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The role of subsidies for exports: Evidence from Portuguese manufacturing firms

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Abstract

Production subsidies have not been used by International Business literature to explain firms internationalization processes. We argue subsides may have a role to play in that process. Using a longitudinal database (1996-2003) at the plant level, this paper aims to shed light on the causal nexus between production-related subsidies and exports, in Portugal. We implement a propensity score matching approach in order to evaluate the effects of subsidies on both the probability of domestic firms to begin exporting and on the probability of increasing the export share of already exporters. We find no impact of subsidies on the ability of domestic firms to become exporters; additionally, no effects of subsidies are detected on export shares. Such disappointing results may be explained by the inefficiency in the granting criteria.

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1. Introduction

Exports are decisive for countries´ economic growth, especially in downturn cycles when domestic aggregate demand is weak, however, firms, in order to start exporting or to export more, must overcome several difficulties and costs. So, most governments, to promote exports, apply various specific export promotion policies and generic production subsidies, even if direct export subsidization is forbidden by World Trade Organization (WTO) rules.

At the firm level, the internationalization of Small and Medium Enterprises (SME) has been explained, in International Business (IB) literature, by various models and theories; however, given the complexity of such a process, the comprehension of internationalization, requires the understanding of factors that make it happen or at least that make it possible which leads to an integrative model of internationalization as proposed by Etemad and Wright (1999). Such models assume foreign market knowledge as the key factor to enhance SME internationalization and in such a scenario subsidies could prove to be very useful as they can enhance market, network, cultural and entrepreneurial knowledge.

However, there are few empirical proofs that governmental (exporting) promotional policies are, indeed, effective in removing or at least in reducing the difficulties of exports. This lack of evidence may result from the fact that there are diverse institutional arrangements (both formal and informal, both direct and indirect, designed to help reducing such sunk costs of exporting) deriving complex the task of distinguish the mechanisms which are effective in promoting exports and which are not; moreover, such complexity and the very nature of the supporting mechanisms may open path to misuses, to abuses (e.g., Nogués, 1989) and even for a practical impossibility of controlling firms´ subsidies. Another important factor to consider is the scarcity of complete data, at the firm level, on public subsidies designed to help exporting, turning such test even more difficult.

Additionally, there is a methodological difficulty to the referred test given that it is impossible to observe the same firms with and without such subsidies and supports; in fact, only indirectly the impact of public support to exports has been analyzed. All these facts increase the doubt on this subject: are the public policies of export promotion ineffective or are we methodologically unprepared?

In line with some few and recent papers which investigate the connections between production-subsidies and exports, we use a large firm level dataset and matching procedures (e.g., Gorg et al., 2008 for Irish firms or Girma et al., 2009a for German firms) in order to assess the importance of subsidies to exporting activities. The main motivation of this paper is to present significant evidence of the links between production related subsidies granted to Portuguese firms and their export performance. In order to do it, we use the most representative panel data for manufacturing firms in Portugal, for the period 1996-2003, and apply a propensity score matching approach to reveal the causality nexus from subsidies to exports.

This paper adds a contribution to a relatively new and limited branch of international management literature which studies the relationships between subsidies and exports; although Portugal is not a major partner in international trade, the long tradition of Portuguese governments in supporting firms with production subsidies gives to our analysis a special importance.

In line with previous studies (Gorg et al, 2008; Girma et al. 2009.a) for other countries, we notice that production subsidies have, in general terms, no impact on the probability of domestic firms to begin exporting;

moreover, even a counterproductive effect is noticed one year after grants are received suggesting their misuse. Regarding exporting firms, we found no effects of subsidies on exports; previous studies had only found weak effects mainly concentrated in highly subsidized and intensive capital firms.

At another level we have also studied the role production-subsidies may have in the economic performance of firms; in general, subsidies seem to generate positive effects on the efficiency and sales of firms already exporters and fewer effects on domestic firms, thus explaining the idea of the incapacity of subsidies to promote new exporters as they do not improve their efficiency required for foreign markets.

The rest of the paper is organized as follows: Section 2 presents a brief summary on the main related literature. Section 3 describes the data used for this study. Section 4 presents some evidence on subsidies and exports in Portuguese firms. In Section 5 we present the main econometric results obtained for the analysis of subsidies´ impact on exports. Section 6 analyzes subsidies´ impact on firms´ general performances and Section 7 concludes.

2. