

# Trade Sides or Trade Modes: What Matters for Productivity Sorting of International Traders? Evidence from Latin American Countries

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## Abstract

In this paper, we complement the empirical evidence on the productivity sorting literature by considering different modes of import combined with different modes of export. Using the data of six Latin American countries, we test the first-order stochastic dominance to evaluate the Total Factor Productivity (TFP) differences among eight categories of traders. Our main result shows that, rather than the side, it is the mode of trade that matters. We show that the most productive firms choose to trade directly. In addition, firms that are both importers and exporters are more productive than firms active just on one side of the international market. Provided that the mode of trade is the same, firms that just import do not differ from those that just export. Similarly, we did not find a significant productivity difference between firms trading directly on one of the two trade sides and indirectly on the other. Thus, we concluded that direct two-way traders have the highest TFP, followed by direct one-way traders and then mixed two-way traders, indirect two-way traders, and, finally, indirect one-way traders.

**JEL Codes:** D22, F14, O31.

**Keywords:** TFP, Productivity Sorting, Direct and Indirect Trade, Import, Export, Stochastic Dominance

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## 1. Motivation and Background Literature

In this paper, we investigate heterogeneity across firms that may both export outputs and import inputs and, simultaneously, may choose to trade either directly or indirectly through intermediaries. Thus, we establish a productivity ranking among firms differently involved in international markets, both with respect to the modes and in terms of the two sides of international trade.

The role of firm-level heterogeneity in determining the trading behavior of firms, particularly the role of productivity, has been extensively documented in the new-trade literature (Blum et al., 2018). However, there are separated strands of literature where productivity differentials are linked either to the decision to trade or not, to the selection of the trade side (import, export, or both), or to the choice of the trade mode (directly or indirectly through intermediaries).

On the one hand, the existing literature largely investigated and found support about productivity differentials between exporters and nonexporters. Indeed, theoretical models show as only the more productive firms export, because of the existence of fixed costs of exporting that need to be covered (Melitz, 2003). Even though there is also ample empirical evidence that exporters are significantly more productive than nonexporters,<sup>1</sup> this focus, however, may have led to the underestimation of other means and other contexts in which also less productive firms may trade abroad.

On the other hand, a related line of recent research has focused on import activities in order to better understand the nature of heterogeneity in productivity across firms (Bernard et al., 2009; Amiti and Konings, 2007), and evidence suggests that importers tend to be more productive than nonimporters (Kasahara and Rodrigue, 2008). This is because, similar to what has been observed for exporters, only firms that can bear the burden of sunk and/or fixed costs become active importers (Halpern et al., 2015). Indeed, import activities require establishing a network with foreign suppliers, learning foreign customs regulations (Kasahara and Lapham, 2013) and foreign procedures (Castellani et al., 2010), implementing new production processes (Kiryama, 2012), and increasing the

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<sup>1</sup>See Wagner (2012) for a comprehensive survey of the empirical literature.

firms' absorptive capacity (Augier et al., 2013). In particular, Andersson et al. (2008) pointed out that importing is associated with fixed costs that are sunk costs, because imports require a preliminary search process for potential foreign suppliers, inspection of goods, and contract formulation. Moreover, the authors found out that firms that are both importers and exporters (i.e., two-way traders) tend to be more productive than firms that are active in either import or export activities (i.e., one-way traders). This finding is explained by the notion that two-way traders are fully involved in the international division of labor and use inputs based on frontier knowledge and technology in their production process. Due to sunk cost complementarities, Kasahara and Lapham (2013) also confirmed that two-way traders are more productive than one-way traders. Furthermore, Vogel and Wagner (2010) reported that, compared to firms that do not trade at all, two-way traders have the highest performance, followed by firms that only export, whereas firms that only import have the smallest premia with respect to nontraders. Differently, Castellani et al. (2010) confirmed the first result but pointed out that firms that only import outperform those that only export. However, productivity differences between one-way traders vanish once they control for fixed effects.

Finally, there is a further strand of literature with increasing attention toward different modes of trade (i.e., direct trade versus indirect trade through intermediaries). Import intermediaries differ from export intermediaries in several important features. For instance, export intermediaries trade mainly in homogenous goods and tend to be concentrated in commodity sectors, whereas import intermediaries largely trade in differentiated goods along a variety of sectors (Blum et al., 2018). Nevertheless, both import and export intermediaries have been proved to be particularly significant for small traders and more distant, smaller, difficult, or protected markets, which explain their widespread diffusion also in developing and emerging contexts (Bernard et al., 2010; Blum et al., 2010). Hence, several studies have focused on the relevance of intermediaries in facilitating trade (Ahn et al., 2011) and the ways in which indirect traders differ from direct traders (Abel-Koch, 2013). In particular, small firms choosing to trade through intermediaries can access foreign markets, even though they are unable to cover the fixed costs of direct export. Thus, intermediaries may alleviate the difficulty of reaching less accessible markets and help less efficient firms to supply foreign markets (Crozet et al., 2013). Since uncertainty about product quality is endemic in international trade, intermediaries may also eliminate the costs to acquire information about product

quality; in this case, the producers who benefit the most are those with the highest quality (Dasgupta and Mondria, 2018). In addition, intermediaries may also be useful in reducing the cost of matching international sellers and buyers (Petropoulou, 2010). Notwithstanding import intermediaries have been found to account up to three times more than export intermediaries in terms of the respective whole trade volumes (Blum et al., 2018), according to a number of authors (Muûls and Pisu, 2009; Castellani et al., 2010; Ahn et al., 2011; Wagner, 2012; Grazzi and Tomasi, 2016; Blum et al., 2018), scant attention has been paid to the modes of import compared to that of export. Thus, on the export perspective, theoretical models usually assume lower (or null) fixed costs of dealing with the intermediaries relative to those of direct export. However, at the same time, firms that export indirectly have to share a portion of their exporting revenue with intermediaries.<sup>2</sup> Therefore, while only the most productive firms export directly, those firms whose productivity is under a given threshold export through intermediaries. Nevertheless, while most empirical analyses showed that the most productive firms choose to export directly (Muûls and Pisu, 2009; Lu et al., 2017; Wagner, 2017), the productivity premia of indirect exporters over domestic firms are not always confirmed in the available empirical evidence. For instance, while Békés and Muraközy (2018) found out that firms that export only through intermediaries show no productivity premium compared to nontraders, McCann (2013) concluded that indirect exporters tend to be more productive than domestic firms.

