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PRODUCTIVITY DIFFERENCES BY EXPORT DESTINATION

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Productivity differences by export destination[•]

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Abstract This paper investigates differences in productivity by destination market of firms exports. The total factor productivity (TFP) is used as measure of productivity. The productivity differences by export destination are estimated using multilevel approach considering the first destination country of the firm's exports as the second level group of the model. The analysis is based on a dataset that provides comparable cross-country data of manufacturing firms in seven European countries (Austria, France, Germany, Hungary, Italy, Spain and the United Kingdom).

The results are as follows. Productivity differs from market to market and, thus, it gives support to the expectations derived from Chaney's model (2008). The estimates confirm that non-exporters are, on average, the less productive. On the contrary, the European firms that export to China and India register the highest positive difference. A positive difference also exists for firms that export to the USA and Canada. On the contrary, there is no relevant TFP difference for firms exporting to the EU-15 area. The difference is positive but slight for the Other Asian countries and Other EU countries, while it is negative for Other areas, Other non EU countries and Central and South America. Among firm-specific characteristics only size and sector membership help to explain the productivity differences by destination market and the role of size is by far the most dominant factor.

Keywords: Productivity, Heterogeneous firms, Export, Market of destination, Multilevel model

JEL classification: D22, F10, F14, C31

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1 Introduction

Bernard and Jensen (1995) in their seminal work compared exporters and non-exporters for the entire U.S. manufacturing sector and established that exporters are substantially different from non-exporters, even in the same industry and region. Exporters are larger, more productive, pay higher wages, use more skilled workers, and are more technology- and capital-intensive than their non-exporting counterparts. In a related work on German firms, Bernard and Wagner (1997) found the same patterns of systematic differences between exporters and non-exporters. Since then numerous authors have confirmed Bernard and Jensen's results across a wide range of industries, regions, time periods and countries at varied levels of economic development.

In the "new trade theory" framework (Krugman 1979) all firms export since firms produce a unique product variety that consumers buy since they have a preference for variety The reason why all firms export is related, however, to the hypothesis that firms do not face fixed costs of exporting. In the real world some firms export, while others in the same industries do not, and firms that enter export markets incur sunk costs. Melitz (2003) developed a dynamic industry model with heterogeneous firms operating in monopolistically competitive industries, which helps to explain these stylized facts. In his model, firms within an industry face fixed costs of exporting but differ in terms of productivity. As a result, only the most productive firms export while the less productive serve the domestic market only. This sorting pattern is consistent with the empirical evidence. The Melitz model is not the only one that points to causal link between exporting and industry productivity. Bernard et al. (2003) developed a model of international trade and heterogeneous firms that focuses on the relationship between plant productivity and exporting and Helpman et al. (2004) extended the Melitz model to allow firms to serve foreign markets either by exporting or by establishing subsidiaries in foreign countries that sell directly to the host country (horizontal FDI). In this case, only the most productive firms engage in horizontal FDI, low productivity firms only serve the domestic market, and firms with intermediate productivity export. A review of the theoretical literature can be found in Helpman (2006), Lopez (2005), Greenaway and Kneller (2007).

In the literature two hypotheses about the positive correlation between export status and productivity are investigated. The first is that the most productive firms self select into foreign markets as they can overcome sunk costs associated with foreign sales. The second hypothesis raises the possibility of "learning by exporting". Firms participating in international markets acquire knowledge and technology with a positive feedback as regards knowledge and technology accumulation. Furthermore firms active in the international markets are exposed to more intensive competition than firms that sell their products domestically only. From the results of the empirical research it emerges that the more productive firms self-select into export market while exporting per se does not cause an increase in productivity via learning effects. Results from earlier studies are reviewed in Wagner (2007a), Bernard and Jensen (1999), Greenaway and Kneller (2007), Lopez (2005) while a survey of empirical studies since 2006 is in Wagner (2012).

In recent studies, it has been argued that sunk cost may vary across different export destinations (Eaton et al., 2004). The consideration of export markets would imply relaxing the Melitz (2003) assumption of a unique exporting threshold, and allowing for different destination thresholds that would increase with the level of difficulty of the destination market (Máñez-Castillejo 2010). In extensions of Melitz's model to many countries, such as Chaney (2008), firms incur entry costs per market and, thus, the productivity threshold is country specific.

Recent empirical studies show that exporter productivity premia vary across export destinations (see Wagner (2012) for a survey)**.** For France, Bellone et al. (2009) and Crozet et al. (2011) show that once controlled for the destination of exports, the premium vanishes for intra-Europe exporters, whereas the premium remains high and significant for global exporters (outside Europe). Comparing data from the French and Japanese manufacturing industries, Bellone et al. (2014) show that productivity differences between French and Japanese exporters vary across export destinations: the largest average productivity gap is between exporters to Europe, while the lowest one is between exporters to Asia. These results are consistent with the idea that trading to Europe is less costly for French firms, while the Asian markets are more accessible to Japanese exporters. For Germany, Wagner (2007b) and Verardi and Wagner (2012) compares productivity premia for exporters to eurozone versus non-eurozone and document that firms that export to countries inside the euro-zone are less productive than firms that export to countries outside the euro-zone.[1] For Italy, Serti and Tomasi (2009) evidence higher productivity levels for firms exporting to high medium income countries than for those exporting to European and low income countries.[2] For Spain, Blanes-Cristóbal at al. (2008) find that during 1990–2002 sunk exporting costs were significant for Spanish firms, and there were differences depending on the destination market. Besides, the costs of entering/re-entering were higher in developed markets.

The main objective of this paper is to investigate differences in firm productivity by export destination. The contribution of this paper is threefold. The first is to compute productivity differences by single destination market of the firm's exports. The second contribution is to assess the difference in the productivity for non-exporters, and for exporters as regards different geographical areas. Third, the paper analyses specific factors of firm that help explain the difference in the productivity between trade partners.

A common approach used to compute the so-called exporter premia is to regress the productivity indicators on the current export status dummy and a set of control variables. In order to estimate how productivity differs between different trade partners the multilevel approach is used in this paper. Multilevel models are particularly appropriate for research designs where data are nested. The units of analysis are usually individuals at first level (e.g. firms) nested within group units at a higher level (e.g. regions, countries). Multilevel models recognise the existence of such hierarchies by allowing intercepts to vary across groups through the inclusion of random coefficients. To apply multilevel methodology to estimate the productivity differences by export destination, the first destination country of the firm exports is used as group. By considering the destination countries as the second level of the model, it is possible to calculate the group-level residual that represents the difference between the TFP mean of firms that export to partner *j* and the overall mean of TFP. Group-level residuals can, thus, be considered a measure of productivity differences by export destination. Moreover, a useful aspect of the multilevel approach is the possibility of using the variance at the different levels of analysis to estimate how much of the variation in outcomes might be attributable to unobserved factors operating at each level of the model.[3]

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[1] Wagner (2007b) uses cross-section data for 2004 to document that firms that export to countries inside the euro-zone are more productive than firms that sell their products in Germany only, but less productive than firms that export to countries outside the euro-zone. Verardi and Wagner (2012) reach similar results but using longitudinal firm-level data for the years 2003-06 to estimate the productivity premium of German firms exporting to the Euro-zone and beyond controlling for unobserved time-invariant firm-specific effects in a linear fixed effects panel data model.

[2] The same sort of hierarchy emerges in Serti and Tomasi (2012) which focuses on ex-ante productivity differences between firms starting to export to distinct geographical areas.

[3] The multilevel approach has already been applied to firm productivity but in different contexts. Raspe and van Oort (2007) link firm productivity to the knowledge-intensive spatial contexts in the Netherlands. For Italy, Fazio and Piacentino (2010) investigate the spatial variability of fims' labour productivity, while Aiello et al. (2014) analyse how firms' characteristics and regional factors affect TFP heterogeneity and Aiello at al. (2015) extended the analysis to sector specificities. Mahlberg at al. (2013) refer to Austria and explore the link between age and labour productivity by federal states (NUTS-level 2) on the one hand and by sector on the other hand as well as by sectors-by-regions (i.e. an interaction of region and industry). Aiello and Ricotta (2015) employ the same dataset used in this paper to detect

The analysis is based on a dataset that provides comparable cross-country data of manufacturing firms in seven European countries (Austria, France, Germany, Hungary, Italy, Spain and the United Kingdom): the EU-EFIGE/Bruegel-UniCredit dataset (EFIGE dataset in short). The dataset contains data from a survey carried out in 2010 and covers quantitative as well as qualitative information and detailed information on trade activities (Altomonte and Aquilante 2012). While the survey refers to the 3-year-period 2007-2009, much of the information is averaged over the years under scrutiny, or relates to 2008 only. As a measure of productivity, the TFP calculated for 2008 by Bruegel is used. The focus of the analysis is, thus, on the EU manufacturing firms represented by the EU7-EFIGE countries sample.

