



School of Economics and Management

TECHNICAL UNIVERSITY OF LISBON

Department of Economics

Horácio Faustino, Joana C. Lima & Pedro V. Matos

**Exports, Productivity and Innovation:
Evidence from Portugal using micro data**

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Exports, Productivity and Innovation: Evidence from Portugal using micro data

Horácio C. Faustino, ISEG-Technical University of Lisbon and SOCIUS

Joana C. Lima

Pedro Verga Matos, ISEG-Technical University of Lisbon and Advance Research Centre

Abstract: This study examines the evolution of Portuguese exports to Spain and its determinants in the period 2004-2008, based on a sample of the 97 largest exporters to Spain. The econometric study, using panel data and a static and dynamic analysis, considers as theoretically relevant explanatory variables productivity, equity capital, remuneration and innovation measured by the expenditure on research and development (R&D). The static results of the estimated models confirm the positive influence of productivity and equity capital on the variation of exports, and the negative effect of the labour costs. The variable R&D is statistically significant, with a positive effect on Portuguese exports in the dynamic model. The dynamic estimations also suggest that the exports in the previous period have a positive effect on contemporaneous exports.

Keywords Exports. Innovation. Panel data. Productivity. Portugal. Spain.

JEL Classification C33. F14. L25

Correspondence:

Horácio C. Faustino (corresponding author)

ISEG- Instituto Superior de Economia e Gestão, Rua Miguel Lúpi, 20.
1249-078 Lisboa. Email: faustino@iseg.utl.pt.

Joana C. Lima

Alameda das Linhas de Torres, N° 254, 14° Dt°, 1750-172 Lisboa. Email: ljoana_2@hotmail.com

Pedro Verga Matos

ISEG- Instituto Superior de Economia e Gestão, Rua Miguel Lúpi, 20.
1249-078 Lisboa. Email: pvmatos@iseg.utl.pt.

I. Introduction

Portugal has not been immune to the current global financial and economic crisis. Since it is a small open economy, the economic growth of which is partly dependent on the performance of its exports, the effect of the crisis has been felt particularly in the export sector. Promoting exports is the highest priority of the Portuguese government in order to stimulate economic growth and to reduce the external deficit. The sole contiguous neighbour, Spain, has become Portugal's main trading partner, both as a client and as a supplier.

As Portugal's economic growth should be based on export growth – since the onset of the crisis, there has been a political consensus on this - and Spain is the main trading partner, we chose to study the leading 100 Portuguese companies exporting to the Spanish market. For statistical reasons we have had to eliminate three firms from our sample. To the best of our knowledge, there have been few Portuguese empirical studies that link exports and their determinants at the firm level, taking bilateral trade into account (see Lima and Faustino, 2010, for example). Serrasqueiro and Nunes (2008), analysed the performance and size of Portuguese SMEs, while Silva (2011) considered the link between financial constraints and firm exporting behaviour at the firm level. Gomes and Faustino (2011) analysed the main determinants of exports of SMEs and large companies operating in Portugal.

The relationships between exports, innovation and productivity finds theoretical support in various studies (see, for example, Castellani, 2002; Melitz, 2003; Özçelik and Taymaz, 2002; Taymaz, 2005; Kimura and Kiyota, 2006; Hirsch and Bijaoui, 1985; Wakelin, 1998; Wagner, 2007, 2008). In the fragmentation theory of production (Jones and Kierzkowski, 2000, 2001) and in the new economic geography theory (Krugman, 1991), distance, used as a proxy for transport costs, is considered an important variable to explain the trade in final and intermediate products. When the gravity equation is used, the empirical studies find a negative correlation between trade and distance. Thus, it is of great importance for Portugal to have a neighbour with a large domestic market, where there are no impediments to trade based on distance or trade barriers. The idea developed by economic geographers is also developed by Porter (1990) and the literature concerning industrial clusters and regional development (see, for example, Baptista and Swann, 1998; Baptista 2000; and Baptista et al. 2008)

The main obstacle to conducting such empirical studies in Portugal is the lack of available micro data, since the law on data confidentiality prevents the INE (National Institute of Statistics) from providing detailed data by firm. However, at the international level, we find several studies that have used data by firm (see, for example, Fryges and Wagner, 2008; Lachenmaier and Woessmann, 2004; Cassiman and Martínez-Ros, 2008; Kimura and Kiyota, 2006).