All of the above arguments highlight separate but related lines of research where, in each branch of the literature, only one of the firms' choices is taken into account. Accordingly, it has been shown in recent literature that internationalization strategies are more complex than simply considering two alternatives (Békés and Muraközy, 2016). Particularly with respect to the literature on productivity sorting of international traders, since most analyses focused only on a specific international choice, the first drawback of these approaches is that distinct strategies are often tackled as one singular category. In addition, and more importantly, the second limitation of the above studies is that some

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<sup>2</sup>For instance, Blum et al. (2009) assumed that intermediaries enjoy economy of scale, which allows for fixed cost reduction. Rauch and Watson (2004) interpreted the share of exporting revenue for the intermediaries as a result of the negotiation between firms and intermediaries.

strategies could be mistreated. Indeed, firms involved in some international activities could also be treated as nontraders. In this regard, while Bernard et al. (2007) and Wagner (2007) focused on productivity differences between exporters and nonexporters, Halpern et al. (2015) and Kasahara and Rodrigue (2008) investigated the efficiency hierarchy between importers and nonimporters. Conversely, Kasahara and Lapham (2013), Castellani et al. (2010), and Vogel and Wagner (2010) compared firms active in both the import and the export market with firms engaged just in either import or export. Lastly, Felbermayr and Jung (2011) and Lu et al. (2017) studied the role of trade intermediaries in explaining the productivity differences among direct exporters, indirect exporters, and nontraders. Differently and notwithstanding the importance of trade intermediaries also for import (Bernard et al., 2010), theoretical or empirical analysis of productivity sorting of direct and indirect importers remains quite absent. Hence, all of the above paradigms cannot completely pick the relationship between firms' heterogeneity in productivity and the interdependent choices they make when involved in the international markets along multiple channels (Bernard et al., 2018).

Consequently, it has not yet been investigated in prior research how trade sides and trade modes, when simultaneously considered, affect the efficiency order of firms. Thus, what matters for productivity ranking of international traders? Trade sides, trade modes, or both? In order to answer this question, we complement the empirical evidence on the sorting literature by investigating firms' heterogeneity in a more complex structure, where different modes of import may be combined with different modes of export. For these purposes, we use a cross-country (cross-sectional) dataset of firms created by pooling data from the World Bank Enterprise Survey (WBES) implemented in six Latin American countries in 2006, 2010, and 2017. In particular, we test the rank ordering of the productivity distribution of firms that are differently involved in international markets, in terms of both trade sides and trade modes. Specifically, by following Delgado et al. (2002), we use the nonparametric two-tailed and one-tailed Kolmogorov–Smirnov (K-S) tests of first-order stochastic dominance to account for Total Factor Productivity (TFP) differences among eight categories of traders. Once the productivity ranking among traders is established, the internationalization conditions chosen by firms

become suitable to be treated in terms of an ordinal variable. Thus, we also implement an ordered logit model (and its generalized version) to investigate the extent to which a shift in productivity produces a reallocation of firms among traders' categories.<sup>3</sup>

First, since the literature still lacks comprehensive evidence regarding a productivity sorting model that accounts for both international trade sides and modes, we contribute to the empirical literature that studies the relationship between productivity and different internationalization choices.<sup>4</sup> Second, we complement another multicountry perspective on the available evidence on emerging markets. The methodological approach is the third contribution of our paper. In particular, we use the stochastic dominance criterion to compare the entire distribution of productivity of traders, who may be involved in either the output supply side (i.e., exports) or the input demand side (i.e., imports) under different trade modes (i.e., either directly or indirectly through intermediaries). Our main result shows that, rather than the side, it is the mode of trade that matters for productivity sorting among firms involved in the international market.

Finally, let us point out the main limitations of our study. Since our data are cross-sectional, it was not possible to precisely estimate causal effects. In other words, we were not able to discern what part of the productivity differentials could depend on the characteristics of firms prior to entering into the international markets (i.e., self-selection hypothesis) and what part could be a result of this behavior (i.e., learning by trading). This, to some extent, reflects a trade-off between estimating causal effects and establishing productivity sorting.<sup>5</sup> However, the purpose of our study, rather than determining whether higher productivity is due to selection or learning by trading, is to complement the sorting literature on the relative performance of eight categories of

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<sup>3</sup>Similarly to Békés and Muraközy (2018), we are confident that an ordered logit regression may be appropriate to estimate sorting along multiple potential international choices. Nonetheless, the question is whether or not productivity differentials exist even if other factors, related to both productivity and international trade strategies, are controlled for.

<sup>4</sup>A partial exception is due to Grazzi and Tomasi (2016). However, rather than establishing productivity sorting, the authors found evidence of different productivity premia associated with firms engaged in both importing and exporting activities, either directly or indirectly.

<sup>5</sup>Greenaway and Kneller (2007) and Wagner (2007) offered a review of these pieces of literature. However, while the evidence of the first mechanism is quite conclusive for exports (e.g., Bernard and Jensen, 1999) and for imports (e.g., Muûls and Pisu, 2009), evidence of the effects of international trade on productivity is more mixed (Wagner, 2012).

firms, in which heterogeneity is simultaneously characterized by the choice of both the side and the mode of the international trade.

The remainder of this paper is structured as follows. Section 2 describes the data and illustrates our empirical strategy. The estimation results are presented in Section 3. Specifically, Section 3.1 reports the results of tests of first-order stochastic dominance. Estimations based on the ordered logit model are presented in Section 3.2. Finally, Section 4 concludes the paper and suggests avenues for further research.

## **2. Data and Empirical Strategy**

### *2.1. Data Description*

Our empirical study draws on data from the WBES, detailed firm-level data collected by the World Bank. Since 2006, and for each country under investigation, surveys were collected under a common global sampling methodology. The sample was stratified by sector, size, and geographical region. Country data are currently available for 148 economies and more than 168,000 firms.

