not test this hypothesis in this paper.

In subsequent analysis, we do not include these controls in our main specification as they could be “bad controls” in the Angrist and Pischke sense: outcomes of the independent variable that cause the dependent variable. For instance, weak control of corruption or low quality regulation, which enable tariff avoidance, could be mechanisms through which commodity export dependence leads to import concentration. To the extent that income and inequality proxy for institutional weakness, they are also subject to this critique. From this perspective, it is difficult to interpret the relationship between natural resource dependence and import concentration conditional on these country-year factors.

Columns 5 and 6 use the export commodity price index in the place of the commodity export share. In Column 5, which includes country-product and product-year fixed effects but no controls,  $\beta_1 = 1,050$  (614). This implies that a one standard deviation increase in the price index of 0.03 is associated with an increase in HHI of  $1,050 \times 0.03 = 31.5$ , much smaller than a one standard deviation increase in the commodity export share, and not economically significant. In Column 6, an economically similar result

---

<sup>7</sup>The positive impact of commodity exports on import concentration holds in a cross country regression in which the dependent variable is the simple average of the HHI across products and the independent variable is the commodity export share including country and year fixed effects.

obtains when adding the country-year controls. These results suggest that economically relevant variation in the HHI is driven by the quantity of commodity exports rather than their price alone. Nonetheless, these results exploiting exogenous international price variation give us confidence the association between natural resource dependence and import market concentration is causal.

**Results by product category.** Table 3.1, Panel B explores the heterogeneous association between commodity export intensity and import market concentration by splitting the sample between goods with different end uses: capital goods, consumption goods, and primary goods according to the United Nations Broad Economic Categories. Examples of primary goods are iron ore, raw sugar, soybeans, and wheat; examples of capital goods are transmission apparatuses, data processing machines, and airplanes; examples of consumption goods are medicaments, small vehicles, and televisions. Columns 1, 2, and 3 report the associations of the commodity export share and HHI of imported primary, capital, and consumption goods markets respectively; Columns 4, 5, and 6 report the associations of the export commodity price index and HHI of those same goods markets. For the export commodity share, there is no significant heterogeneity, but for the export commodity price index there is significant heterogeneity, with the association being much stronger for primary and consumption goods.

**Results for alternative measures of import concentration.** To complement our baseline results using HHI, we present in Table 3.2 estimates of Equation 3.1 using as dependent variables alternative import market concentration measures. The results show that commodity exports result in higher concentration of imports in the top firm (column 1) or the top four firms (column 2). Focusing on different extensive margins of imports, the evidence implies that countries more dependent on commodity exports have significantly lower numbers of importing firms (column 3) and import sources (column 4). As a manifestation of import concentration, we consider unit values per market and find them to be higher for countries with higher commodity export shares or price indexes (column 5). Finally, higher commodity export quantities or prices may increase the import market share of firms that are also commodity exporters, and thus import concentration, though the effect is not statistically significant (column 6).

### 3.4 Trade policy mechanisms for import monopolization

Figure 3.1b showed that commodity export dependent economies have greater trade protection. There are multiple potential reasons for this, including industrial policy intended to develop infant industries and vested interests that gain commercial advantages from avoiding tariffs. Whatever the reason for this pattern, in this section we present evidence that trade protection can concentrate import markets. We consider two protectionist trade policies: tariffs and non-tariff measures imposed on imports.

**Tariffs.** Tariffs could cause concentration through three mechanisms:

1. Demand decrease: When passed through to consumers, tariffs raise prices and decrease demand, potentially leading to exit of importing firms and increased concentration of market shares.<sup>8</sup>

---

<sup>8</sup>We confirm in our sample that import markets shrink as they become more concentrated: the elasticity of import value to HHI, conditional on country-product fixed effects, is -0.24 (0.002).

2. Symmetric cost increase: Tariffs raise working capital requirements and financing costs, since they must be paid upon import before goods are sold, potentially leading to exit of importing firms and increased concentration of market shares.
3. Asymmetric cost increase due to tariff evasion: In a weak governance environment and in the presence of corruption, tariff evasion allows evading importing firms to increase their costs by less than others, increasing their market share relative to firms that do not evade.

We test for these mechanisms using a mediation analysis that evaluates the association of tariffs and import market concentration, and how that is mediated by commodity exports. Table 3.3 reports regressions of the following form:

$$y_{i,c,t} = \delta_{c,t} + \delta_{i,t} + \beta_2 T_{i,c,t} + \beta_3 (T_{i,c,t} \times ExpCom_{c,t}) + v_{i,c,t} \quad (3.2)$$

where  $y_{i,c,t}$  is an outcome, either HHI or a measure of tariff evasion, the latter to identify the role of corruption;  $T_{i,c,t}$  is a measure of trade policy, either the tariff rate  $\in [0, 1]$  or a dummy variable  $\in \{0, 1\}$  indicating the presence of an NTM;  $\delta_{c,t}$  is a country-year fixed effect subsuming national characteristics, including market size and commodity export dependence of country  $c$ ;  $\delta_{i,t}$  is a product-year fixed effect capturing global supply and demand for product  $i$ ; and  $v_{i,c,t}$  is an error. Country-product fixed effects are excluded so the identifying variation is across products within countries. The coefficients of interest are  $\beta_2$ , the direct association of trade policy and import market concentration, and  $\beta_3$ , the mediated association.

