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Heterogeneous Exporters: Quantitative Differences and Qualitative Similarities

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Abstract:
We combine two detailed datasets on Colombian manufacturing firms and document several stylized facts on exporter heterogeneity of total factor productivity (TFP) and export-market orientation, refining some previously known facts and unveiling some new others. We first show that the exporter productivity premium is remarkably robust across the methodologies used to recover TFP. We then document that the most productive exporters are those that export (1) a higher share of their total production, (2) to a larger number of countries, (3) to destinations less-frequently reached by other exporters, (4) a larger number of products, and (5) with greater frequency and stability. In contrast, (6) the type of destination country or (7) the type of exported product has no significant effect on exporter productivity differences. These facts are robust to alternative definitions and specifications and can provide useful guidelines for policy makers.

JEL Classifications: D24, F14, L60
Keywords: productivity premium, export intensity, export extensive margins

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1 Overview

Firm heterogeneity has been at the center of recent research in the international trade literature. Both theoretical and empirical work has shown the importance of firm productivity differences in shaping aggregate trade flows (Melitz and Redding 2014). Typically, the analysis centers on the distinction between exporters and nonexporters (Bernard and Jensen 1999, Roberts and Tybout 1997). A strand of the literature also studies how firms choose their set of export destinations and/or exported products (Eaton, Kortum, and Kramarz 2011, Bernard et al. 2016, Hottman, Redding, and Weinstein 2016). In this paper, we extend the literature, and we study the relationship between a firm's productivity and the different aspects that characterize its exporting decisions—the combined quantitative and qualitative features that encompass the firm's engagement in international markets.

We make use of two detailed datasets on Colombian manufacturing firms that allow us to recover the firms' unobservable total factor productivity (henceforth, TFP) and to have a comprehensive picture of their exporting behavior. The data include firm-level balance sheet and operational information as well customs information on international trade flows. From the former dataset, we obtain information on firms' sales, use of intermediate inputs, labor, and capital stock, among other variables. From the latter dataset, we observe quantitative aspects of exporting, such as the value of exports, the (number of) destination countries, the number of exported products, and the frequency (even within the year) of exporting. We also observe qualitative aspects of exporting, like the type of destination country or the kind of product exported. Being able to observe all these different features of the exporting decisions enables us to assert the importance of these markets for the firm along its quantitative and qualitative aspects.

Our main findings can be summarized as follows. We first document the existence of the well-known export productivity premium and show that this premium is robust across different specifications and across the several methods that we follow to estimate TFP. In fact, once we control for firm fixed effects, the estimated premium is remarkably similar across methods. Next, focusing on exporter heterogeneity, we find a positive association between firm productivity and the degree of export intensity, defined as the ratio of export sales to total sales. Moreover, the number of products exported and the number of countries reached are also associated with higher productivity levels. Further, those firms reaching destinations infrequently reached by other exporters are associated with higher TFP levels as well. We also find stark differences in TFP across exporters conditional on their frequency

of exporting: while those firms that export every year in our sample have TFP levels above those of nonexporters, the TFP of other firms that export only occasionally is actually below that of nonexporters. Even further, when looking at the exporting frequency within a year, we find that the most productive firms are those exporting in the largest number of months and with the lowest coefficient of variation. Finally, and somehow in contrast with the previous results, we find no evidence of any relationship between the *type* of product exported or the *type* of destination and a firm's TFP.

These findings illustrate the richness and multiple layers underlying a firm's decision to export. For starters, there are several margins in play. That is, in addition to the intensive margin measured by the ratio of export sales to total sales, we identify three *within-firm* extensive margins that relate to the firm's TFP: the number of export destinations, the number of exported products, and the number of months with export shipments. The findings on the first three margins are consistent with a framework like the one developed by Bernard et al. (2016), where firms with higher productivity have a greater participation in international markets along all margins simultaneously. Instead, the finding on the frequency-of-exporting extensive margin is somewhat harder to interpret with the trade workhorse models. Essentially, the data are suggesting that the most productive firms have a "daily" orientation toward foreign markets because their exports represent a steady flow that takes place every month and without large variation from month to month.[1] In other words, for the most productive firms, exports are the norm in their everyday business, not the exception, such that these firms are permanently oriented toward foreign markets. At the same time, the fact that continuous (occasional) exporters are more (less) productive than nonexporters is consistent with previous findings showing that, while exporters as whole are more productive, those new exporters that fail (and a large share of them do) are even more likely to go out of business than nonexporters (Eaton et al. 2007, Mora 2015). Further, the finding that firms that export to destinations infrequently reached by other exporters are more productive than those that export to common destinations could suggest the presence of significant heterogeneity of entry costs into certain markets. However, this is somewhat gainsaid by the fact that there are no significant differences between exporters specializing in reaching different types of destinations, neither in geographical terms nor in terms of income level. These results, combined with the fact that there are no productivity differences by the type of exported product (either by the product's physical characteristics, its end-use, or the type of market it is traded in), suggest that TFP and export-market orientation are certainly

[1] Vannoorenberghe, Wang, and Yu (2016) finds similar results: among large exporters, exporting to a more diversified set of destinations is associated with lower export volatility.

linked through a quantitative margin, where more productive firms export (to) more products/countries/often, but not through qualitative features, inasmuch the TFP is unrelated to where/what the firm exports.

The paper is related to a large empirical literature that studies the relationship between a firm's productivity and its participation in international markets. Indeed, several studies find a positive correlation between TFP and exporting status, starting with the seminal work by Bernard and Jensen (1995, 1999) for the case of the United States. Similar results are found using data from several other countries, like Taiwan and Korea (Aw, Chung, and Roberts 2000), Chile (Pavcnik 2002), Slovenia (DeLoecker 2007) and sub-Saharan Africa (Van Biesebroeck 2005). In the particular case of Colombia, studies by Clerides, Lach, and Tybout (1998), Eslava et al. (2004), López (2006), Meléndez and Seim (2006), and Fernandes (2007), to name a few, also find a positive relationship between trade and productivity.[2,3] However, despite the vast literature supporting the hypothesis of exporters' productivity premium, recent work by Gandhi, Navarro, and Rivers (2016) states that this premium depends on the estimation strategy followed to recover the unobservable productivity. In particular, it argues that productivity heterogeneity between exporters and nonexporters decreases greatly (and, in some cases, disappears completely) once the production function is estimated in such a way that all of the function's coefficients can be properly identified.[4] In our work, we consider several alternative methods to recover TFP to assess precisely the robustness of our findings.

Our paper is also related to the literature that examines differences within the group of exporters. There are a handful of papers that look at the relationship between export intensity and productivity, and their findings are mixed. For instance, Baldwin and Gu (2003) finds that a higher level of export intensity is associated with higher TFP growth for Canadian firms. In contrast, Aw, Chung, and Roberts (2000) finds that for firms in Taiwan and South Korea, differences in export intensity are not associated with any significant productivity differences. There is also a body of work looking at different margins of exporting.

[2]Most of these papers look into a related question from which we abstract in this paper—namely, whether most productive firms self-select into exporting or whether it is exporting that makes firms more productive.

[3]Our focus is on studies that estimate productivity at the firm level using structural models, like the *proxy* methods proposed by Olley and Pakes (1996), Levinsohn and Petrin (2003), and Ackerberg, Caves, and Frazer (2015), and the inverse share equation method proposed by Gandhi, Navarro, and Rivers (2016). For an extensive review of the literature on the relationship between trade and productivity with nonstructural productivity estimations, see Wagner (2007).

[4]Even further, Rivers (2010) estimates the TFP of Colombian manufacturing firms in the apparel sector for the period between 1981 and 1991, following the methodology proposed by Gandhi, Navarro, and Rivers (2016), and finds that, once the simultaneity and unobserved prices biases are corrected, the difference between exporters and nonexporters is not statistically different from zero.

For example, Eaton, Kortum, and Kramarz (2011) finds that, in the case of France, most of the observed (aggregate) export flows are explained by variations along the extensive margin of exporting firms. Baldwin and Gu (2009) looks at the within-firm extensive margin of the number of products and finds that Canadian firms reduced the number of products following the Canada-U.S. free trade agreement, while Goldberg et al. (2010) does not find a similar product reduction in the case of India. Bernard, Redding, and Schott (2011), which is perhaps the closest to our paper, finds that in the case of U.S. firms, those firms exporting many products also serve many export destinations and that these features are positively correlated with firm TFP.

This paper contributes to this broad literature in several ways. First, we evaluate the sensitivity of the well-documented exporters' premium to the methodology used to recover firm-level TFP. As mentioned above, both Rivers (2010) and Gandhi, Navarro, and Rivers (2016) argue that the productivity premium is negligible once the production function is properly estimated. In this paper, we estimate firm-specific productivity and the corresponding exporters' productivity premium using several methodologies, including the one proposed by these authors, and we find that exporters are, on average, more productive than nonexporters regardless of how TFP is estimated. Moreover, we estimate the premium to be around 5–7 percent for all our TFP measures. Thus, we provide evidence that the exporters' premium is robust to the methodology employed to recover unobserved productivity.

The paper also contributes to the literature by conducting a comprehensive analysis of the different aspects of a firm's exporting decisions. That is, on top of looking at the widely studied relationship between export status and productivity, we exploit our rich trade data to further analyze the export-market orientation of firms by looking at more comprehensive measures beyond the exporter status premium. In particular, we analyze aspects not so thoroughly studied in the literature, such as export intensity, frequency of exporting, and the number and type of products and countries of destination. In this way, we contribute to the literature by highlighting not just the differences between exporters and nonexporters, but also the stark differences within the group of exporters.

The rest of the paper is organized as follows. Section 2 describes how the data are collected and presents some features of our estimation sample. In Section 3 we discuss the productivity estimation, and study the basic relationship between a firm's productivity and its decision to participate in the export market. In Section 4 and Section 5 we explore the quantitative and qualitative aspects of a firm's exporting decisions, respectively, and how

they are related to productivity. Section 6 concludes.

2 Data Description

2.1 Data Sources and Basic Statistics

In our analysis, we combine two different firm-level datasets: one has information on firms' foreign market participation, while the other contains detailed balance sheet and operational information. Our data cover the period 2005–2013.[5]

The data on international trade come from the customs agency (DIAN) and the department of statistics (DANE) and include information on all foreign-trade transactions. The data on exports include the exporting firm's tax identification number, the 10-digit product code (according to the Nandina classification system, based on the Harmonized System), the type of good according to the End Use Classification System (CUODE), the FOB value (in U.S. dollars) and volume (net kilograms) of exports, and the country of destination, among other details. The data are available on a monthly basis, and for most of our analysis we aggregate exports to the annual level.