We performed our analyses on six Latin American countries (Argentina, Bolivia, Ecuador, Paraguay, Peru, and Uruguay) by merging the 2006, 2010, and 2017 waves of the WBES. The dataset originally contained 11,833 observations. Once we focused on firms interviewed at least in two consecutive surveys, we were left with 4,892 observations. Specifically, 1,000 firms were observed in 2006 and 2010, 585 firms were observed in 2010 and 2017, and 574 firms were observed in all waves. Thus, our starting sample was made up of 2,159 firms and 4,892 observations.<sup>6</sup>

The survey questionnaire was organized around several topics, including firm characteristics, access to finance, annual sales, costs of inputs, workforce composition, infrastructure, trade, competition, capacity utilization, innovation and technology, and performance measures. Of particular interest for our research question, firms were asked

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<sup>6</sup>We remark that the WBES has limited time-series properties. However, even though the longitudinal component of the data is insufficient to pick up time variations, as described in the next section, we make use of the longitudinal dimension to estimate firms' TFP, which is crucial for our analysis.

to report the percentages of establishment's sales sold domestically, through indirect export and through direct export. This allowed us to distinguish among nonexporters, indirect exporters, and direct exporters. Similarly, firms were also asked to report whether they imported material inputs from foreign countries and, if so, whether they were imported directly. Coherently, we classified firms as nonimporters, indirect importers, and direct importers. In particular, firms were considered nonexporters (nonimporters) if they had sales (purchases) only in the domestic market. Differently, while firms were classified as indirect exporters (indirect importers) if they had a positive share of sales (purchases) in the form of indirect exports (indirect imports), firms were considered direct exporters (direct importers) if they had a positive share of sales (purchases) in the form of direct exports (direct imports). With respect to firms that reported positive shares of sales in the forms of both direct and indirect exports, we coded these firms as direct exporters.<sup>7</sup> Similarly, we coded as direct importers those firms that import both directly and indirectly.<sup>8</sup>

Summing up, we are able to distinguish among eight different categories of traders<sup>9</sup>:

- (a) *Indirect only-exporters*: firms trading indirectly only on the export side.
- (b) *Indirect only-importers*: firms trading indirectly only on the import side.
- (c) *Indirect two-way traders*: firms trading indirectly on the import and export sides.
- (d) *Mixed two-way traders with direct exports*: firms trading indirectly on the import side and directly on the export side.
- (e) *Mixed two-way traders with direct imports*: firms trading indirectly on the export side and directly on the import side.
- (f) *Direct only-exporters*: firms trading directly only on the export side.
- (g) *Direct only-importers*: firms trading directly only on the import side.
- (h) *Direct two-way traders*: firms trading directly on the import and export sides.

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<sup>7</sup>Inspired by the models of Melitz, McCann (2013) used the same approach, noticing that when firms trade through both modes, they have already overcome the higher fixed costs of trading directly.

<sup>8</sup>The number of observations shrinks to 3,228 records with valid information about the chosen side and mode of trade.

<sup>9</sup>We take domestic firms (i.e., firms that do not trade internationally) as a separate category with respect to firms actually involved in import and/or export activities.



**Table 1** shows the number and share of firms belonging to each category.

Thus, to answer our research question, we attempted to establish a productivity ranking among these different internationalization conditions chosen by firms. As a measure of productivity, we refer to firms' TFP.<sup>10</sup> In particular, we estimated the TFP under the Levinsohn and Petrin (2003) methodology to account for endogeneity and existence of unobservable productivity shocks.<sup>11</sup> **Table 2** shows the average TFPs (and other statistics) by categories of traders.

## 2.2. Estimation Strategy

In order to reach our goal, we implemented the nonparametric two-tailed and one-tailed K-S tests of first-order stochastic dominance between the distributions of TFP, by looking simultaneously at the side and the mode of trade chosen by firms. Tests can be constructed in the following way. Let  $F$  and  $G$  be the Cumulative Density Functions (CDFs) of the TFP of, respectively, two categories of firms differing in the side and/or the mode with which they trade. Under the null hypothesis, the two-tailed K-S test checks whether the two distributions are equal, against the alternative hypothesis of different distributions. Formally,

$$H_0: F(z) - G(z) = 0 \quad \forall z \in \mathbb{R} \quad \text{versus} \quad H_1: F(z) - G(z) \neq 0 \text{ for some } z \in \mathbb{R},$$

where  $z$  is the productivity level. Thus, the two-tailed test can be used to identify, among the above categories, clusters of firms homogenous in terms of the distribution of TFP.

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<sup>10</sup>The variables (in logs) used to estimate the gross output measure of the TFP include firms' annual sales as a proxy of output (Y); the number of skilled and unskilled workers as a proxy of labor inputs (L); and the net value of machinery, vehicles, and equipment as a proxy of capital inputs (K). As is standard in the literature, we use the cost of raw and intermediate materials (M) in a control function to account for unobserved productivity shocks. All the above monetary variables are expressed in local currency units, which refer specifically to each national survey and the data span on different fiscal years. Thus, for our cross-country estimations, all data were converted into US dollars using the official exchange rate. Moreover, the data were also deflated to 2009 using the GDP deflator for USA. Notice that we are able to estimate the TFP for 1,615 firms interviewed at least in two consecutive surveys and for which we have valid information about the side and the mode of trade.

<sup>11</sup>Since the method of Olley and Pakes (1996) treats the endogeneity problem by making use of firms' investment as a proxy for unobservable productivity shocks, the absence of information regarding firms' investments precludes the application of this alternative methodology.

Differently, the one-tailed test can be formulated as follows:

$$H_0: F(z) - G(z) \leq 0 \quad \forall z \in \mathbb{R} \quad \text{versus} \quad H_1: F(z) - G(z) > 0 \quad \text{for some } z \in \mathbb{R}.$$

By testing the hypothesis that the distribution  $G$  contains smaller values than the distribution  $F$ , a positive and significant value of the statistic implies that the distribution  $F$  lies to the left of  $G$ . Therefore, by detecting first-order stochastic dominance, the one-tailed test is able to establish a productivity ranking among categories of traders who differ in the side and/or the mode with which they trade.

Once the ranking of productivity among traders is established, we investigate the extent to which a shift in productivity produces a reallocation of firms among categories of traders. To this end, we implemented an ordered logit model where the dependent variable reflects those categories of traders for whom the distributions of TFPs strictly differ. This, indeed, allowed us to treat the ( $N \leq 8$ ) internationalization conditions chosen by firms in terms of an ordinal variable, which takes values  $j = 0, \dots, N$ .<sup>12</sup>

Let  $y_i$  be this ordered response variable. Furthermore, let  $i = 1, \dots, n$  be an index for the  $n$  firms observed in the sample and  $x_i$  be a vector of covariates. An ordered logit model assumes that the observed value of each  $y_i$  is related to an unobserved continuous variable  $y_i^*$  such that

$$y_i = j \quad \text{iff} \quad \phi_j \leq y_i^* < \phi_{j+1},$$

where  $\phi$ 's are cutoff values with  $\phi_0 = -\infty$  and  $\phi_{N+1} = +\infty$ . Finally, the model assumes that  $y_i^* = x_i' \beta + e_i$ , where  $\beta$  is a vector of parameters,  $x'$  is a set of firm characteristics, and  $e$  is the error term. The model can be written as

$$\Pr(y_i > j | x_i) = \frac{\exp(x_i' \beta - \phi_j)}{1 + \exp(x_i' \beta - \phi_j)}, \quad j = 0, \dots, N.$$

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<sup>12</sup>For the reference category, we set  $j = 0$  by indicating domestic firms.

Thus, we were able to verify whether or not productivity differentials persist even when other factors are controlled for.<sup>13</sup> In particular, in addition to the TFP, our empirical model includes the *firm age* (number of years since the firm was established), *firm size* (a categorical variable that takes three possible values, i.e., small [employees < =50], medium [50 < employees ≤ 250], and large [employees < 250] firms), *product quality* (dummy equals 1 if a firm received an internationally recognized quality certification), *mono product firm* (dummy equals 1 if the firm produces only a single product), *contract enforceability* (a categorical variable that reflects whether a firm is more or less confident that the judicial system will enforce its contractual and property rights in business disputes), *foreign technology* (dummy equals 1 if the firm uses technology licensed by a foreign-owned company), and *skill intensity* (fraction of skilled employees divided by the total number of employees).<sup>14</sup> Moreover, to account for the heterogeneity across countries, industries, and years, we controlled for the country, industry, and year fixed effects. In addition, we computed robust standard errors clustered at the industry level to account for potential heteroscedasticity.<sup>15</sup> **Table 3** shows summary statistics for these additional variables.

As a robustness check, we estimated a generalized ordered logit model. In the standard ordered logit model, the effects of the covariates are constant across response categories. Such assumption is commonly referred to as the proportional odds hypothesis. One way to relax this assumption is to allow covariates to have category-specific slopes. This causes an increase in the parameters to be estimated, while it might not necessarily be true that all slopes are category-specific. In order to identify the subset of covariates whose slopes vary across categories, we used the Brant (1990) test. The model can then be rewritten by splitting the set of covariates in the following way:

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<sup>13</sup>For a similar approach, see Lu et al. (2017) and Békés and Muraközy (2018).

<sup>14</sup>Abel-Koch (2013) selected the same covariates as firms' characteristics able to explain their trading behavior.

<sup>15</sup>After deleting observations without valid information about trade sides, trade modes, TFP measures, and the above further firms' characteristics, we were able to run an estimation for a final sample of 1,474 observations.

$$\Pr(y_i > j|x_i) = \frac{\exp(x'_{1i}\beta_1 + x'_{2i}\beta_{2j} - \phi_j)}{1 + \exp(x'_{1i}\beta_1 + x'_{2i}\beta_{2j} - \phi_j)}, \quad j = 1, \dots, N,$$

where  $\beta_1$  is a vector of parameters associated with a subset  $x_{1i}$  of covariates, which were not found to violate the proportional odds assumption, and  $\beta_j$  is the vector of parameters that vary with categories and are associated with the subset  $x_{2i}$  of explanatory variables.

### 3. Results

#### 3.1. Trade Sides, Trade Modes, and Productivity Sorting

In line with what was described in the previous section, we tested the stochastic dominance of TFP distributions among different categories of traders. We started by implementing all possible comparisons among the four categories of firms involved in either import or export [i.e., categories (a), (b), (f), and (g)], and then we compared the four categories of firms involved in both sides of the international market [i.e., categories (c), (d), (e), and (h)].

In particular, first, we performed separate K-S tests between only-importers (only-exporters) by distinguishing indirect versus direct mode of trade. In other words, we tested for stochastic dominance between indirect only-importers (exporters) and direct only-importers (exporters). Second, we performed separate K-S tests between indirect (direct) traders by distinguishing importers from exporters. Specifically, on the one hand, we compared the distributions of indirect only-importers versus indirect only-exporters. On the other hand, we checked the differences between direct only-importers and direct only-exporters. Third, we used the K-S test to evaluate the differences in TFP distributions between indirect only-importers and direct only-exporters. Similarly, we performed the test between indirect only-exporters and direct only-importers. Then, we checked for differences among TFP distributions of two-way traders. In particular, we performed six separate K-S tests by considering all possible comparisons among the four categories of two-way traders (i.e., indirect two-way traders, mixed two-way traders with direct import, mixed two-way traders with direct export, and direct two-way traders).

In **Table 4**, we report the results of the K-S tests. In the first row of each comparison, we report the statistics and  $p$ -values of the two-tailed test of equality of distributions. Once we assessed whether the two distributions are equal or not, we performed the one-

tailed test to determine which of the two distributions dominates the other. The results are reported in the second and third rows of each panel.

Panel (a) shows that the TFP distribution of indirect only-importers (exporters) is statistically different from that of direct only-importers (exporters). Indeed, in both cases, we were able to reject the null hypothesis of equal distributions. Moreover, the one-tailed tests failed to reject the null hypothesis that the TFP distribution of indirect traders is stochastically dominated by the distribution of direct traders (for both importers and exporters). When we performed similar tests to check for the inverted relationship, we did not fail to reject the null hypothesis of stochastically dominated TFP distributions. Thus, direct traders outperform indirect traders involved on the same side of the international market.

Moving on to panel (b), we did not find a significant difference between the distributions of TFP in both comparisons. In particular, the results show a similar distribution for indirect only-importers versus indirect only-exporters. The same conclusion also holds for direct only-importers versus direct only-exporters. Thus, we concluded that indirect traders (those who trade just on one side of the international market) are homogenous in terms of the distribution of TFP independently of the side of the market on which they trade. By gathering these categories of traders homogenous in terms of TFP, we labeled as *indirect one-way traders* those firms trading indirectly, either on the export or on the import side. Similarly, we labeled as *direct one-way traders* those firms trading directly, either on the export or on the import side.

At the same time, panel (c) shows that direct only-exporters tend to be more productive than indirect only-importers, as well as direct only-importers versus indirect only-exporters. Therefore, we confirmed the conclusions of Muûls and Pisu (2009), Lu et al. (2017), Wagner (2017), and Békés and Muraközy (2018), who proved that the most productive firms choose to trade directly. Nevertheless, our results extend this finding by concluding that, rather than the side, it is the mode of trade that matters for productivity sorting among firms involved just in one side of the international market. These results partially support the conclusions by Castellani et al. (2010). Indeed, firms that just import do not show a different distribution of TFP from those that just export. However, we pointed out that this is true provided that the mode of trade is the same.

In panel (d), we compare the TFP distribution of two-way traders. Direct two-way traders outperform all other categories of two-way traders. Moreover, the TFP distributions of mixed two-way traders (those with direct import and those with direct export) stochastically dominate the TFP distributions of indirect two-way traders. Interestingly, we did not find a significant difference between the distributions of TFP associated with the two categories of mixed two-way traders. Thus, we merged these categories and labeled them uniquely as *mixed two-way traders*. Therefore, also among two-way traders, rather than the side, it is the mode of trade that matters for productivity ranking. Once again, only the most productive firms choose to trade directly, even when they trade on both sides of the international market.

Now, we performed further checks useful to construct the ordered dependent variable of the logit model, with the aim of verifying whether or not productivity differentials among traders persist even if other factors are controlled for. Therefore, considering the Kasahara and Lapham (2013) hypothesis, we also checked for differences between the TFP distribution of one-way traders (distinguishing between indirect and direct traders) and the TFP distribution of two-way traders (distinguishing among indirect, mixed, and direct traders). Thus, by considering all possible comparisons among these five categories of traders (which distributions of TFP strictly differ), we performed 10 evaluation tests of first-order stochastic dominance.

In panel (a) of **Table 5**, we compare indirect one-way traders with all the other categories. The results clearly show that the TFP distribution of indirect one-way traders lies to the left of the TFP distribution of all the other traders. As expected, from the two-tailed tests, we rejected, at the conventional value, the null hypothesis that distributions are identical. In addition, from the one-tailed tests, we concluded that indirect one-way traders are at the bottom of the performance hierarchy. Similarly, in panel (b), we see that indirect two-way traders are outperformed by mixed two-way traders, direct one-way traders, and direct two-way traders. Then, with respect to panel (c), we found that mixed-two-way traders tend to be less productive than direct one-way traders and direct two-way traders, even if, in the former case, the two-tailed test fails to reject the null hypothesis of equal distributions ( $p$ -value = 0.133). Finally, panel (d) focuses on the comparison of direct one-way traders against direct two-way traders. As expected, the TFP distribution of the latter stochastically dominates that of the former. Consequently, on the one hand, we confirmed the results of Vogel and Wagner (2010), Kasahara and

Lapham (2013), and Andersson et al. (2008), who found that firms that are both importers and exporters tend to be more productive than firms active just on one side of the international market. On the other hand, we shed light on the extent to which the choice to trade directly just on one side of the international market is correlated to higher productivity than that associated with mixed two-way traders. Probably, this result depends on the fact that the latter have not yet reached such productivity threshold that allows them to overcome the high fixed costs to trade directly on both sides of the international market.

In the end, we conclude that direct two-way traders have the highest TFP, followed by direct one-way traders and then mixed two-way traders, indirect two-way traders, and, finally, indirect one-way traders. Intuitively, because direct traders incur higher fixed costs, they have to be more productive than firms that choose to trade through intermediaries. In addition, our results are consistent with the empirical literature (Andersson et al., 2008; Muûls and Pisu, 2009; Castellani et al., 2010; Vogel and Wagner, 2010; Kasahara and Lapham, 2013; Grazzi and Tomasi, 2016), suggesting that two-way traders are more productive than one-way traders, due to sunk costs complementarity, or because the former base their production process on frontier technologies and knowledge.

Thus, by considering the above figures, we created a categorical (dependent) variable accounting for six mutually exclusive *trade* conditions strictly ordered in terms of TFP<sup>16</sup>:

- (1) *Indirect one-way traders*: firms trading indirectly, either on the export or on the import side.
- (2) *Indirect two-way traders*: firms both exporting and importing indirectly.
- (3) *Mixed two-way traders*: firms trading directly on one of the two trade sides.
- (4) *Direct one-way traders*: firms trading directly, either on the export or on the import side.
- (5) *Direct two-way traders*: firms both exporting and importing directly.

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<sup>16</sup>In unreported tests, we also checked and confirmed the stochastic dominance of TFP distributions of importers, exporters, and two-way traders against the TFP distribution of domestic firms irrespective of trading directly or indirectly. Thus, we used domestic firms as the reference category.

In the next section, we will check this productivity sorting by controlling also for other factors related to firms' productivity. Then, we will investigate the extent to which a shift in productivity produces a reallocation of firms among the above six categories of traders.

### 3.2. *Testing the Ordered Logit Model*

**Table 6** shows the results of the ordered logit model. The estimated coefficient of firms' productivity is positive and statistically significant. In addition, the estimated cutoff points are positive and significant. The large difference between the first and the last cutoff point is a clue to the different cost structure (and, therefore, of different productivity thresholds) faced by firms under different internationalization conditions (Békés and Muraközy, 2018). Thus, jointly considered, these findings further confirm the results of the previous section about productivity sorting among traders who differ in terms of the side and mode of trade in the international market.

Before turning our attention to the TFP variable, we will summarize the results of the other covariates included in the empirical model. First of all, at this stage, a positive and significant sign of a coefficient can only be interpreted as firms being more likely to fall into the highest category (i.e., direct two-way traders) and less likely to fall in the lowest category (i.e., domestic firms) with respect to an increase of the explanatory variable. Specifically, we found that the larger effect on the probability of moving up the ladder of trade exposure stems from the firm size and the share of skilled workers. A positive but smaller effect has been found for firms' age, product quality, and the adoption of foreign technology. We also found that contract enforceability has no effect on productivity sorting, whereas being a monoprodukt firm reduces the probability of being involved in international trade.

Turning our attention to our main research question, the results show that, along with an increase in the TFP, firms are less likely to be domestic and more likely to be direct two-way traders. The estimated coefficients amount to 0.637. Thus, by looking at



the sign of the coefficients, we can infer the direction of the partial effect of the TFP on the predicted probabilities of the extreme categories. Therefore, the TFP has a significant and negative effect on the probability of being a domestic firm, whereas it has a positive effect on the probability of belonging to the category of direct two-way traders.<sup>17</sup> Such effects, as well as those of the other explanatory variables, remain ambiguous on the probabilities of intermediate outcomes.<sup>18</sup> Nevertheless, we can rely on average predicted probabilities and determine average marginal effects (AMEs) to qualitatively and quantitatively describe the impact of our explanatory variables on all trade categories.<sup>19</sup> Therefore, we report the average predicted probabilities and AMEs in **Table 7**, where AMEs measure the impact of a marginal change in each explanatory variable on the probability of belonging to one of the six categories, while holding constant all other independent variables.

