

# Firms in International Trade: Importers and Exporters Heterogeneity in the Italian Manufacturing Industry\*

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## Abstract

This paper offers a portrait of Italian firms that trade goods. Combining data on firms' structural characteristics and economic performance with data on their exporting and importing activity, we uncover evidence supporting recent theories on firm heterogeneity and international trade, together with some new facts. In particular, we find that importing behaviour is associated with substantial firm heterogeneity. *First*, we document that trade is more concentrated than employment and sales, and we show that import is even more concentrated than export both within sectors and along the sector and country extensive margins. *Second*, while supporting the fact that firms involved in both importing and exporting (*two-way traders*) are the best performers, we also find that firms involved only in importing activities perform better than those involved only in exporting. Our evidence suggests that there is a strong self-selection effect in the case of importers. *Third*, the performance premia of internationalised firms correlate relatively more with the degree of geographical and sectoral diversification of imports.

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# 1 Introduction

Empirical and theoretical literature has emphasized the importance of firm heterogeneity in international trade. It has been shown that exporters are larger and exhibit significant performance premia relatively to non-exporting firms (see The International Study Group on Export and Productivity, 2008, for an international comparison). Two different theoretical interpretations have been proposed to explain such a productivity export premia: the self-selection hypothesis and the post-entry mechanisms.

Recently it has been stressed that export is only part of the story. On the one hand, some authors have started arguing that also importing activities should be taken into account in order to understand the nature of heterogeneity across different plants in the economy (Bernard et al., 2007; Halpern et al., 2005; Kasahara and Lapham, 2008; Vogel and Wagner, 2008). According to this view, empirical investigation should move forward by considering the engagement of firms in international transaction, either by means of exports, imports or a combination of the two. On the other hand, the empirical literature has also been concerned with new evidence regarding the degree of concentration of both exports and imports and the product and geographical diversification of trading firms (Bernard et al., 2007; Muuls and Pisu, 2007; Mayer and Ottaviano, 2007; Eaton et al., 2004). These analyses suggest that, in order to understand heterogeneity across firms and its influence on aggregate productivity levels, one should further explore the characteristics of traders in terms of their geographical and sectoral diversification.

Following these intuitions, the goal of the paper is to contribute to a better understanding of how internationalised firms differ. We investigate both firm heterogeneity on the import and the export side as well as in terms of their degree of diversification of trading activities. Combining data on structural characteristics and economic performances with data on exporting and importing activity on approximately 12.000 Italian firms over the 1993-1997 period, we spur further empirical research into firms and trade by presenting a new set of stylized facts. These data, which contain detailed information on the variety and the numbers of countries and sectors in which a firm trades, allow us to know a great deal more about the firm's international activity than just its trading status. Throughout the paper we explore different issues. We first describe the patterns of concentration of imports and exports across firms, and compare it with concentration of employment and sales. Then, we tackle the issue of the intensive and extensive margins in Italian international trade by offering a comprehensive view of both the number of traders, the intensity of their activities and their diversification both in terms of products and in terms of geographical markets. Finally, we convey a picture of firm heterogeneity associated to trade activities by showing how internationalised firms characteristics differ from those of domestic firms by considering both their trade status (we differentiate firms involved in both trading activities, the "two way traders", from firms that only export and from those that only import) and the diversification of their activities (the number of sectors and geographical markets in which they trade).

Our results are in line with evidence on the U.S. and other European countries, showing that exports and imports are more concentrated than employment, and that the bulk of international firms trade only a few products with a few countries, but a handful of diversified traders account for the majority of exports and imports. We also confirm that firms engaged in international activities are larger, more productive and more capital intensive than non-trading firms. Such large differences, estimated with pooled OLS regressions (controlling for sector, size, region and time effects), reduce, but remain positive and significant, once time invariant firm-specific heterogeneity is taken into account (FE model). Combining our findings using Pooled OLS and FE models, our evidence suggests that the advantage of firms involved in international trade over the non traders is the result of a self-selection mechanism, but some post-entry effects cannot be ruled out. In addition, a sort of hierarchy emerges also among traders: firms engaged in both import and export outperform both non-trading firms and firms involved in either importing or exporting only. However, firms involved in importing but not in exporting activities outperform those engaged only on the export side, but

this premium vanishes once we control for fixed effects. We submit that this result is consistent with the idea that self-selection may be stronger in the case of import than in the case of export. This interpretation is further reinforced by an analysis on ex-ante differences: future importers are larger, more productive and more capital intensive than non-traders and future exporters even three years prior to initiate their trading activities. We also find that importers tend to diversify less in terms of countries of origin than exporters do (in terms of destination markets), and that a higher diversification on the import side is strongly associated with higher productivity at the level of the firm.

The rest of the paper is organized as follows. In Section 2 we briefly review the existing literature on firms' heterogeneity and trading activities. In particular, Section 2.1 discusses the empirical and theoretical contributions on export and firm heterogeneity, while in Section 2.2 we focus on the empirical and theoretical analyses regarding the relationship between import and firm heterogeneity. Section 3 illustrates the data. Section 4 provides evidence on the degree of concentration both within and between sectors and along the country and sector extensive margin of imports and exports. Section 5 reports results on the association between firms' degree of internationalization (also along the country and sector extensive margins) and their size, productivity and capital intensity. Section 6 concludes.

## 2 Background literature

### 2.1 Exporting and firm heterogeneity

Starting from Bernard and Jensen's pioneering paper, a large number of micro-level studies have highlighted that differences in firm performances within sectors are strongly correlated with the firm decision to engage in international transactions. These studies have mainly examined the relationship between export activity and firm's characteristics and they have found that exporters are larger and exhibit significant performance premia relatively to non-exporting firms. Two different, but not mutually exclusive, hypotheses about how firms' performances are related to the export status have been put forward. On the one hand, it has been postulated that the existence of sunk costs, such as transport costs or expenses related to establishing a distribution channel, induces a self-selection of more productive firms (Roberts and Tybout, 1997; Bernard and Jensen, 1999). On the other hand, it has been noted that firms can become more efficient after they begin exporting through learning or economies of scale effects (Clerides et al., 1998). Empirical evidence has provided rather robust support to the first hypothesis, while less widespread evidence has been found in favor of the post-entry mechanisms.<sup>1</sup> However, some recent investigations conclude that learning by exporting may also occur under specific circumstances (Van Biesebroeck, 2006; Isgut and Fernandes, 2007; Lileeva and Trefler, 2007; Serti and Tomasi, 2008).

Firm heterogeneity entered the empirical literature on international trade also with some new evidence regarding the degree of concentration of export and the product and geographical diversification of trading firms. Bernard et al. (2007) find, for the US, that export volumes are accounted by a handful of firms, which export many products in many countries, while the large majority of firms sell only few products in a limited number of foreign countries. Moreover, firms that trade many products with many countries are larger than other internationalised firms. Muuls and Pisu (2007) provide evidence of a positive relationship between labour productivity and geographical and product diversification using data on Belgium firms. Similarly, Andersson et al. (2007) show that in the case of Sweden, the productivity of exporters is increasing in the number of traded products and markets served. Mayer and Ottaviano (2007), using information for different countries, find that aggregate exports are determined by few exporting firms which supply several foreign markets with several differentiated products.

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<sup>1</sup>See Wagner (2005) and Greenaway and Kneller (2005) for a review of the literature.

All these findings have pointed to new theoretical challenges. They are in fact clearly at odd with the traditional theories of international trade based on comparative advantages and differentiated products framework, which assumed a representative firm and predicted that all firms in a given sector would be either exporters or non-exporters.<sup>2</sup> In response to the failure to accommodate the new stylized facts, recent theoretical models have removed the assumption of representative firms. For example the theoretical framework proposed by Melitz (2003) combines firm heterogeneity with a monopolistic competition framework. This model assumes that exporters incur sunk costs, so only some firms (i.e. those with a sufficiently high level of productivity) can make positive profits in international markets. To the extent that the productivity distribution is very skewed across firms and/or there is high elasticity of substitution between firm varieties, this framework explains why few firms may account for the bulk of exports only (see Bernard et al., 2007, for details). By further assuming that sunk costs are specific to individual geographical destinations (Chaney, 2008; Helpman et al., 2007) and to individual exported products (Bernard et al., 2006), this augmented model is able to explain why most exporters would sell only few products to few countries and, in general, the high inequality that is detected in the distribution of exports across firms.

## 2.2 Importing and firm heterogeneity

While substantial work has been done on firm heterogeneity and exports, much less attention has been devoted to the relationship between import behaviour and firm's characteristics. Even fewer analyses consider both import and export activities. This is unfortunate, given the strong interconnection between importing and exporting and the key role of imports in the global economy. As a matter of fact, around 20% of total exports are due to intermediate inputs being used for further processing (Hummels et al., 2001). Only recently, the availability of detailed transaction data have spurred new empirical research on firm heterogeneity and international trade, combining information on both the import and export sides.

In line with the results found for export, these studies point to the existence of a positive correlation between import and firms' productivity. More generally, importers display similar characteristics as those observed for exporters. Bernard et al. (2005) consider exporters and importers in US, showing that both trading firms are associated with better performances. These results further reinforces the idea that firm's heterogeneity can be better captured by analyzing trade flows in greater details. Focusing only on the import side, Halpern et al. (2005), Kasahara and Rodrigue (2005) and Amiti and Konings (2007) find evidence of substantial heterogeneity and a high level of productivity among importers. Similarly, Muuls and Pisu (2007), using Belgian data, provide evidence of a positive relationship between firms' productivity and both import and export, while Altomonte and Bekes (2008) investigate the complementarity of importing and exporting activity for Hungarian firms, finding that most of the productivity premium of exporters, is in fact due to the fact that they are also importers. Vogel and Wagner (2008) estimate significant export and import productivity premia among German firms. Similarly to Altomonte and Bekes (2008), they find that part of the productivity premium of exporting firms is due to the fact that they are also importing.

How does the literature explain the positive relationship between importing activity and firm performance? In which direction goes the causality: from import to productivity or vice-versa? In principle, as in the export case, both post-entry and self-selection effects could underlie the observed relationship.