The results are as follows. Productivity differs from market to market and, thus, it gives support to the expectations derived from Chaney's model (2008). The estimates provide further evidence that non-exporters are, on average, the less productive firms. On the contrary, the European firms that export to China and India register the highest positive difference. A positive difference also exists for firms that export to the USA and Canada. On the contrary, there is no relevant TFP difference for firms exporting to EU-15 area. The difference is positive but slight for the Other Asian countries and Other EU countries, while it is negative for Other areas, Other non EU and Central and South America. Among firm-specific characteristics only size and sector help to explain the productivity differences by destination market and the role of size is by far the most dominant factor.

The paper proceeds as follows. In the next section, data are described. Section 3 presents descriptive evidence. Section 4 specifies a multilevel model where the export destination market represents the second level of the model. Section 5 reports empirical results: subsection 5.1 focuses on the estimate of productivity differences by trade partner/geographical area while subsection 5.2 analyses the role of firm-specific factors in explaining the productivity differences. The concluding section summarizes the results.

2. Data

The analysis is based on a dataset that provides comparable cross-country data of manufacturing firms in seven European countries (Austria, France, Germany, Hungary, Italy, Spain and the United Kingdom): the EU-EFIGE/Bruegel-UniCredit dataset. This dataset is a by-product of the EU project "European Firms in a Global Economy: internal policies for external competitiveness". The EFIGE project surveys around 15 thousand European firms, many of which are in Germany, France, Italy and Spain, followed by United Kingdom, Austria and Hungary.[4] The survey carried out in 2010 covers quantitative as well as qualitative information ranging from R&D and innovation, labor organization, financing and detailed information on trade activities (Altomonte and Aquilante 2012). While the survey refers to the 3-year-period 2007-2009, much of the information is averaged over the years under scrutiny, or relates to 2008 only. As a measure of productivity, the TFP calculated for 2008 by Bruegel is used.[5] The variables needed to estimate the production function from which the TFP is retrieved come from balance sheets database of Bureau van Dijk, Amedeus.

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through the multilevel analysis how much of the difference in European firm performance can be attributed to individual heterogeneity and how much of this difference reflects territorial conditions.

[4]The sampling design has been structured following a three dimension stratification: industry (11 NACE-CLIO industry codes), region (at the NUTS-1 level of aggregation) and size class (10-19; 20-49; 50-250; more than 250 employees). For details on EFIGE dataset see Altomonte and Aquilante (2012) and Barba Navaretti at al. (2011).

[5] Bruegel researchers have estimated the TFP by applying the Levinsohn and Petrin (2003) approach and considering sectoral production functions. Estimates also control for country and year fixed-effects over the 2001-2009 period. In terms of the variables included in the estimation of the production function, Bruegel researchers follow the standard practice in this literature using the added value as proxy of output, deflated with industry-specific price indices retrieved from Eurostat datasets. The labour input is measured by the number of employees, while capital is proxied by the value of tangible fixed assets and expressed in real terms by using the GDP deflator. Refer to Altomonte at al. (2012) for detailed information on TFP calculations.

The matching procedure of the EFIGE survey with the Amadeus archive generates a reduction by about 50% of the sample (7,435 firms, see Barba Navaretti at al. 2011). From the sample with TFP, the outliers, i.e. firms with a TFP below the first or above the ninety-ninth percentile of the distribution, have been eliminated. Moreover, the exporters that do not declare in the survey the country of destination of its exports are not considered in the sample.[6] The sample used in this paper (see table 1) is, thus, formed by 6,372 European firms, the majority of which are in the countries with a good quality of balance sheet data: Spain (32.4%), Italy (31.9%) and France (21.1%).[7]

Table 1 Distribution of firms by country: EFIGE survey and Sample

Country	EFIGE Survey	%	SAMPLE	%
Austria	443	3.0	18	0.3
France	2973	20.1	1346	21.1
Germany	2935	19.9	413	6.5
Hungary	488	3.3	134	2.1
Italy	3021	20.5	2033	31.9
Spain	2832	19.2	2066	32.4
UK	2067	14.0	362	5.7
Total	14759	100	6372	100

Source: Author's calculation from EU-EFIGE/Bruegel-UniCredit dataset

3 Descriptive results

Table 2 compares exporters and non-exporters considering the country of origin. Firms are classified as exporters if they reply "yes, directly from the home country" to a question in the questionnaire asking whether the firm has sold abroad some or all of its own products/services in 2008.[8]

First of all, table 2 highlights that a good share of firms in the EU7-EFIGE countries sample, about 65%, are exporters. The same holds for each single country: the share of exporters is lower than the value of all the sample only for France (60%) and Spain (58%). It is worth noting that firms with fewer than 10 employees were excluded from the EFIGE survey and this could lead to the over-estimation of export participation. It is easy to note that exporters perform better than other firms in terms of TFP for all countries, except Austria where there are too few observations to be reliable.

[6] From the sample have been eliminated also 11 firms that declared to be exporters but that have indicated their country of origin as destination market of their exports.

[7] It is worth noting that the unit of analysis in EFIGE survey is the firm and no information is reported on the number of each firm's establishments. However, it is also important to bear in mind that more than 68% of the dataset is formed by small-sized firms which are probably single-plant firms (see table 3).

[8] In order to encompass the phenomenon of temporary traders, Bruegel researchers have considered as exporter also a firm replying "regularly/always" or "sometimes" to the question "Before 2008, has the firm exported any of its products?" (see Altomonte and Aquilante 2012).

Table 2 TFP by export status and country of origin

Country of origin	Non-exporters	%	Exporters	%	All
Austria					
Number of firms	3	*17%*	15	*83%*	18
Average TFP	1.53		1.29		1.33
France					
Number of firms	541	*40%*	805	*60%*	1346
Average TFP	0.96		1.15		1.07
Germany					
Number of firms	100	*24%*	313	*76%*	413
Average TFP	1.15		1.31		1.27
Hungary					
Number of firms	37	*28%*	97	*72%*	134
Average TFP	1.32		1.54		1.48
Italy					
Number of firms	576	*28%*	1,457	*72%*	2033
Average TFP	0.82		0.95		0.91
Spain					
Number of firms	877	*42%*	1,189	*58%*	2066
Average TFP	0.89		1.03		0.97
UK					
Number of firms	71	*20%*	291	*80%*	362
Average TFP	0.94		1.04		1.02
Total					
Number of firms	2,205	*35%*	4,167	*65%*	6,372
Average TFP	0.91		1.06		1.00

Source: see table 1.

EFIGE data are very detailed in terms of exporting activity listing for each firm its first, second and third main export destination market. In this paper the focus is on the first destination country. In table 3 and 4 the destination countries are aggregated in 8 areas.[9]

Table 3 shows TFP by size distinguishing between non-exporters and exporters and for the latter group by area of first destination market of the firm's exports. Table 3 evidences that exporters are more productive than non-exporters for each size class and medium-sized firms perform better than small firms, but less well than large enterprises. The same ranking holds for the different geographical area, except for the single firm exporting to Central and South America that shows a TFP lower than small and medium firms. Large exporters as a share of all firms exporting to each area are more present for the USA and Canada (16.5%), China and India (14.3%), EU-15 countries (11.4%) and Other Asian countries (11%). The presence of medium firms is higher for China and India (35.3%), the USA and Canada (34.3%) and other Asian countries (33.8%). High is the share of small firms as exporters to Central and South America (75.5%), Other Areas (69%), Other European countries not EU (68.7%) and other EU (67.8%).

[9] For a detailed list of all countries included in each area see table 7.

Table 3 TFF by size and area of 1st destination market

	Small (10-49 employees)			Medium (50-249 employees)			Large (over 250 employees)		
	N. firms	*%*	TFP	N. firms	*%*	TFP	N. firms	*%*	TFP
Non-exporters	1,823	*82.7*	0.85	306	*13.9*	1.10	76	*3.4*	1.40
Exporters	2,546	*61.1*	0.91	1,180	*28.3*	1.17	441	*10.6*	1.65
Total	4,369	*68.6*	0.89	1,486	*23.3*	1.15	517	*8.11*	1.61
Exporters by area	Small (10-49 employees)			Medium (50-249 employees)			Large (over 250 employees)		
	N. firms	*%*	TFP	N. firms	*%*	TFP	N. firms	*%*	TFP
EU 15	1777	*60.7*	0.90	817	*27.9*	1.16	334	*11.4*	1.62
CENTRAL & SOUTH AMERICA	71	*75.5*	0.85	22	*23.4*	1.27	1	*1.1*	0.70
CHINA & INDIA	60	*50.4*	0.99	42	*35.3*	1.27	17	*14.3*	1.91
OTHER AREAS	103	*69.1*	0.87	42	*28.2*	1.15	4	*2.7*	1.82
OTHER ASIAN	77	*55.4*	0.89	47	*33.8*	1.20	15	*10.8*	1.80
OTHER EUROPEAN NOT EU	204	*68.7*	0.91	73	*24.6*	1.14	20	*6.7*	1.41
OTHER EU	135	*67.8*	0.98	54	*27.1*	1.17	10	*5.0*	1.93
USA & CANADA	119	*49.2*	0.91	83	*34.3*	1.15	40	*16.5*	1.74

Source: see table 1.

In table 4 data are aggregated by country of origin and area of the first destination market. As expected the EU-15 countries are the main destination for each of the EU7-EFIGE countries followed by Other European countries not EU and USA and Canada. Only 6% of European firms export to Asia and 3% to the two largest countries of the area, China and India. For all the sample, the European exporters to China and India show the highest level of TFP, this holds for the single country, except in the case of France. In terms of TFP average, China and India are followed by firms that export to USA and Canada.

Table 4 shows high heterogeneity in exporters TFP considering the same origin country (one of the EU7-EFIGE countries) to different areas and between different origin countries to the same destination area. Comparing the highest TFP value to the lowest one for two countries, e.g. France and Germany, the difference in percentage amounts to 23% for France (TFP average of firms that export to other EU countries compared to firms exporting to other areas) and 37% for Germany (comparison between firms that export to China and India and firms exporting to Central and South America). If we compare France to Germany considering two areas, the TFP of French exporters is 13% higher than the German exporters to Other EU countries while it is 21% lower for exporters to China and India. Such heterogeneity suggests that we should also consider as group firm's country of origin and destination market combination (see § 4 and 5).

Table 4 TFP for exporters by country of origin and area of 1st destination market

AREA DESCRIPTION	Austria	France	Germany	Hungary	Italy	Spain	UK	All
EU 15 COUNTRIES								
Number of exporters	13	543	190	68	924	1,029	161	2928
Average TFP	1.26	1.13	1.32	1.58	0.94	1.04	1.05	1.06
CENTRAL & SOUTH AMERICA								
Number of exporters		9	6		36	39	4	94
Average TFP		1.33	0.97		0.93	0.86	1.00	0.94
CHINA & INDIA								
Number of exporters	1	30	19		43	11	15	119
Average TFP	2.23	1.23	1.56		1.06	1.21	1.18	1.22
OTHER AREAS								
Number of exporters		56	3		46	29	15	149
Average TFP		1.05	1.25		0.87	0.96	0.94	0.97
OTHER ASIAN COUNTRIES								
Number of exporters		30	6		61	12	30	139
Average TFP		1.28	1.26		1.05	1.06	0.99	1.09
Number of partners		19	3		8	11	8	28
OTHER EUROPEAN COUNTRIES NOT EU								
Number of exporters		57	35	5	153	35	12	297
Average TFP		1.16	1.29	0.92	0.89	0.96	1.02	1.00
Number of partners		11	6		20	7	9	25
OTHER EU COUNTRIES								
Number of exporters	1	27	24	22	91	27	7	199
Average TFP	0.80	1.37	1.20	1.52	0.93	0.93	0.88	1.08
USA & CANADA								
Number of exporters		53	30	2	103	7	47	242
Average TFP		1.22	1.29	2.13	1.05	0.96	1.08	1.12

Source: see table 1.

4. Estimation strategy

The common approach used to compute the so-called exporter premia is to regress the productivity indicators on the current export status dummy and a set of control variables (see Wagner 2007a). In order to obtain an estimate of productivity differences by destination market the multilevel approach is used here. Multilevel models are particularly appropriate for research designs where data are nested. The units of analysis are usually individuals at first level (e.g. firms) nested within group units at a higher level (e.g. regions, countries). Multilevel models recognise the existence of such hierarchies by allowing intercepts to vary across groups through the inclusion of random coefficients.[10]

In order to estimate the productivity differences by export destination a two-level model has been used. Firms constitute the first level and the first destination market of firm's exports represents the second level. All non-exporters are identified in a unique group. Productivity differences by export destination are estimated considering the following model:

$$y_{ij} = \beta_{0j} + e_{ij} \qquad [1]$$

where the outcome variable *y* is *TFP* of the *i-th* firm (*i=1,…., n*) that exports to destination market *j*. The second level is thus represented by the firm's trading partners (included the group for non-exporters).

As *j* group also the combination of the country where the firm is located (one of the seven EU-EFIGE countries) and the first destination country of its exports is considered as second level. In this case the *j* group represents the combination of country "*o*" and partner "*d*" *(origin-destination).* For non-exporters the origin country is considered as destination market.

[10] It is worth noting that multilevel analysis relaxes the assumption of independence among errors that is violated in clustered data since the observations in the same group are related. In this case OLS estimators have deflated standard errors, making test of significance misleading (Bickel 2007).

β_{0j} is the intercept and e_{ij} is the random error term with zero mean and σ_e^2 as variance. In eq. [1], the regression parameters β_{0j} vary across level-2 units.

$$\beta_{0j} = \gamma_{00} + u_{0j} \qquad [2]$$

u_{0j} is a random error term defined at second level with zero mean and assumed to be independent of e_{ij}.

Equation [2] distinguishes between the mean relation over all observations across groups, γ_{00}, and the group-specific variability (random effects) which indicates deviations from the overall mean, u_{0j}. Positive values of u_{0j} imply that the outcome of the respective group is above the overall mean coefficient and negative values the contrary.

Combining eq. [1] and eq. [2] yields the "empty model", i.e. a model without any explanatory variables:

$$y_{ij} = \gamma_{00} + u_{0j} + e_{ij} \qquad [3]$$

Eq. [3] estimates the overall mean of TFP (γ_{00}) and it is possible to calculate the group-level residual (u_{0j}) that represents the difference between the TFP mean of firms that export to partner *j* and the overall mean of TFP. Group-level residuals can, thus, be considered a measure of productivity differences by export destination.

Moreover, since eq. [3] allows the decomposition of the variance of *y* into two independent components, i.e. the variance of e_{ij} (σ_e^2), the so-called within-group variance, and the variance of u_{0j} (σ_{u0}^2), also known as between-group variance[11], one can calculate the proportion of total variance "explained" by the grouping structure, i.e. the intra-class correlation ICC:

$$ICC = \frac{\sigma_{u0}^2}{\sigma_{u0}^2 + \sigma_e^2} \qquad [4]$$

The intra-class correlation coefficient measures the correlation between the y-values of two randomly selected firms from the same group. For simple multilevel model, the ICC is equal to the variance partition coefficient (VPC) that represents the proportion of total variance that is due to differences between groups (Leckie 2013).

5 Empirical results

5.1 Productivity differences by export destination

Table 5 displays results obtained when estimating the empty model (eq. [3]) considering different second level groups and different samples. In column 1 and 2 the first destination market of a firm's exports in considered as second level cluster while in column 3 and 4 the group refers to the combination of the country where the firm is located (one of the seven EU-EFIGE countries) and the first destination country of its exports (origin country for non-exporters). The last columns refer to the three countries for which the number of observations at firm level is fairly large, Italy, France and Spain.

[11] In the multilevel approach the requirements of precise measurement of between-group variance impose a "sufficient" number of clusters. However, there is no clear indication about the number of clusters (Richter 2006). Some authors suggest that 20 is a sufficient number of groups (Heck and Thomas 2000; Rabe-Hasketh and Skondal 2008), others 30 (Hox, 2002) or 50 (Mass and Hox 2004). Regarding cluster sizes, the only requirement is that there are a good number of clusters of two or more elements (Rabe-Hasketh and Skondal 2008).

The likelihood-ratio test that compares the empty model with the standard linear regression is always highly significant and thus supports the use of a multilevel model.[12]

Considering partners as group the value of ICC evidences that the correlation between randomly chosen pair of firms belonging to the same destination market is low, 0.03. However, figure 1 shows high TFP heterogeneity among destination markets. Figure 1 shows destination market residuals (u_{0j}) in rank order together with 95% confidence intervals, for the TFP. There are 115 residuals, one for each destination group (including the group of non-exporters). Each residual represents how much TFP of firms exporting to each destination market differs for the overall mean. The width of the confidence interval (CI) associated with a particular country depends on the standard error of that group's residual estimate, which is inversely related to the size of the sample. The residuals represent group departures from the overall mean, so a destination market group whose confidence interval does not overlap the line at zero (representing the whole sample TFP mean) is said to differ significantly from the average at the 5% level (Steele 2008). The caterpillar plot evidences that productivity differs from market to market and, thus, it gives support to the predictions derived from Chaney's model (2008). At the left-hand side of the plot, there is a cluster of partner groups whose TFP mean is lower than average; the lowest residual is for the groups of firms exporting to Greece, at the second rank appears the group of non-exporting firms, followed by firms trading with Venezuela. At the other extreme, there are a cluster with above-average TFP. The highest difference refers to the group of firms exporting to China, followed by firms trading with Slovakia and Hungary.

In column 2 of table 5, the empty model is augmented by introducing a dummy variable for each of the EFIGE country. The estimated coefficients evidence the differences in productivity across European countries (Germany is used as controlling group). Italy and Spain show the lowest values, followed by the UK and France while Austria[13], Germany and Hungary lead the group. Comparing the 2nd level variance of the model 2 with the same value of the empty model (column 1) points out that origin country fixed effects explain 27% of the variation of TFP between partners.[14]

[12] The null hypothesis is that $\sigma_{uo} = 0$. If the null hypothesis is true, an ordinary regression can be used instead of a multilevel model.

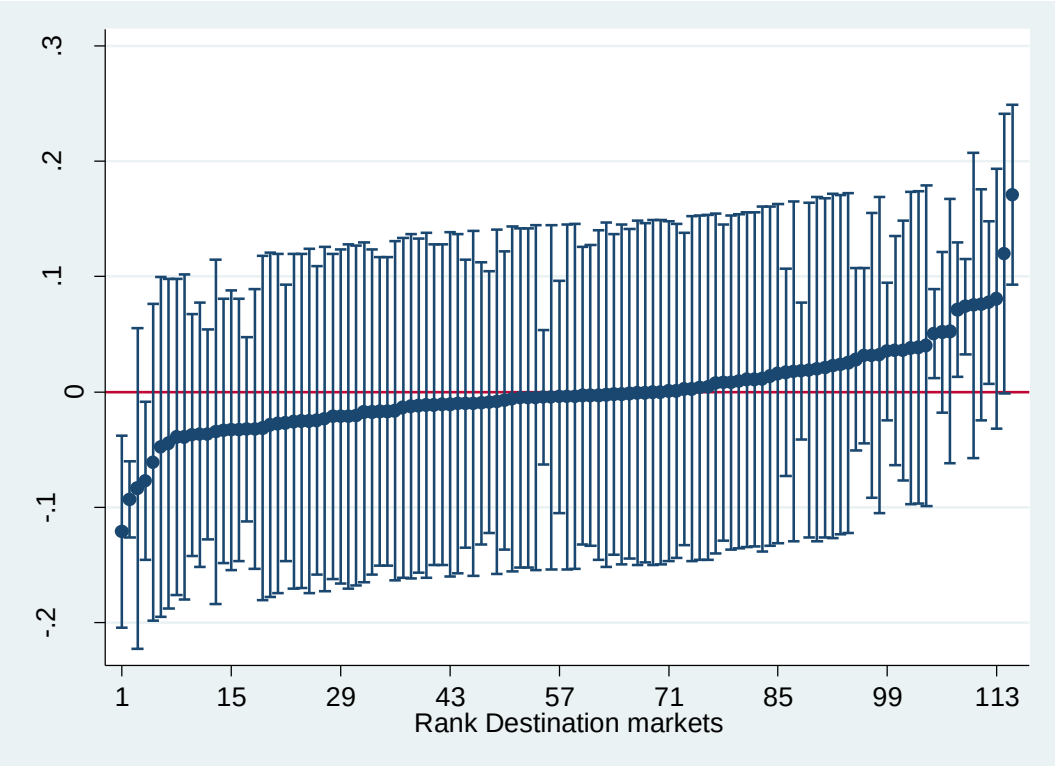
[13] Austrian firms do not appear to be significantly different from German enterprises in terms of TFP.

[14] For more details on how to determine the variability explained by factors operating at each level of the model see § 5.2 and note 18.

Table 5 Productivity differences by export destination: the Empty Model

	Destination Market		Origin-Destination Market		Italy	France	Spain
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fixed Effects							
Constant	-0.0842***	0.160***	-0.0542***	0.163***	-0.180***	0.0151	-0.119***
	(-5.88)	(6.70)	(-3.79)	(5.55)	(-10.32)	(0.59)	(-5.51)
Austria		-0.0818		-0.0287			
		(-0.81)		(-0.25)			
France		-0.169***		-0.146***			
		(-6.97)		(-3.94)			
Hungary		0.109***		0.0669			
		(2.58)		(1.21)			
Italy		-0.353***		-0.343***			
		(-15.30)		(-9.83)			
Spain		-0.265***		-0.283***			
		(-11.38)		(-7.64)			
United Kingdom		-0.237***		-0.228***			
		(-7.62)		(-5.43)			
Random Effects							
Variance							
Destination markets	0.006	0.004	0.024	0.006	0.005	0.011	0.006
Firms	0.186	0.175	0.174	0.174	0.176	0.174	0.167
Total	0.192	0.179	0.198	0.180	0.181	0.185	0.173
ICC	0.03	0.02	0.12	0.03	0.02	0.06	0.03
R^2 *level 2*		0.27		0.74			
R^2 *level 1*		0.06		0.00			
R^2		0.07		0.09			
LR test	156.6	168.6	421.1	149.0	35.5	43.7	62.7
Log restricted-likelihood	-3702.9	-3521.9	-3570.6	3531.7	-1132.3	-748.2	-1097.7
Number of groups	115	115	318	318	79	63	66
Observations	6372	6372	6372	6372	2033	1346	2066

Fig. 1 Caterpillar plot showing destination market residuals and 95% CI for TFP[(a)]



(a) Figure 1 reports the u_{0j} estimated considering model 1 of table 5. When the u_{0j} from model 2 are considered there are few changes in the position of countries. Indeed, the Spearman's rank correlation coefficient (0.89) shows that there is a high correlation between the ranks derived from the two models.

Comparing the model with partner as second level group with the model with the combination origin-destination as second level cluster, the ICC appears higher (0.12) in the latter case but decreases to the level of the first model when the origin country fixed effects are introduced. In this case the introduction of country dummies explains a higher share of the variability (74%) related to origin-destination combination since they allow consideration of the level of TFP differences among the EU7-EFIGE countries (see table 2).

In terms of ICC, the results for the single countries are quite similar to the previous ones.

The residuals u_{0j} obtained from the empty models presented in table 5 are aggregated considering different geographical areas.[15] For each geographical area the average of group residuals that have as destination market one country of the area is calculated and this represents how much, on average, the TFP of firms that export to the area considered differs from the overall mean.

Figure 2 reports productivity differences by geographical area of export destination by considering the different groups and samples.

[15] For a detailed list of all countries included in each area see table 7.