The estimate in Column 1 of Table 3.3 is consistent with the demand and symmetric cost increase channels, as  $\beta_2 = 3,514$  (1,019), indicating higher tariffs are associated with more concentrated markets. This relationship is economically significant, with a standard deviation increase in the tariff rate of 0.05 (or 5 percentage points) raising HHI by  $3,514 \times 0.05 = 176$ , above the amount presumed to increase market power in current FTC and DOJ guidelines.

We test for the asymmetric cost increase channel by measuring tariff evasion directly and exploiting variation in the type of commodity export that is associated with rent-seeking. Isham et al. (2005) find that rent-seeking associated with the resource curse is greatest when countries export ‘point-based’ resources, whose revenues transit directly through government coffers, as opposed to ‘diffuse’ resources whose revenues flow to many small holders. Oil is the quintessential point-based commodity whose extraction is often controlled by the state and is associated with state capture (see, e.g., Ross, 2012). The anecdotes of import monopolies cited in the introduction are in oil-exporting states. In contrast, production of food crops is typically diffuse. Ores and metals are an ambiguous case: industrial extraction can be capital-intensive and thus point-based, but labor-intensive artisanal mining with diffuse ownership can account for a substantial portion of output in some countries due to variation in geography (Rigterink et al., 2022). Consistent with these arguments, Table 3.7 shows there is less control of corruption as the commodity export share increases, but this relationship is strongest for countries with larger fuel exports, weakest for countries with larger food exports, and of intermediate magnitude for countries with larger ore and metals exports. Table 3.7 also shows there is no statistically significant relationship between changes in the commodity export price index and control of corruption, suggesting that commodity export quantities generate important variation in corruption beyond price. This finding motivates our focus on the commodity export share as an independent variable in this analysis.

Column 2 of Table 3.3 reports estimates of Equation (3.2) where  $ExpCom_{c,t}$  is separated into three variables, each indicating the share of exports in these three commodity types, measured as differences

from the median. In this specification  $\beta_2 = 1,794$  (1,073), which implies that a standard deviation increase in the tariff rate increases HHI by  $1,794 \times 0.05 = 90$  points. The coefficient on the interaction between tariff and fuel export share is positive  $\beta_3^{fuel} = 8,696$  (1,907) indicating that the positive association between tariffs and concentration is much stronger in fuel exporting economies: at the median, a 5 percentage point increase in the tariff rate (the standard deviation) and an 18 percentage point increase in fuel export share (the standard deviation) will raise HHI by about  $8,696 \times 0.05 \times 0.18 = 78$  points. The interaction term for ores and metals exports is positive, though much smaller, and the interaction term for food exports is negative. The result is clear that tariffs contribute to import market concentration, but especially in fuel exporting economies.

To confirm that the interaction effect is due to greater tariff evasion in fuel exporting economies, we use a proxy for tariff evasion as the dependent variable in the same regression. We use the measure of Fisman and Wei (2004, note 6) based on import underinvoicing:

$$\text{evasion gap}_{c,i,t} = \frac{(\text{exports}_{w,i,c,t} - \text{imports}_{c,i,t})}{(\text{exports}_{w,i,c,t} + \text{imports}_{c,i,t})}$$

where exports are total exports by all countries  $w$  of product  $i$  to destination country  $c$  (one of our importing countries) in year  $t$  reported in COMTRADE, and imports are as reported in our customs data. Results are reported in Column 3 of Table 3.3. The interaction coefficients follow a similar pattern as in Column 2, where the coefficient on the interaction between tariff and fuel export share is positive  $\beta_3^{fuel} = 0.36$  (0.17), indicating greater evasion, but the coefficients on the interaction between tariff and ores and metals export share and food export share is negative. Higher tariffs are associated with higher values of the proxy for tariff evasion in fuel exporting economies, but not in ores and metals or food exporting economies. This result suggests that while the demand and symmetric cost increase mechanisms of tariffs explain import market concentration in all commodity exporting economies, the asymmetric cost increase mechanism through tariff evasion has explanatory power in fuel exporting economies. This result is consistent with less control of corruption in fuel exporting economies.

**Non-tariff measures.** NTMs, in particular measures that restrict entry or pricing among importers, namely licenses, quotas, prohibitions, and price-control measures, including additional taxes or fees paid at customs, are other forms of trade protection that could influence import market concentration. The mean of our NTM indicator is 0.42, indicating these NTMs are quite common. Regressing this indicator on the commodity export share (less its median) in a linear probability model yields a positive coefficient on the commodity export share equal to 0.29 (0.12), indicating NTMs are more common in countries with a higher commodity export share. In our sample, at the median, an increase in the commodity export share by one standard deviation, or 24 percentage points, increases the likelihood of an NTM by  $0.29 \times 0.24 = 0.07$  or 7 percentage points.

Columns 4, 5 and 6 of Table 3.3 replicate Columns 1, 2 and 3, but where the measure of trade protection is the NTM indicator. In Column 4, as in Column 2, the coefficient  $\beta_2$  is positive, though quantitatively the effect is smaller. The coefficient  $\beta_3$  is also positive. However, the coefficients are not statistically significant. In Column 5, we again separate out the different types of commodity exports. The interactions of the NTM indicator with fuel export share and the ores and metals export share are positive, while the interaction with food exports is negative. Nevertheless, only the interaction of the NTM indicator with food export share is statistically significant. These results indicate that NTMs can explain import market concentration, especially in ores and metals dependent economies.

The dependent variable in Column 6 is the proxy for tariff evasion, as in Column 3. In contrast to Column 3, the interaction effect for the fuel export share is negative here, indicating NTMs are not significantly associated with greater evasion in fuel exporting economies. An explanation for this is that since NTMs provide legal asymmetric cost advantages (e.g., for firms with access to quotas), they make tariff evasion less attractive as a means to maintain market share in fuel exporting economies.

### 3.5 Import monopolization and domestic prices

A manifestation of the resource curse is higher prices in commodity exporting economies. Sachs and Warner (2001) showed that commodity export intensive economies had higher price levels relative to the global average in 1979. A question is whether import monopolization can account for this phenomenon. In theory, the relationship between concentration and prices is not obvious. If higher concentration is associated with higher fixed costs but lower marginal costs of importing, it could be associated with lower prices, even if also associated with higher markups (e.g., as in a differentiated products Nash-in-prices game). Alternatively, higher concentration could be associated with higher prices, if the associated markups outweigh any marginal cost savings.

To distinguish between these hypotheses, we relate import market concentration to ICP data on the average local currency domestic prices of 685 narrowly defined goods (i.e., parboiled long-grain rice, basmati rice, brown rice—family pack). From this correlation, we infer whether, on average, marginal cost differences associated with import market concentration outweighs the markups associated with concentration in determining equilibrium prices. The spirit of this exercise is an accounting decomposition, not an attempt to estimate a causal relationship between prices and concentration. The industrial organization literature has long argued that such causal effect is not well-defined, because a variety of economic mechanisms can cause a (positive or negative) correlation between prices and concentration (see Miller et al., 2022). Our exercise is simply to estimate the correlation between prices and concentration, conditional on product-year fixed effects that account for global supply and demand.

Define the price of product  $i$  in country  $c$  and year  $t$  as  $P_{c,i,t}^{LCU}$ . The ICP provides these prices for two years, 2011 and 2017. Formally, we estimate the regression:

$$\ln(P_{c,i,t}^{LCU}) = \alpha_{i,t} + \beta_4 \ln(HHI_{c,s(i),t}) + \beta_5 E^{LCU/USD} + \beta_6 \mathbf{X}_{c,t} + \epsilon_{c,i,t} \quad (3.3)$$

where  $\alpha_{i,t}$  is a product-year fixed effect. Import market concentration  $HHI_{c,s(i),t}$  is calculated at the level of the ICP basic heading  $s$ , one of 88 product groupings that include multiple products  $i$ . An example is the basic heading for rice, which includes 9 varieties, including parboiled long-grain rice, basmati rice, and brown rice—family pack. While at least one variety of rice is observed per country, not all varieties are observed in every country. Calculating the HHI at the basic heading level ensures the market definition is consistent and comparable across countries.<sup>9</sup>

Estimates of Equation 3.3 are reported in Table 3.4. In Column (1), the coefficient  $\beta_4 = 0.07$  (0.02) indicates a 1 percent increase in HHI (i.e., an increase of 42 units, since the mean value of HHI is 4,211 in Table 3.1, Panel A, Column 1) is associated with 0.07 percent higher prices. In Column (2), country-year controls are included and the coefficient falls to  $\beta_4 = 0.04$  (0.02), though it remains positive and

<sup>9</sup>When experimenting with specifications we found the log of HHI to fit better than the level of HHI, consistent with the non-linear associations of HHI with prices, conditional on marginal cost, in the Cournot model.

statistically significant at the 5 percent level. The controls apparently explain some variation in prices correlated with HHI, but not all of it.

The value added of these regressions, beyond the magnitude of the coefficient, is that they indicate that markups associated with higher concentration appear to outweigh any lower marginal costs of importing, at least on average. This is consistent with a model of a competitive world price and importers who are price-takers but have market power in local distribution. Importing firms in India, for example, have been shown to conform to this model (De Loecker et al., 2016). The association between import concentration and higher prices—a symptom of the resource curse—suggests import concentration is a novel channel through which the curse materializes. An exciting avenue for future research would exploit data on prices, domestic consumption, and market concentration to estimate demand and evaluate the consequences of import monopolization for consumer welfare.

### 3.6 Concluding remarks

This paper identifies a novel channel for the ‘resource curse’: the monopolization of imports. Commodity export intensity is associated with more concentrated import markets, which can account for the higher price levels typically attributed to the Dutch disease. Trade policy measures and tariff evasion are mechanisms contributing to import market concentration.

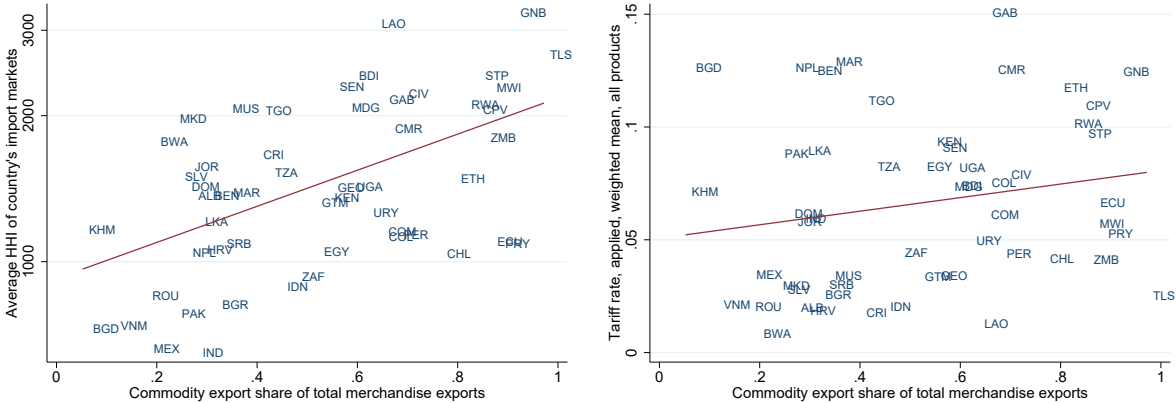
While economies’ export orientation has been the focus of the trade and development literature, the role of imports and import market structure has been overlooked. Openness to imports is generally thought to increase competition in an economy, but this effect could attenuate severely in the presence of importer market power. Further research could explore which domestic value chains can emerge from more competitive import markets, especially in commodity export intensive economies.

Given the size of the import sector in developing countries, the policy agenda to de-monopolize imports is paramount. Direct policy interventions to increase import competition include reforms that lower tariffs and remove NTMs such as quotas that restrict entry. The creation or strengthening of credible independent local bodies will help promote competition in general and in the import sector in particular. Fighting anti-competitive practices can prevent the perpetuation of oligarchies who constitute an important lobby and can seize control of liberalization attempts. Another integral part of a competition agenda is transparency and data availability. In many countries, barriers to entry into the import sector like licenses and the exact role of state-owned enterprises are not easily measured. The flow of funds between public banks and other state-owned enterprises is opaque and leads to asymmetric cost advantages. Transparent public procurement and the use of auctions to allocate import licenses could also increase import market competition.

### 3.7 Exhibits

Figure 3.1: Import market concentration in natural resource-dependent countries, trade protection

(a) Import market concentration                      (b) Trade protection



Notes: Panel A displays the average HHI of a country's import markets and the country's average commodity export share, where averages are taken over years. Within years, the HHI is the import value-weighted average of the log of the HHI across HS 6-digit products for a given country. The slope of the best fit line in Panel A is 0.86 (standard error = 0.19). Panel B displays the import value-weighted average tariff rate of a country and the country's average commodity export share, where averages are taken over years. The slope of the best fit line in Panel B is 0.031 (0.022).

Table 3.1: Import market concentration and commodity exports

Dependent variable	(1) HHI	(2) HHI	(3) HHI	(4) HHI	(5) HHI	(6) HHI
Panel A) All Products						
Commodity export share $\in [0, 1]$	901*** (132)	1,238*** (169)	438* (228)	358** (170)		
Export commodity price index (1=2012)					1,050* (614)	767 (488)
Log GDP per capita				-665*** (163)		-684*** (161)
Gini coefficient $\in [0, 1]$				-2,904*** (574)		-1,645*** (553)
Control of corruption				-484*** (65)		-553*** (64)
Regulatory quality				-391*** (74)		-291*** (74)
R-squared	0.00	0.40	0.75	0.76	0.75	0.76
Number of observations	2,190,652	2,188,974	2,176,363	1,716,738	2,249,099	1,789,513
Dependent variable mean	4,219	4,216	4,198	4,121	4,184	4,107
Country-product fixed effects	No	No	Yes	Yes	Yes	Yes
Product-year fixed effects	No	Yes	Yes	Yes	Yes	Yes
Panel B) By Product Category						
Broad Economic Category (BEC)	Primary	Capital	Consumption	Primary	Capital	Consumption
Commodity export share [0,1]	500** (219)	489* (254)	458* (264)			
Export commodity price index (1=2012)				1,141* (581)	338 (769)	1,616** (686)
R-squared	0.72	0.73	0.72	0.72	0.73	0.72
Number of observations	103,755	334,895	613,310	107,580	345,683	632,973
Dependent variable mean	6,015	3,544	3,630	5,990	3,529	3,622
Country-product fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Product-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

The dependent variable is the HHI, i.e., the sum of squared percent import market shares in a country-product-year, which has a maximum value of 10,000. Products are classified by the 6 digit Harmonized System. The number of observations summed across columns (1)-(3) or (4)-(6) in Panel B is smaller than the total number of import markets in columns (3) and (5), respectively, of Panel A because intermediates in the BEC product categories are not considered in Panel B. Standard errors clustered at the country-year level are in parentheses. \*\*\*, \*\*, and \* indicate significance at 1%, 5%, and 10% levels, respectively.

Table 3.2: Alternative measures of import market concentration

Dependent variable	(1) Share of the largest importer	(2) Share of the 4 largest importers	(3) Log number of importers	(4) Log number of source countries	(5) Log unit value	(6) Share of commodity exporters
Panel A)						
Commodity export share $\in [0, 1]$	0.04* (0.02)	0.02 (0.01)	-0.25* (0.13)	-0.23*** (0.08)	0.33* (0.18)	0.00 (0.02)
R-squared	0.73	0.85	0.94	0.90	0.82	0.56
Number of observations	2,176,363	2,176,363	2,176,363	2,176,363	1,818,137	1,969,637
Dependent variable mean	0.530	0.807	2.616	1.762	1.739	0.189
Panel B)						
Export commodity price index (1=2012)	0.09* (0.05)	0.04 (0.04)	-0.40 (0.35)	-0.58*** (0.20)	0.95*** (0.27)	0.01 (0.06)
Number of observations	2,249,099	2,249,099	2,249,099	2,249,099	1,883,317	2,034,411
R-squared	0.73	0.85	0.94	0.90	0.82	0.57
Dependent variable mean	0.53	0.81	2.63	1.77	1.74	0.19
Country-product fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Product-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Dependent variables in columns 1, 2, and 6 range from 0 to 1. Standard errors clustered at the country-year level are in parentheses. \*\*\*, \*\*, and \* indicate significance at 1%, 5%, and 10% levels, respectively.

Table 3.3: Trade policy mechanisms for import market concentration

Dependent variable	(1) HHI	(2) HHI	(3) Evasion $\in [-1, 1]$	(4) HHI	(5) HHI	(6) Evasion $\in [-1, 1]$
Tariff $\in [0, 1]$	3,514*** (1,019)	1,794* (1,073)	-0.48*** (0.13)			
Commodity export share x Tariff	-1,636 (1,399)					
Fuel export share x Tariff		8,696*** (1,907)	0.36** (0.17)			
Ores and metals export share x Tariff		1,459 (1,827)	-0.24 (0.18)			
Food export share x Tariff		-9,887*** (1,551)	-0.93*** (0.16)			
NTM $\in \{0, 1\}$				35 (40)	1 (47)	-0.00 (0.01)
Commodity export share x NTM				58 (137)		
Fuel export share x NTM					146 (186)	-0.02 (0.02)
Ores and metals export share x NTM					532*** (201)	0.03 (0.03)
Food export share x NTM					-126 (174)	-0.04** (0.02)
Number of observations	1,848,851	1,848,851	1,848,851	342,148	342,148	342,148
R-squared	0.47	0.47	0.19	0.52	0.52	0.17
Dependent variable mean	3,896	3,896	0.0439	3,429	3,429	0.03
Country-year fixed effects	Yes	Yes	Yes	No	Yes	Yes
Product-year fixed effects	Yes	Yes	Yes	No	No	No

Notes: Commodity, fuel, ores and metals, and food exports shares are measured in difference from their median value. Non-tariff measures (NTMs) are those those in Chapters E and F of the UNCTAD classification. Standard errors clustered at the country-year and country-product levels are in parentheses. \*\*\*, \*\*, and \* indicate significance at 1%, 5%, and 10% levels, respectively.

Table 3.4: Import market concentration and domestic prices

Dependent variable	(1) Log domestic price	(2) Log domestic price
Log HHI	0.07*** (0.02)	0.04** (0.02)
Log nominal exchange rate with US dollar	0.92*** (0.01)	0.87*** (0.01)
Log GDP per capita		-0.04 (0.02)
Gini coefficient		5.34*** (0.31)
Control of Corruption		0.14*** (0.02)
Regulatory Quality		-0.23*** (0.03)
R-squared	0.91	0.90
Number of observations	19,215	15,900
Dependent variable mean	6.53	6.80
Product-year fixed effects	Yes	Yes

*Notes:* The HHI is calculated at the level of the ICP basic heading level (e.g., rice) which is constructed to include at least one product in each country and maps roughly one-to-one to 2 digit HS codes. There are 88 distinct basic headings. Domestic prices are observed for 685 distinct goods (e.g., long grain rice; basmati rice) though not all are observed in each country. Standard errors clustered at the ICP basic heading-year are in parentheses. \*\*\*, \*\*, and \* indicate significance at 1%, 5%, and 10% levels, respectively.

### 3.8 Bibliography

- Aghion, P., Bloom, N., Blundell, R., Griffith, R., and Howitt, P. (2005). Competition and innovation: An inverted-u relationship. *The Quarterly Journal of Economics*, 120(2):701–728.
- Antràs, P., Fort, T. C., and Tintelnot, F. (2017). The margins of global sourcing: Theory and evidence from us firms. *American Economic Review*, 107(9):2514–2564.
- Arezki, R., Ramey, V. A., and Sheng, L. (2017). News shocks in open economies: Evidence from giant oil discoveries. *The Quarterly Journal of Economics*, 132(1):103–155.
- Benkard, C. L., Yurukoglu, A., and Zhang, A. L. (2021). Concentration in product markets. Working Paper 28745, National Bureau of Economic Research.
- Davis, P. and Garcés, E. (2009). *Quantitative techniques for competition and antitrust analysis*. Princeton University Press.
- De Loecker, J., Goldberg, P. K., Khandelwal, A. K., and Pavcnik, N. (2016). Prices, markups, and trade reform. *Econometrica*, 84(2):445–510.
- Edmond, C., Midrigan, V., and Xu, D. Y. (2023). How costly are markups? *Journal of Political Economy*, 131(7):1619–1675.
- Fernandes, A. M., Freund, C., and Pierola, M. D. (2016). Exporter behavior, country size and stage of development: Evidence from the exporter dynamics database. *Journal of Development Economics*, 119:121–137.
- Fisman, R. and Wei, S.-J. (2004). Tax rates and tax evasion: evidence from “missing imports” in china. *Journal of Political Economy*, 112(2):471–496.
- Frankel, J. A. (2012). The natural resource curse: A survey of diagnoses and some prescriptions. *Commodity price volatility and inclusive growth in low-income countries*, pages 7–34.
- Freund, C. (2016). *Rich People Poor Countries: The Rise of Emerging-Market Tycoons and their Mega Firms*. Peterson Institute for International Economics.
- Goldberg, P. K. and Reed, T. (2023). Is the global economy deglobalizing? if so, why? and what is next? *Brookings Papers on Economic Activity*.
- Gruss, B. and Kebhaj, S. (2019). *Commodity terms of trade: A new database*. International Monetary Fund.
- Harding, T. and Venables, A. J. (2016). The implications of natural resource exports for nonresource trade. *IMF Economic Review*, 64(2):268–302.
- Isham, J., Woolcock, M., Pritchett, L., and Busby, G. (2005). The varieties of resource experience: natural resource export structures and the political economy of economic growth. *The World Bank Economic Review*, 19(2):141–174.
- Kaufmann, D., Kraay, A., and Mastruzzi, M. (2010). *Worldwide Governance Indicators*. World Bank.

- Krueger, A. O. (1974). The political economy of the rent-seeking society. *The American Economic Review*, 64(3):291–303.
- Leone, F., Macchiavello, R., and Reed, T. (2024). The high and falling price of cement in africa. *American Economic Journal: Applied Economics*.
- Miller, N., Berry, S., Scott Morton, F., Baker, J., Bresnahan, T., Gaynor, M., Gilbert, R., Hay, G., Jin, G., Kobayashi, B., et al. (2022). On the misuse of regressions of price on the hhi in merger review. *Journal of Antitrust Enforcement*, 10(2):248–259.
- Nocke, V. and Whinston, M. D. (2022). Concentration thresholds for horizontal mergers. *American Economic Review*, 112(6):1915–48.
- Rigterink, A., Ghani, T., Lozano, J., and Shapiro, J. (2022). Mining competition and violent conflict in africa: Pitting against each other. *University of Washington mimeo*.
- Robinson, J. A., Torvik, R., and Verdier, T. (2014). Political foundations of the resource curse: A simplification and a comment. *Journal of Development Economics*, 106:194–198.
- Ross, M. L. (2012). The oil curse. In *The Oil Curse*. Princeton University Press.
- Sachs, J. D. and Warner, A. M. (2001). The curse of natural resources. *European Economic Review*, 45(4-6):827–838.
- Tornell, A. and Lane, P. R. (1999). The voracity effect. *American Economic Review*, 89(1):22–46.
- Tullock, G. (1967). The welfare costs of tariffs, monopolies, and theft. *Economic inquiry*, 5(3):224–232.
- UNCTAD (2019). International classification of non-tariff measures. Technical report.
- UNCTAD (2021). Key statistics and trends in international trade 2020.
- UNCTAD (2024). Trains. <https://trainsonline.unctad.org/home>. Accessed February 2024.
- United States Federal Trade Commission and Department of Justice (2023). Merger guidelines.
- Van der Ploeg, F. (2011). Natural resources: curse or blessing? *Journal of Economic Literature*, 49(2):366–420.
- Venables, A. J. (2016). Using natural resources for development: why has it proven so difficult? *Journal of Economic Perspectives*, 30(1):161–84.
- World Bank (2011, 2017). Average prices from the international comparison program. <https://thedocs.worldbank.org/en/doc/550841576791478325-0050022019/original/ICPDataAccessandArchivePolicyDecember2019.pdf>.
- World Bank (2024a). World development indicators. <https://datatopics.worldbank.org/world-development-indicators/>. Accessed June 20, 2024.
- World Bank (2024b). World integrated trade system. Accessed February 12, 2024.

3.9 Online Supplement to  
Arezki, Fernandes, Merchán, Nguyen, and Reed  
“Natural Resource Dependence  
and Monopolized Imports”