The present paper performs an econometric analysis using panel data for the period 2004-2008.

We have also conducted a dynamic analysis, using the system GMM estimator, in order to avoid endogeneity problems. Several econometric studies suggest that exporting also has positive effects on innovation and productivity (see, for example, Kneller and Pisu, 2007; Fryges and Wagner, 2008). In dynamic panel data models, the system GMM estimator eliminates the unobserved firm-specific effects through the equations in first differences and also controls for the endogeneity of the explanatory variables. A standard assumption on the initial conditions allows the use of the endogenous lagged variables for two or more periods as valid instruments, if there is no serial correlation (Blundel and Bond, 1998, 2000).

The remainder of the paper is structured as follows. Section 2 presents the literature review, which will underpin the econometric model and the hypotheses that will be formulated. Section 3 formulates the empirical model and the explanatory hypotheses. Section 4 is devoted to the empirical study, using panel data and presenting the results for both the static and dynamic analyses. In the static analysis, the paper uses three different estimators (OLS plus time dummies, within estimator with orthogonal deviations and within estimator, using the Baltagi method). In the dynamic analysis, the paper uses the system GMM estimator, with the Windemeijer correction for small samples. The respective tests are carried out to make the results robust. In this section, the descriptive statistics of variables used in the model are also presented. Finally, section 5 summarises the main conclusions.

II. Literature review

II.1. Exports and productivity

Exporting firms have specific characteristics compared to the non-exporting firms. For example, exporting firms tend to have higher productivity levels, scale economies, employment and production efficiency. The exporting firms also incur high costs (sunk costs) when they endeavour to enter competitive international markets (Choi, 2003). According to the model developed by Choi (2003), the exporting firm faces a relatively high cost in its initial entry in the foreign market. These fixed costs act as a barrier to entry for many new exporting firms. Only companies with high levels of productivity can enter the foreign market. Girma et al. (2002), based on data from companies in the UK, found that exporting firms are, on average, larger and more productive than the other firms.

From the strategic point of view of the company, it is important to examine how competitive the company is in the internal market. Firms with market power in the domestic market may have less incentive to face international competition (and Hirsch and Bijaoui, 1985). However, a secure base at home can be a good platform for internationalisation and a competitive domestic market provides a better learning environment in order to compete in foreign markets (see, for example, Krugman, 1984; Porter, 1990). Moreover, large firms may acquire economies of scale, increases in productivity, efficiency and improvements in organisational and cultural characteristics if they attain the international market.

There are two hypotheses that justify the positive relationship between productivity and exports. The first hypothesis considers that there is a selection of the most productive firms, since to sell goods in foreign markets involves additional costs (transport costs, distribution costs and marketing, among others), which constitute a barrier to entry for less competitive companies. Based on Ricardo's theory of comparative advantage, the more efficient firms have higher productivity levels and are more likely to export (Bernard et al., 2003; Melitz, 2003). The second hypothesis points to the importance of learning-by-exporting. Firms' increasing exports are the result of knowledge and experience related to the external market (Fryges and Wagner, 2008; Aw et al. 2000). Exporting firms are exposed to more intense competition and have to act more quickly than firms that do not export.

Learning-by-exporting, as learning-by-doing, is mainly acquired by firms' participation in two ways. First, the contact with foreign clients promotes the transmission of knowledge and technology, allowing access to specific expertise, for example new product design and new

production methods, among others. Second, the foreign demand leads to higher capacity utilisation, and thus allows the economies of scale (see, for example, Castellani, 2002). Greenaway and Kneller (2003), based on data from industrial firms in the UK, concluded that the learning effects are not permanent and are significant only in the early period after the firm has entered the international market.

The Helpman et al. (2004) model suggests that higher productivity firms export whereas the low productivity firms remains in the domestic market. The model also suggests that the highest productivity firms may engage in exports and in FDI. Therefore, productivity is an important factor in explaining both exports and FDI. However, both exports and FDI may improve the firm's productivity (Kimura and Kiyota, 2006). This raises the problem of simultaneity and the need for appropriate instruments to resolve the problem. Fryges and Wagner (2008) estimated the relationship between exports and growth rate of labour productivity in German firms. They found that the relationship between productivity growth and the ratio of export sales is not stable over time.

