GEE Papers

What Determines Firm-level Export Capacity? Evidence from Portuguese firms

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Abstract

Internationalization of firms is an indicator of their competitiveness. Using a dataset that covers all Portuguese non-financial corporations, we assess, at micro level, what are the key factors that explain the export capacity of individual firms (and thereby of increased competitiveness). From a public policy perspective, we show that policies to promote innovation and investment have a positive impact on the firm-level probability of exporting. Also, younger firms are more prone to export and there are learning effects from the export activity. The reduction of barriers to competition in internal markets is also important to promote firms' inter-nationalization.

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[1] Strategy and Research Office, Ministry for the Economy. The views are those of the authors and do not necessarily coincide with those of the institution.

Acknowledgements

1. Introduction:

For the first time in around twenty years, Portugal managed to generate a current account surplus in 2013 and 2014 (of 1.4% and 0.6% of GDP, respectively). In fact, between 2008 and 2014, the Portuguese Current Account improved 13 percentage points (p.p.), one of the largest improvements in the European Union (*Chart 1*). This resulted from a deceleration of imports (-1.4 p.p. of GDP)[2] and a boost in exports, which increased their weight on GDP by more than 9 p.p..
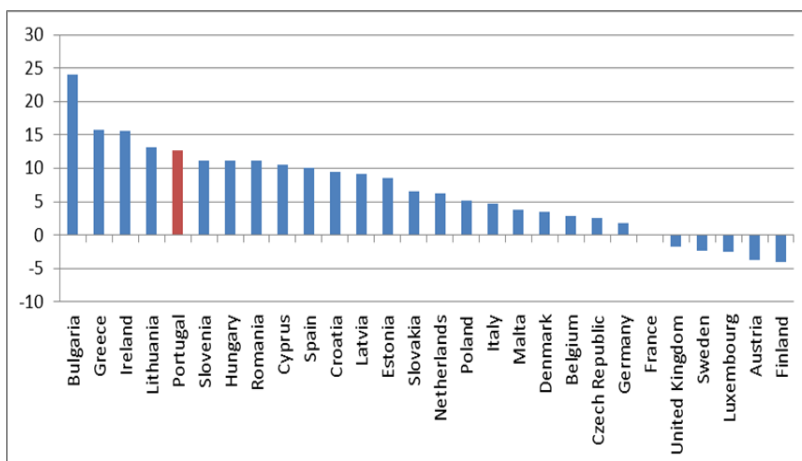

Chart 1. Change in Current Account Balance as a % of GDP – percentage points - 2008-2014, EU countries // Source: Eurostat

Chart 2. Exports and Imports as a % of GDP, 2008-2014, Portugal // Source: INE and Banco de Portugal

A dynamic export sector is seen as a measure of a country's competitiveness (Altomonte et al, 2012). Together, companies represent the capacity of a country to operate in international markets and this relies on firm-level competitiveness. Furthermore, being also dependent on demand from foreign coun-tries, exporting firms are less tied to the domestic cycle, and less subject to financial constraints induced by recessions in their home country, diversifying risk (Campa and Shaver, 2002). For small economies, like

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[2] For an assessment of this adjustment, disentangling cyclical and structural effects please refer to Cruz e Gouveia (2015)

Portugal, export markets are even more relevant as otherwise firms would not be able to achieve sufficient scale. Krugman (1997) argues that the internationalization capacity of firms can be regarded as a consequence of their productivity (and thus competitiveness).

For this reason, internationalization of Portuguese firms has received a lot of attention from policymakers. Nowadays there are several channels for export promotion of Portuguese firms, namely through programs such as Portugal 2020, Credit Lines, Export credit insurance schemes, Mutual Guarantees, Venture capital, among others[3]. Effective public support should be directed to specific characteristics of the firm that need improvement. The identification of those characteristics is the focus of this paper.

Using a very rich administrative database (Informação Empresarial Simplificada) from Banco de Portugal, covering all Portuguese companies from 2010-2013, we find some important results for policy makers. We show that policies to promote innovation, investment and the creation of firms have a positive impact on the firm-level probability of exporting. In addition, there are learning effects, and thus support to internationalization of firms may have lasting effects instead of rendering only one-off bene-fits. The reduction of barriers to competition in internal markets is also important to promote firms' inter-nationalization.

The choice of performing this analysis at the firm level in detriment of averages or other macroeconomic aggregates is in line with the most recent literature that favors the use of micro data for deriving more robust estimates (Bartelsman and Wolf, 2013). Indeed, a recent study conducted by the European Central Bank (2014) alerts for the problems of basing policy-making on the "average firm" pointing, for in-stance to the high level of heterogeneity of performance within firms of the same sector, which is even more evident within different sectors of the economy (IMF, 2015).

The remainder of the paper is organized as follows. Section 2 provides an overview of previous studies aimed at assessing the link between exporting activity and firm-level characteristics. Section 3 illustrates firm heterogeneity in Portugal and provides preliminary evidence on the differences between exporters and non-exporters. In Section 4 we present the model used to assess the determinants of exporting capacity along with the main results from its estimation. Finally, Section 5 concludes by presenting the policy implications and opportunities for further research.

2. Literature review:

The European Commission (2014), in a cross-country European study that aims at defining new policies at the EU level for SMEs growth, distinguishes between two determinants of internationalization, namely internal factors inherent to the characteristics of the firm itself (e.g. size, labor productivity, innovation, human capital) and external factors (e.g. tariffs, culture, transportation costs, export-promotion programs). In particular, this study highlights the importance of granting more favorable conditions for firms to access financing especially for SMEs since these are the companies struggling the most in getting access to credit and simultaneously the most sensitive to interest expenses. Additionally, the authors show that factors such as innovation, R&D, size and human capital are indeed relevant to ex-plain the competitiveness of firm. Some external factors like the efficiency of public administration, language, the size of the market and the geographic distance were also considered as important determinants of internationalization.

Burgel and Murray (2000) study high tech, young firms (New Technology Based Firms) from Germany and the UK and concluded that "age, size at start-up, regular R&D activity, and founders with international

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[3] See AICEP- Financial channels of support to Internationalization

experience prior to start-up are all associated with a greater likelihood of internationalization". Lamotte and Colovic (2013) look into the relationship between innovation and internationalization in young entrepreneurial firms using data from the Global Entrepreneurship Monitor and the World Bank for 64 countries for 2001-2008. They show that young firms involved in innovation activities are more likely to be internationalized.

Mariasole et al (2013) analyze a specific program implemented by the Italian Government to promote Italian firms' direct investments abroad and found a positive impact on companies´ performance. They support the idea of incremental internationalization whereby experience in external markets increases firms' knowledge not only about international markets but also about the process of internationalization on itself and hence improve their subsequent capacity to operate in these new markets. Sinani and Hobdari (2008) use firm-level data for Estonian companies between 1994 and 1999 and also conclude that if a firm has been exporting the last period or the period before that significantly increases the probability of exporting in the current period as well. Besides, larger firms that verify high capital intensity and foreign ownership have a higher likelihood of exporting. Bernard and Jensen (2004) make use of a dynamic model of the export decision by a profit-maximizing firm with a panel of US manufacturing plants. By testing for the role of plant characteristics, spillovers from neighboring exporters, entry costs and government export promotion expenditures, they conclude that entry costs are significant, while spillovers from the export activity of other plants are not very important. Also, State export incentives have no significant effect on the probability of exporting.

Caloff (1994) find for 14.072 Canadian manufacturers that firm size is positively related to export behavior. For Portugal, Monteiro (2013) study the link between firm size and export performance using a sample of Portuguese firms with different proxies to measure size. The exact definition of sized is crucial to the results, as the author obtains opposite signals according to the proxy used.

Based on data on manufacturing firms in France, Bellone et al (2010) find that firms enjoying better financial health are more likely to become exporters implying that financial constraints act as a barrier to internationalization. On the contrary, Tang and Zhang (2012), based on firm-level data for Chinese private firms, do not find any effect of financial constraints on the probability of exporting. In the same vein, Greenaway and Kneller (2007), using a panel of UK manufacturing firms over the period 1993-2003, find no evidence that firms enjoying better ex-ante financial health are more likely to start to export. However, looking at the continuity of the presence in external markets, the authors find that continuous exporters display lower liquidity and higher leverage than starters, which might be explained by the sunk costs associated with the moment of entrance. They thus argue that export promotion policies can be beneficial to the economy not only through their well-known direct growth-enhancing role, but also be-cause they are likely to reduce the level of financial constraints faced by firms.

On the effect of market concentration on the likelihood of exporting, Guimarães and Faria (2010) use Polish firm-level data between 1996 and 2004 and show that the larger the concentration of the market, the higher the probability of exporting. Glejser et al (1982) argued that high concentration of the domes-tic market affects negatively the level of exports (and the probability that the firm will export).

Finally, Ortega et al (2013) studies the relationship between exports and productivity in Chilean firms via four main theories, namely 1) Self-selection hypothesis (whereby high productivity generates exports), 2) Learning-by-exporting hypothesis (whereby exports increase productivity), 3) Exporting-by-innovating hypothesis (whereby R&D is a determinant of exports) and 4) Innovating-by-exporting hypothesis (whereby exports promote innovative practices). They find that exports explain productivity rather than productivity influencing exports. Moreover, R&D expenditures increase the probability that a firm will export, but the reverse scenario is not verified.

3. Database description
3.1. The dataset

The dataset is constructed from *Informação Empresarial Simplificada* (IES, from Banco de Portugal), which provides financial accounting data on all Portuguese companies. We use data for the period 2010-2013. We look into the universe of the non-financial corporations whose principal activity is the production of market goods or non-financial services and we exclude the firms that belong to the non-tradable sector[4]. To determine if the company qualifies as exporter we use the definition of Banco de Portugal[5], namely:

- At least 50% of annual turnover is from exports of goods and services; or

- At least 10% of annual turnover due to exports and their value is over 150.000€

As a result, our final panel is composed by a total of *981.935* annual observations, on an annual average of *245.483* companies. In what concerns the exporters, we find an annual average of 16.726 firms (*Table 1*.). Between 2010 and 2013, the number of exporters has been increasing as well as export participation (number of exporters/number of firms).

Year	Nr of firms	Nr of exporters	Annual rate of change of exporters (%)	Export participation (%)
2010	258.808	14.970	__	5.8%
2011	244.811	16.690	11.5%	6.8%
2012	235.836	17.051	2.1%	7.2%
2013	242.480	18.154	6.5%	7.5%

Table 1. Export dynamics, 2010-2013

3.2.The variables

We compute measures of *productivity*, *financial situation*, *profitability*, *concentration*, *age, industry* and *size.* For exact definitions and summary statistics please refer to *Annex 1.* and *Annex 2.*, respectively.

Total Factor Productivity (TFP) is estimated as the residual of a production function, *i.e.* the part of firm´s revenues that is not explained by the inputs labor and capital and that is linked to technology catch-up effects and other efficiency gains in the productive process. We use the Levinsohn and Petrin (2003) estimation strategy which is widely used in the literature as it accounts for the correlation between input levels and productivity by using energy or material costs (in our case, *external supplies and services*) as intermediate inputs to proxy for the unobservable characteristics of productivity.[6] Therefore, by avoiding endogeneity, it offers methodological superiority in the consistency of the outputs relative to OLS and fixed-effects estimates.