Table 3.5: Import market structure and commodity exports by country

No.	Country	Min. year	Max. year	Median HHI	Average HHI	Commodity export share	Fuel export share	Ores & metal export share	Food export share
1	Albania	2007	2021	3285	4258	0.27	0.11	0.09	0.07
2	Bangladesh	2005	2015	2885	3983	0.06	0.01	0.00	0.04
3	Benin	2016	2021	5632	5949	0.30	0.00	0.01	0.30
4	Botswana	2004	2010	3321	4201	0.20	0.00	0.16	0.03
5	Bulgaria	2001	2006	2555	3531	0.32	0.09	0.13	0.10
6	Burundi	2010	2021	6408	6413	0.59	0.00	0.06	0.53
7	Cabo Verde	2010	2021	4069	4914	0.84	0.00	0.00	0.84
8	Cambodia	2016	2021	4489	5134	0.05	0.00	0.00	0.05
9	Cameroon	2007	2017	4019	4785	0.67	0.34	0.06	0.27
10	Chile	1997	2021	2357	3403	0.77	0.01	0.53	0.22
11	Colombia	1997	2021	2468	3465	0.65	0.47	0.01	0.17
12	Comoros	2016	2021	5317	5730	0.65	0.00	0.01	0.64
13	Costa Rica	2010	2021	2922	3926	0.40	0.00	0.01	0.38
14	Cote d'Ivoire	2000	2021	4212	4915	0.69	0.20	0.00	0.49
15	Croatia	2007	2015	2167	3257	0.29	0.13	0.04	0.12
16	Dominican Republic	2002	2021	3081	4052	0.26	0.04	0.02	0.20
17	Ecuador	2002	2021	2739	3791	0.87	0.48	0.01	0.38
18	Egypt, Arab Republic	2005	2016	2442	3495	0.52	0.33	0.05	0.14
19	El Salvador	2006	2021	3304	4252	0.24	0.03	0.01	0.20
20	Ethiopia	2012	2021	3756	4605	0.79	0.00	0.00	0.79
21	Gabon	2009	2021	4471	5134	0.65	0.62	0.03	0.00
22	Georgia	2000	2021	3689	4582	0.55	0.04	0.21	0.29
23	Guatemala	2005	2013	3082	4070	0.52	0.05	0.05	0.41
24	Guinea-Bissau	2014	2018	8068	7059	0.91	0.00	0.00	0.91
25	India	2016	2021	1527	2516	0.28	0.13	0.04	0.11
26	Indonesia	2020	2020	1978	2929	0.45	0.16	0.06	0.24
27	Jordan	2008	2021	3837	4688	0.26	0.01	0.09	0.17
28	Kenya	2006	2021	3403	4310	0.54	0.04	0.04	0.46
29	Lao PDR	2015	2021	5641	5998	0.64	0.17	0.25	0.21
30	Madagascar	2007	2021	4578	5197	0.58	0.04	0.20	0.34
31	Malawi	2005	2021	4767	5321	0.87	0.00	0.03	0.84
32	Mauritius	2000	2021	3554	4431	0.34	0.00	0.01	0.33
33	Mexico	2011	2021	1598	2539	0.18	0.08	0.03	0.07
34	Morocco	2002	2013	2417	3504	0.34	0.04	0.10	0.20
35	Nepal	2011	2014	2886	3898	0.26	0.00	0.04	0.22
36	North Macedonia	2008	2018	3213	4187	0.23	0.04	0.06	0.13
37	Pakistan	2019	2021	2410	3623	0.24	0.01	0.04	0.19
38	Paraguay	2000	2021	3338	4328	0.88	0.35	0.01	0.53
39	Peru	2000	2021	2568	3567	0.68	0.08	0.41	0.19
40	Romania	2005	2011	1864	2806	0.18	0.08	0.04	0.06
41	Rwanda	2002	2016	5198	5582	0.82	0.00	0.36	0.46
42	Sao Tome and Principe	2017	2019	5166	5714	0.84	0.00	0.02	0.82
43	Senegal	2000	2020	4319	5026	0.55	0.17	0.05	0.33
44	Serbia	2006	2007	2377	3403	0.33	0.03	0.11	0.19
45	South Africa	2010	2021	2108	3058	0.48	0.10	0.27	0.10
46	Sri Lanka	2016	2021	3107	4040	0.28	0.02	0.01	0.25
47	Tanzania	2003	2021	3608	4477	0.43	0.01	0.10	0.32
48	Timor-Leste	2018	2021	4757	5357	0.97	0.67	0.00	0.30
49	Togo	2015	2021	5824	6157	0.41	0.06	0.13	0.22
50	Uganda	2011	2020	3669	4536	0.59	0.03	0.01	0.55
51	Uruguay	2001	2021	3118	4105	0.62	0.02	0.00	0.59
52	Vietnam	2018	2021	1569	2577	0.12	0.01	0.01	0.09
53	Zambia	2010	2021	3567	4451	0.85	0.01	0.76	0.08

Table 3.6: Summary statistics of independent variables and controls

Variable	Mean	Std. Dev.
Commodity export share	.53	.24
Food export share	.31	.22
Fuel export share	.12	.18
Ores and metals export share	.11	.17
Commodity price index (1=2012)	.99	.03
Log GDP per capita	8.82	.85
Gini coefficient	.45	.08
Control of corruption	-.32	.67
Regulatory quality	-.12	.61
Tariff, applied	.08	.05
NTM, Chapter E or F	.44	.50
Evasion gap	.05	.51

*Notes:* Summary statistics are based on the estimating sample for all products used in Table 3.1.

Table 3.7: Natural resource dependence and control of corruption

Dependent variable	(1) Control of corruption	(2) Control of corruption	(3) Control of corruption
Commodity export share $\in [0, 1]$	-0.39** (0.17)		
Fuel export share $\in [0, 1]$		-0.64*** (0.14)	
Ores and metals export share $\in [0, 1]$		-0.27 (0.26)	
Food export share $\in [0, 1]$		-0.02 (0.23)	
Export commodity price index (1=2012)			-0.59 (0.48)
Log GDP per capita	0.58*** (0.11)	0.65*** (0.11)	0.59*** (0.11)
Gini coefficient	0.90* (0.51)	1.18** (0.52)	0.55 (0.43)
Regulatory quality	0.52*** (0.06)	0.49*** (0.06)	0.48*** (0.06)
R-squared	0.95	0.95	0.95
Number of observations	488	488	508
Dependent variable mean	-0.301	-0.301	-0.313
Country fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes

Note: Robust standard errors are in parentheses. \*\*\*, \*\*, and \* indicate significance at 1%, 5%, and 10% levels, respectively.