Theoretical models of trade have recognized that import of intermediate and capital goods could raise productivity via several channels: learning, variety and quality effects (Markusen, 1989; Grossman and Helpman, 1991; Eaton and Kortum, 2001; Acharya and Keller, 2007). Productivity gains could arise because of learning effects from the foreign technology embodied in the imported intermediate inputs. Positive productivity effects could be due to the access to more varieties of

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<sup>2</sup>See Bernard et al. (2007) for a more detailed analysis on the predictions of these models and a comparison with recent empirical evidence.

intermediate inputs and better match between input mix and the desired technology or product characteristics. Alternatively, importers may purchase abroad higher quality inputs compared to those domestically available and this may, in turn, increase their productivity. On the empirical side, few research based on micro level data test for the impact of the use of imports on firm's performance. Kasahara and Rodrigue (2005) and Amiti and Konings (2007) find that importing enhance firms' productivity. Halpern et al. (2005) reach the same result and attribute two-thirds of the increase in plant productivity to an increase in variety and the remaining one-third to an increase in quality.

While most of the empirical and theoretical literature have focused on the impact of import on productivity, very limited research has been done on the self-selection hypothesis. Kasahara and Lapham (2008) have a model where heterogeneous final good producers simultaneously decide whether to export and whether to import. Both importing or exporting activities require paying a fixed cost in any period and in any market they choose to be active. The presence of fixed costs induces only the most productive firms to start importing.<sup>3</sup> On the empirical side, in their analysis of German firms Vogel and Wagner (2008) find evidence in favor of a self-selection mechanism for importers.

While the hypothesis of the sunk costs of exporting is well received in the literature and it is justified on the basis of the cost of acquiring information on the foreign market, setting up distribution channels and adapting products, it is not obvious that the same type of costs would apply to importing. Kasahara and Lapham (2008) do not propose any specific motivation for introducing sunk cost into importing and do not have any prior on whether they should be higher than the sunk costs of imports. Kraay et al. (2002) submits that prior to importing firms may incur sunk costs related to the search for foreign suppliers and to the learning and acquisition of customs procedure. While this is certainly a possible outcome, it is a bit odd to assume that both seller (exporters) bear fixed costs to find their buyers (importers) and vice-versa. We are inclined to think that this kind of costs would be higher for the seller than for buyer, but this may depend on the market structure, and in particular on the relative market power in up-stream and downstream markets. However, importers may incur other types of fixed costs (which need not be sustained by exporters). For example, firms may need to accumulate complementary assets (which we may call absorptive capacities) in order to integrate imported inputs into their production process. This is more likely to occur when firms import knowledge-intensive capital goods or very specific and high-quality intermediate inputs, then in the case of standardized low-price/quality inputs.

But sunk costs are not the only source of self-selection. As we know from the export literature, the productivity threshold required to make profits in international markets may depend on the size and distance of home and host market, as well as the price (Chaney, 2008). In the case of imports, the literature has discussed in particular the role of trade liberalization and imported input prices. On the one hand, firms may substitute domestic inputs with cheaper foreign ones. This would allow also firms with relatively low productivity to enter the market. On the other hand, trade liberalization may widen the scope of previously unavailable inputs (Goldberg, Khandelwal, Pavcnik, and P., Goldberg et al.). This can increase the firms' ability to produce new products, but also induce self-selection. In fact, as suggested by Kugler and Verhoogen (2008), complementarity between input quality and plant productivity may generate higher output quality (the *quality-complementarity hypothesis*). Then, we would observe that more-productive plants are larger, use higher-quality inputs and produce higher-quality products. To the extent that trade liberalization allows importing a larger variety of goods, more productive firms would self-select into import of high-quality inputs and this would lead to a positive correlation between importing and productivity. Kugler and Verhoogen (2009) support their hypothesis by showing that importers are indeed the high-productivity firms and that imported inputs purchased by Colombian plants are higher-quality than the domestic inputs

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<sup>3</sup>In another empirical model, Halpern et al. (2005) suggest that importers may sustain fixed costs due to establishing business relationships with foreign suppliers. Thus, firms would buy foreign inputs only to the extent that these goods would determine a productivity gain high enough to cover the fixed cost (Halpern et al., 2005). The model however does not predict any self-selection effect into import.

Table 1: Number of firms

Years	Micro1	Micro1-COE (merged)
1989	19922	
1990	21208	
1991	19740	
1992	21301	
1993	22076	14579
1994	21720	14036
1995	20004	12320
1996	17231	10512
1997	15532	9215
Mean	19859	12132

purchased by the same plant.

### 3 Data description

This paper relies upon a dataset which combines two different sources of data developed by Italy's Bureau of Statistics (ISTAT), namely MICRO 1 and COE.<sup>4</sup> MICRO 1 contains longitudinal data on a panel of 38.771 firms representing the entire universe of Italian manufacturing companies with 20 employees or more over the 1989-97 period. Entry and exit of firms over the period covered by the data, as well as the existence of missing values, makes of MICRO 1 an unbalanced panel, containing information for an average of around 20.000 firms per year. Firms are classified according to their main activity, as identified by ISTAT's standard codes for sectoral classification of business activities (Ateco), which correspond, to a large extent, to Eurostat's NACE 1.1 taxonomy. The database contains information on a number of variables appearing in a firm's balance sheet. For the purpose of this work we utilize the following pieces of information: number of employees, turnover, value added, capital, labour cost, intermediate inputs cost, capital assets, industry and geographical location (Italian regions).<sup>5</sup> Capital is proxied by tangible fixed assets at book value (net of depreciation). All the nominal variables are measured in millions of 1995 Italian liras and they are deflated using 2 digit industry-level price indices provided by ISTAT.

With this information we built some variables used throughout our empirical analysis. To measure firm level productivity we use two indicators: labour productivity (LP), which has been computed as value added per employee, and total factor productivity (TFP), which is the residual of a two inputs (capital and labour) Cobb-Douglas production function (following the Levinsohn and Petrin (2003) methodology). The scale of operation is measured by total shipments (sales) and by total employment. We define the capital intensity variable as the capital stock over the total number of employees. A firm is defined as foreign owned when some of the shares are owned by non-Italian firms.<sup>6</sup>

The MICRO1 database has been merged with ISTAT's external trade register (COE)<sup>7</sup>, which

<sup>4</sup>The data have been made available under the mandatory condition of censorship of any individual information.

<sup>5</sup>The information at our disposal comes from firm's balance sheet. Unfortunately, we do not have access to other type of data such as R&D investments, innovation, information on multinational firms or employees' level of education. As regards the workforce composition, the only information available regards the distinction between production and non-production workers.

<sup>6</sup>In the empirical analysis we use different (more restrictive) criteria for the construction of this dummy but the results do not change.

<sup>7</sup>Detailed information on the the COE database on foreign trade statistics are available at <http://www.coeweb.istat.it>

Table 2: Participation Rate and Concentration: a comparison between countries

	Italy	United States	Sweden	Belgium
% Exporters	70.6 (62.9)*	27	71	41.2
% Importers	69.3 (45.4)*	14	60	43.2
Gini Exports	0.825	0.972	..	0.959
Gini Imports	0.899	0.965	..	0.956
Gini Sales	0.807	0.916	..	0.873 (value added)
Sources	this paper	Bernard et al. (2007)	Andersson et al. (2007)	Muuls and Pisu (2007)
	Firm-level, 1997 20 empl. or more manufacturing	Plant-level, 2002 All firms manufacturing	Firm-level, 2004 10 empl. or more manufacturing	Firm-level, 1996 all firms manufacturing

\*In brackets are participation rates obtained considering only Extra-UE exports and imports

provides firm-level information on exports and imports over the 1993-1997 period. For each of the about 17,000 firms surveyed on average in the observation period, COE supplies data on firms' trade status and their volume of trade. Moreover, data are available on the destination (origin) of exports (imports), the number of sectors in which a firm exports (imports) (labelled NSE (NSI)) and the number of destination served (for exports) and the number of countries from which firms import (labelled NCE and NCI, respectively).<sup>8</sup> Due to the lack of a complete overlap, merging MICRO1 with COE reduces the size of the sample, to about 12,100 firms, covering (with missing values) the period between 1993 and 1997. Table 1 presents the number of firms active within the manufacturing sector, for the original MICRO1 database and for the database obtained after the merge with COE (merged database). The size of the sample stemming from the merge with COE trading data corresponds to approximately 60% of the sample obtained from MICRO1.<sup>9</sup>

Let us now illustrate the propensity to trade in our sample, and compare it with results obtained for other countries. As reported in Table 2, slightly less than three-fourth of Italian manufacturing firms are internationalised: 70.6% were exporting goods in 1997, and 69.3% were importing. Compared to the stylized facts reported for the US (Bernard et al., 2007), noteworthy differences emerge: in 1997 importers and exporters were, respectively, 14% and 27% of US manufacturing firms. Italian firms are not only much more internationalised than U.S. ones, but they also appear relatively more prone to import. These differences may have to do with the fact that U.S. firms enjoy a larger internal market, so they may have lower incentives/need to source their inputs/sell their product from/to foreign markets.<sup>10</sup> We try to control for this fact by reporting the share of firms trading with non-EU countries. Indeed, the share of Italian trading firms drops to 62.9% for exporters and 45.4% for importers. Interestingly enough, the share of importing firms drops relatively more (from 69.3% to 45.4%). This suggests that 14% of firms import exclusively from EU countries. We will come back to this issue later. Still, significant differences remain between the propensity to trade of U.S. and Italian manufacturing firms. We submit that a part of this difference may be explained by the different size distribution of the two samples. In the case of the U.S., all firms have been considered, while in the case of Italy only firms with more than 20 employees enter the sample.

<sup>8</sup>The number of sectors are counted according to the 4-digit NACE classification system. Unfortunately, no detail is available on the individual sectors where firms trade.

<sup>9</sup>Chi-squared tests (available from the authors upon request) support the hypothesis that the selected sample obtained by merging MICRO1 and COE is consistent with original dataset, both in the terms of sectoral and size distribution.