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[4] These include Financial and Insurance activities, Public Sector, Education, Health and Social Care, Entertainment-related activities, Other Services, Activities for Final Consumption, International Organizations and other Institutions, and all the non-specified cases. Moreover, we also excluded from the analysis all the firms that reported not having External Supplies and Services, Capital, Personnel Costs, non-positive Fixed Tangible Assets or Fixed Intangible Assets, non-positive Current/Non-current Assets, non-positive Current/Non-current Liabilities. Finally, all companies whose district was not specified were dropped as well as the companies based in the free zone of Madeira.
[5] *Statistical Bulletin,* Banco de Portugal, Nr10, June 2015.
[6] See for example Van Beveren (2010) for a review of total factor productivity estimation, and Thomas and Naraynan (2012), Ortega et al (2013) and Greenaway and Kneller (2004) as examples of uses of the Levinsohn and Petrin (2003) method.

3.3. Descriptive analysis

3.3.1. Evidence on firm-level heterogeneity

Portuguese firms are, in fact, a very heterogeneous group, rendering firm level analysis very important. This section illustrates these differences.

As shown in *Table 2.*, Total Factor Productivity dispersion is large across firms. In fact, the 90th percentile company generates around six times as much productivity as the 10th percentile company. In terms of turnover there is also a high dispersion as the 90th percentile company verifies a turnover 80 times larger than the 10th percentile company (*Table 3.*). We present these differences also for the manufacturing sector, to allow for comparisons with other studies. In Portugal, the 90th percentile is around three times more productive than the 10th percentile, while for the US this difference is around 2[7]. In what concerns turnover percentile differences in this sector, we see that in Portugal the ratio is 80, while in the US it is only of 2.[8]

The distribution of total factor productivity density kernels for the whole sample and time period of analysis is depicted in *Chart 3*. Indeed, we notice the accumulation of density around low productive levels for all sizes of firms, but more markedly for microenterprises and SMEs.

Relatively to the relationship between Total Factor Productivity and Age and from the shape of the dispersion presented in *Chart.4* we can conclude that higher TFP levels are found in less mature firms and, as age increases, the TFP decreases markedly.

Percentile ratio *TFP*	p90/p10	p90/p50	p10/p50	p75/p25
All sectors-Average	6.16	3.04	0.49	2.44
Manufacturing	3.46	2.02	0.58	1.82
Energy	14.51	4.21	0.29	3.99

Table 2. Percentile ratios for Total Factor Productivity, average for all and for some sectors

Percentile ratio *Turnover*	p90/p10	p90/p50	p10/p50	p75/p25
All sectors-Average	80.4	10.3	0.13	8.63
Manufacturing	80.86	12.03	0.15	8.43
Energy	437.86	12.87	0.03	22.29

Table 3. Percentile ratios for Turnover, average for all and for some sectors

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[7] Syverson (2011). For developing countries, such as India, China and Chile the discrepancy is even larger- of 22, 12 and 18 times, respectively (World Development Report, 2013).
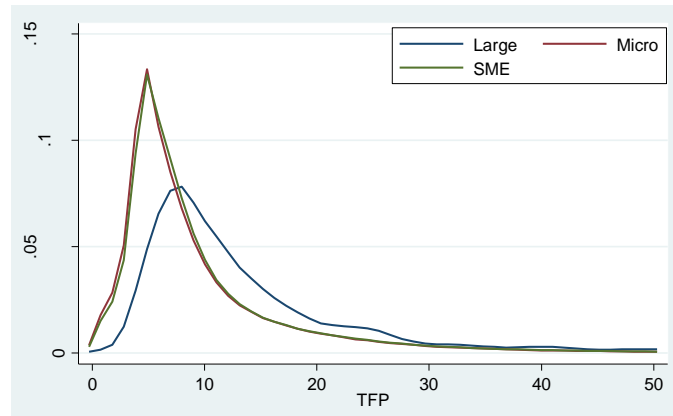[8] http://www.chicagobooth.edu/news/2012-02-09-percentile.aspx.

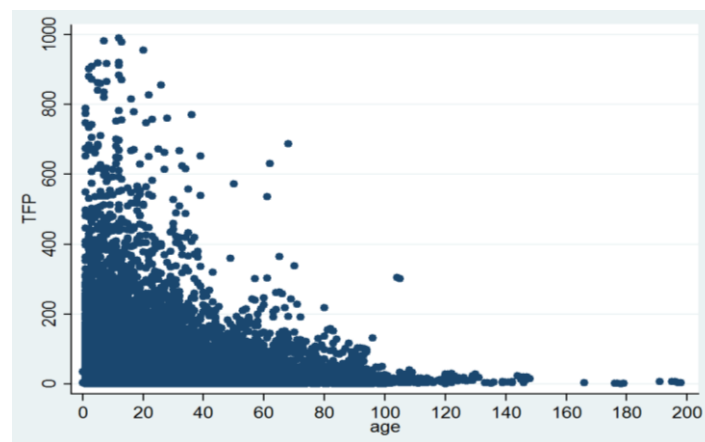**Chart 3.** TFP density kernels by Size, average over 2010-2013

Chart 4. Relationship between TFP and Age, average over 2010-2013[9]

Chart 5. shows the relationship between financial pressure and TFP. Considering that we define financial pressure as the weight of interest expenses in EBITDA[10], a ratio bellow one means that the company managed to generate enough EBITDA to balance interest expenses inherent to credit, while a ratio over one indicates the company was unable to do that and hence incurs in concerning levels of financial pressure (the higher the ratio, the higher the concern). Indeed, *Chart.5* shows that TFP noticeably decreases whenever companies reach a ratio of financial pressure over one.