As **Table 7** shows, the average probability of being a domestic firm is 11.8%, whereas the probabilities of being in the other five categories are, respectively, 22.3%, 2.8%, 10.5%, 22.6%, and 30.1%. A marginal increase in the TFP decreases the estimated probability of the first category by 5.8 percentage points, as well as the probabilities of the second, third, and fourth categories (by 5, 0.2, and 0.3 percentage points, respectively). Differently, the AMEs of the last two categories denote an increase in the probabilities, respectively, by 1.9 and 9.4 percentage points. These results first confirm the conventional wisdom that more productive firms are more likely to be international traders, as an increase in the TFP reduces the likelihood of being a domestic firm by 5.8 percentage points. Nevertheless, and somehow unexpectedly, this likelihood reduction does not spread out uniformly over the remaining categories of traders; rather, we found a reduction for the categories of indirect one-way, indirect two-way, and mixed two-way traders. Second, an overall shift in the TFP produces a reallocation of firms from the first

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<sup>17</sup>The odds ratios associated with a one-unit increase in the regressor are immediately computed by taking the exponential of the coefficients. Thus, the change in the odds associated with a  $\delta$ -unit change is equal to  $\exp(\delta\beta)$ . For instance, a one-standard-deviation increase in the TFP (i.e., 0.736 for the full sample) implies that the odds ratio of moving away from the domestic firm category increases by a factor of 1.598.

<sup>18</sup>Notice that since the sum of the probabilities of belonging to one of the trade categories amounts to one, the sum of the partial effects of an explanatory variable on these probabilities needs to be zero.

<sup>19</sup>The marginal effects at the means could also be calculated. However, we prefer AMEs, first because mean values are only one of many possible sets of values that could be used and, second, because the use of means may produce a set of values that no real firm could in fact have.

four categories to the remaining categories, with the more pronounced effect being driven by domestic firms and indirect one-way traders (-10.8 overall percentage points) moving into the direct one-way and two-way traders categories (+11.3). This suggests that an increase in the TFP reduces the probability of relying on trade intermediaries as stated by Grazzi and Tommasi (2016). Third, by distinguishing between direct and indirect traders, our results extend the findings of Kasahara and Lapham (2013). According to the authors, firms that are both importers and exporters are more productive than firms active just on one side of the international market. On the one hand, we confirmed that, among direct traders, the larger the TFP, the higher the probability of being a two-way (+9.4 percentage points) rather than a one-way (+1.9) trader. Differently, a shift in the TFP would decrease the share of indirect one-way traders (who climb the ladder of internationalization modes toward the two upper categories) relatively more than what we found for indirect and mixed two-way traders.

As pointed out in Section 2.2, the previous ordered logit results rest on the proportional odds assumption. In **Table 8**, we report the statistics from the Brant (1990) test both for the entire model and for each covariate. The test detects that, overall, we can increase the precision of the model by relaxing the assumption, and it suggests that the covariates for which we can estimate varying slopes are the TFP, firm age, firm size, and product quality.

Thus, for robustness purposes, we reestimated the models through generalized ordered logit and we present the AMEs in **Table 9**.<sup>20</sup> From the inspection of the table, we saw that the main conclusions drawn from the previous analysis broadly apply to the generalized model results, with a caveat. We noticed that the marginal effects of the last two categories together imply that a shift in the TFP yields a reallocation of firms into the direct one-way and direct two-way traders categories (+12.80%) larger than what was found in the baseline ordered model (+11.30%). Nevertheless, this result is paralleled to AMEs for direct one-way traders, being of larger magnitude (+5.38%) than in the ordered logit model (+1.95%).

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<sup>20</sup>We report the AMEs for the coefficients with varying slopes. The complete table and the estimated coefficients are available upon request.

#### **4. Discussion and Conclusions**

In this study, we established a productivity ranking among firms that are differently involved in international markets, both with respect to the modes and in terms of the two sides of the international trade. In particular, in this paper, we tried to link related, but separate, strands of literature, where productivity differentials were linked alternatively either to the decision to trade or not, to the selection of the trade side (import, export, or both), or to the choice of the trade mode (directly or indirectly through intermediaries). Since prior research has not yet investigated how trade sides and trade modes, when simultaneously considered, affect the efficiency order of firms, we complemented the empirical evidence on the sorting literature by investigating firms' heterogeneity in a more complex structure, where different modes of import may be combined with different modes of export. Thus, we extended previous works by introducing direct and indirect imports as well as bidirectional trade modes in the already existing productivity sorting evidence, which often refers just to the export side. Our main result shows that, rather than the side, it is the mode of trade that matters for productivity sorting among firms involved in the international market. Indeed, firms that just import do not show a different distribution of TFP from those that just export. However, we pointed out that this is true provided that the mode of trade is the same. Only the most productive firms choose to trade directly, even when they trade on both sides of the international market. In addition, we shed light on the extent to which the choice to trade directly just on one side of the international market is correlated to higher productivity than that associated with mixed two-way traders. In the end, we concluded that direct two-way traders have the highest TFP, followed by direct one-way traders and then mixed two-way traders and finally indirect traders (two- and one-way).

Our analysis was among the first multicountry studies carried out in this branch of literature, with particular reference to emerging markets. Therefore, not only does it have a significant developmental potential, but also, hopefully, it will pave the way for more research in this regard. In this latter respect, we believe that the role of knowledge deserves further particular attention. The literature suggests that international trade requires threshold levels of productivity, as well as distinctive capabilities, which need to be present or created prior to any engagement with international markets. As a matter of fact, knowledge acquisition has been found as a relevant variable in the choice of international trade modes. Indeed, the ability to value, assimilate, and apply new

knowledge has been argued to be among the main determinants to enter import markets (Castellani et al., 2010). From the learning perspective, the work of Augier et al. (2013) provided further support to the role of absorptive capacity in the decision to import, as it has been found to leverage the import effects through the capability to access better inputs. Moreover, Abel-Kock (2013) found that, besides knowledge, product innovation also has an impact on the choice of the export modes. To the extent to which this is not only a mere research matter, this question has also relevant policy implications. There is, in fact, a lot of room for policymaking aimed at identifying, assessing, selecting, and supporting the creation of conditions for endowing local firms with the necessary knowledge and capabilities to raise their productivity levels so as to enter and benefit from international trade. This could be the case for supporting local firms' internationalization with training aids and specific programs to endow firms with highly skilled workers. In this regard, policymakers should consider that, especially for small firms and for emerging markets, this can be done not only by short-lived incentives for the hiring of qualified personnel, but also and more by long-term investments in reinforcing the local education system and promoting tighter linkages between firms and universities.