Fig. 2 Productivity differences by export destination

Fig. 2A Level 2 Group: Partners

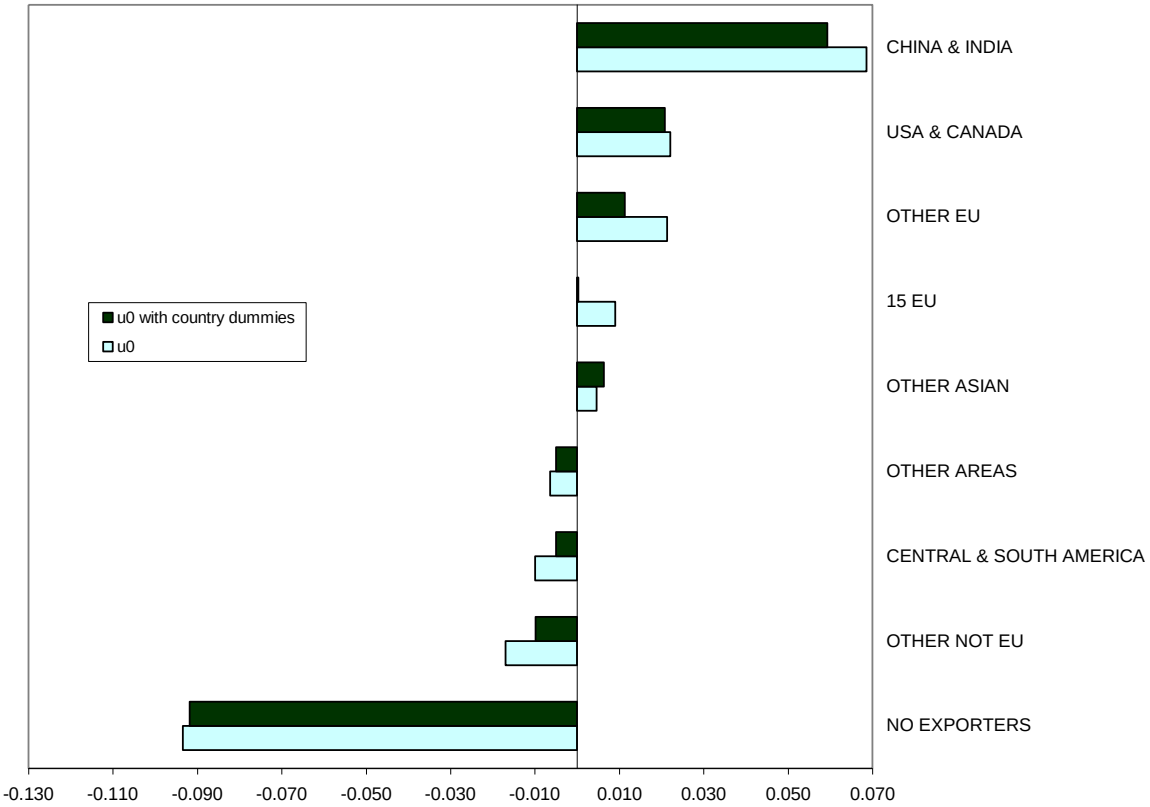


Fig. 2B Level 2 Group: Origin-Destination Combination

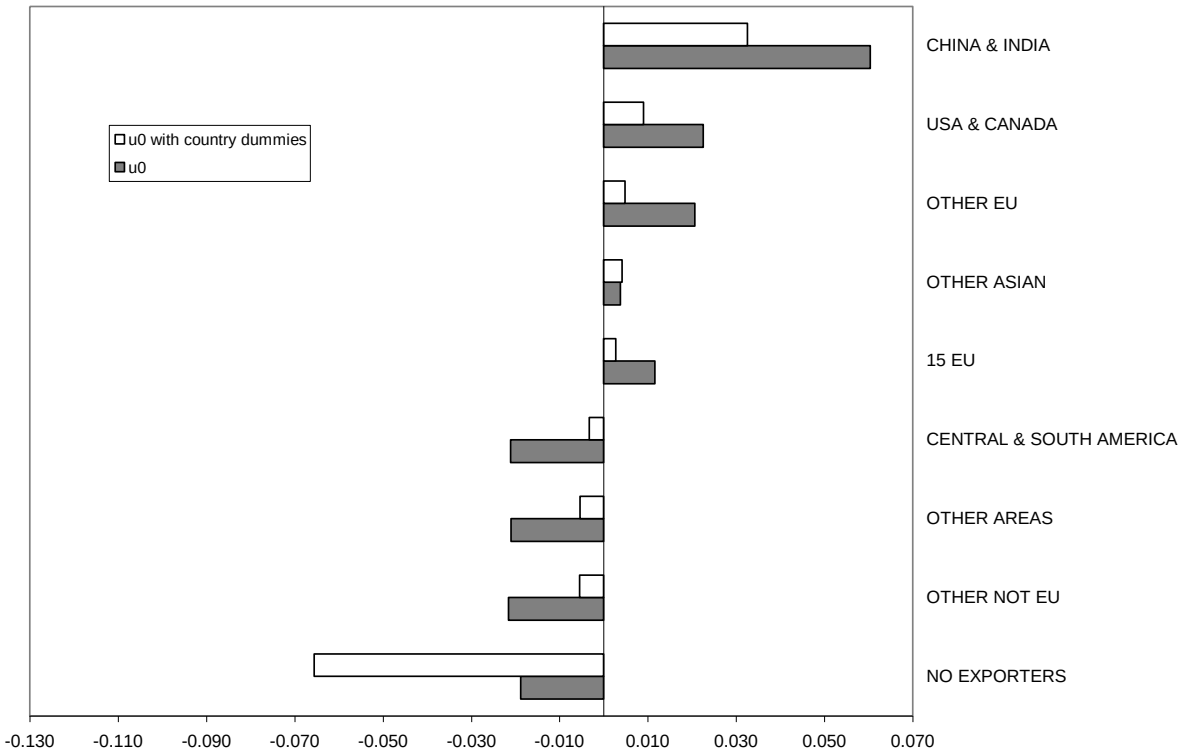
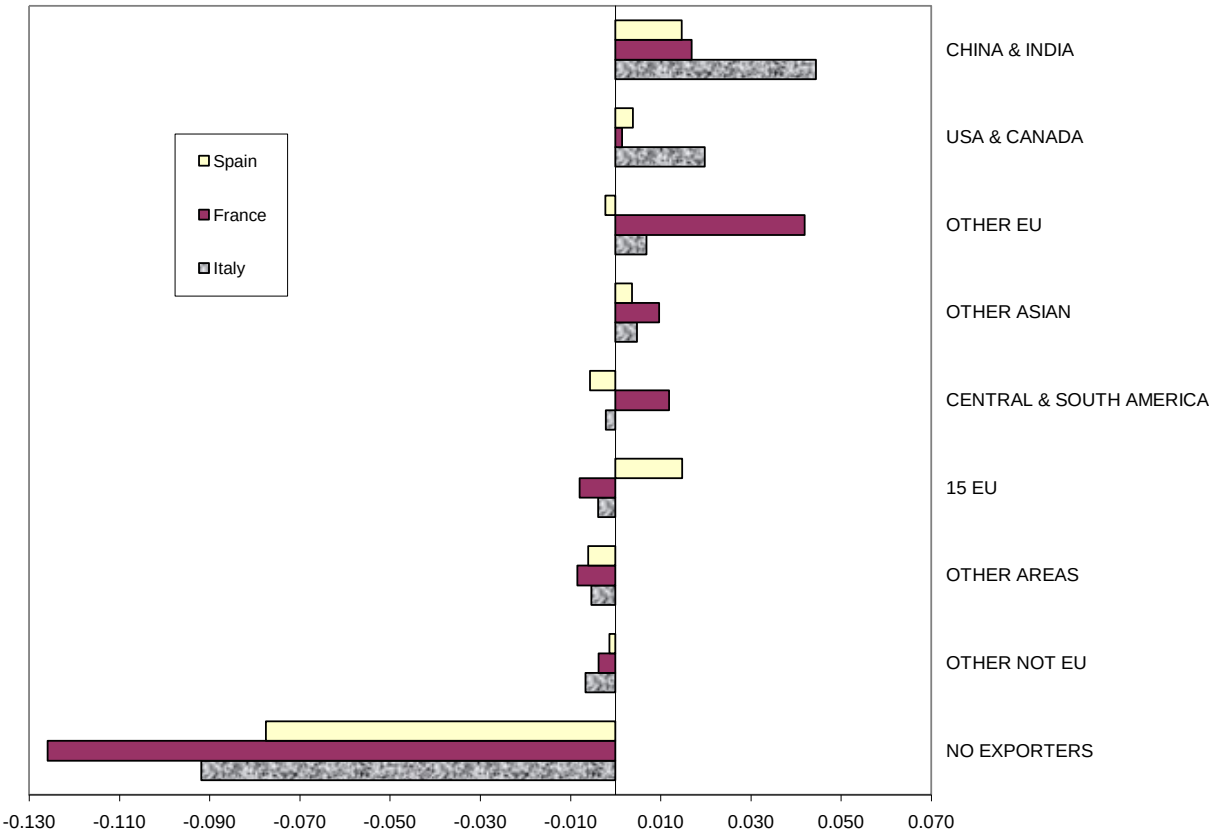


Fig. 2C Level 2 Group: Partners – Single Countries



It is worth noting that the interpretation of residual u_{0j} changes according to the definition of groups or samples considered. When the second level group is partners, residuals show how the TFP difference of European firms exporting to partner *j* differ from the average of the EFIGE sample. When the combination of origin-destination country represents second level group, residuals estimate how much the TFP of firms of origin country *o* (one of the seven EFIGE countries) exporting to destination *d* differs from the mean of all European firms considered. When considering one single country, e.g. France, the u_{0j} residual represents how much the TFP of French exporters to destination *j* differs from the average TFP of all French firms.

The estimates confirm that non-exporters are, on average, the less productive firms. For origin-destination combination, if origin country dummies are not introduced, the TFP difference of non-exporters compared to the whole sample average is lower than the case when these fixed effects are considered. This is because for each origin country a residual is calculated that represents how much the TFP of non-exporters differ from the average of the entire sample; therefore these residuals reflect differences in the level of TFP across the EU7-EFIGE countries. For example, since German firms, on average, have a higher TFP than the sample as a whole (see table 4), the German non-exporters register a positive residual when compared to the TFP of the entire sample. The value for non-exporters in fig. 2B is calculated as an average of the residuals for non-exporters of the seven countries, because for Germany, Hungary and Austria, this difference is positive, the productivity difference of non-exporters is lower in this case. The introduction of fixed effects for origin countries allow consideration of the differences between countries in the level of TFP and the productivity difference of non- exporters compared to the entire sample average is higher. In the case of fig. 2A, the productivity difference of non-exporters is calculated considering all non-exporters as a group.

Considering the single countries (fig. 2C), the productivity difference for non-exporters is higher in the case of France and lower in the case of Spain, while Italy is in-between.

On the upper side of the area's ranking, China and India appear in all cases at the top. The only exception is France for which the highest positive TFP difference is for firms trading with other EU countries.[16] For Spain, the productivity difference of firms trading with China and India does not differ from the value of firms exporting to EU-15 countries. The high value of Spain represents an exception since in all other cases, on average, there is no relevant TFP difference of firms exporting to EU-15 area with respect to the overall mean of TFP. This last result can be interpreted as evidence that for European firms sunk costs of exports are lower inside EU. European firms that export inside the euro-zone, for example, do not have to deal with all extra costs due to changes in the exchange rate. Moreover, transportation costs and other export related costs can be expected to be lower on average than the costs for serving markets outside the EU zone. Enterprises that export to countries with similar economic, political, and cultural conditions may not have to be as competitive as those that export to less familiar markets, where social, economic, and legal differences could represent institutional barriers to exporting that must be overcome.[17]

A possible explanation for the discrepancy of Spain from this main result could be related to the exports strategies of Spanish firms that are more intensively dedicated towards EU-15 area. Table 4 shows that more than 80% of the Spanish exporters in the sample claimed to have one of the EU-15 countries as primary destination for their exports.

A positive difference in TFP also exists for firms that export to the USA and Canada. The difference is positive but slight for the Other EU countries and the Other Asian countries. In the case of the aggregate Other EU countries, the TFP difference is particularly high for French firms exporting to this area, as aforementioned. The productivity difference is negative for Other areas, Other non EU countries and Central and South America (in this last area, the only exception is France). A possible explanation is that the countries of these areas are not highly demanding in terms of quality of goods and productivity.