The hypotheses on the relationship between exports and productivity need to be tested using the appropriate estimators. The Blundell and Bond (1998, 2000) system GMM estimator may resolve the type of problems linked to the endogenous explanatory variables.

II.2. Exports and innovation

Regarding the relationship between exports and innovation, there are distinct strands in the literature of international trade explaining the relationship between innovation and exports. First, in the Vernon (1960) product life cycle model, innovation is an exogenous variable that positively affects exports. According to this model, developed countries export innovative goods that are later imitated by other less developed countries. In the maturity phase, where the technology is standardised, these goods are produced in developing countries and exported to developed countries. Thus, in order to maintain their level of exports, the developed countries must innovate continuously. The more a company innovates, the greater its exports. This is the hypothesis that Lachenmaier and Woessmann (2004) test, using a sample of 981 German firms. Second, we have the endogenous growth models. These models endogenise the innovation and

consider the dynamic effects of international trade on innovative activity and vice versa (Aghion and Howitt, 1998).

The results obtained by Lachenmairer and Woessmann (2004) corroborate the hypothesis that innovation is critical to the performance of exports. They also confirm that innovative firms have substantially higher export quotas than those that do not innovate. Hirsch and Bijaoui (1985) consider also that innovative firms in a given industry have a higher propensity to export than the other firms. In analysing the effects of innovation on exports at the firm level, they have considered R&D expenditures as a proxy for innovation. The hypothesis that product innovation is the driving force behind exports was also confirmed by Cassiman and Martinez-Ros (2008), using data on Spanish firms.

The firms that implement technological innovations, investing in innovation and development (R & D) and that additionally are exporting firms have higher levels of performance in economic terms than firms with similar characteristics that do not innovate or export. Firms that perform both process and product innovation are more likely to export, compared with companies that do not seek to innovate (see, for example, Arbache, 2005; Becker, 2008).

There are two distinct channels by which innovation affects exports. First, the direct channel, when the firms perform innovations to supply the foreign markets with new products or developments of the existing products. Second, indirect effects, when there are external economies or spillover effects from the innovative firms to other firms belonging to the industry. The innovations made in the past by one firm may also have a positive impact on the probability to export of this firm (Wakelin, 1998). As is not easy to measure these spillover effects, the empirical studies generally use a quantitative index to test the effects of innovation on exports. Baptista and Swann (1998, p. 527) consider that agglomeration of industries provides more qualified inputs and “The importance of knowledge spillovers can make geographical proximity vital for innovative activity”.

Small firms that perform small innovations or do not have R&D departments are less likely to export and are better suited to supply only the domestic market. One possible reason is that, as mentioned earlier, entry costs into foreign markets are greater for small firms, leading them to opt for the internal market. Serrasqueiro and Nunes (2008), using dynamic estimators, conclude that performance is related positively to size. However, Cassiman et al. (2010) found empirical evidence that product innovation induces small firms to enter the international market.

II.3. Exports and equity capital

Most of the literature on equity capital focuses on firms' financing constraints, particularly the firm's access to credit (see, for example, Carpenter and Peterson, 2002), or on the relationship between the cost of equity capital and disclosure level and/or ownership, ignoring its impact on exports (see, for example, Botosan, 1997; Gilson and Whitehead, 2007).

Some empirical studies relate the size of the firm to its export capacity, using the number of employees or the total assets as a variable proxy for the size (e.g. Basile, 2001; Guan and Ma, 2003); Ito and Pucik, 1993). However, financial soundness, associated to the equity of the firm, is also a relevant factor in explaining export behaviour by different firms. The equity capital may also be considered as a variable proxy for the firm size, or as having the same effect as the firm size. Larger firms usually have a long history, are more competitive and profitable and have more opportunities to obtain results. Therefore, the dimension is also considered as a reverse proxy for the probability of bankruptcy (Antoniou et al. 2008).

