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Firm heterogeneity and exports in Portugal: Identifying export potential

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Abstract

For Melitz (2003), the driving force behind a firm's decision to export is productivity. If firms pass the productivity cut-off, they all export. Nonetheless, empirical studies show that a substantial share of high-productive firms do not export. Using a dataset that covers Portuguese non-financial firms, between 2010 and 2016, we assess which factors determine the export decision, besides productivity. According to our results, firm's characteristics, such as size, turnover, import as well as export status, age, worker skills and knowledge agglomeration, are crucial in the process of internationalisation of firms.

JEL Classification: D22

Keywords: Exports, firm heterogeneity, firm-level data

Note: This article is the sole responsibility of the author and do not necessarily reflect the positions of GEE or the Portuguese Ministry of Economy.

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1. Introduction

Exporters tend to be more productive as well as capital and technology intensive, when compared to non-exporters. Consequently, they generate higher wages and better future employment prospects for workers, faster growth of shipments, diversification of risk and improvement of survival chances for firms (Bernard et al., 1999). Therefore, exports are seen as the locomotive of economic and social development, since they hold the ability to impact economic growth and reduce inequality.

Notwithstanding, exports are strongly concentrated within the group of large firms, called superstars. According to Mayer and Ottaviano (2008), aggregate exports in Belgium, France, Germany, Hungary, Italy and the UK, are driven by a small number of top exporters. More precisely, the top 1%, 5% and 10% of exporters account for no less than 40%, 70% and 80% of aggregate exports, respectively.

Encouraging non-exporter firms to export is attractive from a public policy perspective. Hence, the key driver of this paper is to understand what leads domestic firms with the potential to export not to do so, in order to create the incentives or the environment through policies that can guide them to new markets.

This Work Project is based on the paper by Brakman et al. (2017) that studied some of the factors, beyond the productivity main stream impact, that lead firms in the Netherlands to export. By following the same approach, we adapted it according to the particular characteristics of the Portuguese firm's context.

The remainder of this Work Project is organised as follows. In section 2 we will present the literature that has shed a light on the theory of international trade. Section 3, an empirical analysis will be included through the explanation of the data used, as well as a range of descriptive statistics about the Portuguese firms. In section 4, we will describe the methodology and the main model with the respective variables. Sections 5, the estimation results and the robustness of the key model will be discussed. Finally, in section 6, we will expose the main conclusions from the study and some policy recommendations.

2. Literature Review

The literature concerning international trade is leading to reviews on the main drivers of globalisation[2] (Greenway and Kneller, 2007), moving from industries and countries to firms and products (Bernard et al., 2012). Since Bernard and Jensen (1995) - where the authors showed that exporting and non-exporting firms co-existed in the same industry, appealing, consequently, to the within-industry heterogeneity of firms[3] - the development of research on this topic was motivated by two key points. On the one hand, the theoretical contributions of authors namely, Melitz (2003) and Eaton et al. (2004), among others, who connected the heterogeneity of firms and the international market participation. On the other hand, the improvement of micro level datasets, which allow for more in-depth research.

Before the impact of Bernard and Jensen's (1995) approach, the *New Trade Theory* by Krugman et al., (1979) influenced the rules of international trade. According to these authors, all firms export. They used two arguments to defend their considerations. Firstly, each firm produces an exclusive product[4], creating a rigid demand to the changes in prices, causing, therefore, an increase in firms' mark-up. Secondly, firms do not face fixed costs to export.

However, when a firm decides to enter a market, it incurs in sunk costs, namely market research, modification of existing products or conception of distribution networks (Greenway and Kneller, 2007). Thus, Clerides et al. (1998), developed a model where only some firms export, in particular, the ones with sufficient gross profits to cover the respective sunk costs. According to Clerides et al. (1998), there is an association between exporting and productivity. Nevertheless, the direction of causation among each other is controversial as per the existing literature. Some authors defend that if one firm wants to become an exporter it must (first) increase its productivity. This idea emerges as ex-ante productivity, since productivity assumed a leading role at the time of the decision of whether or not to export. On the other hand, one firm can "learn by exporting" and develop its productivity, after entering in a new market. Clerides et al. (1998) raised two possibilities for this link. First, the involvement in international markets could be an incentive for the firm to innovate[5] - in order to survive in the new context. Second, the reduction of X-inefficiencies[6] by the firm, since competition is greater in the export market when compared to the domestic one.

Insofar, the discussion refers to intra-firm productivity. The study by Melitz (2003), introduced firm heterogeneity into Krugman's model, generating a key platform to understand the issues of international trade (Bernard et al., 2012). Melitz built a dynamic industry model in a monopolistically competitive market, where firms produce horizontally differentiated products. Potential entrants can enter in an industry by paying a fixed cost, but without knowing beforehand their productivity levels and only after entry do firms draw their productivity from an exogenous distribution, remaining stable thereafter (Melitz, 2003).

With fixed production costs, firms could draw a productivity level below the zero-productivity cut-off, creating negative profits and forcing firms to exit the industry. The connection between fixed and variable costs of exporting, guarantee that only firms with levels of productivity above the export threshold are able to enter in new markets, since these are the ones that generate positive profits (Bernard et al., 2012).