<sup>10</sup>Results on 6 EU countries (Germany, France, UK, Italy, Hungary and Norway) reported by Mayer and Ottaviano (2007) are consistent with this view: exporting is 'rare' only in the UK (only 28.3% of medium-large firms are exporters), but is relatively common in other countries.

Table 3: Trade participation rates of Italian manufacturing firms, by sector (1993-97)

Sectors	Two-way traders	Only Exporter	Only Importer	Non-traders	Exporters	Importers
Food, Beverages	57.9	5.2	12.1	24.8	63.1	70.0
Tobacco	61.9	8.3	8.3	21.4	70.2	70.2
Textiles	65.9	3.6	5.1	25.3	69.5	71.1
Wearing, Apparel	41.1	3.1	2.4	53.4	44.2	43.5
Leather, Allied Product	67.5	7.8	1.1	23.6	75.3	68.6
Wood Manufacturing	55.8	2.9	18.6	22.7	58.7	74.4
Paper, Allied Product	75.1	4.7	8.1	12.1	79.8	83.2
Printing, Publishing	48.9	7.3	10.5	33.3	56.2	59.4
Coke and Petroleum	35.2	2.6	16.9	45.3	37.8	52.1
Chemical Products	88.6	3.2	3.8	4.4	91.8	92.4
Rubber, Plastics	83.3	4.5	3.4	8.8	87.8	86.8
Non Met. Min. Products	48.7	6.9	5.6	38.9	55.6	54.3
Basic Metals	76.5	4.4	4.9	14.2	80.9	81.4
Metal Product	52.7	6.9	5.1	35.3	59.6	57.8
Industrial Machinery	83	5.8	1.5	9.7	88.8	84.5
Office Machinery	69.4	1.9	6.4	22.3	71.3	75.8
Electrical Machinery	63.4	3.8	4.9	27.9	67.2	68.3
Radio, TV, etc.	66.7	3.2	7.9	22.2	69.8	74.6
Med., Prec., Opt. Instr.	77.6	3.7	4	14.7	81.3	81.6
Motor Vehicles	78.7	4.4	5.1	11.7	83.1	83.8
Other Transp. Equip.	64.1	3.7	6.2	26	67.8	70.4
Furniture Manufacturing	73.6	9	3.1	14.3	82.5	76.7
Recycling	35.3	7.8	5.4	51.5	43.1	40.7
Manufacturing	65.4	5.4	5	24.1	70.9	70.5
(excl. firms trading only within-EU)	59.9	4.8	1.6	33.7	60.7	43.2
Manufacturing 1993	61.6	8	6.9	23.6	69.6	68.5
(excl. firms trading only within-EU)	54.4	5.1	1.8	38.7	54.4	38.0
Manufacturing 1997	63.9	6.6	5.4	24.1	70.6	69.3
(excl. firms trading only within-EU)	59.9	5.2	1.5	33.4	62.9	45.4

Since, in the presence of sunk costs to export (and import), small firms should be less likely to trade, a higher share of exporters should be found in a sample consisting of larger firms. According to the figures reported by Ferragina and Quintieri (2000) for a stratified sample representative of the whole universe of Italian manufacturing firms (Mediocredito Centrale) the average export participation rate of the period 1995-1997 was of about 40%. This conjecture is confirmed for the case of Sweden ((Andersson et al., 2007), reported in Table 2). The participation rates for Sweden are in line with Italian ones (71% for export and 60% for import) in the sample of firms with 10 employees or more, but they drop to values much closer to the U.S. (36% and 27%) in the whole sample. Similarly, in the case of Belgian exporters (importers) are 41.2 (43.2) percent of all firms in the whole sample (Muuls and Pisu, 2007), while in the sample restricted to firms with 20 or more employees (The International Study Group on Export and Productivity, 2008) the participation rate of exporters reaches 84%.

While the distinction between exporters and importers is relevant, it is also interesting to observe that the two sides of trade are strongly interconnected. In Table 3 we break down our sample into four categories of firms: (i) firms that do not trade, (ii) firms that both import and export (*two-way traders*), (iii) firms that export but do not import (only exporters) and (iv) firms that import but do not export (only importers). Among the internationalised firms, the large majority are engaged in both import and export (on average, over the 1993-97 period, 65.4% of all firms are two-way traders). These firms are the more engaged in international trade activities and we expect that a proportion of the import-export activity is linked to international fragmentation of production both within and



Table 4: Concentration of Italian trade, employment and sales between and within sectors

	Gini		Theil		% Between Sectors*		% Within Sectors*	
	1993	1997	1993	1997	1993	1997	1993	1997
Exports	0.822	0.825	2.106	2.210	13.0	15.3	87.0	84.7
Imports	0.900	0.899	2.751	2.657	25.5	23.1	74.5	76.9
Total Trade	0.839	0.840	2.262	2.301	17.5	17.2	82.5	82.8
Employees	0.638	0.661	1.437	1.507	15.4	16.3	84.6	83.7
Sales	0.780	0.807	2.180	2.448	25.4	25.4	74.6	74.6

Note:\* The Between and Within components refer to the Theil index

across firm boundaries. Unfortunately, we have no data that allow to single out these firms from the group of two-way traders. It is worth mentioning, however, that the share of two-way traders is relatively higher in sectors where multinational firms are also particularly active (such as Chemical Products, Rubber and Plastics, Motor Vehicles, Medical Instruments). About 10% of all firms are engaged in either only export or only import activities, but significant sectoral heterogeneity exists. The last two rows of Table 3 show that along the five years covered by our data the percentage of traders have slightly decreased, but this has been the result of a composition effect. In fact, the share of one-way traders dropped, while the share of non-traders and two-way traders grew. Therefore the distribution of Italian manufacturing firms becomes more polarized. On the one hand, the number of firms engaged in more articulated and complex internationalization strategies that combine exporting with importing increased (e.g. global sourcing, international partnerships and FDI, as documented by other studies on Italy), but, on the other hand, other firms shut their international contacts down.

## 4 Concentration of international trade activities

Recent empirical evidence on firms in international trade documents that a few firms account for large volumes of aggregate trade. Bernard et al. (2007) report that international trade is a relatively rare phenomenon among US firms (see the discussion in Section 3) and trade is highly concentrated in a few firms. This fact is largely confirmed also in Europe, even if export is relatively more common among EU firms. Mayer and Ottaviano (2007) report that the top five percent of exporters account for more than 70% of exports in five out of six countries considered (Italy is the less concentrated). In Table 2 we compare concentration of export, import and sales for the U.S., Belgium and Italy using the Gini index. Consistently with the finding of Mayer and Ottaviano (2007) concentration in Italy is lower, but still trade is more concentrated than sales.

### 4.1 Concentration within and between industries

The fact that trade is more concentrated than employment may reflect both a between-industry effect (export and import are concentrated in fewer sectors) or a within-industry effect (some firms within a sector account for the bulk of trade). The former effect would be consistent with traditional trade theories, which predict that countries would specialize into specific sectors and trade liberalization would determine concentration of import in some industries and exports in others. On the contrary, theories of international trade based on firm heterogeneity would predict that trade liberalization would favor the most productive firms in each industry, inducing concentration of trade in fewer firms.

In order to answer the question whether concentration of trade is due to sectoral trade specialization or it is a feature that holds within each sector, we first compute concentration for each sectors

and then exploit a property of the Theil index, which can be decomposed in its between sectors and within sectors components.<sup>11</sup>

In Table 4 we report the Gini and Theil coefficients of exports, imports, total trade and, as a mean of comparison, of employment and total sales for Italian manufacturing in 1993 and in 1997.<sup>12</sup> As anticipated, for both years we confirm that international trade is more concentrated than sales and employment, even if for employment and sales the concentration is increasing.<sup>13</sup> Sectoral Theil coefficients across the period 1993-1997 (not shown, but available from the authors), show that in all sectors concentration is very high (with the minor exception of Recycling), even if there is still some heterogeneity across sectors, and the higher concentration in trade (and import in particular) with respect to sales and employment holds in virtually every sector. This result is further reinforced by the decomposition of the Theil index into the within and between sector components, reported in Table 4. The within component is a weighted average of the sectoral Theil indexes (where the weights are the sectoral shares of the aggregate value of the considered variable), while the between component is derived assuming every firm within a given sector display the average sectoral value of the relevant variable. Cowell and Jenkins (1995) show that the within- and between-group components of concentration, defined as above, can be related to overall concentration in the simplest possible way:  $C_b + C_w = C$ . They then suggest an intuitive summary measure,  $R_b$ , of the amount of inequality explained by differences between groups with a particular characteristic or set of characteristics,  $R_b = C_b/C$ . Table 4 reports the percentage of aggregate concentration that is explained by the between sectors component of the Theil Index in 1993 and 1997. For all the variables, the within-industry component explains most of the overall concentration. In fact, the between sector component of concentration accounts at most for one fourth of concentration in the case of import. In the period 1993-1997 the importance of the between sector component of concentration grew for exports and decreased for imports, while it remained rather stable for employment and sales.

In sum, we find that Italian trade is less concentrated than in other countries but, consistently with cross-country evidence for other countries, trade is more concentrated across firms than sales and employment. Interestingly, we find that, especially for exports, this is mainly the result of concentration of trade activities in a handful of firms within each industry, as predicted by the new literature on firm heterogeneity and international trade, rather than the outcome of sectoral specialization, as predicted by traditional trade theories. In the case of imports, which on average are more concentrated than exports, the between-sector component plays a relatively more important, though still minor, role.