Our data on firms' production and input consumption come from "Superintendencia de Sociedades" (SS), the agency in charge of supervising corporations. Specifically, the data come from the "Sistema de Información y Riesgo Empresarial" (SIREM) database. The data are at an annual frequency and are self-reported by the firms, following SS directives.[6] We have access to public information, such as balance sheets, as well as to confidential data included in the annexes filed by the firms. Thus, we are able to observe a great amount of detail about each firm, including the firm's tax identification, its location, the income obtained from the sales of each product (at the 4-digit level, according to the ISIC classification system), the purchase and use of inputs, investments, detailed labor information,

[5] We have access to the confidential data through the Banco de la República, Colombia's Central Bank.

[6] Firms must report their financial data if their assets and/or income (adjusted by inflation) are greater than 30,000 times the current legal monthly minimum wage, if their external liability is greater than the total assets, if the financial expenditures are at least 50 percent of their income, if their cash flow is negative, or if their losses reduce the net equity below 70 percent of the social capital. Hence, the SIREM includes relatively large firms and firms in financial trouble. During our sample period, the average minimum monthly wage was 250 dollars; it oscillated between a minimum of 165 dollars in 2005 and a maximum of 315 dollars in 2012 and 2013.

and some financial information. Additionally, we observe organizational variables, such as whether the firm is a standalone firm, an affiliate, a headquarters with affiliates, or part of a conglomerate.

Throughout the paper, we focus on manufacturing firms producing noncommodity, tradable goods.[7] For our analysis we exclude manufacturers of coke, refined petroleum products, and nuclear fuel (ISIC 23), and manufacturers of basic metals (ISIC 27), which include metals such as gold, silver, platinum, and nickel. We exclude firms in these two industries because, as commodity producers, their dynamics are likely to be different from those of other manufacturing firms.

Given that both datasets include information on firms from several industries, and that we observe multi-product firms not limited to manufacturing activities, we need to define precisely which observations to use in our estimations. Since the data from the SIREM are at the firm level, we need to define whether each firm (and not each product) is a manufacturer. Taking advantage of the detailed income data, we define as manufacturers firms that report having positive income from manufacturing products in all the years they appear in the sample. We then assign firms to the 2-digit ISIC sector that yields the largest share of (deflated) manufacturing output throughout our sample period. Since our trade data are at the firm-product level, we keep all the observations corresponding to exports of manufactures (other than coke, refined petroleum products and nuclear fuel, and basic metals) reported by the firms in our SIREM dataset.[8]

In Table 1, we present some basic statistics of our SIREM sample for the overall manufacturing sector. On average, we have around 2,900 manufacturing firms per year, and roughly half of them export manufactured products. From the second column we observe that the share of exporters ranged (roughly) from 45 to 51 percent, a fairly high share explained by the fact that most firms in SIREM are relatively large.[9] In the remaining columns we report, for the average firm in our sample, the income, capital stock, value of raw materials used, number of workers employed, and share of these that were production workers. The average firm had an average annual income of 29.5 billion Colombian pesos, an average capital stock

[7]We follow the ISIC classification (Rev. 3.1) to define which goods are manufactures. See Table A-1 for the description of the manufacturing sectors considered.

[8]Given the way we define our set of manufacturers, it is possible that our sample includes firms that produce and/or export nonmanufactures, or manufactures in our two excluded ISIC sectors. However, by construction, these cannot be their main product.

[9]Throughout the paper, a firm is considered an exporter if it exports manufactures other than coke, refined petroleum products, nuclear fuel, and basic metals.

of 16 billion, used raw materials worth 12.7 billion, and employed about 160 workers, of whom approximately 55 percent were production workers.[10]

The numbers presented in Table 1 describe the average firm. Our goal for the remainder of this section is to describe the vast heterogeneity across manufacturers that underlies these numbers.

We begin by checking whether exporters are systematically different from nonexporters. To do so, we compare both types of firms across several key variables. We follow Bernard and Jensen (1999) and run the following type of regressions:

$$X_{it} = \beta_0 + \beta_1 EXP_{it} + Industry + Year + \epsilon_{it} \quad , \tag{1}$$

where X_{it} measures, alternatively, (the log of) value-added per worker, wages (payroll) per worker, income per worker, capital per worker, and investment per worker. EXP_{it} is a dummy variable that takes a value of 1 if firm i exports in year t and zero otherwise.

Our estimates for the exporter status coefficient β_1 are presented in Table 2. From the table, it is clear that, in line with the literature, the exporting firms in our data are larger and more capital intensive than nonexporting firms. For instance, we find that exporters pay wages 30 percent higher than nonexporters, and their value added and income per worker are, respectively, 41 and 35 percent higher than those of nonexporters. Likewise, exporters' capital and investment per worker are 35 and 45 percent higher than nonexporters'.

In addition to differences between exporters and nonexporters, there is also great heterogeneity within the group of exporting firms, with differences spanning several aspects of their exporting decisions. In order to better understand these differences, hereafter we focus exclusively on exporting firms. We explore alternative measures that help us characterize exporters according to their intensive and within-firm extensive margins, and according to some qualitative characteristics as well.

[10]The values for income, capital, and raw materials are expressed in billions of Colombian pesos of 2005. Each variable was deflated using a variable-specific deflator.

2.2 Quantitative Margins

In Table 3, we present the annual averages and standard deviations across exporters for the alternative variables that we use to describe how engaged a firm is in international markets—what we call the firm's "export-market orientation." In particular, we report these statistics for export intensity, given by the ratio of exports to total sales; the number of destinations reached; the number of exported products, with each product defined at the 10-digit Nandina level; and the number of months in which an exporting firm makes shipments abroad.[11] These are precisely the intensive and within-firm extensive margins mentioned in the Overview. We find that the average exporter sells 18 percent of its output abroad, reaches six countries, exports nine different products, and makes shipments in eight months per year. While these numbers are fairly stable across our sample period, the standard deviations show that they mask great heterogeneity across exporters.[12] To further illustrate the differences across them, in Appendix Tables A-2 through A-5 we present the averages broken down by industry and year. From these tables, we can see that there is considerable cross-sector heterogeneity in all our export-orientation measures.

We extend our analysis of the export-orientation margins presented in Table 3 in three ways. First, instead of looking at each measure individually, we analyze the co-movement between them. Second, to further analyze the dynamics of firms' exporting decisions, we build year-to-year transition matrices for two measures of their extensive margin: the number of destinations and the number of exported products. Finally, to complement our analysis of exporting frequency, we look at this frequency across years for the complete sample period.

One can get a more comprehensive picture of a firm's export-market orientation by looking at the different margins of the exporting decisions simultaneously rather than individually (see Bernard et al. 2016). With this in mind, in Tables 4 and 5 we present the contemporary co-movement between our measures of export-market orientation.[13] We begin by analyzing the relationship between the number of destinations reached by the firm, the number of ex-

[11] To construct the measure of export intensity, we combine the value of exports from customs declarations with the operational income from SIREM. To make these comparable, we convert the former to pesos (exports are originally reported in dollars) using the monthly average exchange rate. This results in ratios higher than one for a small fraction of observations (less than 1 percent). We discard these observations from our estimation sample whenever we include the intensity variable.

[12] The one exception to the cross-year stability is export intensity, which decreases over the second half of our sample. This can be explained, at least in part, by the exchange rate appreciation that decreased export revenue when measured in local currency. We explore this issue in further detail below.

[13] For Tables 4 and 5, we use data for 2013, the last year in our sample period. We constructed analogous matrices for every year between 2005 and 2012, and the results are practically unchanged.

ported products, and the frequency of its shipments. In Table 4 we present the distribution of the number of firms (left panel) and the export value (right panel) across several pairwise categories. These numbers suggest that there is a positive relationship between these variables. Firms are concentrated around the diagonal of each matrix, indicating that those that export to only one country are likely to export just one product during a single month of the year, while those that export several products also reach several countries and make more frequent shipments.[14] Further, although firms exporting a single product to a single country are the largest group in terms of number of firms (16 percent), the greatest share of exports is sold by firms that sell many products in many markets (60 percent). These differences between the distribution of the number of firms and the distribution of export values is also seen across different extensive margins, where, for example, those firms exporting 11 or more products (or to 11 or more countries) and exporting during the 12 months of the year account for 17.3 (16.4) percent of firms, while the value of their exports accounts for 66.8 (80.3) percent of total exports.

Next, we analyze the relationship between the intensive and the extensive margins, and we find a similar pattern. From Table 5 we can see that the vast majority of exporters export only a tiny fraction of their output, with over 45 percent of them exporting less than 5 percent of their total sales. Further, the largest part of these firms exporting a tiny fraction of their sales also export to just one destination, one product, and in just one month. In contrast, firms selling most of their output abroad account for just 7.5 percent of total exporters but the value of their exports is more than one-third of the value of total exports. Again, these firms, in turn, are most likely to export to a large number of destinations, a large number of products, and in most months of the year.

For our dynamic analysis, we build two transition matrices that show how the number of markets served by a firm changes on a year-to-year basis. We can think of a market in two different ways: as the country reached by the firm's exports, or as the (global) market for each individual product exported by the firm. In Table 6, we report the distribution of observations according to the number of markets in $t-1$ (columns) and the change in market coverage between $t-1$ and t (rows). The top panel describes the dynamics of the number of countries reached by exporters, and the bottom panel shows that of the number of products. These numbers can be interpreted as the frequentist probability that the number of markets covered in period t remains the same, increases by $\{1, \ldots, 5+\}$ markets, or decreases by

[14] Bernard et al. (2016) find the same pattern of co-movement between number of countries and number of products in the case of U.S. firms.

$\{1, \ldots, 5+\}$ markets, given the number of markets a firm exported to in period $t-1$.[15]

The probabilities presented in Table 6 suggest the existence of hysteresis in a firm's exporting status: if a firm does not export, it is very likely that it will remain out of foreign markets in the following period.[16] However, once we focus on exporting firms (that is, firms that sell in one or more markets in $t-1$), a change is the most likely scenario. If we look at country coverage, we observe that 53 percent of firms that export to a single destination see a change: 21 percent increase the number of markets covered, and 32 percent stop exporting during the following period. For firms that export to multiple countries, the chance that the number of destinations remains unchanged is even lower, and decreasing with the number of covered markets. If we focus on firms covering 11+ countries, large coverage changes are likely scenarios; on the contrary, firms with lower initial coverage rarely change their destinations by more than one. When we analyze product coverage, we find that more than half the firms that export a single good either increase the number of products (25 percent) or stop exporting (29 percent) during the following period. For firms that export multiple goods, the chance that the number of exported products remains unchanged is lower, and decreasing with the number of products. Moreover, larger changes become more common as the number of exported products rises. In particular, if we focus on firms exporting 11+ goods, the tails are really fat: when exporting many products, very large changes are the most likely scenario (the probability of increasing or reducing this number by five or more is 50 percent). Finally, in an interesting comparison with the transition probabilities for countries, note that large changes in the number of exported products (5+) are likely for all columns. This could indicate that the fixed costs associated with expanding exports coverage are more significant at the country level than at the product level.

Finally, we revisit the idea of exporting frequency. As an alternative to within-year frequency measured with the number of months with shipments per year, we look at the inter-year frequency of exporting. In particular, we break down exporters into four distinct, time-invariant groups. "Always exporters" includes those firms that export in every year of

[15] To build these matrices, we keep all the firms included at least once in the SIREM database and we transform our data into a balanced panel for the period between 2005 and 2013. We then use our trade data to calculate the change in the number of markets served between $t-1$ and t for each firm-year observation. We convert our unbalanced panel into a balanced one to avoid introducing noise to our measure of market-coverage change. Given that the SIREM dataset is only a selected sample of firms, a firm may exit the sample without actually going out of business. In such cases, if the firm is an exporter, we would erroneously quantify its exit from the *sample* as a drop from $n_{(t-1)}$ to 0 in the number of export destinations. As a result of this methodological choice, we overrepresent the share of firms that do not export in either t or $t-1$.

[16] Although, as mentioned above, we are overrepresenting the share of observations in the (0,0) cell, when we look at the unbalanced panel, remaining a nonexporter is still the most common outcome for nonexporters.

our sample. "Entrant exporters" are those firms that do not export during the first year(s) of our sample but, once they enter the export market, continue exporting for the remainder of the sample. "Exit exporters" are those firms that export during the first year(s) of our sample, then drop out and stay out of the export markets. Finally, we give the name "occasional exporters" to the remaining firms that export in at least one year t, but do not fall into any of the previous categories. In Table 7 we show the distribution of firms across the categories just described, plus the manufacturing firms that never export during our sample period. We observe that 41 percent of our sample never export, while another 23 percent export every year in the period 2005–2013. Likewise, 19 percent are occasional exporters, 12 percent are "exit exporters," and 5 percent are "entrant exporters."

2.3 Qualitative Margins

In addition to the quantitative aspects of our data just described, we evaluate the qualitative dimension of exports by looking at *which* countries manufacturing firms export to, and *which* products they sell abroad.[17]

In Table 8 we show the distribution of exports across different trading partners and across product types. The first column presents the percentage of exporters that export to a given market, and the second column presents the share of the total export values directed to each market. In both cases, we calculate annual values and average across years. In the upper half of the table we focus on destination countries. We find that over 79 percent of the Colombian exporters reached countries in South America. The majority of firms in this group (84 percent) exported to other members of the Andean Community (CAN, for its acronym in Spanish), a customs union formed by Bolivia, Colombia, Ecuador, and Peru.[18] At the same time, 53 percent of exporters accessed the OECD (Organisation for Economic Co-operation and Development) markets. Moreover, the two countries reached by the largest fraction of exporters are neighboring Ecuador (60 percent) and Venezuela (49 percent), both of which share active borders with Colombia. We find a similar pattern when we look at the value of exports that reach these markets.

[17] Throughout the paper, we sometimes use the word "margin" in a loose sense. That is, we use it in the usual sense to refer to all the quantitative aspects of exporting, like the number of products exported. But we also use it to refer to the different types of countries or products reached/exported—what we call the "qualitative margins of exporting."

[18] Venezuela was a member of the CAN until 2006. Exports to Venezuela during 2005–2006 are included in CAN totals.

To further explore the detailed information on the goods exported by manufacturing firms, we break down exports according to three alternative classifications. In particular, we follow the CUODE classification, which classifies products according to their end use and hence allows us to distinguish whether a product is considered a consumer good, a capital good, or an intermediate good; the Nandina tariff system, which follows the Harmonized System and divides traded goods into 21 sections according to their main component material; and the Rauch classification, which categorizes 4-digit goods into differentiated products, reference priced goods, or homogeneous goods. Succinctly, the first classification is about the use to which the goods are put, the second classification is about the products' physical characteristics, and the third one is about the structure of the markets in which the products are traded. In the bottom half of Table 8 we present the distribution of exports across categories under these three characterizations. We observe that almost two-thirds of the exporting firms export consumer or intermediate goods; in contrast, only 43 percent of exporters export capital goods. In terms of export value, consumer and intermediate goods have shares of 42 and 46 percent, respectively, while capital goods constitute almost 13 percent of exports. If we focus on the Nandina sections, presented in the middle panel of the bottom part of the table, we observe that firms exporting rubbers and plastics are the largest group, with more than one third of exporters selling products from this category. However, chemical products have the largest value share, 18.3 percent of total exports.[19] Finally, when looking at the Rauch classification, our data show that almost all firms export at least one homogeneous product, while roughly over a quarter of them export differentiated goods, and only 5 percent export a reference-priced good. In terms of value, two-thirds of sales come from the first group, 21 percent from differentiated products, and 12 percent from reference-priced products.

So far, we have characterized the different aspects of the exporting decisions measured by the different quantitative (intensive and extensive) and qualitative margins. Further, we have also studied the co-movements and looked into the dynamic behavior along the different margins. In the next sections, we focus on the main goal of the paper, which is to analyze how all these margins interact with firms' TFP heterogeneity.

[19]For the sake of space, in this table we show three of the larger sections, the only ones that are in the top 5 both in terms of total sales and in terms of the number of firms exporting products in that group.

3 Productivity and Export-Market Participation

As mentioned in the Overview, there is a vast literature that finds that exporters are more productive than nonexporters. In addition, our findings from Table 2 suggest that, indeed, exporters are very different from nonexporters along several firm characteristics. In this section, we study the relationship between firms' total factor productivity (TFP) and their export-market participation to establish whether there is a significant difference in the productivity of the exporters relative to the nonexporters—the so-called exporters' productivity premium.

3.1 Productivity Estimations

The first step in estimating firm-level TFP is to estimate the firm's production function, which relates inputs to output. Productivity is generally understood as a source of heterogeneity across firms in the measure of output per inputs consumed. However, production function estimations have a fundamental difficulty: if the unobserved productivity shocks are correlated with the firm's input choices, then standard econometric techniques will yield biased estimates of the production function coefficients, affecting the resulting TFP estimates as well. In this section, we describe the different methodologies that we follow in order to account for the potential simultaneity bias in the production function estimation.[20]

The different algorithms can be grouped into two categories, according to the way they incorporate productivity into the estimation procedure. In the first approach, an observable variable is used to approximate productivity. This idea was originally presented by Olley and Pakes (1996), and later extended by Levinsohn and Petrin (2003) and Ackerberg, Caves, and Frazer (2015). Following the idea that productivity is positively correlated with the demand for inputs, the estimation technique proposed by these authors uses a firm's (observed) input demand as a proxy for (unobserved, to the econometrician) productivity shocks. By inverting the input demand function, it is possible to express productivity as a function of only observable variables. This way, the proxy variable is used to control for the endogeneity in the production function.

[20]Two potential, more traditional methods of controlling for this endogeneity problem are fixed effects and instrumental variables. These approaches, however, have not yielded satisfactory results in the particular setting of production functions (see Ackerberg et al. 2007 for a review).

The second algorithm, proposed by Gandhi, Navarro, and Rivers (2016), uses the information implicit in the firm's optimization problem with respect to flexible inputs—in particular, that the input demand is implicitly defined by the production function through the first-order condition. Hence, by transforming this first-order condition to express the intermediate input's revenue share as a function of observable variables, one can account for unobserved productivity through the observed input demand while removing the productivity term from the estimation procedure and obtain consistent estimates for the production function parameters.

In this paper, we first compare the methods by Levinsohn and Petrin (2003), Ackerberg, Caves, and Frazer (2015), and Gandhi, Navarro, and Rivers (2016) to obtain different estimates for firm-level TFP. Henceforth, we will refer to these methods as LP, ACF, and GNR, repectively. For most of our empirical exercises relating TFP to exports, we use the estimations obtained following GNR. We chose this method as our baseline for two reasons. First, as documented in Casas and González (2016), it yields the most robust productivity estimations. Second, as documented by Gandhi, Navarro, and Rivers (2016), when the production function coefficients are estimated with a value-added specification the heterogeneity of productivity will be overstated.[21] Given that proxy methods are valid for value-added production functions (see ACF) and that any premium that we estimate will be a measure of productivity heterogeneity (either between exporters and nonexporters or between different types of exporters), by using productivity estimates à la GNR, we obtain conservative estimates of the correlation between different aspects of firms' trading decisions and productivity. Nonetheless, we repeat our exercises using the TFP measures we obtain with all estimation methods, and the overall conclusions of our paper are robust to the different productivity estimates.

Before we turn to our analysis of exporting decisions, an important remark regarding all our productivity estimates is needed. Since we do not observe physical units of outputs or inputs, our productivity measure is actually what is often referred to as "revenue productivity." Although it cannot be directly interpreted as the physical productivity that often comes to mind (that is, how many shirts a firm can produce with a given amount of cloth, hours of labor, and machinery), it still is a good measure of a firm's performance. Hence, the results presented below are still valid if we want to compare the performance of firms

[21] In a value-added specification, we control for the variation of *some* inputs (capital and labor), but part of the observed output heterogeneity across firms will be the mechanical result of including (heterogeneous) intermediate inputs on the left-hand side of the production function. This additional heterogeneity will be captured by the productivity term.

with different degrees of export-market orientation.

3.2 Exporters' Productivity Premium

In order to study the relationship between a firm's productivity and its export-market orientation, we conjecture that a firm's TFP depends, among other things, on its exporter status. In particular, we consider the following specification:

$$TFP_{it} = \alpha + \beta EXP_{it} + \mathbf{X_{it}}'\gamma + \epsilon_{it} \ , \tag{2}$$

where TFP_{it} is the log of the productivity; EXP_{it} is a dummy variable that takes a value of 1 if firm i exported in year t and 0 otherwise; and $\mathbf{X_{it}}$ is a vector of controls that includes firm characteristics that may affect productivity, such as the firm's size, age, location, and legal structure, as well as year, industry, and firm fixed effects.[22] Our main variable of interest is the coefficient β that estimates the productivity premium of exporting firms.

We present the results of our estimations in Table 9. We find that there is a positive and statistically significant productivity premium for exporters across all the methodologies considered. Moreover, although always positive, we find that there are important differences in the levels of the estimated premium. From the first column we see that the unconditional exporters' productivity premium ranges from 17 to 65 percent. As we add firm-specific controls, column (3), the disparity across estimations is reduced, and, as expected, the premium is generally larger when TFP is estimated with a value-added production function (following any of the *proxy* methods) than when it is estimated using a gross output specification. Once we add firm-specific fixed effects, column (4), the premium is estimated to be around 5–7 percent, and the premium estimates are not statistically different from one another.[23]

[22]Specifically, we measure size with the log of the total number of employees; age with the difference between the year when the firm was established and the reporting year; location with fixed effects by department (Colombia's largest administrative and political divisions); and legal structure with three dummy variables, describing whether firm i is a headquarters with affiliates, is itself an affiliate, or is part of a conglomerate.

[23]For the method proposed by ACF, we estimate two alternative sets of production function coefficients: sector-specific coefficients (for industries defined at the 2-digit level) and manufacturing industry-level coefficients estimated pooling data from all sectors. Given that this is the only method that allows us to estimate precisely sector-specific coefficients, in Table 9 we present only the premium estimated using the TFP calculated with the latter alternative, which is comparable with our other estimates. If we use the former instead, the results are very similar: the estimated productivity premium (controlling for year, industry, and firm fixed effects) is 5 percent.

To summarize, there are three main takeaways from Table 9. First, the (well-known) export productivity premium also holds in our data. Second, this premium is extremely robust to the alternative specifications and methodologies employed. Finally, a novel element, the *magnitude* of the premium is remarkably similar across the different TFP estimations once firm-specific characteristics are controlled for with fixed effects.[24]

4 Quantitative Export-Market Orientation

Our results from the previous section suggest that, on average, a firm's exporter status is strongly associated with a higher TFP. However, as we documented in Section 2, there is great heterogeneity across exporters, and their differences span several decisions such as how much to export, where and what to export, and how often to export. We now turn our analysis precisely to this broader set of the firms' export decisions, and we analyze how these are related to their productivity level.

4.1 Export Intensity

Our first measure of the degree of export-market orientation of exporting firms is their export intensity—the share of a firm's income that is derived from exports. From Table 3 we see that, on average, exports represent 18 percent of an exporting firm's operational income. However, the relevance of exports differs greatly across manufacturing industries. In this section, we analyze precisely the relationship between export intensity and productivity.

We begin by checking whether there is an "export intensity" premium. That is, we run a similar regression to the one in the previous section, but we replace the exporting dummy EXP_{it} in equation (2) with a firm's export intensity. For this exercise, the main right-hand-side variable still takes the value of zero for nonexporters, but it takes different, positive values for exporting firms.[25] We run this regression for all firms in our sample, and for exporting firms only.

[24] Our premium estimates might be somewhat smaller than those of previous studies. Still, the framework developed by Bernard et al. (2016) implies that there is a magnification effect by which even small differences in productivity can translate into large differences in trade outcomes. In the next sections, we show that, indeed, there are significant differences in trade outcomes across Colombian firms.

[25] In order to keep the observations corresponding to nonexporting firms and to still be able to give a clear

We present our results in Table 10. We find that there is an unconditional positive relationship between export intensity and productivity. From the coefficients in the top panel of the table, we can see that a 1 percent increase in intensity is associated with an increase of as much as 6 percent in a firm's TFP. Once we keep only exporting firms (that is, once we condition on $EXP_{it} = 1$), the estimated coefficients are slightly smaller but still highly significant. These results suggest that, once we take into account the productivity premium of being an exporter, being a more intensive one still makes a difference in terms of productivity. In other words, greater export intensity is associated with additional productivity gains.

An important issue regarding our measure of export intensity is that it is sensitive to changes in the exchange rate. That is, if the peso/dollar exchange rate depreciates (appreciates), the peso-value of exports mechanically increases (decreases), and the export intensity moves along with it.[26]

In order to rule out the possibility that exchange rate movements are the *only* source of variation in export intensity, we test an alternative explanation. At a general level, changes in export intensity are the result of changes in sales in the domestic market, foreign markets, or both. One particular case that we can test in our data occurs when firms substitute sales in one market for sales in the other.[27] We test whether this is the case by regresssing the log-change of domestic sales on the log change of exports, the log-change in TFP, and our usual set of controls. It is important to include TFP as a control to account for possible efficiency shocks that could impact a firm's production (see Ahn and McQuoid 2015). The results are presented in Table 11. We find that, once we control for firm fixed effects, increases in exports are associated with decreases in domestic sales. This suggests that there is a (small) trade-off between the two markets, such that the observed changes in intensity are not just a mechanical result of changes in the exchange rate, but rather a compositional change. In other words, if changes in export intensity were just a result of an exchange rate movement,

interpretation to our estimates, we define our *Intensity* regressor as follows:

$$Intensity = \begin{cases} 0 & \text{if } Intensity = 0 \\ NA & \text{if } Intensity = 0 \in (0,1] \\ log(Intensity) & \text{if } Intensity = 0 \in (1,100] \end{cases}.$$

We also run the regression with intensity in levels (such that it lies in the [0,100] interval) in order to check that the exclusion of the small fraction of firms that export 1 percent of their output or less does not affect our findings, and the results are indeed unchanged in terms of sign and statistical significance.

[26]This can be partly seen, at the aggregate level, in the first column of Table 3, where the decline in intensity in the last years of our sample coincides with an appreciation of the Colombian peso

[27]This can be the case if, for example, a firm is operating at high capacity and cannot easily increase production to increase sales in one market while maintaining sales constant in the other market.

we should not observe any association between exports and domestic sales.

4.2 Export Markets

An alternative way to gouge how export-oriented a firm is consists of looking at the number of markets served by the firm. In this section, we explore whether there is a consistent relationship between a firm's productivity, the number of destinations it reaches, and/or the number of products it exports.

We begin by evaluating the relationship between the number of countries reached by a firm and its productivity. To do so, we replace the EXP_{it} dummy in equation (2) with the number of countries, such that the variable still takes the value of zero for nonexporters, but it takes different, positive values for exporting firms. Then, we check whether there is a "number of destinations" premium.

We present our results in Table 12, where we find that the number of destinations has a positive and significant effect on productivity across all the specifications considered. These results indicate that indeed there is a "number of destinations" premium. That is, the larger the number of markets covered, the higher the firm's productivity, with our estimates indicating that an increase of one destination is associated with a TFP increase of 1.5–2.5 percent. Moreover, this effect does not go away once we focus on exporters only. This implies that there is a greater productivity gain from exporting to more markets and that this effect is in addition to the average exporter's premium.

When thinking about the number of countries covered by an exporting firm, one can conjecture that firms reaching a large number of destinations are more likely to sell in "exotic" markets. Conversely, firms exporting to a small number of countries will likely serve the most popular markets (Eaton, Kortum, and Kramarz 2011). With this in mind, for each firm we construct a variable, $LeastFrequent$, that identifies the destination country reached by the smallest number of other Colombian exporters and assigns to the firm precisely this number of other exporters. We then run a regression similar to equation (2), but with $LeastFrequent$ instead of EXP. The results are presented in Table 13, where we find negative and statistically significant estimates across all specifications. This indicates that, for any given exporter, the fewer other Colombian firms exporting to its rarest destination, the higher the exporter's TFP. In other words, this finding suggests the existence of a "in-

frequent market" premium whereby a higher TFP is associated with a firm exporting to a country reached by relatively few other Colombian exporters.

Next, we think of markets not as countries but as global markets for individual products. In this context, we look at the number of (10-digit) products exported by a firm, and we evaluate the relationship between this number and the firm's productivity. That is, we replace the EXP_{it} dummy in equation (2) with the number of exported products, and we check whether there is a "number of products" premium.

We present our results in Table 14. We find that the number of products has a positive and significant effect on productivity across all the specifications considered, and that the positive correlation does not go away once we focus on exporters only. Specifically, we find that an increase of one in the number of products exported is associated with a TFP increase of 0.25–1 percent. In other words, we find that a larger number of covered markets is associated with higher productivity, even within the group of exporters, suggesting a premium on top of the average exporters' status premium.

4.3 Frequency of Exporting

Another way of assessing the degree of the firm's export-market orientation, is to look at how important the export market is for the firm's everyday operations. Thus, we also use the frequency with which a firm exports as a measure of its degree of export-market orientation. We first consider the exporting frequency within the year. In particular, we exploit the high frequency of our exporting data and analyze the relation between firm TFP and the number of months in which the firms make shipments abroad. In this way, we distinguish between those firms that are constantly attending to their export markets from those that are oriented toward foreign markets sporadically throughout the year. In formal terms, we repeat the same kind of empirical exercise as in equation (2) but using the number of months with positive export shipments as the main regressor. The results presented in Table 15 are quite clear: those firms that export in more months during the year are associated with a higher TFP level. The fact that our estimates are positive even when we focus on exporting firms only indicates that these effects are additional to the average exporters' premium.

Further, in the lower panel of Table 15, we replace the number of months with the coefficient of variation of the firm's monthly exports. That is, we regress productivity on

the firm's average monthly export value divided by its standard deviation. The estimated coefficient is consistently negative, implying that those firms with relatively stable export flows tend to have higher productivity levels. These facts combined suggest the existence of a productivity premium for those firms that have steady, stable export flows.

Next, we also look at the exporting frequency in terms of variations in annual participation, and we group firms into two broad categories. "Continuous" exporters are the firms that, once they start selling in foreign markets, keep doing so until the end of our sample. We consider these to be the most export-oriented manufacturers. In contrast, the group of "occasional" exporters includes all firms that, after exporting, stopped doing so, regardless of whether they exported again.[28] We then compare how these firms fare (in terms of productivity) with respect to firms that never exported during our sample period.

In order to formally assess the importance of inter-year frequency, we run a multinomial logit specification where we regress a dummy variable, taking positive values for each exporter type and zero for nonexporters, on TFP and our usual set of controls.[29] We report the marginal values so that our estimates can be given a straightforward interpretation. The results are presented in Table 16. From the table, it is clear that higher TFP is associated with a higher probability of being a continuous exporter, while it has the opposite effect on the probability of being an occasional exporter. Taken together, these two findings suggest that the well-documented exporters' premium is actually driven mainly by the firms that export continuously.

5 Qualitative Export-Market Orientation

We just showed that the number of markets (countries or products) covered by a firm has a positive and significant effect on its productivity level, beyond the average productivity premium for being an exporter. In this section, we explore whether there is a pattern in productivity that can be attributed to *which* markets a firm accesses.

[28] Compared with the categories presented in Table 7, the group of "continuous" exporters includes "always" and "entrant," and the group of "occasional" exporters includes "occasional" and "exit."

[29] Note that, since we are not assigning any causality interpretation to our findings, in the multinomial logit equation we flip the TFP to the left-hand side of the equation and the exporter status to the right-hand side. Also, for this exercise we cannot add fixed effects by firm since our regressors are time-invariant categories. Hence, the best way we control for firm-specific characteristics that can affect TFP is to include the set of controls presented in the third column of Table 9.