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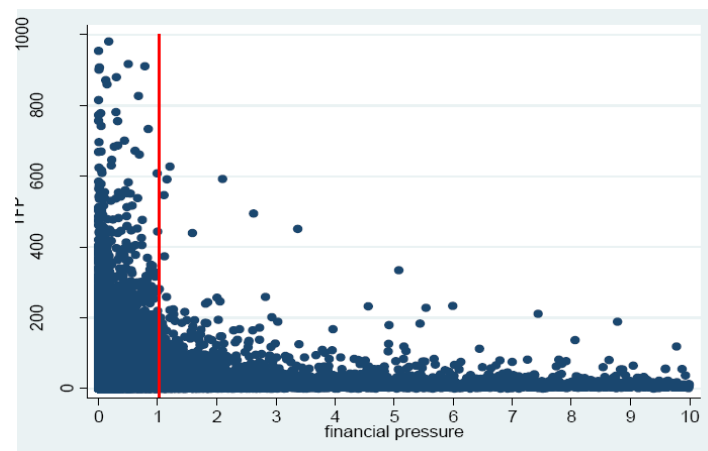
[9] To allow for a clearer reading of the chart, we limited the TFP range to 1000 and Age to 200 years old.
[10] We impose that EBITDA is non-negative

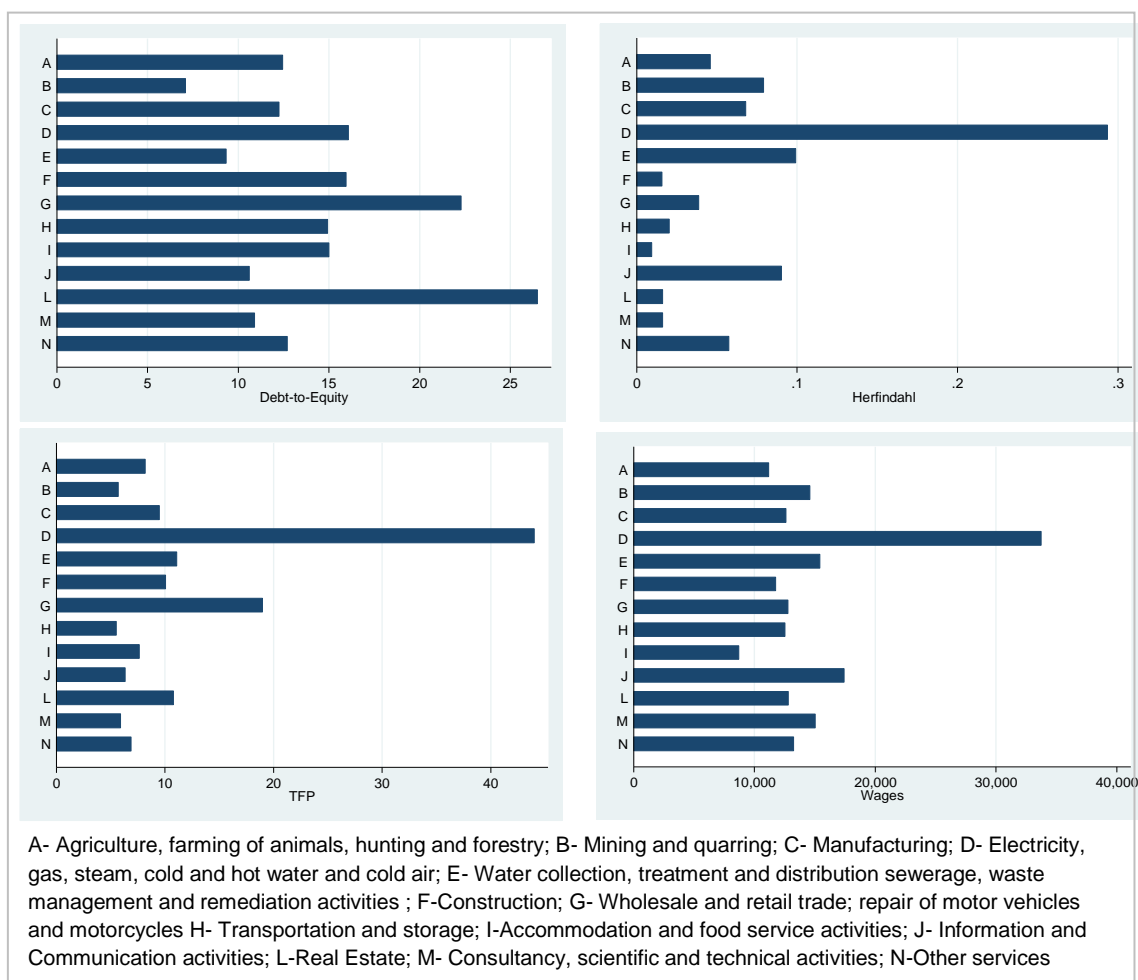**Chart 5.** Relationship between financial pressure and TFP[11], average over 2010-2013

3.3.2. Evidence on firm-level heterogeneity

The next set of charts raises attention to the importance of accounting for sectorial heterogeneity in our model. As a matter of fact, we observe that *(i)* Sectors such as *Real-Estate*, *Retail* and *Energy* register the highest ratios of Debt-to-Equity, above 15, while *Mining* and *Water and Residuals* have ratios below 10; *(ii)* The *Energy* sector seems to be the outlier in terms of market concentration as measured by the Herfindahl Index; in general, we can conclude that the degree of market concentration of the Portuguese economy is considerably low; *(iii)* In terms of *TFP*, with the exception of the *Energy* and *Trade* sectors, the levels are relatively similar; *(iv)* finally, *wages* paid in the Energy sector are much higher than in the rest of the sectors, while wages in the *Accommodation* sector seem to be the lowest.