The idea that a firm's size and its export behaviour is positively correlated was first presented by Krugman (1979), who considered the external market as an extension of the domestic market. Large firms have internal scale economies, reducing the unit fixed cost when the production increases. So, it is expected that the export intensity of large firms is higher than the export intensity of small firms (see, for example, Bonaccorsi, 1992; Basile, 2001; Guan and Ma, 2003).

The notion that the sunk costs, associated with large firms, are necessary to enter in the foreign markets probably induces firms to increase equity capital in order to remain in the foreign market. Thus, we can assert that the equity capital plays an important role in the firm's efforts to penetrate and remain in the international market.

III. Empirical model

In this section, we specify the econometric model. The variables to be used in the model and the theoretically expected signs are defined, as well as the descriptive statistics of the variables.

III.1. Dependent variable

The dependent variable corresponds to the exports (in euros) of the 97 largest Portuguese exporters to Spain for the period 2004 to 2008. The statistical source used was Dun & Bradstreet, with data that is obtained directly from the respective firms in the sample.

III.2. Hypotheses and explanatory variables

Based on the theoretical literature, the paper considers the following hypotheses and explanatory variables.

H1 The higher the productivity of the Portuguese firm, the greater are its exports to Spain.

The variable productivity (Product) is measured by gross value added (VA) per employee. The theoretically expected sign is positive (Melitz, 2003; Helpman et al. 2004; Kimura and Kiyota, 2006). Melitz and Ottaviano (2008, p.296) consider that “trade forces the least productive firms to exit and reallocates market shares towards more productive exporting firms”.

H2 An increase of equity capital will increase Portuguese exports to Spain.

Equity capital (EC), is the capital of the firm. The theoretically expected sign is positive. The equity can be viewed from two different perspectives. On the one hand, it is considered to be a possible way of financing investment activities and holding firms. On the other hand, it represents the assets of the company at a given time. Taking into account both definitions, equity reflects the "financial health" of the firm, i.e., high levels of capital provide greater security and capacity to the firm to invest in the exploration of overseas markets. Thus, increasing the equity represents the only way possible for the firm to obtain an increase in its production.

H3 The greater the remuneration per worker, the less will the Portuguese firm export to Spain.

The remuneration per worker (W) is the average salary in each firm. The theoretically expected sign is negative, since the higher the level of wages, the less competitive will the Portuguese firm be. Based on international trade theory, we can say that as Portugal, compared to Spain, is relatively abundant in non-qualified and semi-qualified labour, it has a comparative advantage in producing labour-intensive goods (Heckscher-Ohlin theorem). So, as non-qualified or semi-qualified workers receive lower wages, compared with those in Spain, it is expected that decreased wages will increase Portuguese exports to Spain. The HO theorem explains inter-industry trade, but not intra-industry trade (Krugman and Obstfeld, 2009)

H4 Greater R&D per capita leads to increased exports

R&Dpc is the expenditure on research and development per capita. If we consider that the competitive advantage is based on new products and product differentiation, the expected sign is positive (see Krugman, 1979, 1980, and the theory of intra-industry trade). The authors Lachenmairer and Woessmann (2004) argue that innovation is critical to the performance of exports. Cassiman and Martínez-Ros (2008) concludes that innovation in products is the driving force of exports. López-Pueyo et al. (2008) also link the effects of technology generated in the industry with productivity and international trade.

The trade in new products is mainly explained by scale economies, product differentiation, human capital and innovation (Krugman and Obstfeld, 2009; Artal et al. 2009). The comparative advantage (relative labour costs) may also influence this type of trade, but it is not the principal determinant (see, for a survey, Helpman and Krugman, 1985). Thus, we can consider that the Portuguese exports to Spain also include products differentiated by quality or other characteristics.

Therefore, if we consider that some Portuguese firms that export to Spain are innovative, greater R&D per capita may have a positive statistical effect on exports.

III.3. Econometric models

III.3.1. The static model

The following model tests for the effects of explanatory variables on Portuguese firms' exports (X) to Spain.

$$\text{Log}X_{it} = \beta_0 + \beta_1 \text{LogPRODUCTIVITY}_{it} + \beta_2 \text{LogEC}_{it} + \beta_3 \text{LogWit} + \beta_4 \text{Log(R\&Dpc)}_{it} + U_{it}$$

$$U_{it} = \eta_i + \delta t + \varepsilon_{it}$$

Where η_i is the unobserved time-invariant industry-specific effects; δt captures a common deterministic trend; ε_{it} is a random disturbance assumed to be normal, independent and identically distributed (IID) with $E(\varepsilon_{it}) = 0$ and $\text{Var}(\varepsilon_{it}) = \sigma^2 > 0$.