## 4.2 Concentration along the extensive margins

Concentration of international trade have been observed not only across firms (i.e. few firms accounting for the bulk of imports and exports) but also along the product and country extensive margins.<sup>14</sup> Eaton et al. (2004) show that, in the case of France, most exporting firms served only a few markets, so that a negative relationship exists between the number of destinations served by each firm (the market extensive margin) and the number of firms that exported to those destinations. The same pattern has been found for Slovenia (Damijan et al., 1998), Belgium (Muuls and Pisu, 2007), Sweden (Andersson et al., 2007) and the US (Bernard et al., 2007). The last three studies provide

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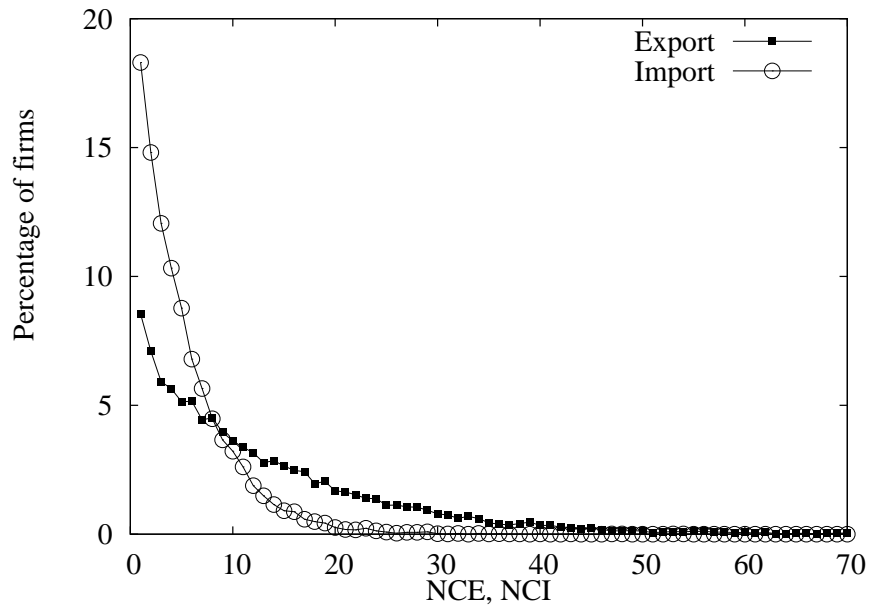
<sup>11</sup>We use the Theil index because the Gini Index is not exactly decomposable in a within and a between component.

<sup>12</sup>In order to purge the confounding effect of the propensity from the actual concentration of trade flows among trading firms, and to give lower bound estimates of the concentration of trade, concentration indexes for total trade, export and import are computed on positive values of these variables.

<sup>13</sup>All the indexes of inequality and concentration that respect the four principles of symmetry, population, size independence, mean independence and the Pigou-Dalton criterion, would order these distributions in the same way.

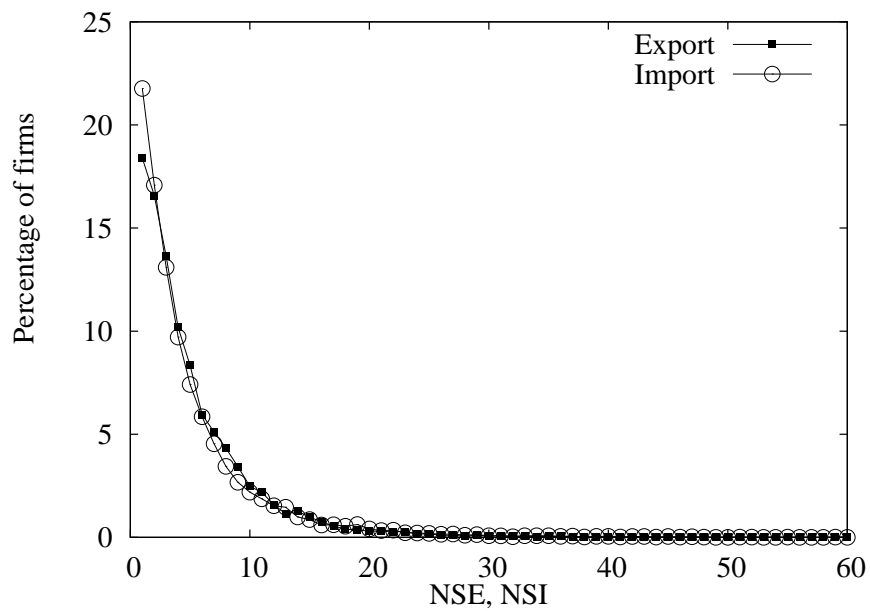
<sup>14</sup>The extensive margin of export (import) refers to the number of firms involved in exporting (importing) activities, while the product and country extensive margins refer to the number of products and countries in/with which a firm trades goods, and can be thought as a measure of geographical and product diversification. See for example Mayer and Ottaviano (2007) for a discussion of this definition.

Figure 1: Number of importers (exporters) along the country extensive margin (year 1993)



Note: The support for export goes from 0 to 134. It has been cut in order to improve readability.

Figure 2: Number of importers (exporters) along the sector extensive margin (year 1993)



Note: The support for export goes from 0 to 66; for imports from 0 to 65.

Table 5: Sector and country extensive margins and the concentration of export: 1993

		NCE				
		1-5	6-10	11-20	21+	Total
% of exporting firms						
NSE	1-5	30.0	16.6	15.2	5.2	67.1
	6-10	1.9	4.1	7.5	7.8	21.3
	11-20	0.4	0.9	2.4	5.9	9.5
	21+	0.0	0.1	0.3	1.6	2.1
Total		32.3	21.7	25.4	20.6	100.0
% of export value						
NSE	1-5	3.0	5.1	8.5	7.0	23.5
	6-10	0.5	2.0	5.9	14.8	23.3
	11-20	0.2	0.8	2.9	16.9	20.8
	21+	0.0	0.5	1.1	30.9	32.5
Total		3.7	8.3	18.4	69.6	100.0

also evidence of a negative relationship between the number of countries from which firms import (country extensive margin of imports) and the number of firms that imports from those markets. A similar pattern have been found along the product extensive margin: many firms export (import) few products, and a handful of firm trade in a several different products.

These stylized facts are confirmed also in the case of Italian manufacturing. In Figure 1 we depict the country extensive margins of exports and imports (labelled as NCE and NCI, respectively) and the percentage of firms that are actually observed along these dimensions. The number of firms declines monotonically with the country extensive margin, for both importers and exporters, but is lower in the case of the former. In 1993, about 8% of exporting firms exported to only one country and about 18% of importing firms imported from only one country and the percentage of importing firms declines more steeply with respect that of exporting firms: from 8 countries onwards the percentage of exporting firms is greater than the percentage of importing firms. The same picture emerges looking at the average number of exporting/importing countries, which is 13.0 in the case of exports and 5.3 in the case of imports. Moreover the support of NCI is smaller than the one of NCE: the former is in the interval  $[0; 54]$  while the latter is in  $[0; 134]$ .<sup>15</sup>

Let us now consider the product/sector<sup>16</sup> extensive margins (Figure 2). Substantial concentration emerges also along this dimension: about 18% of exporting firms, in 1993, traded products in only one 4-digit sector, while about 22% of importing firms sourced in only one sector from abroad. The average number of sectors in which each firm exported goods was 5.2 in 1993 and 5.9 in 1997, while the average number of sectors in which firms imported goods was 5.2 in 1993 and 6.1 in 1997. According to Muuls and Pisu (2007), Belgian internationalised manufacturing firms on average exported 12 products and imported 34 products, while Bernard et al. (2005) report that in 2000 on average exporters sold 8.9 products and importers sourced 10 products. Thus, the product extensive margin may appear lower in Italy than elsewhere. However, international comparisons are difficult here, since our data refer to the number of 4-digit sectors in which firms trade rather than the number of products actually traded, as in the case of Belgium and the U.S..

By combining information on the extensive margins, the number of firms and the volumes of

<sup>15</sup>The high degree of concentration is broadly confirmed in 1997, although one can observe an increase in the average NCE and NCI (to 18.1 and 6.3 respectively).

<sup>16</sup>Since our data allow to identify the number of 4-digit sectors in which firms trade, we would better refer to the sector, rather than product, extensive margin.

Table 6: Sector and country extensive margins and the concentration of import: 1993

		NCI				
		1-5	6-10	11-20	21+	Total
% of importing firms						
NSI	1-5	56.4	10.3	2.3	0.1	69.1
	6-10	6.5	8.8	3.3	0.2	18.7
	11-20	1.3	4.1	3.6	0.4	9.5
	21+	0.1	0.5	1.5	0.6	2.7
Total		64.3	23.8	10.7	1.3	100.0
% of import value						
NSI	1-5	5.9	5.3	2.8	0.3	14.4
	6-10	2.7	4.5	5.4	0.9	13.5
	11-20	0.9	5.5	12.4	2.7	21.6
	21+	0.1	2.0	15.6	32.8	50.5
Total		9.7	17.3	36.1	36.8	100.0

traded goods, we shed some further light on one results which we illustrated in the previous section: trade is concentrated in very few firms, which are very diversified. The upper panel of Table 5 plots the share of exporting firms by number of export markets (NCE) and number of sectors in which goods are exported, and shows that 30% of exporters sell in up to 5 countries and (4-digit) sectors, while only 1.6% of exporters operate in more than 20 sectors and countries. The lower panel of Table 5 shows that this small share of firms accounts for 30.9% of overall exports. These stylized facts are consistent with theoretical models in which exporters incur sunk cost in every product/sector and geographical market in which they sell goods (as Chaney, 2008; Bernard et al., 2006). However, the same dynamics holds even more true for imports. Table 6 shows that 56.4% of all importers (active in less than 5 markets and sectors) account for only 5.9% of all imports, while the more diversified importers (which are less than 1% of the total) account for 32.8% of overall imports. This raises the theoretical question on whether there are sunk costs on the import side as well. We will provide some evidence in this direction in the next section, where we will investigate whether importing and exporting firms exhibit significant differences in productivity and other characteristics as opposed to non internationalised ones, and if these differences are related also to the degree of sectoral and country diversification.

## 5 Firm heterogeneity and international trade activities

### 5.1 Firm characteristics and the international trade status

As discussed in Section 2, the bulk of the empirical analysis on the characteristics of internationalised firms has focused just on exporting firms and has shown that they are “better” than non-exporters. Much less work has been done on import behaviour and firm characteristics. Although evidence is not as extensive as in the case of exports, some empirical works have documented that importers tend to outperform firms that do not trade (Bernard et al., 2007; Muuls and Pisu, 2007; Halpern et al., 2005; Kasahara and Rodrigue, 2005; Vogel and Wagner, 2008; Kugler and Verhoogen, 2009).