The results are consistent with previous works (Bellone at al. 2009, 2014; Crozet at al. 2011; Wagner 2007b; Verardi and Wagner 2012; Serti and Tomasi 2009) and confirm that, as evidenced by Serti and Tomasi (2012) and Ruane and Sutherland (2005), firms trading with partners characterized by similar, political and cultural conditions may not have to be as efficient as firms trading with countries that are more "distant" in geographical terms and, even more so, in terms of cultural and institutional characteristics.

5.2 Explaining productivity differences by export destination: the role of firms' specific characteristics

The previous section evidences productivity differences depending on the destination of exports. In this section, the analysis is deepened by considering the role of specific factors of firms in explaining the level of TFP and by exploring whether these characteristics help to understand the TFP differences by trading partners**.** The multilevel approach facilitates this aim since allows the investigation of whether variables at the firm level influence the variance at the second level, i.e., as regards this paper, the productivity variability by trade partners.

[16] The contradictory evidence for France is due to two circumstances: the French firms exporting to Hungary show the uppermost value of u_{0j} and the high value of TFP difference for China is partly offset by the negative value of India. It is worth noting that the upper position for the China and India area is always driven by the value of China which TFP difference appears to be the highest or among the highest values. On the contrary, the value of India is always negative, except in the case of Italy.

[17] A similar result has been found by Ruane and Sutherland (2005) in the case of Irish exporters to the United Kingdom. On the basis of the historical economic, institutional, and social ties between the two countries, they consider UK as a 'local' market for Irish firms and they find that non-UK exporters appear to be more productive than UK exporters.

In order to reach this objective, model [3] has been extended to identify which firm characteristics might explain parts of the components of variance, that is:

$$y_{ij} = \gamma_{00} + \beta_{0i} X + \lambda S + \mu D + \varphi C + u_{0j} + e_{ij} \qquad [5]$$

Eq. [5] is a random intercept model. The variable y_{ij}, i.e. *TFP*, depends on a set, *X*, of variables measured at firm level, some sectoral dummies (S), a set, *D*, of dummy variables related to firm size and the country fixed effects (*C*). After introducing these variables into the model, the residual components of variance can be estimated. A useful aspect of the multilevel approach is the possibility of using the variance at the different levels of analysis to calculate the coefficient of determination and to estimate how much of the variation in outcomes might be attributable to unobserved factors operating at each level of the model. This is done by comparing the "empty model" with an extended specification of the model (Rabe-Hesketh and Skrondal 2008).[18]

Hence, eq. [5] includes a set of proxies of firm-specific factors which in accordance with the relevant literature may be correlated to TFP.[19] First, in the model sectoral dummies S as proxies of sectoral characteristics and two dummy variables, one referring to medium-sized firms (50-249 employees) and the other to large firms (over 250 employees) to control for size (the reference group comprises small firms) have been introduced.[20]

As regards firm-specific characteristics, the propensity to innovate and the capability of firm's employees to develop new process and absorb knowledge acquired by other firms (Cohen and Levinthal 1990) has to be considered. For the first, a dummy (*Innovator)* that is unity if the firm has introduced at least one innovation (product, process or organizational innovation) and zero otherwise is used. As a proxy of *Human Capital* a variable that takes the value of one if, at firm level, the share of graduate workers is higher than the national average is considered. Both variables are expected to have a positive impact on a firm's TFP.

Ownership is another firm specific feature to control for. In particular, being part of a corporate group can enhance productivity since it stimulates access to more resources and knowledge that ultimately affect the individual firm's ability to innovate, thereby impacting on TFP (Beugelsdijk 2007). Moreover, it is reasonable to suppose that firms belonging to a foreign group are more productive than other firms since they gain from factor price differentials, global economies of scale, outsourcing and the knowledge transfers from parent companies and their subsidiaries. In the model two dummy variables are included to consider if the firm belongs to a national (*National Group)* or a foreign group (*Foreign Group).* Age is introduced as a measure of firm experience. Experience implied by ageing may favour the capability of the firm to recognise and exploit new technological opportunities (Cohen and Levinthal 1990). Age (*Older firms*) is a dummy variable that is one if the firm is more than 20 years old and zero otherwise.

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[18] The coefficient of determination for the two-level model is given by:

$$R^2 = \frac{(\sigma^2_{u0N} + \sigma^2_{eN}) - (\sigma^2_{u0M} + \sigma^2_{eM})}{\sigma^2_{u0N} + \sigma^2_{eN}}$$

where N stands for the null model and M for the model of interest.

The proportional reduction in each of the variance components can be calculated separately. The proportion of the level-2 variance explained by the covariates is:

$$R^2_2 = \frac{(\sigma^2_{u0N} - \sigma^2_{u0M})}{\sigma^2_{\mu 0N}}$$

and the proportion of the level-1 variance explained is:

$$R^2_1 = \frac{(\sigma^2_{eN} - \sigma^2_{eM})}{\sigma^2_{eN}}$$

[19] See table 8 for the definition and some statistics of the variables used in the econometric analysis.

[20] Sectors are classified in 11 groups according to the NACE-CLIO categories.

A set of firm-specific variables relative to international activities other than exporting have been considered such as importer of materials, importer of services, production in another country through direct investment (*FDI*), international outsourcing strategy (*Active outsourcer*) in order to consider whether, as shown by previous literature, firms active internationally tend to exhibit a high TFP premium.[21]

Since the main focus is to investigate firm features helping to explain productivity differences between trade partner the sample in this section is restricted to exporters. However, the main results do not change when the analysis covers the whole population.[22] In any case, the few differences between the two samples will be reported.

Due to the cross-sectional nature of the data, it is not possible to establish causality between firm TFP and the firm-specific characteristics; thus, one should not interpret eq. [5] as showing the direction of causality. Consequently, the models in table 6 should be viewed as a convenient way of summarizing statistical regularities among variables.

Table 6 shows the results. The estimate of the empty model considering only the exporters is reported in column (1). The country fixed effects are introduced in column (2). For exporters, the introduction of dummy variables for origin countries explain 29% of the variation of TFP between partners (the percentage is 27% for the whole sample, see table 5).

In general, the firm-specific variables considered show the expected sign. TFP is positively correlated with firm-size and, among firm-level characteristics, size is by far the most dominant explanatory variable. Medium-sized firms perform better than small firms, but less well than large enterprises. As in previous studies, firms employing highly-skilled workers more intensively than others, on average, perform better. On the contrary, there is no evidence that firms introducing an innovation perform better than firms that do not innovate.[23] This result contrasts with the evidence provided by Griffith at al. (2006) and the studies surveyed by Hall (2011) showing that, even with difference between the type of innovation and the different countries, innovation affects productivity.[24] Similarly to previous research, all else being equal, firms belonging to a group are more productive than their counterparts and the difference is greater in the case of partnership with a foreign group.[25] In table 6, the age variable is never significant: experience does not seem to influence the productivity of exporters.[26] For variables relative to international activities the coefficient is significant only for the importer of services and the same holds when the whole sample is considered. Only this variable is left in the model in column (7).[27]

As expected, the addition of firm-level variables leads to a reduction in the level one variance. The introduction of sector dummies (model 3) and size dummies (model 4) explains 5% (R^2 at level one increases from 0.06 of model 2 to 0.11 of model 3) and 13% of the variability at firm-level,

[21] Kasahara and Lapham (2008) extend Melitz' (2003) model to incorporate imported intermediate goods and show that self-selection is strong also for importing activities. Amiti and Wei (2009) evidence that firms importing services exhibit a higher productivity, possibly due to the reallocation of its relatively inefficient part of production process to another country increasing the average productivity of the remaining workers but also for the access to more sophisticated services. The Global Sourcing model of Antras and Helpman (2004) shows that as productivity increases, firms start first to outsource and then to serve the foreign market via FDI.

[22] See table 9.

[23] The innovator dummy is significant at 10% only in model 5, but the significance disappears when the variables relative to international activities are introduced in the model.

[24] Griffith at al. (2006) find that the results for labour productivity are quite mixed across four European countries. Process innovation is only associated with higher productivity in France, in the other countries there is no such connection. Product innovation is associated with higher productivity in France, Spain and UK, but not in Germany. Hall (2011) evidences a significant impact of product innovation on productivity and a somewhat more ambiguous impact of process innovation, being negative in Italy, not significant in Spain and positive in France.

[25] See, for example, Griffith (1999) for evidence on the UK, Benfratello and Sembenelli (2006) for Italy and Weche Gelübcke (2013) for Germany.

[26] Innovator and age dummies are significant when all the sample is considered (see table 9).

[27] For model (7), the variance inflation factor (VIF) has been calculated and values are lower than 1.5. Thus there does not seem to be a multicollinearity issue in the specified models. Results available upon request.

respectively. Country effects, sector membership and size together explain 24% of the variability at level one. All the other firm variables help only marginally to explain the variability at firm level (from 24% to 26%).

In order to assess if firm characteristics influence productivity differences by trade partner the attention is on R^2 at level two. Sector membership helps to explain 7% of the variability at level two (R^2 at level two increases from 0.29 in model 2 to 0.36 in model 3). The addition of size affects the level two variance significantly (model 4). The introduction of size reduces the variance by 42% (model 4), thereby implying that the size distribution varies a great deal from one destination market to another. In particular, considering the positive individual relationship between TFP and size, the predominance of larger firms exporting to destination market characterized by above-average TFP will inflate $\bar{y}_j$ and the positive u_{0j} will move further away from zero. For partners characterized by below-average TFP and high presence of small firms, the positive individual correlation between TFP and size will push down $\bar{y}_j$ and u_{0j} will become more negative (Steele, 2008). Thus, TFP differences by market destination will appear more marked if the individual-level relationship between TFP and size is not taken into account. This result is consistent with Mayer and Ottaviano (2008), Máñez-Castillejo et al. (2010), Crozet et al. (2011) and Ferrante and Freo (2012). Mayer and Ottaviano (2008) focusing on European firms find that difficult export markets are generally served by large exporters, with a large number of small firms exporting to easier markets. Máñez-Castillejo at al. (2010), using data from Spain and a stochastic dominance technique, shed light on the relevance of differences in firm size: whilst the existence of a binding process of self-selection into exporting is confirmed among small firms, the same is not found for large firms. Crozet at al. (2011) examine the performances of French exporting firms and find evidence that the export premium is particularly marked for small businesses, while for large businesses, the discrepancy between exporters and domestic firms is fairly small. Ferrante and Freo (2012) for Italy find that, after adjusting for size, the net productivity premium is estimated to be positive for the less productive firms (about one-half) and negligible for the other half.[28]

Country effects, sector membership and size account for 78% of productivity differences (model 4). The other firm-specific features only marginally influence the coefficient of determination at level two (0.81 from 0.78), while the introduction of variables relative to international activities do not affect the coefficient and, thus, they do not help to explain TFP differences by destination market.[29]

Figure 3 reports productivity differences by geographical areas of export destination considering exporters only. The figure illustrates the residuals u_{0j} obtained from the model with only country fixed effects (table 6, model 2) and the preferred model (model 7) with firm-level characteristics aggregated by geographical areas. Productivity differences decrease when firm-level variables are introduced but the ranking of areas remains substantially the same than in figure 2A.

[28] Ferrante and Freo (2012) use a decomposition approach that enables evaluation of the productivity gap and the understanding of the proportion of the productivity gap that is attributable to different characteristics of the firms themselves and the proportion attributable to their internationalization status.

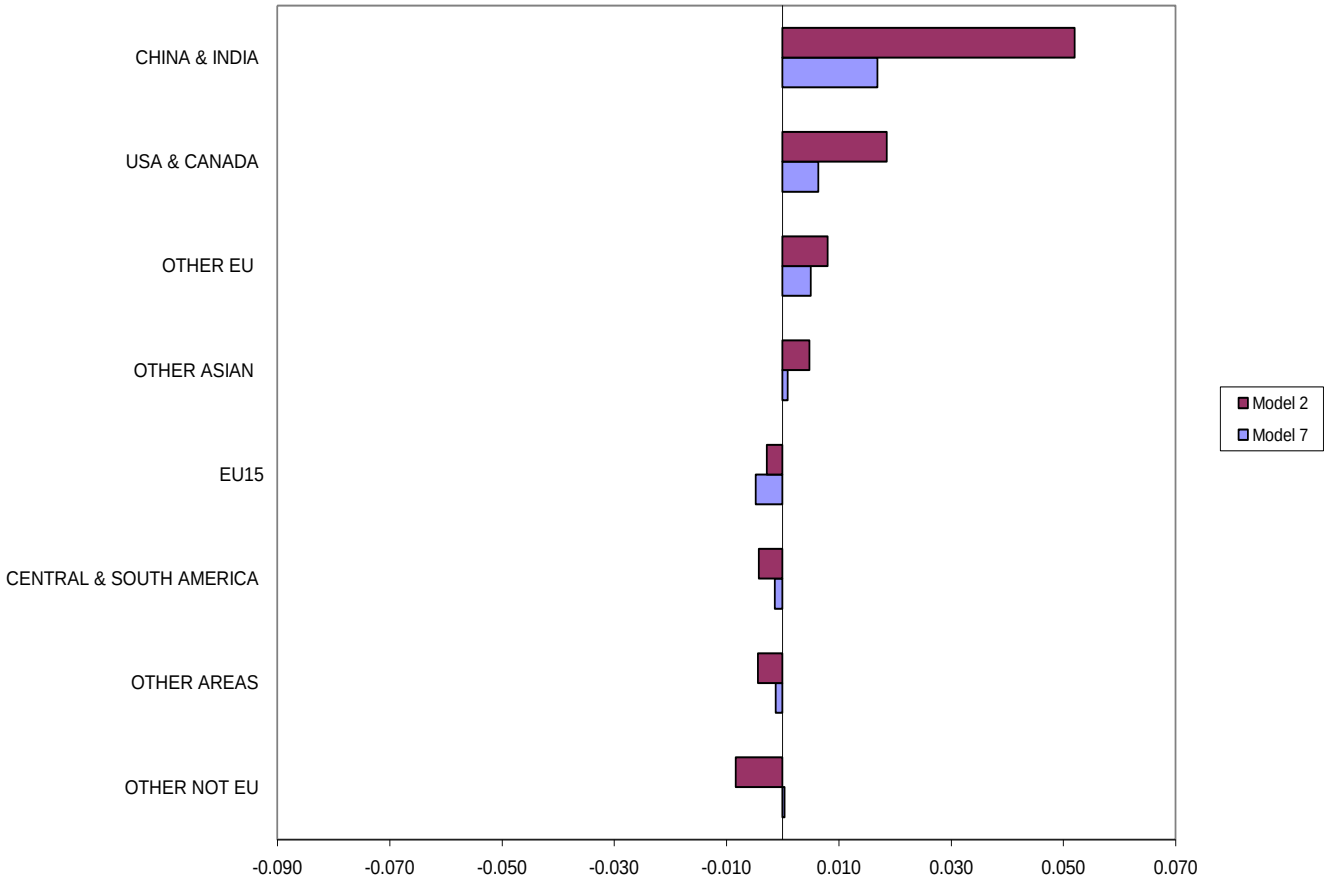
[29] For the whole sample, the percentage of explained variance is a little higher for the second level group while the opposite is the case for firm level variability, e.g. model 7 explains 86% and 24% of the variability, respectively, at level two and level one (see table 9).

Table 6 Productivity differences by export destination: the role of firms' specific factors. Only Exporters

Explanatory Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	-0.0781***	0.172***	0.175***	-0.0731**	-0.116***	-0.125***	-0.122***
	(-5.50)	(6.31)	(5.83)	(-2.51)	(-3.75)	(-3.99)	(-3.93)
Fixed effects							
Level 1: Firms							
Medium firms				0.239***	0.204***	0.197***	0.198***
				(15.88)	(13.14)	(12.52)	(12.68)
Large firms				0.537***	0.461***	0.446***	0.447***
				(25.00)	(20.00)	(18.76)	(19.19)
Older firms (>20 years)					0.0172	0.0160	0.0164
					(1.33)	(1.24)	(1.28)
Innovator					0.0250*	0.0215	0.0220
					(1.80)	(1.54)	(1.58)
Human capital					0.0443***	0.0415***	0.0419***
					(3.36)	(3.15)	(3.18)
National group					0.103***	0.0972***	0.0975***
					(5.96)	(5.58)	(5.62)
Foreign group					0.208***	0.197***	0.198***
					(10.33)	(9.71)	(9.77)
Importer of material						0.0119	
						(0.87)	
Importer of services						0.0481***	0.0496***
						(3.52)	(3.72)
Active outsourcer						-0.0312	
						(-1.15)	
FDI						0.00223	
						(0.09)	
Sector dummies	No	No	Yes	Yes	Yes	Yes	Yes
Country dummies	No	Yes	Yes	Yes	Yes	Yes	Yes
Random-Effects							
Variance							
Destination	0.005	0.004	0.003	0.001	0.001	0.001	0.001
Firms	0.202	0.190	0.179	0.154	0.149	0.149	0.149
Total	0.207	0.194	0.182	0.155	0.150	0.150	0.150
Intraclass correlation (ICC)	0.02						
R^2 *level 2*		0.29	0.36	0.78	0.81	0.81	0.81
R^2 *level 1*		0.06	0.11	0.24	0.26	0.26	0.26
R^2		0.07	0.12	0.25	0.28	0.28	0.28
LR test	28.4	36.0	28.8	5.5	4.78	4.76	4.78
Log restricted-likelihood	-2606.5	-2485.6	-2376.9	-2060.2	-2011.4	-2015.8	-2007.9
Number of groups	114	114	114	114	114	114	114
Number of observations	4167	4167	4167	4167	4167	4167	4167

In parentheses, t-values. Level of significance: *** 1%, ** 5% and * 10%.

Fig. 3 Productivity differences by export destination: Exporters



6. Concluding remarks

The main objective of this paper is to investigate differences in firm productivity by export destination.