5.1 Country Types

We begin by analyzing whether a firm's productivity is related to the type of countries reached by its exports. That is, we are interested in the differences between exporters reaching different groups of countries. Clearly, to be able to make any such assessment, we first need to define what constitutes a type of country. In this regard, as we explain below, we follow a broad approach and consider multiple alternatives, from geographical location to income level to international organization membership. Additionally, in order to make adequate comparisons in the presence of exporters reaching multiple countries, we focus on firms that specialize in certain countries—we consider multiple alternative measures of specialization, and we present results for firms selling 50, 75, and 100 percent of their exported values in a given type of market.[30] The results are presented in Table 17.

We begin our analysis by comparing the productivity levels of exporters conditional on the geographical destination of their exports. That is, we group firms according to their main area of specialization: those that export mainly to South America, those that export mainly to North America, et cetera.[31] One could conjecture that there could be some gravity-like reason why exporting to closer regions might be less productivity-demanding than exporting to regions farther away. To conduct our analysis, we regress TFP on dummy variables taking a positive value for each continent and a value of zero for South America (the omitted variable) and our usual set of controls. We present the results in columns (1)–(3) in Table 17 for the different degrees of specialization. From the table, it is clear that we do not find any statistically significant difference across the different types of exporters relative to the omitted category. That is, there is no systematic difference in the productivity levels of exporters specializing in sales to different parts of the world.

Next, we consider types of countries according to their income level. We use the categories from the World Bank, which partitions the countries into four income categories: high, upper middle, lower middle, and low. One could conjecture that accessing a richer country could entail higher productivity standards due to higher levels of competition; conversely, it is also plausible to conjecture that for gravity reasons richer markets present stronger demand for Colombian exporters. In a similar way as before, we regress TFP on dummy variables (using the high-income category as the omitted one) and firm, industry, and year fixed effects. The

[30] We also defined a firm's specialization in a given type of market according to the the share of destination countries instead of dollars exported. The results are qualitatively the same as the ones presented here.

[31] We drop the categories corresponding to Asia, Africa, and Oceania, due to the small number of firms specializing in exporting to these continents.

results are presented in columns (4)–(6) of Table 17. Once again, our results indicate that there are no systematic productivity differences between those exporters that specialize in reaching countries with high income and those exporters specializing in countries with lower income levels.

Having considered exports destinations' income and distance to Colombia separately, for our third exercise we look at two categories that somehow synthesize these two features. In particular, we assess whether there are systematic differences between firms that reach developed countries grouped in the OECD and those that export to the developing neighboring countries that form the CAN. For this exercise, we keep those firms that export mostly to the OECD (excluding Mexico and Chile) and those firms that export mostly to the CAN. In columns (7)–(9) of Table 17 we present the results of regressing TFP on a dummy variable that takes a value of 1 if the firm specializes in exports to the OECD and 0 otherwise, plus our usual set of controls. As can be seen, in all our specifications the OECD dummy variable is statistically insignificant. Further, if we include Mexico and Chile in the OECD group, results are qualitatively similar.

The findings presented in Table 17 indicate that there are no significant productivity differences among exporters in terms of the destination markets they reach. That is, the qualitative characteristics of the destinations, as captured by the types of countries considered, have no role in terms of the TFP of the Colombian firms that specialize in exporting to them.

5.2 Product Types

As we mentioned above, an export market can be understood either as a destination or as the global market for an individual product. Hence, we now analyze whether the type of good exported is somehow related to the firm's productivity. Once again, since there several classification systems that can be used to sort products into different types, we consider three alternatives.

First, we consider the types of goods according to their end use: capital, consumer, and intermediate goods. One can conjecture different reasons why the type of good might be relevant. For instance, consider the case of an exporter of capital goods. This firm would be competing in global markets with, say, exporters from Germany, one of the largest exporters

of capital goods in the world. In order to succeed in such a competitive environment, this firm would have to be very productive, more so than the average Colombian exporter. With this in mind, we analyze whether a firm's productivity is related to the type of goods it exports, according to their end-use as described in Table 8. In order to compare the firms' productivities, we keep those observations where firms specialize in exporting one type of good and, as in the case of the types of countries, we consider three degrees of specialization: 50, 75, and 100 percent. We define two dummy variables, each taking a positive value if a firm exports either intermediate or consumer goods and zero otherwise (capital goods is the omitted variable). We then regress firm-level TFP on these dummy variables and our usual set of controls. The results are presented in columns (1)–(3) of Table 18. We find that neither dummy variable is statistically significant at any degree of product specialization, suggesting that there is no systematic relationship between the productivity of the exporting firm and the type of end use goods it exports.

Next, we study the types of goods according to their physical attributes. In particular, we classify goods by the 21 sections of the Harmonized System and run a similar regression to the one just described, where we define dummy variables for each section. The results are presented in columns (4)–(6) of Table 18.[32] Again, we find that there is no statistical significance, implying that the data indicate that the TFP of the firms specializing in exporting goods in any of the sectors considered is no different from the TFP of those firms specializing in exports of the omitted sector (metals). This pattern holds for the three degrees of specialization.

Finally, we classify goods according to the type of markets in which they are traded. Specifically, we use the Rauch (1999) classification system, where goods are classified into differentiated goods, goods with a reference price, and homogeneous goods (traded in an organized exchange). We conduct an exercise analogous to those before and present the results in columns (7)–(9) of Table 18. Once more, we find no statistical significance, indicating that there are no productivity differences across those exporters trading mostly in differentiated goods from those trading mostly in reference-priced or homogeneous goods.

The bottom line of the results presented in Table 18 is that the data indicate that there are no productivity differences between exporters according to the types of goods they mostly

[32]For the sake of space, in the table, we present only the estimates for the most important sections in terms of number of observations and value of exports. The estimates for the remaining Nandina sections yield the same message as the ones presented here, namely, that there is no statistically significant TFP differential.

export. This holds true across different features of the products, such as their end use, their physical characteristics (as captured by the Harmonized System), and the kind of market in which they are traded. These results, combined with those of Table 17, indicate that there is no exporter TFP heterogeneity along these *qualitative* margins, in sharp contrast with the heterogeneity along the *quantitative* margins found in Section 4.

6 Conclusions and Policy Implications

In this paper, we use detailed data on Colombian manufacturers to study the relationship between a firm's TFP and its export-market orientation. That is, we connect a firm's productivity with a comprehensive picture of its entire exporting decisions.

We first show the existence of the (well-known) export productivity premium. Moreover, we find that this premium is extremely robust to the alternative specifications and methodologies employed. Further, we also show that, after controlling for firm fixed effects, the premium is remarkably similar across the different estimations.

We also show that export intensity, the number of countries reached, the number of exported products, and exporting to uncommon destinations are all associated with higher productivity levels, even within the group of exporters. Additionally, we find that the exporter's premium is related to the frequency of exporting. In particular, we find stark differences within the group of exporting firms: the TFP of those firms that always export is above that of nonexporters, while the TFP of those firms that export only occasionally is below nonexporters' TFP. Further, we also find differences across exporters depending on the frequency with which they export within a year, with higher productivity associated with a steadier export income flow.

In addition, we find that the type of exported product or type of export destination country has no statistical association with a firm's productivity. That is, we find no evidence of firms specializing in exporting a certain type of good or to a certain type of country having any productivity differences with other exporting firms.

Finally, all these facts can provide useful guidelines for policy makers. In particular, the large productivity differences between continuous and occasional exporters are worth taking into account when designing (trade) policies. For instance, when designing economic policies

that aim to improve a country's productivity and economic growth by enhancing foreign trade, our findings suggest that these policies should not just focus on helping firms enter foreign markets but should also focus on helping them *remain* as exporters. Further, our findings also suggest that helping exporters expand the number of markets (countries and products) they reach can be associated with productivity gains. Thus, policies might be more effective if instead of being focused on facilitating access to a specific type of market, they are focused on increasing the number of markets available for firms.

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Tables

Table 1: Basic Statistics: Overall Manufacturing Sector

	Firms (#)	Exporters (%)	Income ($)	Capital ($)	Materials ($)	All Workers (#)	Production Workers (%)
2005	2,832	51.3	25.4	11.4	11.6	146.7	58.9
2006	3,275	49.3	25.4	10.7	11.4	142.3	59.0
2007	2,859	50.7	30.2	14.6	13.3	162.4	57.9
2008	2,804	50.7	29.9	16.3	12.9	167.7	54.8
2009	3,001	47.5	26.9	15.4	11.4	150.0	54.8
2010	2,888	47.9	29.2	17.6	12.4	154.9	55.2
2011	2,979	45.4	30.2	17.9	12.7	160.3	54.3
2012	2,848	46.1	32.0	18.9	13.3	170.6	52.6
2013	2,644	47.6	35.9	21.3	14.8	179.4	51.1
Average	2,903	48.5	29.5	16.0	12.7	159.3	55.4

Source: Authors' calculations based on data from SIREM and DIAN/DANE.
Notes: The sign '$' corresponds to billions of Colombian pesos of 2005. We exclude manufacturers of coke, refined petroleum products, nuclear fuel, and basic metals from manufacturing totals.

Table 2: Differences between Exporters and Nonexporters

	Wage	Value-added	Income	Capital	Investment
EXP_{it}	0.299***	0.408***	0.350***	0.347***	0.446***
	(0.0156)	(0.0218)	(0.0239)	(0.0324)	(0.0346)
Observations	25,979	26,042	26,130	26,130	25,091

Notes: Standard errors (in parentheses) clustered by firm. '***', '**' and '*' refer to statistical significance at the 1%, 5%, and 10% levels, respectively. The dependent variables are measured in billions of Colombian pesos of 2005 per worker. All specifications include controls for year and sector.

Table 3: Statistics for Exporting Firms

	Intensity (%)		Destinations		Products		Months	
	Mean	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*
2005	20.4	21.2	6.1	6.4	9.8	15.6	8.3	4.1
2006	21.0	21.0	5.9	6.5	9.2	14.9	8.1	4.1
2007	20.9	21.0	6.1	6.6	9.7	16.2	8.3	4.1
2008	20.4	21.8	6.1	6.8	9.5	16.0	8.0	4.2
2009	17.5	21.5	6.0	6.7	9.4	16.3	7.8	4.2
2010	15.2	19.4	6.0	7.0	9.2	15.7	7.7	4.2
2011	15.8	19.9	6.1	7.0	9.6	17.8	7.9	4.2
2012	15.4	20.2	6.2	7.2	10.1	19.0	8.1	4.2
2013	15.5	20.5	6.0	7.2	9.9	19.9	7.8	4.3

Source: Authors' calculations based on data from SIREM and DIAN/DANE.