[2] According to Greenway and Kneller the key drivers are: cross-border trade and cross-border investment.
[3] Olley and Pakes (1996), Roberts and Tybout (1996) and Aw et al. (1997) did contribute in within-industry heterogeneity firms approach.
[4] This model was built based on Dixit-Stiglitz monopolistic competition.
[5] This idea was modeled by Holmes and Schimitz (2001).
[6] Term used by Harvey Leibenstein (1975) to characterize the inefficiency that happens when some industry (or firm) has higher average costs than they would be with competition.

According to Melitz's model, an overall reduction in trade barriers across countries leads to variations in industry equilibrium. First, high-productivity exporters increase revenues through greater sales. Second, high-productivity non-exporters generate enough profits to enter in international markets – increasing the share of exporting firms in the same industry. Finally, low-productivity firms exit, while pure domestic firms contract their revenues. These modifications create a so-called Schumpeterian *wave of creative destruction*[7], raising aggregate industry productivity, via changes in its structure.

Through Melitz's contribution, we understand, theoretically, that the driving force behind the decision to export is productivity; that all firms above a domestic productivity threshold will survive and sell domestically; and that firms above an export productivity cut-off will sell both domestically and abroad. Nonetheless, empirical contributions[8] show that a substantial portion of high-productive firms do not export. In some countries, the productivity distribution across exporters and non-exporters overlap - both labour and total factor productivities. Mayer and Ottaviano (2007) used data from Belgium and showed that at the tails of distribution some firms cross the productivity cut-off but do not export.

Instead of being productivity, *per se*, the reason for a firm to export, recent empirical results highlight a different perspective. Firm productivity is necessary (but not sufficient) to explain the firm's decision to enter or not to enter a new market.

The latter is the main topic behind this paper. *Which factors determine the export decision, besides productivity?* For Melitz (2003), the only difference across firms resides in their productivity. However, giving the novel literature in these topics it is possible that others dimensions may have to be taken into account. Our main goal is to determine which factors drive the decision for Portuguese firms to internationalise themselves, in order to develop stimulus policies tackling trade barriers. For this, we will follow the same methodology outlined by Brakman et al. (2017).

[7] Term coined by Joseph Schumpeter (1942) that describes as: *the process of industrial mutation that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one*.
[8] Authors such as Van den Berg and Van Marrewijk (2017); Melitz and Trefler (2012); and Altomonte et al. (2012) showed for different countries that firm productivity distribution overlaps.

3. Empirical Analysis

3.1 Data

The dataset was derived from the Central Balance Sheet Database – which is constructed and made available by *Banco de Portugal* – and provides economic and financial information on non-financial firms operating in Portugal. This dataset is mostly based on information reported trough Simplified Corporate Information (IES, *Informação Empresarial Simplificada*).

The time sample used is from 2010 to 2016. We considered non-financial firms in activity that produce market goods or non-financial services and we excluded firms belonging to the non-tradable sector[9], as well as firms based in the free zones of Madeira and Azores. Furthermore, we filtered the data for unrealistic values, namely negative imports or exports, negative assets, none or negative wages and firms without workers, following the criteria used by Barbosa and Pinho (2016) and Groot and Van Weterings (2013).

As a result, the final panel of data is composed by a total of 886,000 observations, on an annual average of 126,000 firms. Out of that annual average, approximately 10,000 are exporters. In what concerns the exporters, the criteria that was used to define them followed the definition of *Banco de Portugal*[10], namely: *(i)* at least 50% of annual turnover is from exports of goods and services; or *(ii)* at least 10% of annual turnover is due to exports and their value is over 150,000$.

3.2 Firm-level Heterogeneity

As discussed in the previous section, Bernard and Jensen (1995) showed, using a database for the US, that firms with different characteristics co-existed in the same industry. In this section, we will analyse a range of specific statistics to understand if in Portugal the scenario is similar. For this purpose, the approach outlined by Gouveia and Correia (2016) was followed.

As shown in Table 1, labour productivity dispersion is significant across firms. More precisely, the 90th percentile firms generate around 11.5 times as much labour productivity as the 10th percentile firm, for all firms in the sample. In order to eliminate some distortions that could arise from sector disparities, we created two groups of firms, operating with the same method as Brakman et al. (2017). The first group is composed by sectors (2-digit disaggregation – CAE): A, B and C – Manufacturing group – and the second group composed by sectors: D, E, F, G, H, I, J, L, M and N – Services group. In these cases, the 90th percentile firm is around 9.2 times and 12.2 times more labour productive than the 10th percentile of Manufacturing and Services groups, respectively.

With respect to the turnover percentile differences for all firms (Table 2), the 90th percentile firm registers a level of turnover which is around 39 times larger than the 10th percentile firm. On the other hand, regarding the turnover percentile differences for both the Manufacturing and Services groups, it is observable that at 90th percentile firm displays a level of turnover around 46 and 37 times larger than a 10th percentile firm, respectively.

[9] 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.
[10] Statistical Bulletin, Banco de Portugal, Nr10, June 2015.

Chart 1 shows the relationship between total factor productivity (TFP) and the age of Portuguese firms. From the shape of the dispersion, we are able to conclude that higher TFP levels are found in less mature firms.

Table 1. Percentile ratios for Labour Productivity, average for all and for Manufacturing and Services sectors.

Percentile ratio – *Labour Productivity*	**p90/p10**	**p90/p50**	**p10/p50**	**P75/p25**
All firms	11.69	3.96	0.34	3.52
Firms in *Manufacturing Group*	9.20	4.30	0.34	3.02
Firms in *Services Group*	12.22	4.12	0.34	3.69

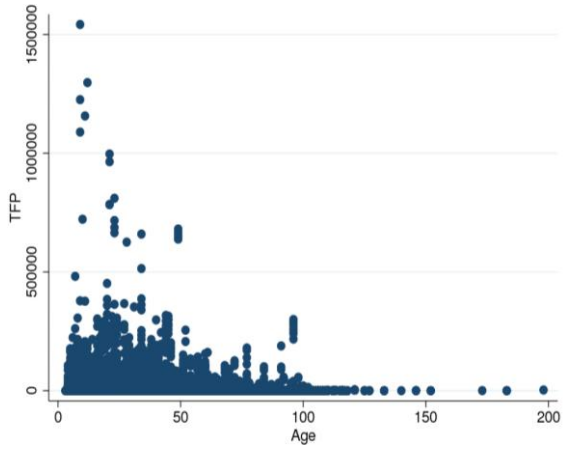
Source: Author's calculation with BPLIM database.

Table 2. Percentile ratios for Turnover, average for all and for Manufacturing and Services sectors.

Percentile ratio – *Turnover*	**p90/p10**	**p90/p50**	**p10/p50**	**P75/p25**
All firms	39.79	8.34	0.21	6.49
Firms in *Manufacturing Group*	46.36	9.90	0.21	6.8
Firms in *Services Group*	37.66	7.98	0.21	6.37

Source: Author's calculation with BPLIM database.

Chart 1. Relationship between TFP and Age, average over 2010-2016.



Source: Author's calculation with BPLIM database.

3.3 Export Dynamics

Table 3 describes the evaluation of average export intensity[11] considering two different groups of firms: *(i)* all firms; and *(ii)* firms which are classified as exporters by *Banco de Portugal*. Thus, from the results provided in Table 3 it can be conclude that, in general, Portuguese firms have turned into an increasing weight of the volume of exports in total sales and provision of services. Between 2010 and

[11] $average\ export\ intensity = \frac{total\ amount\ of\ exportations}{total\ turnover}$

2016, the extensive margin of Portuguese firms increased around 1.7 percentage points. Concerning exporter sales to international markets, these were, on average, 69% of their annual turnover during the same period.

Nevertheless, if extensive margin across sectors are to be consider, as shown in Table 4, we are able to understand that the representativeness of exporters in different sectors remains low (do note that only tradable sectors are being used). Our results are thus in line with Gouveia and Correia (2016), with the main difference being the time sample that is pondered. For instance, just 4.8% of the firms in the Retail sector are exporters.

Table 3. Average export intensities (%).

Year	All firms	Exporters
2010	5.6	68.2
2011	6.4	69.2
2012	7.0	68.4
2013	7.5	68.4
2014	7.5	68.3
2015	7.4	68.7
2016	7.3	69.0

Source: Author's calculation with BPLIM database.

Table 4. Extensive margin of exporters by sector (%).

Sector	All firms
Agriculture	4.9
Mining	14.1
Manufacturing	14.2
Energy	5.5
Water	8.6
Construction	5.7
Retail	4.8
Transportation	14.3
Accommodation	1.0
Communication	12.9
Real Estate	1.8
Consultancy	6.7
Other Services	7.0

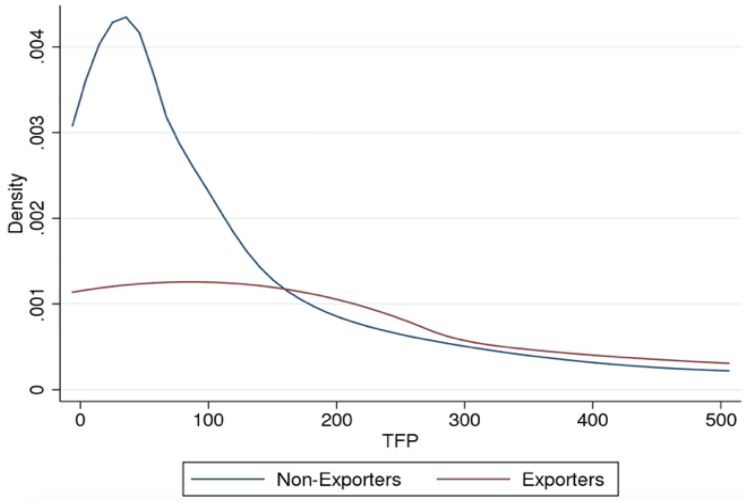
Source: Author's calculation with BPLIM database.

Chart 2 shows the distribution of TFP by Portuguese firms, according to their export status. Moreover, the ranking of firms is consistent with the literature. The dispersion of exporters shifts to the right, implying

higher productivity. Additionally, non-exporters present an accumulation of TFP concentrated around the distribution's lower levels.

A combined analysis of the TFP levels was performed, with the growth of the same variable (as shown in Table 5). While non-exporters registered a positive mean growth between 2012 and 2016, exporters displayed a positive mean growth across 2010 and 2013 (even under the strain of the economic crisis).

Chart 2. TFP density kernels according to export status over 2010-2016.



Source: Author's calculation with BPLIM database.

Table 5. Mean TFP growth according to export status (%).

Time Period	Mean TFP growth – *All firms* (%)	Mean TFP growth – *Exporters* (%)	Mean TFP growth – *Non-Exporters* (%)
2010-2011	-6.0	+4.1	-10.1
2011-2012	-6.3	+2.9	-9.1
2012-2013	+1.7	+2.3	-0.6
2013-2014	+1.8	-0.3	+2.1
2014-2015	+1.6	-1.1	+2.3
2015-2016	+0.1	-1.8	+2.2

Source: Author's calculation with BPLIM database.

3.4 Exporters *VS* Non-exporters

It is important to take a glance at the difference between Portuguese exporters and non-exporters, across a range of different firm characteristics. For that end, we estimate model **(1),** adopting the same approach as Greenaway and Kneller (2004) for UK firms. We condition the export premium for Portuguese firms on other covariates that affect their performance, with the following regression:

Model (1): Panel Linear regression model, estimated with fixed effect.

$$\ln Y_{it} = \alpha_0 + \alpha_1 EXPDUM_{it} + \alpha_2 \ln Z_{it-1} + \sum_{j=1}^{12} \alpha_j S_j + \sum_{t=1}^{6} \alpha_t T_t + \varepsilon_{it}$$

where Y is the firm characteristic under test. $EXPDUM_{it}$ is a dummy variable that indicates if firm i exports at time t ($EXPDUM_{it} = 1$ if firm i exports). Z is the covariates matrix that controls for other firm characteristics, such as, the firm turnover, the average wages, the labour productivity and the TFP – all variables are measured in $t-1$. S and T control for sector and time fixed effects[12], respectively. The subscripts j, i and t indexes sectors, firms and time, respectively. As in Greenaway and Kneller (2004), we only report the coefficient estimated on the export dummy and its *t-statistic*s.

This methodology allows us to attain more accurate results than performing a simple comparison of variables' means across Portuguese exporters and non-exporters. Furthermore, and using the example given by the authors, if only a simple mean approach was to be performed, the export premium could have given rise to biased upwards results for those exporters that are concentrated in sectors where economies of scale play a relevant role.

The results presented in Table 6 suggests that Portuguese exporters are larger, pay higher wages and have higher labour as well as total factor productivities. Although, we cannot conclude about the causal relation between performance and exports, i.e., we do not know if a firm becomes an exporter because it has a better performance or if the better performance of a firm is because it is an exporter. These results are consistent with the literature, in particular with the one develop by Bernard et al. (1999).

Looking at the export premium presented in Table 6, we are able to conclude that, in terms of size, the premium is around 22.2% higher when measured by turnover; for wages the premium is around 8.6% higher; and for productivity it is between 13.8% and 16.7% higher, measured by TFP and labour productivity, respectively.

Table 6. Percentage difference between exporters and non-exporters and their statistical significance.

Firm characteristics	Export premium	*t-statistics*
TFP	13.8	20.42*****
Labour Productivity	16.7	29.81*****
Turnover	22.2	34.54*****
Wages	8.6	15.89*****

*****denotes significance at the 1% level.
Source: Author's calculation with BPLIM database.

[12] Sector (2-digit disaggregation) and time dummies are included. Note that we have 13 sectors and 7 years in our sample. However, we included only 12 sectors and 6 years in the regression to prevent multicollinearity issues, since we have a constant in our model.

4. Methodology

In order to answer our main research question, a relevant next step is to study the export behaviour of firms that are above the productivity cut-off. As shown in the previous sections, the relation between productivity and the firm's export status can be seen in the Portuguese sectorial landscape.

Following Brakman et al. (2017), we started by identifying the productivity cut-off value, which constitutes the value that allows us to constraint our sample between the most productive firms, i.e., the firms that pass the productivity cut-off. The authors' results suggested that the 7th productivity decile as the cut-off level, since more than 50% of all Dutch firms in this decile export. However, our sample has no percentile with more than 50% of all Portuguese firms that export – these results reflect the Portuguese economy, more precisely the number of Portuguese exporters in relation to all firms. Thus, we considered the median of Portuguese exporters, both for manufacture and services, as the cut-off. The reason behind the median method is related to the fact that if non-exporters have similar levels of productivity as exporters, and still decide not to export, which implies that also there are other factors that determine the export status of Portuguese firms.

It is therefore crucial to analyse which factors determine the export status for Portuguese firms above the cut-off. Consequently, we estimate the following probit regression model **(2)** that analyses a firm's probability of exporting conditional on its productivity, for both Manufacturing and Services groups (as previously described).

Model (2): Probit regression model, estimated with fixed effects.

$$P(EXPDUM_{it} \mid Productivity_{it}) = f(\beta_0 + \sum_{n=1}^{12} \beta_n X_{it} + \sum_{j=1}^{12} \beta_j S_j + \sum_{t=1}^{6} \beta_t T_t + \varepsilon_{it})$$

Where $EXPDUM$ is a dummy variable that indicates if firm i exports at time t ($EXPDUM = 1$ if firm i exports), conditional to its productivity level (note that here only both exporters and non-exporters that pass the productivity cut-off are considered, i.e., Portuguese firms with a productivity equal or higher than the Portuguese exporters). The measure of productivity follows the Levinshon and Petrin (2003) approach – explained in detail below. Additionally, X is a matrix of firms and location specific explanatory variables such as, lag of exports (if a firm exports in $t-1$), age, financial pressure (ratio of interest expenses to EBITDA), skills (measured as wage per worker), salary of the board, turnover (sum of total sales and services of the firm), import status (dummy equals 1 if firm imports), number of workers, distance to the main airport and port, distance to the Spanish border and density of exporters (number of exporting firms in own industry/km^2 in the same district; a large density could facilitate export-market knowledge spill-overs). Sector fixed effects S and time fixed effects T were also included, following the methodology described in the model **(1)**. Lastly, ε is the error term.

The methodology used for the model was based on Brakman et al. (2017). Notwithstanding, we consider the inclusion of new variables such as, board salary, financial pressure, firm's age, number of workers and the lag of exports.

4.1 Variables

4.1.1 Total Factor Productivity (TFP)

As defined by Comin (2006), TFP represents the portion of the output which is not explained by the firm's decision on the amounts of labour and capital inputs, whose value reflects both the level of efficiency and intensity of those inputs in the production process.

We used the method developed by Levinsohn and Petrin (2003) (henceforth LP), which is considered, as of now, the standard one to estimate TFP. An important matter in the estimation of this variable is the correlation among unobservable productivity shocks and input levels. When true, OLS estimates of the production function are biased. Consequently, this method provides biased estimates of productivity (Levinsohn et al., 2003). Thus, it becomes crucial to find a proxy variable for these unobservable shocks. Due to data availability, we employed the variable external services and utilities (FSE) as a proxy, instead of costs of energy as in LP. Concerning labour and capital inputs, we used total wages and material assets, respectively.

Table 7. Descriptive statistics for the main variables in production function.

Variable	Proxy	Mean	Stand. Dev.	Min	Max	Observations
Output (Y)	Turnover	1 451 574	$2.52x10^7$	0.06	$6.75x10^9$	886,832
Capital (K)	Fixed Tangible Assets	332 998	6 741 516	1.02	$1.82x10^9$	886,832
Labour (L)	Personnel Expenses	148 956	1 743 650	0.01	$3.62x10^8$	886,832
Intermediate Input (M)	External Services and Utilities	460 838.7	$1.51x10^7$	0.01	$5.12x10^9$	886,832

Source: Author's calculation with BPLIM database.

4.1.2 Lag of exports

Firms that export in the last period or the period before that, are more likely to export in the current period as well (Hobdari and Sinani, 2008). We can easily withdraw this conclusion since, as we discussed in section 1, firms can "learn by exporting" and develop its productivity (Clerides et al. 1998). Meaning that, firms that exported in $t-1$ are more likely to export in t, given that firms learn from past behaviour. Furthermore, firms need to invest in infrastructures or transport networks when they decide to internationalise. Consequently, in later periods, firms can dilute the fixed cost from these investment decisions.

4.1.3 Skills

Higher skilled workers tend to increase the export likelihood by firms (Brakman et al. 2017). In general, exports require highly-intensive skilled labour services, such as, distribution, transportation or advertising (Matsuyama, 2007). However, the destination is determinant whenever a firm opts to enter international markets. The empirical research by Brambilla et al. (2012), where the authors used microdata from Argentina, suggests that exporting to high-income countries leads firms to hire more skilled workers relative to firms that export to middle-income countries (or sell domestically). This happens because the Argentinean market is relatively similar to the one in middle-income countries. In our case, we will not focus on market destination, as in the previous case. However, it is relevant to refer its importance.

4.1.4 Age

The existing literature is not consensual when it comes to the effects of age on the exporting likelihood. In fact, there are arguments that sustain both sides of the question. Young firms depend heavily on both constraints on capital and creativity, as well as on social interactions (given that they are an early stage). Under this reasoning, links to clients, supporters, or customers may not be yet be fully established, hindering the ability of newly – formed firms to connect with external markets (Stinchcombe et al., 1965). On the other hand, Lamotte & Colovic (2013) argued the opposite, nowadays, especially for young technology-based firms, innovation and internationalisation are more likely to be instantaneous, fast and inter-related (Onetti et al., 2012). This gives us the notion that the age of firms and the exporting behavior will vary in accordance to the type of firm and its sector.

4.1.5 Financial Pressure

The notion of causality of financial pressure arises from the neoclassical theory that defends the independence between a firm's capital structure and its investment decisions. Nevertheless, the effect of firm financial health on export decisions has different approaches across the literature. For Bellone et al. (2010), based on their work with French manufacturing firms, there is a positive relation between financial health and exports, meaning that firms with better financial health are more likely to export. This view gives a notion about the financial condition of firms as a barrier to internationalisation. On the other hand, the work of Tang and Zhang (2012) based on Chinese private firms, or the one developed by Greenway and Kneller (2007), who used a panel of UK manufacturing firms, none of them found any link between the export status and the financial condition.

4.1.6 Size

The linkage between the firm size and the export behavior has been widely analysed in the international business literature (Pla-Barber et al., 2007). Monteiro (2013), used Portuguese firms to study the relationship between the Portuguese export performance and size, measured in different manners. The author concluded that the exact definition of size is essential to determine the direction of the effects. For our consideration, we will measure the firm size by the firm's turnover, as Brakman et al. (2017). However, some authors used employment (number of workers) as a proxy for firm size.

Certain theoretical explanations suggested that large firms hold more financial and human resources, as well as higher economy of scale levels (Wagner, 1995), contributing to the positive relation between firm size and export intensity. The fundamental theoretical approaches that support this idea are: the resource-based view of the firm (Dhanaraj & Breamish, 2003) and the transaction cost approach (Verwaal & Donkers, 2002).

4.1.7 Import Status

Brakman et al. (2017) proposed that for importers it is easier, *ceteris paribus*, to acquire knowledge about foreign markets and how to do business abroad, increasing the effects of imports on the exporting likelihood. Additionally, Kasahara et al. (2005) examined whether importing intermediate goods improves firm performance. According to their results, a firm that switched from non-importer to an importer can improve its productivity. Furthermore, the authors found that importers accumulate more capital and are

less likely to exit than non-importers, which indicate that importing goods plays a key role in re-allocating resources across heterogeneous firms.

4.1.8 Board Salary

In order to assess the schooling of the firm's board, we used their wages as a proxy. The reasoning behind that lies in the fact that the dataset did not present information on this topic. Nonetheless, there are several studies that demonstrate the positive link between wages and years of schooling. By Andre Serrano et al. (2015), who used information from the state at Góias and the Federal Distric in Brazil, and verified that the impact of education on income increases with schooling, for both units of the federation.

4.1.9 Location

As Brakman et al. (2017), we used location specific variables to understand how these variables affect the export decision of Portuguese firms. More precisely, the following variables: distance to airports (in km), distance to ports (in km) and distance to the Spanish border (in km). Furthermore, we took into account a concentration index measured by the density of exporters.

4.1.9.1 Distances to Airports and Ports

Given the distance from Portugal to key international markets, airports and ports are an important tool for Portuguese firms.

According to the report: *Estatísticas dos Transportes e Comunicações* (2017) by INE – Instituto Nacional de Estatística – where the institution publishes the main statistical outputs about the transports and communications sectors in Portugal, the airports of Lisbon, Porto and Faro, are the busiest ones in the country. Additionally, the survey on the carriage of passengers and goods by sea (INE) suggested that the ports of Lisbon, Leixões and Sines are the ones with more international cargo movements in Portugal, having reached 12.6%, 16% and 49.9% (in percentage of all Portuguese ports), respectively, in 2017.

Thus, we used the variable *Distance to Airports* and *Distance to Ports.* These variables are constructed from the aggregation of three other variables. Using the *Distance to Airports* as example, we studied the distance of firms to the nearest airport (see Table 11), assuming that one firm between two airports will choose the nearest one. This criterion is supported by transportation costs.

4.1.9.2 Distances to the Spanish border

Spain is the main client of Portuguese firms together with France, Germany, the United Kingdom and the US. Together, the countries represent around 61.5% of the total exported by Portugal during the first half of 2017 (AICEP Portugal Global, 2017). Consequently, it becomes relevant to study how the distance to this key client affects the exportations of Portuguese firms.

4.1.9.3 Density of exporters

Firms that participate in export markets, contact with international best practice and benefit from learning and productivity growth (World Bank, 1997). Blomström and Kokko (1998) contribute for knowledge spill-overs from export activities. The authors suggest that multinational firms have experience in international marketing, established international distribution networks and market power in their domestic markets, leading to competitive advantages in the world market. The export events by

multinational firm incentive the domestic ones to export. This happens due to affect that they develop transport infrastructure and share information about international trade that can be used by non-exporter firms (Wei and Liu, 2006). Clerides et al. (1998) used micro-data from Mexico, Colombia and Morocco, where they found positive regional externalities in neighbor firms. Furthermore, Aitken, Hanson and Harrison (1997) argue that externalities, caused by region and industry effects, tend to reduce the cost of access to foreign markets. The higher the nearness from other exporters, the higher the probability of a firm to export (Bernard et al., 2004). To conclude this, the authors used a model based on export decision, to estimate the impact of other exporters that co-existed in the same industry or region.

5. Estimating results

The most important issue in the estimation of model **(2)** is related with the identification of unobserved characteristics which affect the decision to export by the firm. For Bernard and Jensen (2004), these characteristics tend to induce persistence in export behaviour, since these features are (potentially) permanent and serially correlated with the regressors, thus leading to overestimate results.

The estimation of the dynamic binary choice with unobserved heterogeneity can be solved by a probit with fixed effects, as Brakman et al. (2017) used in their framework. However, most of fixed effect models produce biased parameters estimators, especially if the dependent variable is a lagged one – which is not our case. Even so, after estimating the model **(2)** in levels (simple fixed effects), we performed the first difference, following the strategy used by Bernard and Jensen (2004). Nonetheless, the results did not change significantly.

Table 8 shows the estimation results for model **(2)**. Column 1 presents the variables used in the model, whereas Columns 2 and 3 show the marginal impacts of the regressors on the probability of export by firms of both manufacturing and services groups, respectively. Note that we performed the marginal impacts with the derivative (*dy/dx*), since we are not able to conclude about the impact of a coefficient's value using a probit model, just the direction of its effect.

Portuguese firms that export in past periods are more likely to export in the current one. This result is true for both manufacturing and services firms. Notwithstanding, the impact on the manufacturing sector is greater. Additionally, larger Portuguese firms (measured in turnover terms) tend to increase the likelihood of exporting. On the other hand, if we use de number of workers as a proxy for size, we are not able to conclude on the impact for manufacturing firms. In regards to services firms, the impact is very low. This diversity towards the effects is supported by Monteiro (2013).

The skills of workers as well as the import status positively impacts the decision of Portuguese firms to export. In terms of the age of the firm, the younger it is, the greater the likelihood of entering into international trade. However, neither the salary of the board nor the financial pressure are significant for both manufacturing and services firms to export.

In terms of the specific location variables, the agglomeration of Portuguese exporters around another Portuguese firm positively affects the probability of these firms starting to export, regardless of whether it is manufacturing or services sectors. Nonetheless, the greater the distance to the Spanish border, the less likely manufacturing firms to are export.

Table 8. Marginal effects of the probit model and their statistical significance.

Variable	*dy/dx* for Manufacturing firms (p-values)	*dy/dx* for Services firms (p-values)
Exportations in *t-1*	**0.6242*** (0.000) ◇▣	**0.1790*** (0.000) ◇▣
Log Turnover	**0.0669*** (0.000) ◇▣	**0.0075*** (0.000) ◇▣
Log Skills	**0.0201*** (0.003) ◇▣	**0.0129*** (0.000) ◇▣
Import Status	**0.0922*** (0.001) ▣	**0.0057*** (0.000) ◇▣
Board Salary	**$1.45x10^{-8}$** (0.765) ◇▣	**$4.20x10^{-9}$** (0.188) ◇▣
Age	**-0.0012*** (0.000) ◇▣	**-0.0006*** (0.000) ◇▣
Financial Pressure Squared	**$-9.47x10^{-6}$** (0.494) ◇▣	**$-1.9x10^{-5}$** (0.106) ◇▣
Workers	**$2.14x10^{-5}$** (0.702) ◇▣	**$-9.46x10^{-6}$ **** (0.024) ◇
Density of Exporters	**1.0583*** (0.000) ◇▣	**0.2257*** (0.000) ◇▣
Distance to Airport	**-0.0004** (0.099) ◇	**$3.59x10^{-5}$** (0.356) ◇▣
Distance to Port	**0.0004** (0.080) ◇	**$-7.84x10^{-5}$ **** (0.035) ◇
Distance to Spanish Border	**-0.001*** (0.000) ◇▣	**$1.5x10^{-5}$** (0.143) ▣

* denotes significance at the 1% level.
****** denotes significance at the 5% level.
◇ denotes Labour Productivity Robustness.
▣ denotes Q3 Robustness.
Source: Author's calculation with BPLIM database.

In order to gauge the robustness of our results, we estimate model **(2)** using different cut-off values. On the one hand, we used the median of labour productivity exporters for both sectors. Indeed, the labour productivity derives an important concept about a firm's labour costs and business efficiency. In our case, we used the ratio between the turnover and the number of workers[13]. On the other hand, we estimated model **(2)** using the productivity upper quartile (third quartile – Q3) of exporters as the cut-off, also for both sectors. This measure allows us to split the lowest 75% productivity exporters from the highest 25% productivity ones. The reason behind these two procedures is similar to the TFP method. This means that if non-exporters have similar values of labour productivity or similar levels of productivity as the highest productivity exporters, and still decide not to export, we can conclude that there are other factors that influence the export status of firms.

[13] $Y = AF(K,L) = \frac{AK^{\alpha}L^{1-\alpha}}{L} = \frac{AK^{\alpha}L^{1-\alpha}}{L^{\alpha}L^{1-\alpha}} = A(\frac{K}{L})^{\alpha}$

6. Conclusion and Policy Implication

Portuguese exporters are larger, pay higher wages and have higher labour productivity as well as TFP. For this reason, policy-makers have an incentive to promote internationalisation.

Theoretically, the driving force behind the decision to export is productivity (Melitz, 2003). However, the empirical results show us a different perspective. The productivity of Portuguese firms is a necessary, but not a sufficient condition for exporting. Other firm characteristics are decisive in the process of exporting by firms, namely, the firm size, the turnover, the worker's skills, the import status, the age of the firm and if the firm already exported. These features are relevant regardless of the sector (manufacturing or services) where the firm is included.