The first contribution is to compute productivity differences by single destination market of the firm's exports. These differences are estimated by means of a multilevel approach that considers the first destination country of the firm's exports as the second level of the model. The group-level residual in this case represents the difference between the TFP mean of firms that export to partner j and the overall mean of TFP and, thus, can be considered as a measure of productivity difference by export destination. The results show that productivity differs from market to market and seems to signal that each foreign market is associated with a productivity threshold. Self-selection mechanisms seem to differ from market to market and, this gives support to the expectations derived from Chaney's model (2008).

The second contribution is to assess the difference in productivity for non-exporters, and for exporters as regards different geographical areas. The estimates provide further evidence that non-exporters are, on average, the less productive firms. Considering the different geographical areas, the European firms that export to China and India register the highest positive difference. A positive difference is also found for firms that export to the USA and Canada. On the contrary, there is no relevant TFP difference for firms trading inside the EU-15 area. The difference is still positive but slight for the Other Asian countries and Other EU countries, while it is negative for Other areas, Other non EU and Central and South America.

Third, the paper analyses specific factors of firms that help to explain the difference in productivity between trade partners. Among firm-specific characteristics only size and sector membership help to explain the productivity differences by destination market and the role of size is

by far the most dominant factor. This last result is consistent with the evidence that productivity cut-offs are firm size dependent (Máñez-Castillejo 2010; Crozet at al. 2011, Ferrante and Freo 2012). Productivity differences by geographical area decrease when firm-level characteristics are considered, but there is no relevant change in the ranking of areas.

To sum up, more distant markets not just in physical terms but also in terms of technological, cultural and institutional characteristics, entail diversities in terms of costs for exporters and hence higher risks as there is more uncertainty about "far away" markets, such as China: only firms with higher productivity can afford to serve these markets. On the contrary, firms trading with partners with similar, political and cultural conditions do not need to be as efficient as firms trading with "more distant" countries.

As regard policy implications, the findings suggest that a general promotion programme may be inefficient. Export-enhancing public policies should target firms attempting to export to "more difficult" destinations with particular attention to small businesses.

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Table 7 List of countries included in each area

UE15 COUNTRIES	CHINA & INDIA	CENTRAL & SOUTH AMERICA	OTHER AREAS
Austria	China	Antigua	Ethiopia
Belgium	India	Argentina	Fiji
Denmark		Bahamas	Gabon
Finland	OTHER ASIAN COUNTRIES	Barbados	Gambia
France	Afghanistan	Belize	Ghana
Germany	Bahrain	Bolivia	Guinea
United Kingdom	Bangladesh	Brazil	Guinea Bissau
Greece	Bhutan	Chile	Equatoral Guinea
Ireland	Brunei	Colombia	Kenya
Italy	Myanmar	Costa Rica	Kiribati
Luxembourg	United Arab Emirates	Cuba	Lesotho
Netherlands	Philippines	Dominica	Liberia
Portugal	Japan	Ecuador	Libya*
Spain	Jordan	El Salvador	Madagascar
Sweden	Indonesia	Grenada	Malawi
OTHER EU COUNTRIES	Iran	Guatemala	Mali
Bulgaria	Iraq	Guayana	Marshall
Cyprus	Israel	Haiti	Mauritania
Estonia	Cambodia	Honduras	Mauritius
Latvia	Kazakhstan	Jamaica	Micronesia
Lithuania	Korea DPR	Mexico	Morocco
Malta	Korea Rep. (South)	Nicaragua	Mozambique
Poland	Kuwait	Panama	Namibia
Czech Republic	Kyrgyzstan	Paraguay	Niger
Romania	Laos	Peru	Nigeria
Slovakia	Lebanon*	Dominican Rep.	New Zealand
Slovenia	Maldives	St.Kitts-Nevis	Papua New Guinea
Hungary	Malaysia	St. Lucia	Central African Republic
OTHER NOT EU	Mongolia	St. Vincent	Rwanda
Albania	Nepal	Suriname	Samoa (West)
Andorra	Oman	Trinidad Tobago	Sao Tome+Principe
Armenia	Pakistan	Uruguay	Senegal
Azerbaijan	Palau	Venezuela	Seychelles
Belarus	Qatar		Sierra Leone
Bosnia Herzegovina	Yemen Rep,	OTHER AREAS	Solomon
Croatia	Saudi Arabia	Algeria	Somalia
Georgia	Singapore	Angola	South Africa
Iceland	Sri Lanka	Australia	Sudan
Liechtenstein	Syria	Benin	Swaziland
Macedonia	Thailand	Botswana	Tanzania
Moldova	Taiwan	Burkina Faso	Togo
Monaco	Tajikistan	Burundi	Tonga
Montenegro	Timor - Leste	Cameroon	Tunisia
Norway	Turkmenistan	Cape Verde	Tuvalu
Russia	Uzbekistan	Chad	Uganda
San Marino	Vietnam	Comoros	Vanuatu
Serbia		Congo	Democratic Rep. Congo
Switzerland	USA & CANADA	Cote d'Ivoire	Zambia
Turkey	Canada	Djibouti	
Ukraine	USA	Egypt	
Vatican		Eritrea	

Table 8 Description of variables and summary statistics

	Description	Obs	Mean	SD	Min	Max
TFP	Total factor productivity 2008	6372	-0.094	0.438	-1.34	1.41
Medium firms	Dummy for medium firms (50-249 employees)	6372	0.233	0.423	0	1
Large firms	Dummy for large firms (over 250 employees)	6372	0.081	0.273	0	1
Older	Dummy for older firms (>20 years)	6372	0.589	0.492	0	1
Innovator	Dummy for firms that carried out at least one innovation (product, process, organizational) in years 2007-2009	6372	0.665	0.472	0	1
Human capital	Dummy for Human capital: firm has a higher share of graduate employees with respect to the national average share of graduates	6372	0.303	0.460	0	1
National group	Dummy for national group: firm belongs to a national group	6372	0.158	0.365	0	1
Foreign Group	Dummy for foreign group: firm belongs to a foreign group	6372	0.102	0.302	0	1
Exporter	Dummy for exporter - wide definition: firm is direct exporter in 2008 or has been actively exporting in years before 2008.	6372	0.654	0.476	0	1
Importer of materials	Dummy for importer of intermediate goods in 2008 or before.	6372	0.524	0.499	0	1
Importer of services	Dummy for importer of services in 2008 or before.	6372	0.245	0.430	0	1
Active outsourcer	Dummy for the firm that has production activity contracts and agreements abroad.	6372	0.040	0.195	0	1
FDI	Dummy for firm running at least part of its production activity in another country via direct investment	6372	0.049	0.217	0	1

Table 9 Productivity differences by export destination: the role of firms' specific factors
The whole sample

Explanatory Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	-0.0842***	0.160***	0.169***	-0.0733***	-0.120***	-0.129***	-0.126***
	(-5.88)	(6.70)	(6.64)	(-2.97)	(-4.70)	(-5.03)	(-4.93)
Fixed effects							
Level 1: Firms							
Medium firms				0.230***	0.197***	0.190***	0.192***
				(18.05)	(15.10)	(14.43)	(14.65)
Large firms				0.518***	0.441***	0.426***	0.429***
				(27.12)	(21.85)	(20.53)	(21.04)
Older firms (>20 years)					0.0245**	0.0235**	0.0239**
					(2.45)	(2.35)	(2.39)
Innovator					0.0238**	0.0207**	0.0217**
					(2.28)	(1.98)	(2.08)
Human capital					0.0497***	0.0472***	0.0479***
					(4.67)	(4.43)	(4.50)
National group					0.0998***	0.0951***	0.0958***
					(7.15)	(6.79)	(6.85)
Foreign group					0.214***	0.203***	0.204***
					(11.97)	(11.25)	(11.33)
Importer of material						0.0161	
						(1.49)	
Importer of services						0.0449***	0.0479***
						(3.65)	(4.00)
Active outsourcer						-0.0246	
						(-0.99)	
FDI						0.00543	
						(0.23)	
Sector dummies	No	No	Yes	Yes	Yes	Yes	Yes
Country dummies	No	Yes	Yes	Yes	Yes	Yes	Yes
Random-Effects							
Variance							
Destination	0.006	0.004	0.004	0.001	0.001	0.001	0.001
Firms	0.186	0.175	0.165	0.146	0.142	0.142	0.142
Total	0.192	0.179	0.169	0.147	0.143	0.143	0.143
Intraclass correlation (ICC)	0.03						
R^2 *level 2*		0.27	0.37	0.77	0.85	0.86	0.86
R^2 *level 1*		0.06	0.11	0.22	0.24	0.24	0.24
R^2		0.07	0.12	0.23	0.26	0.26	0.26
LR test	156.6	168.6	120.9	24.8	9.43	5.37	6.28
Log restricted-likelihood	-3702.9	-3521.9	-3369.8	-2976.7	-2897.4	-2900.6	-2892.9
Number of groups	115	115	115	115	115	115	115
Number of observations	6372	6372	6372	6372	6372	6372	6372

In parentheses, t-values. Level of significance: *** 1% and ** 5% .