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## Tables and figures

**Table 1: Number of firms by categories of traders**

Categories of traders	Number of firms	Share of firms (%)
<i>Domestic firms</i>	486	15.06
<i>Indirect only-exporters</i>	28	0.87
<i>Indirect only-importers</i>	752	23.30
<i>Indirect two-way traders</i>	85	2.63
<i>Mixed two-way traders with direct exports</i>	98	3.04
<i>Mixed two-way traders with direct imports</i>	180	5.58
<i>Direct only-exporters</i>	721	22.34
<i>Direct only-importers</i>	128	3.97
<i>Direct two-way traders</i>	750	23.23
<i>Full sample</i>	3,228	100

**Table 2: Average TFP by categories of traders**

Categories of traders	TFP			
	Mean	Std. Dev.	Min	Max
<i>Indirect only-exporters</i>	5.815	0.751	3.993	6.948
<i>Indirect only-importers</i>	6.001	0.589	4.509	8.510
<i>Indirect two-way traders</i>	6.120	0.566	4.591	8.267
<i>Mixed two-way traders with direct exports</i>	6.299	0.747	4.325	8.205
<i>Mixed two-way traders with direct imports</i>	6.357	0.591	4.205	8.921
<i>Direct only-exporters</i>	6.435	0.647	4.328	9.403
<i>Direct only-importers</i>	6.470	0.573	5.449	8.280
<i>Direct two-way traders</i>	6.637	0.796	0.261	13.257
<i>Full sample</i>	6.334	0.736	0.261	13.257

**Table 3: Summary statistics**

Variables	Mean	Std. Dev.
<i>Firms age</i>	3.291	0.691
<i>Firms size (base: small)</i>		
<i>Medium</i>	0.269	0.443
<i>Large</i>	0.129	0.335
<i>Product quality</i>	0.267	0.442
<i>Mono product firms</i>	0.257	0.437
<i>Contract enforceability (base: not confident)</i>		
<i>Less confident</i>	0.299	0.458
<i>Confident</i>	0.150	0.357
<i>Strong confident</i>	0.044	0.204
<i>Foreign technology</i>	0.156	0.363
<i>Skill intensity</i>	0.742	0.246



**Table 4: One-tailed and two-tailed Kolmogorov–Smirnov test of stochastic dominance**

	comparison	statistic	p-value	comparison	statistic	p-value
<b>Panel a)</b>						
Equality of distributions	indirect only-importers VS. direct only-importers	0.352	0.000	indirect only-exporters VS. direct only-exporters	0.446	0.003
Difference favorable to	indirect only-importers direct only-importers	0.352 -0.006	0.000 0.997	indirect only-exporters direct only-exporters	0.446 0.000	0.002 1.000
<b>Panel b)</b>						
Equality of distributions	indirect only-importers VS. indirect only-exporters	0.180	0.638	direct only-importers VS. direct only-exporters	0.100	0.659
Difference favorable to	indirect only-importers indirect only-exporters	0.054 -0.180	0.914 0.371	direct only-importers direct only-exporters	0.048 -0.100	0.796 0.369
<b>Panel c)</b>						
Equality of distributions	indirect only-importers VS. direct only-exporters	0.281	0.000	indirect only-exporters VS. direct only-importers	0.506	0.002
Difference favorable to	indirect only-importers direct only-exporters	0.281 -0.003	0.000 0.997	indirect only-exporters direct only-importers	0.506 0.000	0.002 1.000
<b>Panel d)</b>						
Equality of distributions	indirect two-way traders VS. mixed two-way traders with direct imports	0.295	0.010	indirect two-way traders VS. mixed two-way traders with direct exports	0.258	0.076
Difference favorable to	indirect two-way traders mixed two-way traders with direct imports	0.295 -0.015	0.005 0.986	indirect two-way traders mixed two-way traders with direct exports	0.258 -0.039	0.047 0.932
Equality of distributions	indirect two-way traders VS. direct two-way traders	0.458	0.000	mixed two-way traders with direct imports VS. mixed two-way traders with direct exports	0.131	0.533
Difference favorable to	indirect two-way traders direct two-way traders	0.458 -0.008	0.000 0.995	mixed two-way traders with direct imports mixed two-way traders with direct exports	0.063 -0.131	0.756 0.301
Equality of distributions	mixed two-way traders with direct imports VS. direct two-way traders	0.223	0.000	mixed two-way traders with direct exports VS. direct two-way traders	0.332	0.000
Difference favorable to	mixed two-way traders with direct imports direct two-way traders	0.223 -0.006	0.000 0.993	mixed two-way traders with direct exports direct two-way traders	0.332 -0.019	0.000 0.968

Notes: Positive and significant statistics means that the sub-group distribution lies to the left of that of the alternative sub-group.

**Table 5: Kolmogorov-Smirnov test: one-way traders vs. two-way traders**

	comparison	statistic	p-value	comparison	statistic	p-value
<b>Panel a)</b>						
Equality of distributions	indirect one-way traders VS. indirect two-way traders	0.208	0.083	indirect one-way traders VS. mixed two-way traders	0.274	0.000
	indirect one-way traders indirect two-way traders	0.208	0.049	indirect one-way traders mixed two-way traders	0.274	0.000
Difference favorable to	indirect one-way traders indirect two-way traders	-0.065	0.748	indirect one-way traders mixed two-way traders	-0.017	0.943
	indirect one-way traders VS. direct one-way traders	0.300	0.000	indirect one-way traders VS. direct two-way traders	0.461	0.000
Equality of distributions	indirect one-way traders VS. direct one-way traders	0.300	0.000	indirect one-way traders VS. direct two-way traders	0.461	0.000
	indirect one-way traders direct one-way traders	0.000	1.000	indirect one-way traders direct two-way traders	-0.006	0.987
<b>Panel b)</b>						
Equality of distributions	indirect two-way traders VS. mixed two-way traders	0.278	0.013	indirect two-way traders VS. direct one-way traders	0.331	0.001
	indirect two-way traders mixed two-way traders	0.278	0.008	indirect two-way traders direct one-way traders	0.331	0.000
Difference favorable to	indirect two-way traders mixed two-way traders	-0.021	0.972	indirect two-way traders direct one-way traders	-0.005	0.998
	indirect two-way traders VS. direct two-way traders	0.480	0.000	indirect two-way traders VS. direct two-way traders	0.480	0.000
Equality of distributions	indirect two-way traders VS. direct two-way traders	0.480	0.000	indirect two-way traders VS. direct two-way traders	0.480	0.000
	indirect two-way traders direct two-way traders	-0.009	0.994	indirect two-way traders direct two-way traders	-0.009	0.994
<b>Panel c)</b>						
Equality of distributions	mixed two-way traders VS. direct one-way traders	0.113	0.133	mixed two-way traders VS. direct two-way traders	0.244	0.000
	mixed two-way traders direct one-way traders	0.113	0.073	mixed two-way traders direct two-way traders	0.244	0.000
Difference favorable to	mixed two-way traders direct one-way traders	-0.006	0.992	mixed two-way traders direct two-way traders	-0.007	0.990
	mixed two-way traders VS. direct two-way traders	0.113	0.073	mixed two-way traders VS. direct two-way traders	0.244	0.000
<b>Panel d)</b>						
Equality of distributions	direct one-way traders VS. direct two-way traders	0.213	0.000	direct one-way traders VS. direct two-way traders	0.213	0.000
	direct one-way traders direct two-way traders	0.213	0.000	direct one-way traders direct two-way traders	-0.013	0.940
Difference favorable to	direct one-way traders direct two-way traders	-0.013	0.940	direct one-way traders direct two-way traders	-0.013	0.940
	direct one-way traders VS. direct two-way traders	0.213	0.000	direct one-way traders VS. direct two-way traders	0.213	0.000

Notes: Positive and significant statistics means that the sub-group distribution lies to the left of that of the alternative sub-group.