Table 4: Co-movement along the Within-Firm Extensive Margins

Products \ Countries	1	2	3	4	5	6–10	≥11
1	16.0	3.9	1.4	0.5	0.3	0.5	0.6
2	4.8	3.6	2.7	1.3	0.7	1.1	0.8
3	2.3	2.1	1.7	1.3	0.5	1.2	0.6
4	1.4	1.1	0.9	1.4	0.3	1.5	0.9
5	0.2	1.0	0.5	0.7	0.2	2.2	0.5
6–10	2.1	1.9	1.5	1.9	1.3	5.3	2.5
≥11	1.2	1.1	1.3	1.2	1.0	5.8	11.5

Products \ Countries	1	2	3	4	5	6–10	≥11
1	0.3	0.7	0.1	0.1	0.0	0.3	5.3
2	0.4	0.2	0.5	0.2	0.2	0.8	3.6
3	0.1	0.2	0.1	0.1	0.1	0.7	0.4
4	0.1	0.2	0.1	0.1	0.2	0.6	1.5
5	0.0	0.1	0.0	0.1	0.1	0.7	4.9
6–10	0.1	0.2	0.1	0.4	0.3	2.5	5.3
≥11	0.1	0.2	0.3	0.3	0.4	6.9	59.9

Months \ Countries	1	2	3	4	5	6–10	≥11
1	12.1	0.4	0.0	0.0	0.0	0.0	0.0
2	4.5	2.0	0.5	0.0	0.0	0.0	0.0
3	2.8	2.5	1.0	0.2	0.0	0.0	0.0
4	1.3	2.1	1.1	0.0	0.1	0.2	0.0
5	1.4	1.0	0.8	0.7	0.1	0.1	0.0
6	1.1	0.8	0.6	0.4	0.2	0.2	0.0
7	1.0	0.7	0.8	0.6	0.1	0.8	0.0
8	1.0	1.0	1.5	0.6	0.5	0.5	0.0
9	0.6	0.6	0.5	0.6	0.5	0.6	0.1
10	1.2	0.8	0.9	0.7	0.6	1.0	0.2
11	0.3	1.0	0.7	1.5	0.6	2.9	0.6
12	0.7	1.8	1.6	2.8	1.7	11.4	16.4

Months \ Countries	1	2	3	4	5	6–10	≥11
1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.1	0.0	0.0	0.0	0.0	0.0
3	0.0	0.1	0.0	0.0	0.0	0.0	0.0
4	0.0	0.1	0.2	0.0	0.1	0.0	0.0
5	0.0	0.1	0.0	0.0	0.0	0.0	0.0
6	0.1	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.1	0.0	0.0	0.0	0.1	0.0
8	0.1	0.1	0.1	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.3	0.1	0.1	0.1	0.1	0.2	0.1
11	0.0	0.2	0.0	0.1	0.2	1.6	0.4
12	0.2	1.0	0.7	1.0	0.8	10.5	80.3

Months \ Products	1	2	3	4	5	6–10	≥11
1	9.5	1.4	0.6	0.3	0	0.5	0.2
2	2.9	2.1	0.6	0.5	0.1	0.7	0.2
3	2.7	1.5	0.6	0.7	0.2	0.4	0.2
4	1.7	1.2	0.6	0.4	0.3	0.3	0.3
5	0.6	1.0	1.1	0.5	0.2	0.6	0.1
6	0.8	0.9	0.6	0.2	0.1	0.6	0.3
7	0.6	0.9	0.5	0.4	0.2	1.0	0.5
8	0.6	1.2	0.8	0.5	0.3	0.9	0.8
9	0.6	0.7	0.5	0.4	0.4	0.6	0.3
10	0.5	1.0	0.6	0.5	0.4	1.7	0.9
11	0.6	1.2	1.2	0.6	0.7	1.6	1.9
12	2.3	2.0	2.2	2.5	2.5	7.5	17.3

Months \ Products	1	2	3	4	5	6–10	≥11
1	0.0	0.0	0.0	0.0	0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.1	0.1	0.0	0.0	0.0	0.0	0.0
4	0.1	0.3	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.1	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.1	0.0	0.0	0.0
8	0.1	0.1	0.0	0.0	0.0	0.0	0.1
9	0.0	0.1	0.0	0.0	0.0	0.0	0.0
10	0.1	0.3	0.1	0.1	0.1	0.3	0.2
11	0.5	0.7	0.1	0.1	0.1	0.3	0.9
12	5.8	4.3	1.2	2.6	5.7	8.2	66.8

Source: Authors' calculations based on data from SIREM and DIAN/DANE for 2013.
Notes: The left panel presents the distribution of the number of firms; the right panel the distribution of export values.

Table 5: Co-movement of Export Intensity and the Within-Firm Extensive Margins

		Export Intensity (%)						Export Intensity (%)				
		≤5	**5–10**	**10–20**	**20–50**	**≥50**		**≤5**	**5–10**	**10–20**	**20–50**	**≥50**
Countries	**1**	21.9	2.2	1.8	1.5	0.7	**Countries**	0.4	0.1	0.1	0.3	0.1
	2	8.1	2.1	2.0	1.2	1.1		0.2	0.1	0.5	0.3	0.3
	3	5.8	1.3	1.6	0.9	0.3		0.2	0.2	0.4	0.4	0.1
	4	3.4	1.9	1.3	1.1	0.4		0.2	0.5	0.2	0.2	0.2
	5	1.0	1.0	1.0	1.0	0.3		0.1	0.3	0.3	0.4	0.2
	6–10	4.2	3.4	4.1	4.8	1.4		1.2	1.9	3.1	4.0	2.4
	≥11	1.4	2.3	3.8	6.5	3.3		1.2	4.2	7.6	37.4	30.6
Products	**1**	17.4	1.9	1.5	1.0	1.4	**Products**	0.2	0.1	0.2	0.3	5.8
	2	8.2	1.9	2.0	1.9	1.0		0.2	0.3	0.5	1.2	3.7
	3	5.3	1.1	1.4	1.3	0.6		0.4	0.2	0.2	0.2	0.7
	4	3.2	1.4	1.1	1.2	0.6		0.2	0.4	0.5	1.0	0.8
	5	1.8	1.2	1.1	0.9	0.2		0.1	0.5	0.2	0.5	4.6
	6–10	5.3	2.2	3.5	3.8	1.6		0.7	0.6	1.2	4.1	2.4
	≥11	4.4	4.4	4.9	7.1	2.2		1.6	5.2	9.5	35.8	15.9
Months	**1**	11.5	0.6	0.3	0.1	0.0	**Months**	0.0	0.0	0.0	0.0	0.0
	2	5.8	0.6	0.2	0.3	0.2		0.0	0.0	0.0	0.0	0.0
	3	5.1	0.2	0.7	0.2	0.1		0.1	0.0	0.0	0.0	0.0
	4	3.9	0.2	0.3	0.2	0.2		0.1	0.1	0.0	0.2	0.0
	5	2.6	0.4	0.6	0.2	0.3		0.1	0.0	0.0	0.0	0.0
	6	1.8	0.5	0.3	0.7	0.1		0.0	0.0	0.0	0.0	0.0
	7	2.5	0.6	0.7	0.2	0.0		0.1	0.1	0.0	0.0	0.0
	8	2.1	1.0	0.8	0.8	0.3		0.1	0.1	0.1	0.1	0.1
	9	1.6	0.6	0.6	0.4	0.2		0.1	0.0	0.0	0.0	0.0
	10	2.2	1.4	1.0	0.6	0.3		0.2	0.2	0.2	0.4	0.1
	11	2.4	1.3	2.3	1.3	0.5		0.5	0.3	0.5	1.0	0.4
	12	4.4	6.6	7.8	12.0	5.4		2.2	6.5	11.4	41.1	33.2

Source: Authors' calculations based on data from SIREM and DIAN/DANE for 2013.
Notes: The left panel presents the distribution of the number of firms; the right panel the distribution of export values.

Table 6: Market Coverage Transition Matrices

		Country coverage in $t-1$							
		0	**1**	**2**	**3**	**4**	**5**	**6–10**	**≥11**
Coverage change in t	**≥5**	0.2	0.5	1.1	1.1	1.2	2.0	2.5	6.0
	4	0.1	0.3	0.6	0.8	1.4	1.4	1.9	3.3
	3	0.3	1.2	2.3	2.6	3.4	2.8	4.5	5.5
	2	0.9	4.2	5.8	4.8	8.5	7.5	8.8	9.6
	1	5.1	14.6	15.7	15.3	13.5	17.8	14.2	11.9
	0	93.4	47.2	35.6	30.7	24.4	22.5	20.7	14.2
	-1	0.0	32.0	28.2	26.4	24.6	21.6	18.8	14.4
	-2	0.0	0.0	10.7	12.9	14.9	13.2	13.3	12.4
	-3	0.0	0.0	0.0	5.2	5.3	6.3	8.0	8.0
	-4	0.0	0.0	0.0	0.0	2.8	2.7	3.5	5.3
	≤-5	0.0	0.0	0.0	0.0	0.0	2.4	3.8	9.5
		Product coverage in $t-1$							
		0	**1**	**2**	**3**	**4**	**5**	**6–10**	**≥11**
Coverage change in t	**≥5**	0.7	2.1	3.0	4.6	4.1	5.1	9.7	18.2
	4	0.3	1.2	2.0	1.6	2.6	2.5	3.3	3.6
	3	0.5	2.5	2.7	4.00	3.8	5.0	4.3	4.0
	2	1.1	5.6	6.3	6.3	6.9	7.8	6.9	5.0
	1	4.0	13.7	13.6	12.9	12.6	13.5	9.8	5.6
	0	93.4	46.0	33.3	25.1	21.1	18.6	13.0	6.6
	-1	0.0	28.9	24.7	22.1	19.1	17.3	13.4	6.6
	-2	0.0	0.0	14.5	13.7	14.5	11.4	12.4	6.6
	-3	0.0	0.0	0.0	9.8	8.2	7.8	8.95	6.4
	-4	0.0	0.0	0.0	0.0	7.1	4.8	6.6	6.2
	≤-5	0.0	0.0	0.0	0.0	0.0	6.3	11.8	31.5

Source: Authors' calculations based on data from SIREM and DIAN/DANE.

Table 7: Distribution by Exporting Frequency

Export Status	Firms	(%)
Always	1,141	23.4
Entrant	230	4.7
Exit	578	11.8
Occasional	933	19.1
Never	1,996	40.9

Source: Authors' calculations based on data from DIAN/DANE.