In the static model, it is considered that all explanatory variables are exogenous. That is, it is assumed that all variables are independent of the random residual term, ε_{it} , for all t . By hypothesis, η_i is not observable and invariant for each firm over time, but differs from firm to firm. If we consider that these effects are translated by a set of unknown constants, or by a set of random variables (average of η and variance σ^2), we have the fixed-effects model or the random-effects model. If fixed effects are equal for all firms, the appropriate estimator would be the least squares estimator (OLS-Ordinary Least Squares). The F-test rejected the null hypothesis that the effects are equal for all firms. Next, we used the Hausman specification test to choose between the random-effects estimator and the fixed-effects estimator (also named within estimator). One alternative to the fixed-effects estimator is the use of the *ordinary least squares* (OLS) with time dummies. The consideration of these dummies allows for the control of effects along the time for all sectional units (firms). Following Wooldridge (2003), and in order to see the sensitivity of the results to the estimator used, we also estimated the equation using OLS with time dummies.

All variables are in a logarithmic format, except dummy variables, allowing for the calculation of elasticities.

III.3.2. The dynamic model

Do exports contribute to increased productivity? This is the reverse effect, or the problem of possible simultaneity. On the other hand, past export experience may be a significant predictor of contemporaneous export behaviour. Firms that were exporters in the previous period are likely to export more than firms that were not previously exporters.

In the case of continuous dependent variables, the system GMM (GMM-SYS) estimator resolves this type of problem. In dynamic panel data models, the GMM-SYS estimator eliminates the unobserved firm-specific effects through the equations in first differences. The GMM-SYS estimator also controls for the endogeneity of the explanatory variables. A standard assumption on the initial conditions allows the use of the endogenous lagged variables for two or more periods as valid instruments, if there is no serial correlation (see Blundel and Bond, 1998, 2000). If we assume that the first differences of the variables are orthogonal to the firm-specific effects, this additionally allows the use of lagged first differences of variables for one or two periods as instruments for equations in levels (see Arellano and Bover, 1995 and Blundell and Bond 1998, 2000). The validity of instruments is tested using a Sargan test of the over-identifying restrictions. First-order and second-order serial correlation in the first-differenced residuals is tested using AR(1) and AR(2) statistics (Arellano and Bond, 1991). As we have a small sample, we decided to use the GMM-SYS estimator, but correcting the likely downward bias-estimated standard errors, using the Windmeijer (2005) correction.

The dynamic panel data model is presented as follows:

$$X_{it} = \beta_0 + \beta_1 X_{it-1} + \beta_2 \text{PRODUCTIVITY}_{it} + \beta_3 \text{EC}_{it} + \beta_4 \text{W}_{it} + \beta_5 (\text{R\&D}_{pc})_{it} + U_{it}$$

In the dynamic specification, the variables in logs are not considered because the estimations results did not improve.

III.4. Descriptive statistics

We present below the summary table of descriptive statistics of variables used in different

estimations.¹

Table 1. Descriptive statistics

Variables	Obs.	Mean	Std.Dev	Min.	Max.
X	435	4,645e+006	1,329e+007	1959,8	9,34e+007
Productivity	275	39902	33880	-242,1	2,36e+005
EC	435	5,55e+006	1,38e+007	-2,5e+005	1,32e+008
R&Dpc	110	2903,4	4216,1	17,497	18871
R&D	485	1,36e+005	5,9e+005	0	5,9e+005
W	275	14673	7119,4	4471,6	47031
W*	426	1,07e+006	1,78e+006	12072	1,73e+007
VA	435	2,88e+006	5,7e+006	-14260	4,69e+007
L	275	70	95,5	2	636

As can be observed, the sample is mainly of small and medium firms. The mean is 70 employees and the standard deviation is 95.5. There is one firm with two employees, while the largest firm has 636 employees. The data supplied by Dun & Bradstreet is highly irregular. We have 435 observations for the value added (VA), but only 275 observations for the number of