**Table 6: Ordered Logit Regression Model**

Variables	Coefficients (S. E.)
<i>TFP</i>	0.637*** (0.155)
<i>Firms age</i>	0.181** (0.073)
<i>Product quality</i>	0.985*** (0.116)
<i>Firms size (base: small)</i>	
<i>Medium</i>	1.348*** (0.180)
<i>Large</i>	1.909*** (0.339)
<i>Mono product firms</i>	-0.203* (0.113)
<i>Contract enforceability (base: not confident)</i>	
<i>Less confident</i>	-0.084 (0.085)
<i>Confident</i>	0.080 (0.173)
<i>Strong confident</i>	0.063 (0.296)
<i>Foreign technology</i>	0.448*** (0.131)
<i>Skill intensity</i>	3.731*** (1.362)
<i>Skill intensity (square)</i>	-2.693*** (0.930)
<i>Cut-off 1</i>	4.786*** (0.747)
<i>Cut-off 2</i>	6.453*** (0.721)
<i>Cut-off 3</i>	6.618*** (0.709)
<i>Cut-off 4</i>	7.211*** (0.746)
<i>Cut-off 5</i>	8.573*** (0.691)

*Notes:* Robust standard errors, clustered at the industry-level, are reported in the brackets. The model includes country, industry and year fixed effects

**Table 7: Average Marginal Effects**

<b>Categories of traders</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<b>Predicted probabilities</b>	0.118	0.223	0.028	0.105	0.226	0.301
<b>Variables</b>	<b>AME</b>					
<i>TFP</i>	-0.058 (0.016)	-0.050 (0.011)	-0.002 (0.001)	-0.003 (0.002)	0.019 (0.004)	0.094 (0.025)
<i>Firms age</i>	-0.016 (0.007)	-0.014 (0.006)	-0.001 (0.000)	-0.001 (0.000)	0.006 (0.002)	0.027 (0.011)
<i>Product quality</i>	-0.089 (0.013)	-0.077 (0.007)	-0.004 (0.001)	-0.005 (0.002)	0.030 (0.003)	0.145 (0.018)
<i>Firms size (base: small)</i>						
<i>Medium</i>	-0.122 (0.014)	-0.105 (0.016)	-0.005 (0.002)	-0.007 (0.002)	0.041 (0.008)	0.198 (0.022)
<i>Large</i>	-0.173 (0.026)	-0.149 (0.029)	-0.007 (0.002)	-0.009 (0.002)	0.058 (0.014)	0.280 (0.041)
<i>Mono product firms</i>	0.018 (0.01)	0.016 (0.008)	0.001 (0.000)	0.001 (0.001)	-0.006 (0.003)	-0.030 (0.017)
<i>Contract enforceability (base: not confident)</i>						
<i>Less confident</i>	0.008 (0.008)	0.007 (0.007)	0.000 (0.000)	0.000 (0.001)	-0.003 (0.003)	-0.012 (0.013)
<i>Confident</i>	-0.007 (0.015)	-0.006 (0.014)	0.000 (0.001)	0.000 (0.001)	0.002 (0.005)	0.012 (0.025)
<i>Strong confident</i>	-0.006 (0.027)	-0.005 (0.023)	0.000 (0.001)	0.000 (0.001)	0.002 (0.009)	0.009 (0.043)
<i>Foreign technology</i>	-0.041 (0.011)	-0.035 (0.011)	-0.002 (0.001)	-0.002 (0.001)	0.014 (0.005)	0.066 (0.019)
<i>Skill intensity</i>	-0.338 (0.118)	-0.292 (0.111)	-0.014 (0.007)	-0.018 (0.007)	0.114 (0.047)	0.548 (0.192)
<i>Skill intensity (square)</i>	0.244 (0.081)	0.211 (0.075)	0.010 (0.004)	0.013 (0.005)	-0.082 (0.032)	-0.396 (0.131)

*Notes:* Robust standard errors are reported in the brackets. Categories of traders, from 1 to 6, are described in the text.

**Table 8: Brant Test**

<b>Variables</b>	<b>chi2</b>	<b>p&gt;chi2</b>
<i>Entire model</i>	167.250	0.000
<i>TFP</i>	10.040	0.040
<i>Firms age</i>	11.430	0.022
<i>Product quality</i>	20.560	0.000
<i>Firms size (base: small)</i>		
<i>Medium</i>	27.750	0.000
<i>Large</i>	37.890	0.000
<i>Mono product firms</i>	6.560	0.161
<i>Contract enforceability (base: not confident)</i>		
<i>Less confident</i>	2.640	0.620
<i>Confident</i>	0.980	0.913
<i>Strong confident</i>	2.250	0.689
<i>Foreign technology</i>	7.190	0.126
<i>Skill intensity</i>	6.780	0.148
<i>Skill intensity (square)</i>	8.010	0.091

**Table 9: Generalized Ordered Logit Regression - AME**

<b>Categories of traders</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<b>Variables</b>	<b>AME</b>					
<i>TFP</i>	-0.061 (0.017)	-0.060 (0.02)	0.010 (0.005)	-0.017 (0.011)	0.054 (0.013)	0.074 (0.023)
<i>Firms age</i>	0.003 (0.015)	-0.037 (0.011)	-0.019 (0.006)	0.015 (0.007)	0.023 (0.014)	0.016 (0.02)
<i>Product quality</i>	-0.129 (0.036)	-0.020 (0.041)	0.005 (0.006)	0.053 (0.017)	-0.065 (0.027)	0.157 (0.021)
<i>Firms size (base: small)</i>						
<i>Medium</i>	-0.086 (0.02)	-0.142 (0.038)	-0.026 (0.007)	0.009 (0.011)	0.063 (0.016)	0.182 (0.044)
<i>Large</i>	0.338 (0.097)	2.640 (0.126)	-5.817 (0.274)	2.410 (0.153)	0.146 (0.04)	0.283 (0.073)

*Notes:* Robust standard errors are reported in the brackets. Categories of traders, from 1 to 6, are described in the text.