Contrarily to the results of Brakman et al. (2017), the location of Portuguese firms is not as relevant as for Dutch firms, only regarding the nearness to other exporters, to take advantages of the externalities generated by these firms. This conclusion is supported by the large distance of Portugal from the main European markets. The cost of transportation will always be high, independently of the distance to the channels of communication with the outside (airports, ports or borders). On the other hand, the decision to locate Dutch firms in the North or South of the Netherlands, will drastically affect the markets of end consumers.

Our analysis helps policy-makers to identify high potential non-exporters, in order to target export policies specifically for this group, since BPLIM has detailed information on all firms in its database.

According to our results, public incentives to encourage non-exporters to become exporters should tackle three main policies: *(i)* invest on the relation between firms and universities, providing incentives to hire skilled students, for example PhD students; *(ii)* promote the exchange of know-how and externalities among exporters and non-exporters through the construction of business centers; *(iii)* provide incentives for the creation of new businesses, in the sense that they have a higher likelihood to engage in export activities.

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A. Appendix

Table 9. Number of firms by sector and size distribution.

Sector	Micro	Small	Medium	Large
Agriculture	23,510	4,327	443	34
Mining	1,344	1,048	109	21
Manufacturing	87,583	54,313	11,478	1,388
Energy	242	226	40	53
Water	1,641	798	310	111
Construction	89,534	27,132	2,695	294
Retail	231,237	45,753	4,656	641
Transportation	35,550	7,886	1,334	332
Accommodation	84,830	16,742	1,246	161
Communication	13,686	3,562	694	219
Real Estate	18,324	1,598	136	7
Consultancy	70,107	8,775	918	129
Other Services	21,893	5,738	1,429	548
Total	679,481	177,898	25,488	3,938

Source: Author's calculation with BPLIM database.

Table 10. Export dynamics 2010-2016.

Year	Number of Exporters	Number of firms	Export Participation (%)
2010	9,256	140,287	6.60%
2011	10,072	134,420	7.49%
2012	10,270	125,202	8.20%
2013	10,595	120,432	8.80%
2014	10,590	120,354	8.80%
2015	10,618	122,592	8.66%
2016	10,453	123,545	8.46%
Total	71,854	886,832	

Source: Author's calculation with BPLIM database.

Table 11. Export frequency by industry

Sector	Exporters	Non-Exporters
Agriculture	1,554	26,760
Mining	520	1,951
Manufacturing	29,393	125,347
Energy	40	521
Water	394	798
Construction	6,843	2,426
Retail	17,272	112,812
Transportation	5,923	265,015
Accommodation	669	102,310
Communication	2,103	16,058
Real Estate	348	19,717
Consultancy	4,776	75,153
Other Services	1,993	27,615

Source: Author's calculation with BPLIM database.

Table 11. Distances.

District	Distance to Airports (in km)			Distance to Ports (in km)			Distance to Spanish border (in km)				
	Lisbon Airport	Porto Airport	Faro Airport	Sines Port	Leixões Port	Lisbon Port	Ayamonte	Badajoz	Vilar Formoso	Vila Verde da Raia	Valença
Aveiro	248.07	28.06	440.83	335.98	29.38	253.82	427.61	266.49	146.8	129.79	119.11
Beja	148.73	378.65	91.54	84.53	377.63	143.02	83.18	141.81	322	441.25	469.57
Braga	313.92	40.48	505.4	402.06	47.33	319.24	490.18	321.73	169.01	87.06	56.15
Bragança	392.12	166	542.39	465.02	176.47	396.61	513.87	326.18	132.89	55.23	158
Castelo Branco	190.35	165.45	328.92	251.58	169.01	193.4	305.3	129.04	93.5	204.19	248.74
Coimbra	169.85	112.29	356.5	253.65	111.29	175.07	344.21	193.02	141.7	195.15	203.46
Évora	114.87	298.81	174.29	114.65	298.52	111.99	156.89	81.71	241.4	358.46	389.14
Faro	196.88	446.22	24.01	107.36	444.59	190.46	60.1	209.27	393.2	512.21	537.44
Guarda	252.38	133.53	395.94	319.05	140.75	256.13	369.94	186.3	37.42	140.04	201.75
Leiria	110.67	163.93	311.64	199.32	160.28	116.31	306.67	185.06	193.53	255.81	254.36
Lisboa	7.15	281	214.65	88.03	276.75	2.7	225.49	188.34	288.47	371.46	370.55
Portalegre	165.79	281.65	218.92	177.99	283.59	164.57	188.16	22.08	193.52	322.12	368.08
Porto	267.18	6.85	462.67	356.33	8.69	273.07	449.94	288.74	160.94	122.02	97.63
Santarém	63.52	219.75	254.01	143.42	216.81	67.54	250.8	153.12	220.03	303.76	310.76
Setúbal	11.54	285.47	212	84.58	281.11	6.51	223.84	190.86	292.95	376.11	374.94
Viana do Castelo	324.92	57.9	525.08	416.11	57.8	330.57	513.09	350.73	206.09	117.52	40.33
Vila Real	304.15	70.91	476.52	384.74	81.44	309.24	455.55	277.4	108.19	60.72	110.03
Viseu	254.56	78.26	423.76	332.83	85.76	259.38	403.41	228.07	84.73	111.64	150.88

Source: Author's calculation.

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