Table 8: Distribution of Exports

	Percentage of Exporting Firms	Export Value Share
By Trading Partners		
South America	79.2	53.9
CAN	66.3	22.8
Mercosur	52.8	27.7
Venezuela	49.0	21.5
Ecuador	59.7	13.7
Central America	57.2	7.9
OECD	53.3	31.0
without Mexico and Chile	42.4	24.3
USA	34.5	15.4
European Union	20.5	5.5
By Type of Good		
Consumption	65.4	41.7
Intermediate	63.7	45.7
Capital	43.0	12.6
Chemicals	21.9	18.3
Plastics / Rubbers	36.9	16.5
Textiles	26.6	10.8
Homogeneous	93.6	67.0
Differentiated	28.3	20.9
Reference Priced	5.4	12.1

Source: Authors' calculations based on data from DIAN/DANE.

Table 9: Export-Status Premium

TFP *à la*	(1)	(2)	(3)	(4)
GNR	0.211***	0.223***	0.176***	0.0748***
	(0.0260)	(0.0250)	(0.0280)	(0.0162)
ACF	0.228***	0.177***	0.233***	0.0532***
	(0.0183)	(0.0186)	(0.0201)	(0.0144)
LP	0.653***	0.677***	0.301***	0.0781***
	(0.0222)	(0.0223)	(0.0199)	(0.0141)
Year		x	x	x
Sector		x	x	x
Size			x	
Age			x	
Legal			x	
Department			x	
Firm				x

Notes: Standard errors (in parentheses) clustered by firm. '***', '**' and '*' refer to statistical significance at the 1%, 5%, and 10% levels, respectively. (S) stands for productivity estimated with sector-specific production function coefficients.

Table 10: 'Export Intensity' Premium

	(1)	(2)	(3)	(4)
		All Firms		
Intensity	0.0816***	0.0846***	0.0652***	0.0506***
	(0.0102)	(0.0099)	(0.0111)	(0.0109)
Observations	23,682	23,682	23,609	23,682
R-squared	0.013	0.091	0.130	0.108
		Exporters Only		
Intensity	0.0677***	0.0707***	0.0523***	0.0393***
	(0.0161)	(0.0156)	(0.0159)	(0.0116)
Observations	10,224	10,224	10,186	10,224
R-squared	0.008	0.100	0.143	0.131
Year		x	x	x
Sector		x	x	x
Size			x	
Age			x	
Legal			x	
Department			x	
Firm				x

Notes: Standard errors (in parentheses) clustered by firm. '***', '**' and '*' refer to statistical significance at the 1%, 5%, and 10% levels, respectively. Firms with exports greater than total income excluded from the sample.

Table 11: Domestic vs. Foreign Sales

	(1)	(2)	(3)	(4)
$\Delta Exports$	-0.00103	-0.00155	-0.00219	-0.00490***
	(0.0014)	(0.0014)	(0.0014)	(0.0013)
ΔTFP	0.284***	0.276***	0.278***	0.258***
	(0.0122)	(0.0123)	(0.0123)	(0.0130)
Observations	19,573	19,573	19,501	19,573
R-squared	0.135	0.153	0.169	0.158
Year		x	x	x
Sector		x	x	x
Size			x	
Age			x	
Legal			x	
Department			x	
Firm				x

Notes: Standard errors (in parentheses) clustered by firm. '***', '**' and '*' refer to statistical significance at the 1%, 5%, and 10% levels, respectively. Firms with exports greater than total income excluded from the sample.

Table 12: 'Number of Destinations' Premium

	(1)	(2)	(3)	(4)
		All Firms		
Destinations	0.0250***	0.0251***	0.0211***	0.0178***
	(0.0025)	(0.0023)	(0.0030)	(0.0029)
Observations	26,130	26,130	26,052	26,130
R-squared	0.020	0.097	0.131	0.106
		Exporters Only		
Destinations	0.0210***	0.0205***	0.0172***	0.0154***
	(0.0029)	(0.0026)	(0.0033)	(0.0027)
Observations	12,672	12,672	12,629	12,672
R-squared	0.025	0.113	0.142	0.121
Year		x	x	x
Sector		x	x	x
Size			x	
Age			x	
Legal			x	
Department			x	
Firm				x

Notes: Standard errors (in parentheses) clustered by firm. '***', '**' and '*' refer to statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 13: 'Infrequent Market' Premium

	(1)	(2)	(3)	(4)
LeastFrequent	-0.0790***	-0.0704***	-0.0545***	-0.0146***
	(0.0094)	(0.0089)	(0.0105)	(0.0049)
Observations	12,823	12,823	12,780	12,823
R-squared	0.023	0.103	0.134	0.117
Year		x	x	x
Sector		x	x	x
Size			x	
Age			x	
Legal			x	
Department			x	
Firm				x

Notes: Standard errors (in parentheses) clustered by firm. '***', '**' and '*' refer to statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 14: 'Number of Products' Premium

	(1)	(2)	(3)	(4)
		All Firms		
Products	0.0101***	0.00966***	0.00673***	0.00394***
	(0.0014)	(0.0015)	(0.0016)	(0.0015)
Observations	26,130	26,130	26,052	26,130
R-squared	0.016	0.092	0.127	0.104
		Exporters Only		
Products	0.00805***	0.00755***	0.00587***	0.00253*
	(0.0014)	(0.0015)	(0.0016)	(0.0014)
Observations	12,672	12,672	12,629	12,672
R-squared	0.022	0.108	0.138	0.117
Year		x	x	x
Sector		x	x	x
Size			x	
Age			x	
Legal			x	
Department			x	
Firm				x

Notes: Standard errors (in parentheses) clustered by firm. '***', '**' and '*' refer to statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 15: TFP and Frequency of Exporting: 'Number of Months' Premium

	(1)	(2)	(3)	(4)
			All Firms	
Months	0.0305***	0.0310***	0.0282***	0.0224***
	(0.0027)	(0.0026)	(0.0032)	(0.0029)
Observations	26,130	26,130	26,052	26,130
R-squared	0.023	0.1	0.134	0.109
			Exporters Only	
Months	0.0381***	0.0365***	0.0329***	0.0233***
	(0.0037)	(0.0035)	(0.0041)	(0.0031)
Observations	12,672	12,672	12,629	12,672
R-squared	0.031	0.117	0.147	0.125
CV(Months)	-0.149***	-0.140***	-0.122***	-0.0692***
	(0.0143)	(0.0136)	(0.0159)	(0.0105)
Observations	12,672	12,672	12,629	12,672
R-squared	0.028	0.114	0.144	0.122
Year		x	x	x
Sector		x	x	x
Size			x	
Age			x	
Legal			x	
Department			x	
Firm				x

Notes: Standard errors (in parentheses) clustered by firm. '***', '**' and '*' refer to statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 16: TFP and Frequency of Exporting: Marginal Effects

	(1)	(2)	(3)
Continuous	0.0547***	0.0608***	0.0420***
	(0.0069)	(0.0071)	(0.0068)
Occasional	-0.0146**	-0.0148**	-0.0133**
	(0.0064)	(0.0066)	(0.0067)
Observations	26,130	26,130	26,052
Year		x	x
Sector		x	x
Size			x
Age			x
Legal			x
Department			x

Notes: Standard errors (in parentheses) clustered by firm. '***', '**' and '*' refer to statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 17: Productivity and Type of Export Destination

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Degree of specialization (%):	*50*	*75*	*100*	*50*	*75*	*100*	*50*	*75*	*100*
Central America & Caribbean	-0.0245	-0.0626**	-0.0641						
	(0.0180)	(0.0278)	(0.0409)						
North America	0.0457*	0.067	0.0732						
	(0.0271)	(0.0419)	(0.0559)						
Europe	0.0086	0.0653	0.0841						
	(0.0637)	(0.1010)	(0.1110)						
Low income				0.111	0.0717	0.0928			
				(0.0918)	(0.1150)	(0.2230)			
Lower middle income				-0.0466	-0.0863	-0.0535			
				(0.0454)	(0.0580)	(0.0811)			
Upper middle income				-0.0237	-0.0394	-0.0238			
				(0.0251)	(0.0359)	(0.0559)			
OECD							(0.0443)	(0.0322)	0.0699
							(0.0494)	(0.0677)	(0.0778)
Observations	11,376	7,969	4,087	11,971	9,614	4,953	7,873	5,705	2,717
R-squared	0.117	0.118	0.098	0.117	0.113	0.08	0.114	0.11	0.072

Notes: All regressions include fixed effects by year, industry, and firm. Standard errors (in parentheses) clustered by firm. '***', '**' and '*' refer to statistical significance at the 1%, 5%, and 10% levels, respectively. Income groups follow the World Bank's classification. Mexico and Chile excluded from OECD.

Table 18: Productivity and Type of Exported Goods

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Degree of specialization (%):	*50*	*75*	*100*	*50*	*75*	*100*	*50*	*75*	*100*
Intermediate	-0.00868	-0.0255	-0.081						
	(0.0314)	(0.0457)	(0.0582)						
Consumption	-0.019	-0.0374	0.0359						
	(0.0364)	(0.0561)	(0.0773)						
Chemicals & Allied Industries				0.0742	0.133	0.0951			
				(0.1240)	(0.1480)	(0.1250)			
Plastics / Rubbers				0.0361	0.127	0.124			
				(0.1310)	(0.1550)	(0.1490)			
Textiles				0.0368	0.0876	-0.267			
				(0.1400)	(0.1710)	(0.2050)			
Machinery / Electrical				0.0143	0.109	0.131			
				(0.1310)	(0.1530)	(0.1430)			
Differentiated products							-0.0419	-0.115	-0.235
							(0.1710)	(0.2570)	(0.3950)
Homogeneous products							-0.056	-0.125	-0.259
							(0.1610)	(0.2430)	(0.3740)
Observations	12,632	11,490	6,176	12,472	11319	5854	10679	9922	6356
R-squared	0.115	0.114	0.119	0.115	0.117	0.113	0.12	0.121	0.117

Notes: All regressions include fixed effects by year, industry, and firm. Standard errors (in parentheses) clustered by firm. '***', '**' and '*' refer to statistical significance at the 1%, 5%, and 10% levels, respectively.

Appendix

In this Appendix we present the averages for our alternative measures of a firm's export-market orientation across industries, broken down by industry and year. We define 2-digit industries according to the ISIC (rev. 3.1) classification presented in Table A-1.

In Table A-2, we report the ratio of exports to total income, a firm's export intensity, averaging across all exporting firms within a sector. We see that there are sectors like ISIC 35 (manufacture of other transport equipment) for which exports are almost nil, while for sectors like ISIC 33 (medical, precision, and optical instruments; watches and clocks) exports account for over a third of their sales. At the same time, sectors differ greatly in the evolution of the export shares over the period between 2005 and 2013. For instance, the share of exports remained relatively unchanged for ISIC 24 (chemicals and chemical products), while it more than halved for ISIC 29 (machinery and equipment), and, after the trade collapse of 2009–2010, it grew steadily for ISIC 31 (electrical machinery).