In this section we convey a picture of firm heterogeneity associated to trade activities, considering both the importing and exporting activities. We estimate productivity differentials, as well as differences in size and capital intensity, between internationalised and non-internationalised firms. Among the former group, we will follow the distinction made in section 3 and distinguish firms involved in

Table 7: Differences between non-traders and other trading categories (average values 1993-1997)

	Neither Exp. nor Imp.	Only Exp	Only Imp	Two way Traders	Exporters	Importers
<i>Absolute value</i>						
Labour Productivity	53.8	65.9	74.4	83.9	82.5	83.2
TFP	101.9	125.8	130.5	178.9	174.8	175.5
Sales	6927	57618	19338	50257	50736	48129
N. Employees	40	78	59	132	129	127
Capital Intensity	82.5	94.3	139.9	121.2	119.3	122.7

\* 100 = Neither Exporters nor Importers

both importing and exporting activities (*two-way traders*) and firms involved in either exporting or importing only.<sup>17</sup>

Table 7 provides some basic descriptive statistics on the sampled firms. Consistently with other studies, we find that non traders are smaller (in terms of both total sales and number of employees) and less productive than internationalised firms. Among this latter group, two-way traders outperform firms engaged in only importing or exporting activities. This is in line with findings of Muuls and Pisu (2007) on Belgium, Andersson et al. (2007) on Sweden and Vogel and Wagner (2008) on Germany. Moreover, it is consistent with previous evidence showing that increasing global engagement of firms is associated with better performances. Firms engaged only in importing or exporting activities lie in between non-internationalised firms and two-way traders both in terms of number of employees and productivity (measured as labour productivity and TFP). The comparison of the two categories of one-way traders yields interesting results. Only exporters are larger (both in terms of sales and number of employees) than only importers, but the latter are more productive (both in terms of labour productivity and TFP). Finally, it is worth noting that capital intensity is very high among only importers, so that on average they are even more capital intensive than two-way traders. However, it should also borne in mind that these unconditional differences may well reflect a sectoral composition effect. In the case of import for example, Table 3 shows that only importers are relatively more likely in some capital intensive industries, such as Food and Beverages, Tobacco, Wood products, Printing and Publishing, Petroleum refining and Radio and TV equipments. In Tables 8 and 9 we account for this, by running regressions which control for sector, size, region and time effects.

In particular, we estimate the relationship between internationalization status and firm heterogeneity in performance (the so-called performance premia), by running the following regression

$$y_{it} = \alpha_A + \beta_A D_{it}^{twoway} + \gamma_A D_{it}^{imponly} + \phi_A D_{it}^{exponly} + \theta_A controls_{it} + v_{it}, \quad (1)$$

where  $y_{it}$  denotes the logarithm of either total revenue, number of employees, labour productivity, TFP and capital intensity,  $D_{it}^{twoway}$ ,  $D_{it}^{imponly}$  and  $D_{it}^{exponly}$  are (mutually exclusive) dummy variables denoting whether firm  $i$  at time  $t$  is, respectively, a two-way trader, a firm engaged in importing or exporting activities only. The omitted (reference) group are the non-trading firms. *Controls* denotes a vector of firm characteristics including the log of employment, calendar year dummies, two-digits

<sup>17</sup>In this respect this paper is closer to Muuls and Pisu (2007) and Vogel and Wagner (2008) than to Bernard et al. (2007), since the former single out two-way traders from firms involved only importing (exporting) activities, while the latter focus on the aggregate of exporting and importing firms. Since, as we have seen in Section 3, most international firms are engaged on both sides of trade, we believe it is more accurate to keep two-traders aside. Unfortunately, we do not have, unlike, Bernard et al. (2005), information on multinational firms, which are most likely part of the two-way trader group and would allow to make a finer distinction.

Table 8: Firm heterogeneity and internationalization status, Pooled OLS regressions (1993-1997)

Dependent variable	Labour productivity	TFP	Sales	N. empl.	Capital Intensity
Two-way traders	0.329*** (0.007)	0.241*** (0.007)	1.468*** (0.017)	0.606*** (0.011)	0.693*** (0.020)
Import only	0.234*** (0.012)	0.162*** (0.011)	0.735*** (0.024)	0.185*** (0.017)	0.594*** (0.029)
Export only	0.156*** (0.012)	0.090*** (0.011)	0.652*** (0.025)	0.145*** (0.017)	0.431*** (0.027)
Foreign Ownership	0.013 (0.018)	0.032** (0.020)	1.394*** (0.064)	1.269*** (0.502)	-0.159 (0.035)
N. observations	60,661	59,987	60,652	60,662	60,031
R-squared	0.344	0.448	0.411	0.198	0.338

Note: Standard Errors in parenthesis below the coefficients. Asterisks denote significance levels (\*\*\*:  $p < 1\%$ ; \*\*:  $p < 5\%$ ; \*:  $p < 10\%$ ). All regressions include the log of employment (except regressions where the dependent variable total sales of the number of employees), as well as sector, region and year dummies as controls.

sector dummies and regional dummies<sup>18</sup> and an indicator taking value 1 for foreign-owned firms.<sup>19</sup> Our interest lies in the value of the coefficients  $\beta_A$ ,  $\gamma_A$  and  $\phi_A$ , that tell us the average premium of the three categories of internationalised firms with respect to the non-internationalised firms.<sup>20</sup>

In Table 8 we will estimate equation (1) using Pooled OLS, and in Table 9 we control for individual fixed effects, which wipe out all the time invariant firm heterogeneity (FE model).<sup>21</sup> In Table 8 the estimated  $\hat{\beta}_A$ ,  $\hat{\gamma}_A$  and  $\hat{\phi}_A$  coefficients can be interpreted as conditional differences in size, productivity and capital intensity across firms with different exposure to international markets. To the extent that firm specific (time invariant) fixed effects are the main driver of the decision to enter international markets (i.e. of possible self-selection phenomena), results from Table 9 may have a “more causal” interpretation of the estimated coefficients, since they basically estimate a correlation between a change in the trade status and a change of the dependent variables under analysis. Differences between OLS and FE coefficients may thus emerge if time invariant firm characteristics are correlated with the internationalization status. Nevertheless, one should be careful when giving a strictly causal interpretation of the coefficients estimated with the FE regression. For example, it might well be that a shock contemporaneously determines a higher probability of switching into exporting (or importing) and a variation in the dependent variable under analysis.

The results of the pooled OLS regressions reported in Table 8 show that even controlling for sector, time region and foreign-ownership differences, significant heterogeneity remains in productivity, size and capital intensity across firms with different degrees of internationalization. In particular, it is rather clear that internationalised firms are larger, more productive and more capital intensive than non-internationalised firms. Moreover, the coefficients attached to the different internationalization status suggest that a sort of hierarchy exists also between two-way traders and firms engaged in either only importing or only exporting activities. For example, if one considers TFP differences, two-way

<sup>18</sup>We will omit the control for size when using the logarithm of the number of employees and the logarithm of sales as a dependent variable.

<sup>19</sup>Results are robust to different (more restrictive) criteria for the construction of this dummy.

<sup>20</sup>Since the dependent variable is in logs and the explanatory variable are dummy variables, the exact percentage differential is given by  $(e^{\beta_A} - 1) \cdot 100$ .

<sup>21</sup>We perform both the Breusch/Pagan test for the relevance of firm specific effects to be incorporated in a panel model and the Hausman test for the orthogonality of the individual specific effects and the regressors (Table 9 and Table 13). The Breusch/Pagan test reject the null hypothesis of no unobserved heterogeneity, while the Hausman test reject the null hypothesis that the individual effects are uncorrelated with the other regressors. Hence, based on these two tests we conclude that the fixed effects estimator is the better choice among the two estimators.

Table 9: Firm heterogeneity and internationalization status, Fixed-effect regressions (1993-1997)

Dependent variable	Labour productivity	TFP	Sales	N. empl.	Capital Intensity
Two-way traders	0.051*** (0.015)	0.044*** (0.014)	0.116*** (0.019)	0.036*** (0.009)	0.060** (0.027)
Import only	0.035*** (0.011)	0.033*** (0.010)	0.047*** (0.012)	0.022*** (0.005)	0.029 (0.021)
Export only	0.038*** (0.016)	0.032*** (0.016)	0.076*** (0.019)	0.019** (0.010)	0.039 (0.032)
Foreign Ownership	0.0157 (0.020)	0.014 (0.020)	0.044** (0.017)	0.027* (0.015)	-0.020 (0.037)
N. obs.	60,661	59,987	60,652	60,662	60,031
R-squared	0.862	0.887	0.907	0.983	0.907
Hausman Test [p-value]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Breush-Pagan test [p-value]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]

Note: Standard Errors in parenthesis below the coefficients. Asterisks denote significance levels (\*\*\*:  $p < 1\%$ ; \*\*:  $p < 5\%$ ; \*:  $p < 10\%$ ). All regressions include the log of employment (except regressions where the dependent variable total sales of the number of employees) and year dummies as controls.

traders are about 27% more productive than non-internationalised firms (once differences due to foreign ownership, size, sectors, region and time are accounted for), while only importers and only exporters are 17% and 9% more productive, respectively. By comparing coefficients, one gathers that only importers are almost twice as productive than only exporters, and in turn two-way traders are 50% more productive than only importers. Similar orders of magnitude are obtained by looking at other characteristics. For all the regressions we run the F-tests for the statistical difference between the two-way traders and the one-way traders coefficients ( $\hat{\beta}_A$  vs.  $\hat{\gamma}_A$  and  $\hat{\phi}_A$ ) and between the only importer and the only exporter coefficients ( $\hat{\gamma}_A$  and  $\hat{\phi}_A$ ). In all cases we reject the hypothesis of equality between the estimated parameters (see Table A1 in Appendix).