A- Agriculture, farming of animals, hunting and forestry; B- Mining and quarring; C- Manufacturing; D- Electricity, gas, steam, cold and hot water and cold air; E- Water collection, treatment and distribution sewerage, waste management and remediation activities ; F-Construction; G- Wholesale and retail trade; repair of motor vehicles and motorcycles H- Transportation and storage; I-Accommodation and food service activities; J- Information and Communication activities; L-Real Estate; M- Consultancy, scientific and technical activities; N-Other services

Box 1. Sectorial heterogeneity across a set of characteristics- *(i) Debt-to-Equity, (ii) Herfindahl Index, (iii) TFP* and *(iv) Wages* -, averages over 2010-2013

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[11] We limited TFP again for a maximum of 1000 and financial pressure to 10, as the pattern verified afterwards is quite similar and does not alter the interpretation of this graph

3.33. Export-Performance Indicators, 2010-2013[12]

Table 4 reports the evolution of average export intensity[13], considering three groups of companies-*(i)* all firms, *(ii)* those firms that sell abroad goods and services, and *(iii)* the ones classified as exporters. We clearly see that the progressive orientation of firms towards external markets has translated into an increasing weight of the volume of exports in total sales. For exporters, goods and services sold to external markets accounted for, on average, 74% of their turnover in this time period.

Year	All firms	Export value>0	Exporters
2010	5.2%	31.0%	73.9%
2011	6.1%	33.1%	74.7%
2012	6.5%	33.1%	73.6%
2013	6.8%	33.5%	74.5%

Table 4. Average export intensities (%)

However, looking into the evolution of the extensive margin of exports by sector[14]in *Table 5*, we conclude that the representativeness of exporters in the different sectors is still low, even in the conventional tradable sectors. For example, only 16% of the firms in the manufacturing sector are exporters. Disaggregating by sector and firm dimension, we notice for instance that large enterprises in the manufacturing and mining sectors export almost all their production, while for SMEs and Microenterprises the relevance is much less significant.

Sector	All firms	Large enterprises	SMEs	Micro enterprises
Agriculture	6%	52%	15%	4%
Mining	17%	100%	27%	10%
Manufacturing	16%	81%	33%	6%
Energy	3%	10%	3%	3%
Water	11%	3%	16%	8%
Construction	5%	29%	10%	4%
Retail	6%	12%	12%	5%
Transportation	10%	16%	17%	9%
Accommodation	1%	9%	1%	1%
Communication	9%	8%	14%	8%
Real Estate	2%	0%	3%	1%
Consultancy	6%	14%	12%	5%
Other service activities	6%	3%	9%	6%

Table 5. Extensive margin of exports[15] (%)

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[12] A more detailed analysis of performance indicators can be found in Banco de Portugal (2015)
[13] Export intensity is the ratio of exports in total turnover
[14] 2-digit disaggregation (*CAE*)
[15]Extensive margin of exports is referred to as the share of exporting firms by sector. The IMF (2015) report finds similar values for 2010-2012

Looking into TFP differences between non-exporters and exporters (*Chart 6.*), we verify that exporters present somehow a fatter tail but the accumulation of TFP is concentrated around low levels of the distribution for both groups of firms.
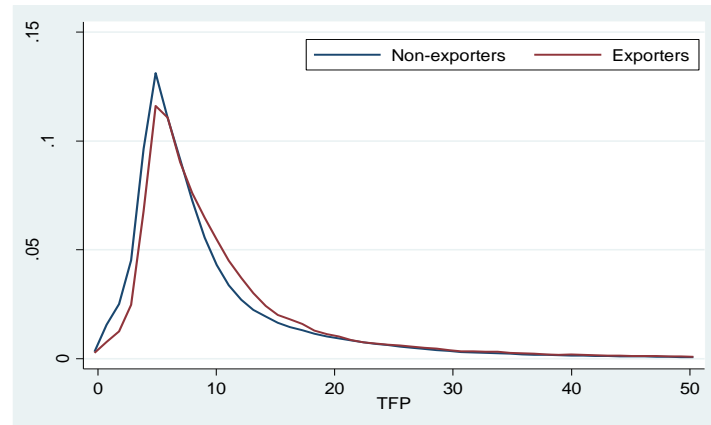

Chart 6. TFP density kernels according to export status, average over 2010-2013

These differences in level are also coupled with differences in terms of TFP growth (*Table 6.*). While for non-exporters positive growth was only achieved between 2012 and 2013, exporters registered positive mean growth across the entire time span of our analysis, even under the strain of the economic crisis. A similar pattern emerges from mean labor productivity growth rates across time (*Table 7.*).

Time Period	Mean TFP growth-*All firms* (%)	Mean TFP growth-*Exporters* (%)	Mean TFP growth-*Non-exporters* (%)
2010-2011	-4.6	+2.3	-5.1
2011-2012	-3.8	+1.3	-4.2
2012-2013	+2.5	+3.1	+2.5

Table 6. Mean TFP growth according to export status

Time Period	Mean Labor productivity growth-*All firms* (%)	Mean Labor productivity growth-*Exporters* (%)	Mean Labor productivity growth-*Non-Exporters* (%)
2010-2011	-6.1	+4.9	-7.0
2011-2012	-5.9	+3.1	-6.6
2012-2013	+2.0	+6.1	+1.7

Table 7. Mean Labor productivity growth according to export status

Looking into the differences between exporters and non-exporters in mean performance indicators (*Table 8.*), we find that exporters have, on average, better performance across a set of different characteristics when compared to non-exporters. The exceptions are the indicators of leverage and financial pressure, where we do not find statistical significant differences.[16]

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[16] For some preliminary insights on the export premium and a comparison between persistent exporters and other firms, please refer to Annex 3. However, conclusions can only be taken if selection issues are taken into account.

Characteristics[17]	Exporters Vs Non-exporters (t-statistics)
Number of employees	252.9% (-25.28)**
Turnover	477.1% (-19.29)**
Wages	55.7% (-89.03)**
Labor productivity	138.6% (-8.73)**
Total factor productivity	15.2% (-6.57)**
Debt-to-Equity	-44.2% (0.69)
Financial Pressure	-76.5% (0.322)

**Denotes significance at 5%

Table 8. Percentage differences in mean firm characteristics according to export status – exporters vs. non-exporters

4. Methodology:

In terms of policymaking, it is interesting to look into the characteristics that explain the probability that a firm will export in the next period. For this analysis, we estimate a Probit regression model whereby the export status of the firm – *exporter* or *non-exporter*, as defined in (1) - is regressed on a set of lagged control variables (to eliminate potential problems of simultaneity bias).[18]

Our regressors, included in lag and, where stated, in logarithm (ln), are $ExpDum_{i,t-1}$, to control for past experience of the firm; $lnTFP_{i,t-1}$, the Total Factor Productivity as stated in *(1)*; $DumSubsidy\_invest_{i,t-1}$, a dummy variable equal to one if the firm received subsidies to investment ; $Share\_RD_{i,t-1}$, the share of personnel employed in R&D activities; $lnWages_{i,t-1}$, as defined in *(1)*; $Age_{i,t}$[19], the age of the firm ; $Fin\_pressure_{i,t-1}$, corresponding to the weight of interest expenses in EBITDA; $EBITDA_{t-1}$, a dummy variable equal to one if EBITDA<0,; $DE_{i,t-1}$, the debt-to-equity ratio of the firm (for the cases where equity is positive); $Equity_{t-1}$, a dummy variable equal to one if Equity<0; $Small_{i,t-1}$, $Medium_{i,t-1}$ and $Large_{i,t-1}$ are dummy size variables, being the comparison group the *Very Small* companies (*i.e. Microenterprises*); $Herfindahl_{j,t-1}$ is the Herfindahl Index for measuring market concentration of industry *j (two digits CAE)*; IND[20], *COUNTY* and *T* are, respectively, industry, county[21] and time dummies to control for common fixed effects.

Table 11 presents the main results from the estimation of the model. In line with previous research, we find that innovation plays an important role in the ability to export (Arnold and Hussinger, 2005, European Commission, 2004, Ortega et al, 2013 or Smith et al, 2002). In fact, firms that allocated a greater share of their workers to R&D activities are more likely to export afterwards. Moreover, companies that received subsidies to investment are also more prone to be able to export afterwards, hinting at positive returns to these investments (see for example, Mariasole et al, 2013).

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[17] T-tests of difference in means are presented in parenthesis.
[18] Annex 3 presents some preliminary evidence on the differences between exporters and non-exporters. However, inference could only be made if selection issues were addressed and is beyond the scope of the paper.
[19] Age limited to the firm being maximum 200 years old.
[20] was the sector used as the reference group, in order to avoid problems of collinearity
[21] *Lisbon* was the county used as the reference group, in order to avoid problems of collinearity

Also, less mature firms are the ones that have a higher probability of exporting. Fafchamps et al (2007) find a similar result and suggest as possible explanation that there is very fast learning-by-doing in young firms, so that export activity is seen as a "learning opportunity" and channel for new firms to grow. Indeed, we find evidence of lasting learning effects, with past export experience increasing the probability that the firm will export in the current period, ceteris paribus (in line with Mariasole et al, 2013 and Sinani and Hobdari, 2008). These results may be also related to the sunk costs for entering external markets, as claimed by Greenaway and Kneller (2004) and Bernard and Jensen (2004). In fact, and in light with Caloff (1994), we do find evidence that size is also relevant for the ability of firms to export.

Furthermore, ex-ante financial health as measured by the variables financial pressure and debt-to-equity are not found to be relevant to explain the probability of exporting. Nevertheless, negative past results (EBITDA<0) and insolvency (Equity<0) decrease the probability of exporting. Tang and Zhang (2012) based on firm-level data for Chinese private firms also do not get any effect of financial constraints on the probability of exporting. Similarly, Greenaway and Kneller (2007) find no evidence that firms enjoying better ex-ante financial health are more likely to start to export.

Concerning productivity and as in Greenaway and Kneller (2004), we find that past performance in TFP is not a determinant of the probability of exporting. This result is also in line with Ortega et al (2013) who claim that it is not productivity that impacts the exporting ability but the other way around. However, we find that higher wages raise the probability that the firm will export, similarly to what Greenaway and Kneller (2004) found for the UK. This common result in the literature may be due to self-selection of more productive (and thus higher-paying) firms into export markets, as argued by Schank et al (2008), who found a similar result for Germany.

Assessing the impact of concentration in each sector, as measured by the Herfindahl-Hirschman Index, we find, as expected, that firms in highly concentrated sectors have a lower probability of exporting. Glejser et al (1982) argues that high concentration of the domestic market affects negatively the level of exports (and the probability that the firm will export) for two main reasons: *(i)* highly concentrated markets have major firms that exploit economies of scale in the domestic markets; *(ii)* "dominant firms can exploit monopolistic prices in the domestic market whereas they might become price-takers in international markets", and thus export activity is regarded as appealing in more competitive markets.

5. Concluding remarks:

Our analysis allows us to derive important policy recommendations for policy makers aiming at increasing the number of exporters in the country and thus raising competitiveness of domestic firms. According to our results, public incentives to promote internationalization should be targeted at:

1. *Innovation* – firms that allocate a higher share of their personnel to R&D activities are more likely to export. Thus, measures that intend to strengthen the link between companies and universities, namely by providing incentives for firms to hire PhDs, are beneficial;

2. *Investment* – public subsidies to investment have a positive return in terms of increasing the ability of firms to export;

3. *Creation of new firms* – younger firms are more dynamic in the sense that they have a higher probability of engaging in export activities. Therefore, measures to potentiate the creation of new firms (such as the reduction of entry barriers or the improvement of the access to finance of start-ups) should be pursued;

4. *Directly promote exports* – initiatives that aim at directly potentiate the export activity, which are seen by some as non-effective given that they would not have lasting effects, prove to be beneficial, with learning effects from export activity;

5. *Improving competition in domestic markets* – measures targeted at reducing excessive concentration in internal markets trigger an increase in the number of firms engaging in exports.

The analysis must be interpreted with caution given that the period covered (2010-2013) is a period of economic crisis in Portugal and thus some of the dynamics may be lined to cyclical effects. For instance, the result that younger firms are more prone to export may be linked to the contraction of domestic demand, meaning that those firms that are created are necessarily more focus on the external market.
 Going forward, it would be interesting to assess the *ex-post* effects of export activity on firms, namely on performance indicators, addressing selection issues. For example, in Greenaway and Kneller (2007) the authors conclude that participation in export markets improves firms' ex-post financial health. Moreover, Ortega et al (2013) find *ex-post* positive effects on firm productivity. Also, an analysis on the factors that determine persistent export activity would provide further interesting insights.

Variable	Estimated coefficient (z-statistic)	Variable	Estimated coefficient (z-statistic)
$lnWages_{t-1}$	0.248 (34.86)**	$Small_{t-1\ (vs.\ Micro)}$	0.255 (27.13)**
$Herfindahl_{t-1}$	-0.495 (-3.22)**	$Medium_{t-1(vs.\ Micro)}$	0.546 (30.28)**
$Fin\_pressure_{t-1}$	0.003 (1.41)	$Large_{t-1(vs.\ Micro)}$	0.552 (13.52)**
$EBITDA_{t-1}$	-0.036 (-3.43)**	$DumSubsidy\_invest_{t-1}$	0.171 (5.22)**
DE_{t-1}	-0.000 (-1.01)	Age_{t-1}	-0.006 (-18.45)**
$Equity_{t-1}$	-0.055 (-4.64)**	$ExpDum_{t-1}$	2.736 (308.80)**
$Share\_RD_{t-1}$	0.177 (3.27)**	$lnTFP_{t-1}$	-0.004 (-0.77)

** Denotes significance at 5%

Table 11. Output of the Probit Model estimation[22]

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[22] Unlike the linear model where we can directly interpret the estimated coefficients, we cannot do the same for the probit model. Indeed, we should look instead at the marginal effects of the regressors, *i.e.* how much the probability of the dependent variable changes when we vary the regressor, *ceteris paribus*. Since we have a random-effects probit model, we are unable to calculate marginal effects in STATA. However, although we cannot infer about the magnitude of the coefficients, we can look at the sign of the coefficients to derive conclusions about the direction of the impact.

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Appendix

1. Summary statistics- Mean and Standard deviations of main variables, averages over 2010-2013

Variable	All firms	All the obs. such that ExpDum=0	All the obs. such that ExpDum=1
Turnover	1175499	884000	5164754
	(*2.71e+07*)	(*1.86e+07*)	(*7.73e+07*)
Capital	536468	465829	1499125
	(*2.03e+07*)	(*2.02e+07*)	(*2.23e+07*)
EBITDA	108637	81518	479775
	(*7818825*)	(*7427838*)	(*1.19e+07*)
Total Assets	1760634	1427466	6320133
	(*6.20e+07*)	(*4.63e+07*)	(*1.65e+08*)
Total Liabilities	1289730	1081871	4134136
	(*4.52e+07*)	(*3.61e+07*)	(*1.10e+08*)
Equity	471023	345702	2186089
	(*2.51e+07*)	(*2.11e+07*)	(*5.60e+07*)
Supplies and Services	2790122	214260	1164779
	(*5795295*)	(*4132748*)	(*1.61e+07*)
Interest Expenses	30579	25890	94467
	(*1385358*)	(*1171109*)	(*3062273*)
Wages	12526	12050	18771
	(*10609*)	(*9733*)	(*17458*)
Number of employees	9	8	28
	(*97.7*)	(*95.0*)	(*127.6*)
Labor productivity	1002277	91295	217513
	(*1883680*)	(*1675183*)	(*3643757*)
TFP	11.7	11.5	13.3
	(*47.5*)	(*48.5*)	(*31.7*)
Personnel Costs	178231	141749	661003
	(*2188763*)	(*1867408*)	(*4667892*)
Share R&D Personnel	0.4%	0.4%	0.7%
	(*.0568*)	(*.0558*)	(*.0683*)
Debt-to-Equity[23]	16.7	17.3	9.3
	(*1423.9*)	(*1482.1*)	(*195.1*)
Financial pressure[24]	1.20	1.28	0.30
	(*680.23*)	(*710.25*)	(*7.02*)

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[23] Equity>0
[24] EBITDA>0

Investment subsidies	3999	3728	7706
	(*625230.9*)	(*646256.1*)	(*158258.2*)
Age	14	14	14
	(*13.1*)	(*13.0*)	(*13.9*)

Appendix

2. Variables description

Expdum - dummy variable that takes the value of 1 if the company is an exporter and 0 otherwise

Turnover - sum of total sales and services of the company

Capital - sum of fixed tangible assets and fixed intangible assets

Wage - ratio of the firms´ total wage bill (personnel costs) to the number of employees in a given year; it includes wages, social security, and pension costs, among others

Labor productivity - annual turnover relative to number of workers

Total factor productivity - estimated as the residual of a production function*, i.e.* the part of a firm´s turnover that is not explained by the inputs labor and capital and that is linked to technology catch-up effects and efficiency gains in the productive process

Share R&D personnel - defined as the share of R&D personnel relative to the number of total workers

Debt-to-Equity ratio - ratio of total liabilities to equity

Financial pressure - ratio of interest expenses to EBITDA

Investment subsisdies - dummy variable equal to one if the company has received investment subsidies, and zero if not

Herfindahl-Hirschman Index - used to measure the degree of concentration of an industry based on market shares

Size - three categories: microenterprises, small and medium enterprises, and large enterprises

Age - defined as the years that passed between the year of creation of the firm and the last year in consideration in the analysis

Industry - 5-digit CAE level; in some situations it is 2-digit

Appendix

3. Export premium and Persistent vs. Non-Persistent Exporters

Despite not being the focus of this paper, we provide preliminary evidence on the export premium and on the differences between exporters. However, a thorough assessment would need to take into account selection issues.

We start by taking a first glance at the differences between exporters and non-exporters across a set of different characteristics, by estimating the following regression (as in Greenaway and Kneller, 2004):

$$lnY_{it} = \alpha_0 + \alpha_1 ExpDum + \alpha_2 \ln\left(Z_{t-1}\right) + \sum_j \alpha_j IND_j + \sum_k \alpha_k COUNTY_k + \sum_t \alpha_t T_t + \varepsilon_{it} \qquad (1)$$

, where Y is the characteristic we are interested in testing, $ExpDum$ is a dummy variable equal to 0 if the firm is not an exporter and 1 if it is an exporter according to the criteria specified in the previous section, Z corresponds to a set of controls such as employment, average wages, and productivity measures, IND accounts for industry-fixed effects[25], $COUNTY$ controls for county differences, T refers to time fixed effects, and the subscripts i, t, k and j correspond to the firm, year, county and industry, respectively.

Non-Exporters Vs Exporters	Export premium (%)	t-statistic
Number of employees	3.4	7.40**
Turnover	20.0	22.89**
Wages	4.0	9.58**
Labor productivity	16.5	21.72**
Total factor productivity	10.1	16.78**

** Denotes significance at 5%

Table 10. Export premium between Exporters and Non-Exporters

As a result, after controlling for a range of firm characteristics and industry, county and year effects, we conclude that there is indeed a premium in performance characteristics between exporters and non-exporters, significantly different from zero for all the characteristics we have studied. In particular, exporters have more employees, register higher levels of turnover, pay higher wages, and are more productive as measured both by labor productivity and TFP.

This analysis suggests that exporters are different (and better) than non-exporters, although it does not tell us if the firm becomes better because it is an exporter or if it is an exporter because it is a better firm. An assessment can only be made if selection issues are properly addressed.

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[25] There might be for instance economies of scale in certain sectors that justify controlling for industries

We further extend the analysis by dividing companies into three categories according to export status, namely:

(i)   persistent (continuous) exporters - firms that exported throughout the four years considered;

(ii)   non-persistent exporters - the ones that exported at least once, but not during the entire time period; and

(iii)   non-exporters - firms that never exported.

We then test for differences on a set a firm characteristics. Results are illustrated in *Table 9*. *Persistence* in exporting is linked with better performance, namely more employees, higher turnover, higher wages and more productivity, when comparing with other exporters. This may hint at improved *ex-post* performance (as found in Greenaway and Kneller, 2007) but, from this simple analysis, the direction of causality cannot be inferred. Again, leverage and financial pressure ratios are not statistically different across groups (there is a difference between non-exporters and persistent exporters regarding financial pressure, but only at 10% significance; this may imply that persistence "came at a cost" in the sense that it brought higher financial pressure to these firms). As stated before, causality can only be established if selection issues are properly addressed.

Characteristics	Persistent Exporters Vs Non-Exporters (t-statistics)	Persistent Vs Non-Persistent Exporters (t-statistics)	Non-Persistent exporters Vs Non-Exporters (t-statistics)
Number of employees	389.5% (-26.44)**	204.0% (-17.66)**	60.9% (-5.32)**
Turnover	711.6% (-19.68)**	258.2% (-5.67)**	126.6% (-6.14)**
Wages	62.2% (-74.37)**	20.3% (-15.06)**	34.8% (-50.12)**
Labor productivity	131.8% (-5.84)**	16.6% (-0.62)	97.9% (-4.55)**
Total factor productivity	25.1% (-8.10)**	27.2% (-6.64)**	-1,64% (0.67)
Debt-to-Equity	-20.7% (0.17)	-42.1% (1.19)	37.0% (-0.35)
Financial Pressure	105.0% (-1.34)***	41.6% (-0.97)	44.8% (-0.66)

** Denotes significance at 5%

Table 9. Percentage differences in mean firm characteristics according to export status – persistent exporters, non-persistent exporters and non-exporters