In Table A-3, we present the average number of export destinations. The average exporter in our sample reached six countries. While this average appears to be fairly stable across years, it masks great cross-sector heterogeneity. For instance, firms that manufacture wood products (ISIC 20) export to, on average, 3.3 destinations. In contrast, firms that manufacture medical, precision, and optical instruments, watches and clocks (ISIC 33) export to, on average, 14.5 countries—four times as many.

In Table A-4, we present the average number of exported products, defined at the 10-digit level. The average exporting firm exported over nine products. As with the number of destinations, this average is stable across years, but there is great heterogeneity across sectors. For instance, exporters in sector ISIC 35 (other transport equipment) export, on average, over 20 different products; in contrast, firms in sectors ISIC 20 (manufacture of wood products) or ISIC 22 (publishing, printing, and recorded media) export fewer than five products on average.

Finally, in Table A-5, we present the average number of months in which an exporting firm made shipments abroad. Although the differences between sectors are smaller than in the previous three cases, there are a couple of industries that stand out. Manufacturers of wood products (ISIC 20) are characterized by a lower-than-average frequency of shipments, with a cross-year average of fewer than six months and with this number reaching a low 4.3 by the end of our sample. On the contrary, manufacturers of instruments, watches, and clocks (ISIC 33), export constantly and even exported every month during 2008—the only industry in our sample to do so.

Table A-1: Industry Codes (ISIC Rev. 3.1)

Code	Description
15	Manufacture of food products and beverages
16	Manufacture of tobacco products
17	Manufacture of textiles
18	Manufacture of wearing apparel; dressing and dyeing of fur
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
21	Manufacture of paper and paper products
22	Publishing, printing and reproduction of recorded media
23	Manufacture of coke, refined petroleum products and nuclear fuel
24	Manufacture of chemicals and chemical products
25	Manufacture of rubber and plastics products
26	Manufacture of other non-metallic mineral products
27	Manufacture of basic metals
28	Manufacture of fabricated metal products, except machinery and equipment
29	Manufacture of machinery and equipment n.e.c.
30	Manufacture of office, accounting and computing machinery
31	Manufacture of electrical machinery and apparatus n.e.c.
32	Manufacture of radio, television and communication equipment and apparatus
33	Manufacture of medical, precision and optical instruments, watches and clocks
34	Manufacture of motor vehicles, trailers and semi-trailers
35	Manufacture of other transport equipment
36	Manufacture of furniture; manufacturing n.e.c.

Table A-2: Export Intensity: Exports to Total Sales of Exporting Firms (%)

Sector	2005	2006	2007	2008	2009	2010	2011	2012	2013
15	13.3	13.4	12.5	13.3	9.6	9.2	9.4	9.4	9.5
17	24.4	21.1	24.8	30.4	27.1	19.7	20.9	20.7	19.7
18	34.9	36.2	30.9	33.9	24.3	21.8	19.1	17.2	14.1
19	25.9	27.3	31.9	23.0	16.6	15.8	10.9	14.1	11.1
20	24.9	21.1	17.4	15.4	16.8	13.7	7.7	10.4	10.6
21	27.2	31.1	30.2	29.1	23.1	19.5	21.2	21.4	19.0
22	13.6	11.6	11.6	12.9	11.8	8.0	8.4	6.1	5.3
24	18.9	18.7	17.9	19.3	19.0	19.6	20.6	20.9	22.3
25	18.5	19.8	20.0	20.6	24.3	22.9	20.2	19.2	21.1
26	16.2	15.3	11.4	11.0	12.7	9.3	15.7	22.7	11.1
28	24.7	28.4	23.5	28.1	25.9	18.1	19.8	14.6	14.2
29	27.3	25.1	28.0	27.2	22.5	15.3	14.0	15.3	12.5
31	19.3	20.4	29.6	21.4	28.0	9.6	12.4	15.9	18.8
33	33.9	35.4	44.4	42.3	38.4	31.7	37.8	35.7	29.5
34	24.7	22.5	32.0	20.4	14.1	12.5	13.3	11.1	20.5
35	7.5	7.9	8.6	6.7	8.7	2.9	3.4	2.2	1.1
36	30.2	37.0	40.0	33.2	21.5	17.8	23.1	20.0	18.2
Overall	20.4	21.0	20.9	20.4	17.5	15.2	15.8	15.4	15.5

Source: Authors' calculations based on data from SIREM and DIAN/DANE.
Notes: Averages weighted by total sales. In order to avoid disclosing confidential information, we do not report sector-specific statistics for ISIC 16, ISIC 30, and ISIC 32; firms in these industries are included in the overall manufacturing averages. Firms with exports greater than total income excluded from the sample.

Table A-3: Average Number of Destinations

Sector	2005	2006	2007	2008	2009	2010	2011	2012	2013
15	6.1	6.2	6.9	7.0	6.7	7.1	6.9	7.9	7.7
17	5.3	5.5	5.5	6.0	5.7	6.2	5.9	5.4	4.6
18	5.8	5.7	5.3	5.5	5.3	5.6	5.8	6.3	6.2
19	5.6	5.6	4.9	5.8	5.7	6.0	5.3	5.0	5.0
20	3.6	3.4	4.2	3.8	3.9	2.7	3.6	3.2	1.7
21	6.9	7.5	7.4	8.1	7.5	7.7	8.8	8.8	7.7
22	6.8	6.7	5.8	6.1	5.9	5.5	6.1	5.3	4.8
24	7.2	7.1	7.0	6.9	7.1	7.4	7.4	7.1	7.2
25	5.6	5.5	5.8	5.8	5.6	5.5	5.5	5.5	5.4
26	8.3	7.6	8.0	8.6	8.3	6.9	8.3	8.0	7.3
28	5.8	5.1	5.9	5.3	5.3	5.1	4.7	5.1	5.2
29	6.3	5.6	5.6	5.9	5.1	5.3	5.7	5.7	5.3
31	6.9	6.9	7.6	7.5	7.3	6.7	6.1	6.6	8.0
33	13.0	14.4	12.6	19.8	14.6	12.2	16.0	16.5	11.1
34	4.7	4.9	4.8	4.5	4.1	4.3	4.5	4.3	4.3
35	6.4	5.3	5.1	6.8	6.8	7.2	7.4	7.3	6.4
36	5.5	5.0	5.6	5.3	5.3	5.5	5.2	5.7	5.2
Overall	6.1	5.9	6.1	6.1	6.0	6.0	6.1	6.2	6.0

Source: Authors' calculations based on data from DIAN/DANE.
Notes: In order to avoid disclosing confidential information, we do not report sector-specific statistics for ISIC 16, ISIC 30, and ISIC 32; firms in these industries are included in the overall manufacturing averages.

Table A-4: Average Number of Exported Products

Sector	2005	2006	2007	2008	2009	2010	2011	2012	2013
15	6.7	7.5	7.8	7.3	7.9	8.6	7.4	8.0	8.1
17	9.0	9.2	9.9	10.1	9.4	9.3	8.7	8.8	9.0
18	16.3	15.2	18.4	17.8	15.6	16.1	17.9	20.0	19.6
19	7.2	7.0	5.0	6.7	7.7	8.5	9.2	4.5	7.0
20	5.8	5.2	5.5	3.8	4.9	3.3	4.1	3.9	2.9
21	7.0	7.5	7.9	7.4	7.3	7.5	7.4	8.9	7.5
22	6.0	5.3	4.6	4.5	5.0	4.4	4.0	3.7	3.7
24	13.6	13.1	13.7	14.1	14.9	15.0	16.1	16.2	16.0
25	6.6	5.3	5.4	5.4	5.1	5.1	5.2	5.5	5.2
26	6.8	6.6	7.4	6.8	7.3	6.3	6.7	6.5	6.2
28	7.0	6.6	7.0	6.4	6.6	6.5	6.4	7.4	7.2
29	13.0	10.7	10.5	12.1	11.6	9.9	10.8	10.6	11.5
31	13.0	12.4	12.8	12.0	11.7	12.0	10.6	12.2	12.5
33	9.0	10.6	10.5	13.2	10.3	7.9	11.0	13.2	9.1
34	12.6	12.6	11.7	11.3	10.0	9.8	11.0	12.0	12.4
35	22.1	21.4	21.6	18.3	24.3	27.6	27.2	25.5	22.8
36	7.7	6.6	7.5	6.0	6.5	7.0	7.3	8.4	7.6
Overall	9.8	9.2	9.7	9.5	9.4	9.2	9.6	10.1	9.9

Source: Authors' calculations based on data from DIAN/DANE.
Notes: In order to avoid disclosing confidential information, we do not report sector-specific statistics for ISIC 16, ISIC 30, and ISIC 32; firms in these industries are included in the overall manufacturing averages.

Table A-5: Average Number of Months with Exports

Sector	2005	2006	2007	2008	2009	2010	2011	2012	2013
15	7.3	7.6	7.9	7.9	7.7	7.9	7.8	8.3	8.3
17	8.3	8.3	8.1	8.6	8.2	8.0	8.2	7.8	7.7
18	8.7	8.5	8.7	8.3	7.6	7.5	7.7	8.2	7.8
19	8.1	7.7	7.3	6.8	6.6	7.5	7.2	6.2	6.6
20	6.3	6.8	7.8	6.6	6.3	4.3	5.0	4.8	4.3
21	7.8	8.0	8.2	8.6	8.4	8.4	9.2	9.7	8.3
22	8.1	7.2	7.0	6.8	7.1	6.4	6.9	6.6	6.4
24	8.8	8.7	8.6	8.5	8.4	8.7	8.6	8.6	8.4
25	8.5	8.3	8.4	7.8	7.7	7.4	7.9	8.1	7.8
26	9.3	9.0	9.5	8.9	8.8	8.5	9.9	9.1	8.8
28	7.8	7.2	8.0	7.6	7.2	6.8	6.8	7.2	7.2
29	7.9	7.1	7.1	7.5	6.9	6.2	6.7	6.8	6.1
31	9.1	8.8	9.5	9.3	8.9	9.3	7.9	8.4	9.0
33	9.9	10.0	7.4	12.0	10.6	9.2	11.3	10.8	9.4
34	9.3	9.9	9.3	9.4	8.9	9.6	9.1	8.9	8.2
35	9.3	7.4	7.9	7.0	7.8	9.4	8.4	10.0	10.0
36	7.4	7.9	8.5	7.7	7.6	7.8	8.1	8.3	7.8
Overall	8.3	8.1	8.3	8.0	7.8	7.7	7.9	8.1	7.8

Source: Authors' calculations based on data from DIAN/DANE.
Notes: In order to avoid disclosing confidential information, we do not report sector-specific statistics for ISIC 16, ISIC 30, and ISIC 32; firms in these industries are included in the overall manufacturing averages.