**3.10 Coauthors'**

**approval**

January 2024

Dr. Hauke Jelschen

Coordinator doctoral programme Quantitative Economics

Kiel University, Germany

Dear Hauke,

I would like to confirm that Federico Alberto Merchan Alvarez, PhD student at Kiel University, made an essential, genuine, and identifiable contribution to the content of “*Natural resource dependence and monopolized imports*” scientific paper according to the DFG Guidelines for Safeguarding Good Research Practice - Code of Conduct.<sup>1</sup> Therefore, he is one of the co-authors of the mentioned paper and he can include it as part of his doctoral dissertation at Kiel University.

Specifically, he contributed to the development and conceptual design of the research project, analysis/evaluation of data (Stata code that transformed raw customs data to the database ready to run the regressions), discussion of the econometric specification, and a representative fraction of the *import market concentration and welfare* section.

Sincerely,



---

Ana Fernandes

World Bank, Development Research Group

---

<sup>1</sup> See mostly section 14: [kodex-gwp-en-data.pdf \(dfg.de\)](https://www.dfg.de/en/DFG-Information/Information-for-Authors/Information-for-Authors-of-Books-and-Journals/kodex-gwp-en-data.pdf)

January 2024

Dr. Hauke Jelschen

Coordinator doctoral programme Quantitative Economics

Kiel University, Germany

Dear Hauke,

I would like to confirm that Federico Alberto Merchan Alvarez, PhD student at Kiel University, made an essential, genuine, and identifiable contribution to the content of “*Natural resource dependence and monopolized imports*” scientific paper according to the DFG Guidelines for Safeguarding Good Research Practice - Code of Conduct.<sup>1</sup> Therefore, he is one of the co-authors of the mentioned paper and he can include it as part of his doctoral dissertation at Kiel University.

Specifically, he contributed to the development and conceptual design of the research project, analysis/evaluation of data (Stata code that transformed raw customs data to the database ready to run the regressions), discussion of the econometric specification, and a representative fraction of the *import market concentration and welfare* section.

Sincerely,



---

Ha Nguyen

---

<sup>1</sup> See mostly section 14: [kodex-gwp-en-data.pdf \(dfg.de\)](https://www.dfg.de/en/DFG-Information/Information-for-Authors/Information-for-Authors/Information-for-Authors/kodex-gwp-en-data.pdf)

January 2024

Dr. Hauke Jelschen

Coordinator doctoral programme Quantitative Economics

Kiel University, Germany

Dear Hauke,

I would like to confirm that Federico Alberto Merchan Alvarez, PhD student at Kiel University, made an essential, genuine, and identifiable contribution to the content of “*Natural resource dependence and monopolized imports*” scientific paper according to the DFG Guidelines for Safeguarding Good Research Practice - Code of Conduct.<sup>1</sup> Therefore, he is one of the co-authors of the mentioned paper and he can include it as part of his doctoral dissertation at Kiel University.

Specifically, he contributed to the development and conceptual design of the research project, analysis/evaluation of data (Stata code that transformed raw customs data to the database ready to run the regressions), discussion of the econometric specification, and a representative fraction of the *import market concentration and welfare* section.

Sincerely,



Rabah Arezki

Director of Research, CNRS

Senior Fellow, Harvard's Kennedy School of Government

[Rabah\\_arezki@hks.harvard.edu](mailto:Rabah_arezki@hks.harvard.edu)

---

<sup>1</sup> See mostly section 14: [kodex-gwp-en-data.pdf \(dfg.de\)](#)

January 2024

Dr. Hauke Jelschen

Coordinator doctoral programme Quantitative Economics

Kiel University, Germany

Dear Hauke,

I would like to confirm that Federico Alberto Merchan Alvarez, PhD student at Kiel University, made an essential, genuine, and identifiable contribution to the content of “*Natural resource dependence and monopolized imports*” scientific paper according to the DFG Guidelines for Safeguarding Good Research Practice - Code of Conduct.<sup>1</sup> Therefore, he is one of the co-authors of the mentioned paper and he can include it as part of his doctoral dissertation at Kiel University.

Specifically, he contributed to the development and conceptual design of the research project, analysis/evaluation of data (Stata code that transformed raw customs data to the database ready to run the regressions), discussion of the econometric specification, and a representative fraction of the *import market concentration and welfare* section.

Sincerely,



---

Tristan Reed

Development Research Group, World Bank

treed@worldbank.org

---

<sup>1</sup> See mostly section 14: [kodex-gwp-en-data.pdf \(dfg.de\)](https://www.dfg.de/en/DFG-Information/Information-for-Authors/Information-for-Authors-of-Proposals/kodex-gwp-en-data.pdf)

**Declaration dissertation has been produced independently**

I hereby declare that I have produced my doctoral thesis "*Essays on international trade*" independently and without external assistance, and that I have made a significant contribution as co-author to other scientific articles. I have identified all word-for-word quotations of other authors, as well as comments based closely on other authors' ideas, and I have cited the sources according to the guidelines I received.

*Federico A. Merchán A.*

Federico A. Merchán A.  
Kiel, Germany