¹ The dynamic estimations suggest that there are not enough observations for the second-order autocorrelation (AR2) test. The problem is linked to the variable R&Dpc which has only 110 observations. When 35 missing values are inputted – considering that $R\&D(t) = R\&D(t+1)$ – the test AR2 is performed and the results show that there is no second-order autocorrelation. Other solution is to choose other econometric specification. So, considering that the variables VA (value added), W* (total remuneration) and R&D have the same expected sign and more observations than the variables PRODUCTIVITY, W and R&Dpc, we also estimated the following dynamic model:

$$X_{it} = \beta_0 + \beta_1 X_{it-1} + \beta_2 VA_{it} + \beta_3 EC_{it} + \beta_4 W^*_{it} + \beta_5 R\&D_{it} + U_{it}$$

However, there were multicollinearity problems between EC and VA and between W* and VA. Therefore, we decided not to present these estimations. The results are available from the authors upon request.

employees (L). So, the variable Productivity (VA/L) has only 275 observations. Similarly, we have 426 observations for the variable total remuneration (W*), but only 275 observations for the variable average salary (W=W*/L). Furthermore, the lack of information on the number of employees in some firms reduced the number of observations for the variable R&D per capita (only 110). This is important because in the dynamic models, the number of observations is crucial for conducting certain tests, namely, the Sargan test and the second order autocorrelation test.

IV. Analysis of results

IV.1 Static models

In the static estimations, the paper uses three estimators: OLS with time dummies, within-orthogonal transformations and within-deviations from individual means. We control for time effects by including a time dummy variable, while the regression coefficients are estimated using OLS. Orthogonal transformations and deviations from individual means are two transformation methods of the data matrix that eliminate the individual effect.

Table 2. Static estimations

Dependent variable : LogX						
	(1)		(2)		(3)	
Log Productivity	0,911	**	0,381	**	0,384	**
	(2,29)		(2,25)		(2,24)	
Log EC	0,968	**	0,208	*	0,297	**
	(5,90)		(1,89)		(2,57)	
Log W	-2,360	**	-0,398		-0,261	
	(-2,59)		(-1,37)		(-0,984)	
Log(R&D)pc	0,126		-0,050		-0,044	*
	(1,35)		(-1,51)		(-1,66)	
Constant	5,269		-0,017			
Wald (joint)	62,83 [0,000]		15,79 [0,003]		14,58 [0,006]	
R ²	0,58		0,26		0,29	
N	110		70		108	

Notes: The table shows the results of a panel data estimation Column (1) OLS + Time Dummies; Column (2) WITHIN (ORTHOGONAL) and Column (3) WITHIN (BALTAGI), also known as WITHIN-deviations from individual means.

T-statistics (heteroskedasticity corrected) are shown in round brackets.

P-Values are shown in square brackets.

*, ** and *** denote significance at the 10%, 5% e 1% levels, respectively.

The estimated equations show that for all of the three static models the test of the first hypothesis reveals that when productivity increases by 1%, the exports of the Portuguese firms also increase, but by less than 1%. (0.91% in the first equation; 0.38% in the second and third equations). The elasticity is inferior to 1. These results confirm theoretical predictions that the most productive firms engage in economic globalisation through exports or foreign direct investment (see, for example, Helpman et al., 2004). The explanatory variable EC (equity capital) is also statistically significant, with the predicted positive sign for the three specifications considered (OLS with time dummies, within-orthogonal deviations and within-deviations from individual means). The results show that when the capital is raised from firms' owners and shareholders, instead of by means of debt, this clearly has a positive impact on exports. These significant results for all estimates suggest that for Portuguese firms' survival in the Spanish market, the policy of raising equity capital is crucial.

The third hypothesis, that increasing labour costs (proxied by average wage) will cause decreased exports, is only confirmed when we use the OLS with the time dummies estimator. Thus, we can assert that to increase their exports to the Spanish market, Portuguese firms need to decrease their labour costs. If Portugal, compared to Spain, is relatively abundant in non-qualified or semi-qualified labour, it has a comparative advantage in making and selling goods produced by the intensive use of these types of labour. So, the results are in accordance with the theory. In the long run, higher productivity will possibly lead to higher wages through the labour allocation from less productive to more productive firms. More specifically, in the long run, we may expect a positive correlation between productivity growth and wages and a pattern specialisation change (Lewis and Richardson, 2001).