Once we wipe out the time invariant firm heterogeneity, differences between internationalised and non-internationalised firms sharply decline. As reported in Table 9, the TFP premium of two-way traders drops to less than 5% and the premia of only importers and only exporters shrink accordingly. This suggests that most of the differences in performance between internationalised and non internationalised firms is due to a firm specific time invariant effect. It is rather interesting that, once this effect is controlled for, differences between firms engaged only in import and those engaged only in export activities reduce significantly. Moreover, after controlling for fixed effect we cannot reject the hypothesis of equality between  $\hat{\gamma}_A$  and  $\hat{\phi}_A$ . This is true also when comparing the coefficients between two-way traders and one-way traders, with the only exception of the regression where sales is the dependent variable.<sup>22</sup>

This finding can be interpreted as indirect evidence that the self-selection effect is stronger for only importers than for only exporters. In other words, assuming that selection into trading is due only to firm specific fixed effects, results from Tables 8 and 9 would signal that productivity is probably a more stringent precondition for being an only importer than for being an only exporter.<sup>23</sup>

<sup>22</sup>Table A2 and A3 in Appendix show the analog to regressions in Table 8 and 9, using the two no mutually exclusive dummies of importers and exporters. Results are qualitatively similar.

<sup>23</sup>Kugler and Verhoogen (2009) give a similar interpretation when comparing the OLS and FE coefficients. Analyzing the relationship between imported intermediate inputs and plant's productivity, they conclude that "The coefficient on importer indicator in Columns 1-2 [*those including fixed effect*] is no longer statistically different from zero, suggesting that the positive coefficient on the importer indicator [*estimated using POLS*] is due to selection of high-productivity plants into importing rather than a learning-by-importing effect".



Table 10: Export and Import Starters by Year

	1996	1997	Total
Number of import starters	208	116	324
Number of export starters	94	48	142
of which:			
Number of two-way traders	38	19	57

## 5.2 Self-selection into importing?

In the previous section, comparison of FE and POLS estimates provided us with indirect evidence that self-selection is more stringent for only-importers than for only-exporters. Following this intuition, another possible and more conservative way to test the self-selection mechanism is to compare the characteristics of firms that start trading with those of non-traders, some years before entry into foreign market. This methodology has been largely applied to test the hypothesis of selection into export (Bernard and Jensen, 1999; Wagner, 2005; The International Study Group on Export and Productivity, 2008). In this section, we follow the same approach to test if there is self-selection into importing, other than into exporting.

As a first step we distinguish between three different groups of firms, according to their foreign market participation pattern. First, the group of *import starters*, as those firms that do not trade between  $t - 3$  and  $t - 1$ , start importing in year  $t$  and keep on importing in the following period. Similarly, the group of *export starter* is made by firms that do not trade between  $t - 3$  and  $t - 1$ , start exporting in year  $t$  and keep on exporting in the following period. As third group we select in our sample firms that serve exclusively the domestic market for the entire period, which we name the *non-traders*.

Since the database used in the empirical analysis covers five years, from 1993 to 1997, we can create two cohorts of import and export starters, those that begin in 1996 e in 1997, respectively. Table 10 reports the number of starters in each cohort: we obtain in total 324 firms that enter into the import market and 142 into the export markets.<sup>24</sup> Our control group, i.e. the non-trader, is made of 2914 firms.

A preliminary analysis (available from authors) on the raw differences in the mean value of both import starters' characteristics and non-traders, three and two years before firms start going abroad, reveals that the former significantly outperform the latter, regardless the variable analyzed and the ex-ante time lag considered. The same holds true when we compare the export starters with the control group. To give more formal evidence for such differences, we regress the (log) value of various firm's characteristic at time  $t - \rho$  on a dummy variable indicating if a firm is an import (export) starter at time  $t$  and on a set of controls.

$$\ln(y)_{i,t-\rho} = \alpha_B + \beta_B \text{ImpStarters}_{it} + \gamma_B \text{ExpStarters}_{it} + \theta_B \text{Controls}_{it-\rho} + v_{it} \quad \text{with } 1 \leq \rho \leq 3 \quad (2)$$

where *ImpStarters*(*ExpStarters*) are dummy variables taking value one if firm  $i$  starts to import(export) in  $t$  (Columns A(B) of Table 11), and zero for non-trading firms. *Controls* includes dummies for year, sectoral and regional effects.

<sup>24</sup>A small number of firms (57) start trading with both importing and exporting activities. Considering them as a separate category, as we did in the previous section, would yield very imprecise estimates for this group, so we rather skip this category from the present analysis and focus on the two (non-mutually exclusive) categories of exporters and importers. However, results including the dummies only-export starters, only-import starters are not significantly different, and are available from the authors upon request. For the sake of comparison the reader can refer to A2 and A3 in Appendix where we estimate equation (1) using Pooled OLS and FE, using the two partially overlapping dummies importer/exporter.

Table 11: Self-selection into importing and exporting

	$t - 3$			$t - 2$			$t - 1$		
	A	B	C	A	B	C	A	B	C
Labour Prod.									
Imp starter	0.188*** (0.031)		0.181*** (0.032)	0.231*** (0.029)		0.221*** (0.030)	0.206*** (0.030)		0.199*** (0.030)
Exp starter		0.109*** (0.040)	0.042 (0.040)		0.145*** (0.039)	0.062* (0.039)		0.122*** (0.038)	0.042 (0.037)
n.obs.	5895	5782	5947		5290	5476		4351	4577
TFP									
Imp starter	0.172*** (0.032)		0.168*** (0.032)	0.200*** (0.020)		0.191*** (0.039)	0.158*** (0.029)		0.156*** (0.029)
Exp starter		0.087** (0.037)	0.025 (0.037)		0.134*** (0.038)	0.063* (0.038)		0.077*** (0.040)	0.015 (0.040)
n.obs.	5887	5774	5939	5441	5281	5467	4499	4340	4566
Sales									
Imp starter	0.398*** (0.054)		0.377*** (0.055)	0.482*** (0.052)		0.449*** (0.054)	0.492*** (0.047)		0.458*** (0.048)
Exp starter		0.264*** (0.072)	0.126* (0.072)		0.373*** (0.071)	0.205*** (0.076)		0.384*** (0.064)	0.200*** (0.066)
n.obs.	5894	5781	5946	5419	5289	5475	4503	4344	4570
N.empl.									
Imp starter	0.102*** (0.034)		0.103*** (0.034)	0.107*** (0.034)		0.103*** (0.035)	0.071** (0.030)		0.074** (0.031)
Exp starter		0.033* (0.039)	-0.004 (0.040)		0.056 (0.039)	0.017 (0.041)		0.011 (0.034)	-0.019 (0.036)
n.obs.	5895	5782	5947	5420	5290	4576	4510	4351	4577
Cap. Int.									
Imp starter	0.444*** (0.073)		0.426*** (0.075)	0.515*** (0.071)		0.506*** (0.072)	0.644*** (0.068)		0.609*** (0.070)
Exp starter		0.255** (0.100)	0.097 (0.106)		0.222** (0.103)	0.037 (0.108)		0.420*** (0.090)	0.179** (0.096)
n.obs.	5894	5781	5946	5418	5288	5474	4505	4346	4572

Note: Standard Errors in parenthesis below the coefficients. Asterisks denote significance levels (\*\*\*:  $p < 1\%$ ; \*\*:  $p < 5\%$ ; \*:  $p < 10\%$ ). All regressions include sector, region and year dummies as controls.

Results, reported in column B of Table 11, show that firms that will start exporting are *ex-ante* larger, more productive and more capital intensive than firms that will never trade. For example, the estimated  $\gamma_B$  coefficient suggest that three years before entering the export market, starters are already approximately 9% more productive than non-traders<sup>25</sup>, supporting the evidence on self-selection of better exporters, already reported in a wealth of empirical studies. When we compare import-starters and non-traders (Columns A), the estimated coefficients are also statistically significant and positive, and they are even higher than in the case of export starters (columns B), at  $t - 1$ ,  $t - 2$  and  $t - 3$ . For example, three years before starting importing firms are about 20% more productive than their non traders counterparts (both in terms of LP and TFP). The ex-ante advantages of import starters are even more pronounced in terms of size (sales and number of employees) and capital intensity. Indeed, these findings confirm the indirect evidence that we had in the previous section, comparing POLS and FE estimates of importers' and exporters' premia, about a stronger self-selection mechanism in the case of importing activities.

Even more interestingly, when we include both import and export starters (Columns C of Table 11), the  $\beta_B$  remain virtually unchanged while the  $\gamma_B$  lowers significantly in all regressions and

<sup>25</sup>The advantage of future exporters is less pronounced in terms of number of employees.

often turn non-significantly different from zero.<sup>26</sup> This suggests that exporters' ex-ante advantages estimated in columns B may actually be related to the fact that the larger, most productive and capital intensive exporters are those that start to import, as well as to export.<sup>27</sup>

### 5.3 Self-selection into importing: discussion

All together the evidence presented in this section and in the previous one is thus consistent with the conclusion that "good" firms become importers. Several years before they start trading, these firms exhibit some advantages with respect to those that do not trade (and also with respect to future export-starters). This has interesting implications for theory, since most recent theoretical works have focused on the self-selection into exporting.

As noted earlier, theoretical works able to replicate this fact have appeared only recently and the mechanisms through which self-selection into import may occur are not yet established. In particular, there are two different stories: *(i)* importing entails sunk costs, so only the more productive firms would start buying inputs from abroad (Kasahara and Lapham, 2008) and *(ii)* assuming that input-quality and productivity are complementary to obtain higher-quality output, and that importing allows to choose among a wide variety of inputs, one obtains that more productive firms would have more incentives to exploit the opportunity to buy higher-quality inputs from abroad, thus they would self-select into importing (Kugler and Verhoogen, 2009).