The fourth hypothesis is that exports may increase as a result of higher research expenditure (R&D). This explanatory variable is not significant when we use OLS with time dummies and

within (orthogonal deviations) estimators. Only with the within (Baltagi) estimator is the variable R&D significant, but with a negative sign. This result was not expected. One possible explanation is the endogeneity problem. Using the dynamic specification, we should obtain more reliable results.

IV.2 Dynamic models

The results of the dynamic estimations are displayed further below in Table 3. The equation (2) considers the same explanatory variables considered in the static model and the lagged dependent variable. The results show that only the variable R&Dpc and the lagged exports are statistically significant with a positive effect on Portuguese exports to Spain. The results given by equations (1) and (2) suggest that the exports in the previous period has a positive effect on contemporaneous exports (positive coefficient of the endogenous dependent variable). The productivity variable is also statistically significant with the positive expected sign. This result suggests that the more productive Portuguese firms engage in exports to Spain, whereas the less productive firms concentrate on the domestic market. The variable W (average wage) is also significant with a negative coefficient, as expected, suggesting that comparative advantage also explains the Portuguese exports to Spain (Heckscher-Ohlin theory). However, Portugal also exports R&D-intensive products to Spain. This is directly confirmed by the statistical significance of the variable R&D per capita. In the second equation, which controls for the small sample bias by using the small sample correction, the coefficient of the R&D variable is positive and statistically significant. Portugal has a competitive advantage over Spain in R&D-intensive products. How to explain this? The new theory of international trade considers that the trade between developed countries largely consists of intra-industry trade products and that this trade can be explained either by comparative advantages (labour costs) and/or by innovation, measured by the expenditure on R&D, and other variables such as scale economies and product differentiation. However, these dynamic results should be read with caution because we could not calculate AR2, due to the insufficiency of observations. The number of observations for some variables is too small.

Table 3. Dynamic estimations

Dependent Variable : X				
	(1)		(2)	
X _{t-1}	1,140	***	1,194	**
	(9,68)		(2,11)	
Productivity	450,65	***	1149	
	(3,34)		(1,43)	
W	-1168,57	**	-3231	
	(-2,19)		(-1,29)	
(R&D)pc	-2005,73		3083	**
	(-1,51)		(2,11)	
EC			-1,727	
			(-1,21)	
Constant	-0,042		-0,176	
Wald (joint)	262,9		2813	
	[0,000]		[0,000]	
Sargan Test	15,13		7,22	
	[0,875]		[0,926]	
AR(1)	-0,668		-0,657	
	[0,504]		[0,511]	
AR(2)	-		-	
N	102		102	

Notes: The null hypothesis that each coefficient is equal to zero is tested using two-step robust standard error (finite sample corrected standard errors). T-statistics (heteroskedasticity-corrected) are in round brackets. ***/**/* denote statistical significance at the 1%, 5% and 10% levels respectively. P-values are in square brackets. Year dummies are included in all specifications (this is equivalent to transforming the variables into deviations from time means). The AR(2) test was not possible, due to the insufficiency of observations.

V. Conclusions

In the model explaining the variation in exports to Spain, the static and dynamic results suggest that the increase in productivity and equity capital have a positive effect on increasing the exports of these firms to Spain. In all three static models, the results point to this conclusion. Thus, the Portuguese firms that are in better financial health and are more efficient are better equipped to resist the crisis and be competitive in the Spanish market. The OLS estimates also suggest that the increase of labour costs has a negative effect on exports, as expected. The variable R&D proved to be significant only in within (Baltagi), with a negative effect on Portuguese exports. However, when we control for endogeneity in the dynamic estimation, the results suggest a positive influence of R&D on exports to Spain. Expenditure on R&D is a theoretically important variable in explaining the variation in exports, as is confirmed by different studies at international level. Regarding the static and dynamic results, we may conclude that the dynamic specification provides more reliable results. However, the lack of available micro data for some explanatory variables, namely R&D, is the main obstacle to reach definitive conclusions from dynamic results. Further research should attempt to resolve this problem.

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