Our results do not provide proverbial the smoking gun, which would allow discriminating among competing explanations, but they help in some way. In particular, we offer convincing evidence that the ex-ante productivity premium of future importers is larger than the premium for future exporters. So, if we embrace an explanation based on sunk costs, we would conclude that these entry costs are larger in the case of import than in the case of export. This bring us to elaborate on what is the rationale for sunk costs of importing and why would be higher that in the case of export. The existing literature is not of much help here. Kasahara and Lapham (2008) simply assume that some fixed costs of importing may exists, but they do not provide any economic rationale for them. Kraay et al. (2002) posit that importers may need to bear the cost of searching for suppliers and learning custom procedures. But this is exactly the same type of costs that exporters would have to bear. So, either the two parties are making very ineffective investments, or the market is doing a very poor job in matching supply and demand! Indeed, we are inclined to think that (unless it enjoys a spectacular market power) the seller (exporter) should be making the larger effort to find its buyer (importer), so we expect fixed costs and self-selection.

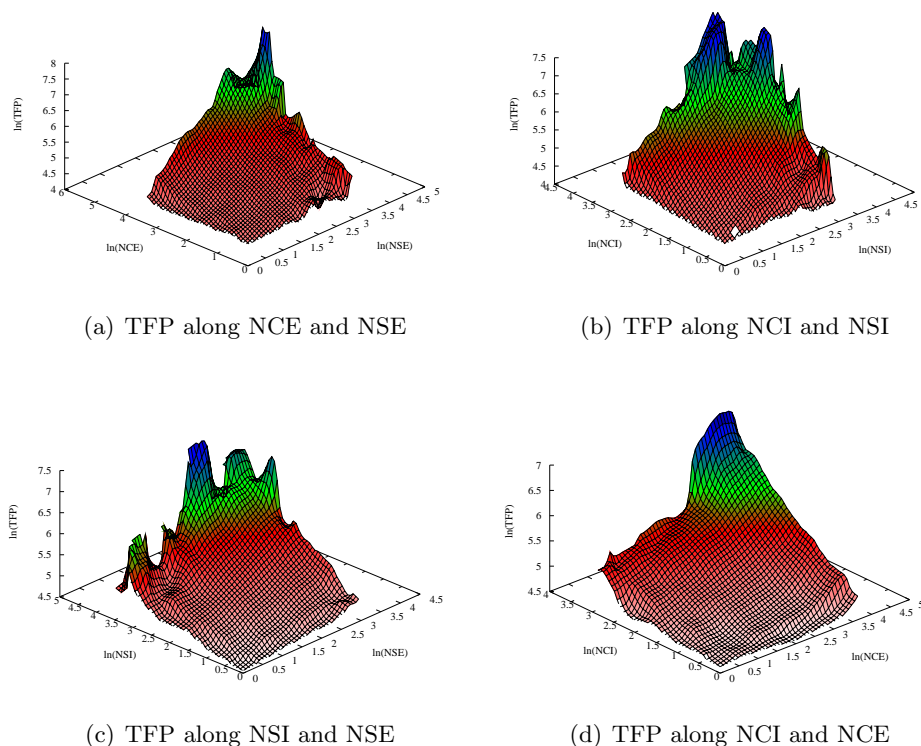
Thus, if we want to explain the higher ex-ante productivity of importers, we need to think at other explanations. Here we submit that importers may need to invest in some complementary assets (or absorptive capacity) in order to be able to effectively use imported inputs in their production process. Admittedly, this is likely to be the case for imported technologies (capital goods) or for high-quality intermediate inputs. A closer look at our data provides some useful insights. From Table 3 one can derive that the majority of only importers trade only with EU countries. In fact, over the 1993-1997 period, 5% of firms are only importers, but if we exclude firms trading only with EU partners the share of only importers drops to 1.6%. To appreciate how sizable this slip is, one can consider that the share of only exporters slides only from 5.4% to 4.8%, suggesting that only a small portion of exporters serve only the EU market. A closer look to the origin of imports reveals that 92% of only importers source from at least one Western European market (including EU15 and Efta countries) and Germany is the largest source country (17% of only importers buy goods only from Germany and, considering also firms sourcing from France and Efta countries (and a combination of them) this

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<sup>26</sup>Altomonte and Bekes (2008) find a similar pattern of results in the case of Hungarian traders.

<sup>27</sup>We have also experimented a specification when we introduce the interaction between the dummies export-starter and import-starter, in order to capture the ex-ante advantage of two-way traders. As we discussed earlier, only a few firms fall into this category, so the coefficient associated with the interaction term is never precisely estimated. Since results on the main effect of import and export starters remain qualitatively unaltered, we do not show these results, which are available upon request.

Figure 3: TFP along country (NC) and sector (NS) extensive margin for import and export, two-way traders (1993)



share reaches about 50% of only importers).<sup>28</sup> The fact that only-importers buy mainly from EU countries, makes the argument of fixed cost related to learning customs procedures rather weak in our case, and it is also hard to believe that within the EU, firms have to bear significant costs to gather information about sellers. Instead, it is likely that Italian only-importers buy technology-intensive inputs from their major European counterparts. For example, they have a relatively high propensity to import capital goods, such as machine tools, and high-tech intermediate goods, such as chemical compounds or electronic components from Germany, Switzerland, France and the UK.

#### 5.4 Firm heterogeneity along the extensive margins

In the previous sections we have shown that a few firms account for the bulk of trade, that those few firms are rather diversified in terms of markets and sectors they trade with, and that the more internationalised firms tend to be also the largest and the most productive firms. The evidence provided so far also suggests that these patterns may be stronger in the case of imports than for exports. In this section, we further develop our analysis of firm heterogeneity and international trade, by assessing the relationship between the sector and country extensive margins and the characteristics of the international firm. We will focus on two-way traders, in order to be able to assess the relative importance of the association between firm characteristics and the intensive margins, both on the import and export side.<sup>29</sup> It is worth mentioning that previous studies on importers and exporters, did not explore this dimension as thoroughly as we do here.

<sup>28</sup>To save space, we do not show detailed tables on the data reported above, but they are available from the authors upon request.

<sup>29</sup>The analyses reported in this Section have been carried out also for the aggregate of exporters and importers, and for only importers and only exporters, but results do not change significantly.

Table 12: Firm heterogeneity along the sector and country extensive margins, Pooled OLS regressions (1993-1997)

Dependent variable	Labour productivity	TFP	Sales	N. empl.	Capital Intensity
ln NSE	0.016** (0.006)	0.036*** (0.006)	0.078*** (0.012)	0.062*** (0.010)	-0.065*** (0.012)
ln NSI	0.046*** (0.006)	0.023*** (0.007)	0.373*** (0.013)	0.424*** (0.012)	0.089*** (0.013)
ln NCE	0.035*** (0.005)	0.019*** (0.005)	0.206*** (0.011)	0.174*** (0.009)	0.000 (0.011)
ln NCI	0.117*** (0.007)	0.119*** (0.007)	0.416*** (0.013)	0.142*** (0.011)	0.149*** (0.014)
N. obs.	35328	35099	35328	35329	35114
R-squared	0.243	0.403	0.508	0.420	0.267

Note: Standard Errors in parenthesis below the coefficients. Asterisks denote significance levels (\*\*\*:  $p < 1\%$ ; \*\*:  $p < 5\%$ ; \*:  $p < 10\%$ ). All regressions include the log of employment (except regressions where the dependent variable total sales of the number of employees) as well as sector, region and year dummies as controls.

First, we will show some non-parametric multivariate kernel regressions. As in a standard parametric regression, the aim of this technique is to estimate the conditional expectation of a dependent variable,  $y$ , given other explanatory variables,  $x$  and  $z$ . However in this case we do not assume that the relationship between the dependent and the independent variables is linear. We instead estimate non parametrically by multivariate kernel methods the conditional expectation of  $y$  given the observed combinations of the explanatory variables  $x$  and  $z$ , i.e.  $E(y|x; z)$ . This is a non-parametric method which does not impose any a priori structure on the data (Pagan and Ullah, 1999; Härdle et al., 2004).

Using the kernel estimation technique, smooth surfaces can be obtained from the observed triples  $\{x, z, y\}$ . In Figure 3 we plot the kernel density estimate of the logarithm of TFP, on the log of our measures of sector and country extensive margins.<sup>30</sup> In other words, for a given combination of NCE and NSE on the horizontal plane, the vertical height of the surface represents the estimated conditional expectation of TFP. In the upper-left panel,  $x$  and  $z$  are, respectively, the logarithm of the number of countries where a firm exports (NCE) and the number of sectors where a firm exports (NSE).<sup>31</sup> In the upper-right panel we depict the country and sector extensive margins for imports (NCI and NSI), while in the lower panels we look at the association between TFP and extensive margins for import and export (sector extensive margin in the lower-left panel and country extensive margins in the lower-right). The main message of this analysis is that firms with the highest productivity are very diversified both in terms of sectors and countries (see the Figure 3 (a) and (b)). In fact, as the number of markets and sectors increases, the vertical height of the surface grows. This suggests that firms' TFP is an increasing function of the number products and countries with which a firm trades. This fact holds quite robustly for all the independent variables under analysis both on the export side (NCE, NSE) and on the import side (NCI, NSI).<sup>32</sup> Comparing diversification on the import and export side (Figure 3 (c) and (d)), one notices that firms with a high degree of sectoral

<sup>30</sup>The kernel density shown in this work were performed using *gbutils*, a package of programs for parametric and non-parametric analysis of panel data, distributed under the General Public License and freely available at <http://www.cafed.eu/gbutils>. If not else specified, density estimation is performed using Epanenchnikov kernel and setting the bandwidth following the "rules" suggested in Section 3.4 of Silverman (1981).

<sup>31</sup>Using the same database, Castaldi et al. (2006) find evidence of a positive (but less than proportional) relationship between firm size and diversification levels.

<sup>32</sup>All the kernel density estimates that are not here reported are available upon request.

Table 13: Firm heterogeneity along the sector and country extensive margins, Fixed-effects regressions (1993-1997)

Dependent variable	Labour productivity	TFP	Sales	N. empl.	Capital Intensity
ln NSE	-0.004 (0.006)	-0.004 (0.006)	0.015*** (0.005)	0.005* (0.003)	0.001 (0.009)
ln NSI	0.017*** (0.007)	0.016*** (0.007)	0.030*** (0.006)	0.020*** (0.004)	0.026*** (0.011)
ln NCE	0.025*** (0.009)	0.021*** (0.009)	0.075*** (0.009)	0.044*** (0.006)	0.033*** (0.014)
ln NCI	0.014** (0.007)	0.014** (0.007)	0.048*** (0.007)	0.022*** (0.004)	-0.007 0.01
N. obs.	35328	35099	35328	35329	35114
R-squared	0.819	0.869	0.976	0.985	0.878
Hausman Test [p-value]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Breush-Pagan test [p-value]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]

Note: Standard Errors in parenthesis below the coefficients. Asterisks denote significance levels (\*\*\*:  $p < 1\%$ ; \*\*:  $p < 5\%$ ; \*:  $p < 10\%$ ). All regressions include the log of employment (except regressions where the dependent variable total sales of the number of employees) as well as sector, region and year dummies as controls.

diversification of imports have a relatively high productivity, even when their sectoral diversification of export is relatively low.

In Section 4.1 we found that few very diversified firms account for the bulk of trade. The results of the multivariate kernel regressions additionally highlight that these superstars are the most productive, the larger and the more capital intensive among two-way traders. Furthermore, firms with the highest productivity tend to be relatively more diversified on the import than on the export side. However, one should keep in mind that these results are unconditional expectations, which may be affected by the sectoral (as well as regional and size) distribution of firms. In order to shed more light on the relative importance of the different extensive margins and to take into account simultaneously all the dimensions of firms' diversification in international trade activities we resort to parametric regressions where we control for additional sources of heterogeneity, by estimating the following equation:

$$y_{it} = \alpha + \lambda_1 x_{it}^{nse} + \lambda_2 x_{it}^{nsi} + \lambda_3 x_{it}^{nce} + \lambda_4 x_{it}^{nci} + \theta controls + v_{it}, \quad (3)$$

where  $y_{it}$  is a measure (in logarithms) of either firm productivity, size or capital intensity, the  $x$ s denote the logarithm of NSE, NSI, NCE and NCI, while  $controls$ , as usual, is vector including the log of firm's employment together with sector, region and year dummies. Each regression refers to the sample of firms which are two-way traders throughout the period. This selection is needed in order to ensure that NCE, NSE, NCI and NSI have non-zero values, and allow us to express them in logs and interpret the estimated  $\lambda$  coefficients as elasticities, which we call the "diversification premium of internationalised firms". For example, we interpret  $\lambda_1$  as the average percentage premium associated with an increased in the number of export destinations by 1%. In Table 12, we estimate equation (3) by pooled OLS regressions, while in 13 we apply the within-group transformation, in order to purge any individual (time-invariant) effect.

Results from Table 12 support the idea that, even controlling for size, sector, region and time effect, the more diversified firms are also larger, more productive and more capital intensive. It is worth noting that diversification of imports has the strongest association with firm heterogeneity. For example, a 10% increase in NCI is associated with 1.2% higher labour productivity and TFP,

4.2% higher turnover and 1.4% higher capital intensity. The premia associated with NSI are smaller, but still sizable and higher than those associated with NCE and NSE. Moreover, the fact that the coefficients for the capital intensity variable are positive and statistically significant only for the import side give support to the argument that, in order to enter the import markets, firms need to have the ability to value, assimilate, and apply new knowledge. Controlling for individual unobserved heterogeneity reduces the estimated premia substantially, but we still find a significant effect of the country and sector extensive margin on firm heterogeneity in most cases. Results, reported in Table 13, suggest that premia associated with imports drop more than premia associated with export diversification. This is consistent with the idea that the difference between the premia associated to NCI and NSI and those associated to NCE and NSE is mainly the result of self selection of better firms into more diversified importing activities. Conversely, our evidence suggests that an increase in diversification of export markets (measured by NCE) is associated with larger firm size, capital intensity and productivity.

## 6 Conclusions

This paper offers a portrait of Italian manufacturing firms that trade goods. Exploiting a rich dataset which combines data on firms' structural characteristics and economic performance with data on their exporting and importing activity, we uncover evidence supporting recent theories on firm heterogeneity and international trade, together with some new facts. We have three sets of findings.

First, we document that trade is more concentrated than employment and sales. This is the result of few firms accounting for a large share of trade volumes and appears to be mainly occurring within rather than between sectors. This fact supports recent theories of international trade with heterogeneous firms against traditional theories based on comparative advantages. Furthermore, we find significant concentration along the sector and country extensive margins: few firms serve trade in many sectors and with many countries, but these firms account for a larger share of import and export. Finally, we show that import is more concentrated than export, especially along the sector and country extensive margins.

Second, we confirm that firms with different exposure to international markets have different performances, in terms of size, capital intensity and productivity. In particular, we support the idea, as in a wealth of recent studies, that firms more engaged in international activities (i.e. those involved in both importing and exporting) are the best performers, but we also find that firms involved only in importing activities perform better than those involved only in exporting. Our results suggest that the importers' premium exists prior to engaging in trading activities and this is consistent with self-selection into importing. We provide some evidence that the argument of fixed cost related to learning customs procedures is rather weak, while the results are consistent with the fact that, in the case of Italy, only-importers buy mainly high-quality capital and intermediate inputs from major European countries. To the extent that these goods incorporate advanced knowledge and technologies, they may entail sunk costs which the importers have to incur to accumulate the complementary assets (absorptive capacity) needed to use those goods in production. However, we cannot also rule out that, as proposed by Kugler and Verhoogen (2009), this self-selection stems from a complementarity between high-quality inputs and productivity in firms producing higher-quality output.

Third, the degree of geographical and sectoral diversification is positively correlated with firm size and productivity. However, diversification premia with respect to capital intensity are connected only to the import side. In particular, we have evidence that on the one hand, larger, more capital intensive and more productive firms are able to import a large number of products from a larger number of countries, and, on the other hand, firms exporting into a larger number of countries are more likely to experience a performance boost.

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## 7 Appendix

Table A2: Firm heterogeneity and internationalization status (importers and exporters), Pooled OLS regressions (1993-1997)

Dependent Variable	Labour productivity	TFP	Sales	N. Empl.	Capital Intensity
importer	0.201*** (0.008)	0.156*** (0.008)	0.780*** (0.017)	0.337*** (0.012)	0.412*** (0.018)
exporter	0.126*** (0.009)	0.085*** (0.009)	0.693*** (0.019)	0.285*** (0.014)	0.263*** (0.021)
Foreign Ownership	0.013 (0.018)	0.032 (0.021)	1.396*** (0.064)	1.275*** (0.059)	-0.018 (0.035)
N. Observations	60661	59987	60652	60662	60031
R-squared	0.344	0.448	0.411	0.196	0.337

Note: Standard Errors in parenthesis below the coefficients. Asterisks denote significance levels (\*\*\*: p<1%; \*\*: p<5%; \*: p<10%). All regressions include the log of employment (except regressions where the dependent variable total sales of the number of employees), as well as sector, region and year dummies as controls.

Table A3: Firm heterogeneity and internationalization status (importers and exporters), Fixed effect regressions (1993-1997)

Dependent Variable	Labour productivity	TFP	Sales	N. Empl.	Capital Intensity
importer	0.023*** (0.007)	0.021*** (0.007)	0.043*** (0.007)	0.019*** (0.004)	0.024* (0.014)
exporter	0.027* (0.014)	0.021 (0.014)	0.073*** (0.018)	0.016* (0.009)	0.035 (0.026)
Foreign Ownership	0.016 (0.020)	0.014 (0.020)	0.044** (0.017)	0.027* (0.015)	-0.021 (0.037)
N. Observations	60661	59987	60652	60662	60031
R-squared	0.8620	0.088	0.979	0.983	0.907

Note: Standard Errors in parenthesis below the coefficients. Asterisks denote significance levels (\*\*\*: p<1%; \*\*: p<5%; \*: p<10%). All regressions include the log of employment (except regressions where the dependent variable total sales of the number of employees) and year dummies as controls.

Table A1: F-tests for equality between coefficients

Coefficients	Results for OLS regression				
	LP	TFP	Sales	N.employ	CI
two way traders=only importer	F(1,20335)=57.28 Prob> F=0.0000	F(1,20197)=45.00 Prob> F=0.0000	F(1,20332)=822.47 Prob> F=0.0000	F(1,20335)=482.44 Prob> F=0.0000	F(1,20213)=12.11 Prob> F=0.0005
two way traders=only exporter	F(1,20335)=279.41 Prob> F=0.0000	F(1,20197)=208.84 Prob> F=0.0000	F(1,20332)=1201.70 Prob> F=0.0000	F(1,20335)=789.83 Prob> F=0.0000	F(1,20213)=134.38 Prob> F=0.0000
only exporter=only importer	F(1,20335)=26.06 Prob > F=0.0000	F(1,20197)=24.31 Prob> F=0.0000	F(1,20332)=6.77 Prob> F=0.0093	F(1,20335)=3.05 Prob> F=0.0809	F(1,20213)=22.91 Prob> F=0.0000

Coefficients	Results for FE regression				
	LP	TFP	Sales	N.Employ	CI
two way traders=only importer	F(1,20335)=1.11 Prob> F=0.2920	F(1,20197)=0.58 Prob> F=0.4457	F(1,20332)=12.61 Prob> F=0.0004	F(1,20335)=2.20 Prob> F=0.1383	F(1, 20213)=1.32 Prob> F=0.2510
two way traders=only exporter	F(1,20335)=2.08 Prob> F=0.1493	F(1,20197)=1.49 Prob> F=0.2223	F(1,20332)=20.71 Prob> F=0.0000	F(1,20335)=8.88 Prob> F=0.0029	F(1,20213)=1.28 Prob> F=0.2576
only exporter=only importer	F(1,20335)=0.03 Prob> F=0.8540	F(1,20197)=0.00 Prob> F=0.9919	F(1,20332)=2.35 Prob> F=0.1251	F(1,20335)=0.07 Prob> F=0.7931	F(1,20213)=0.11 Prob> F=0.7357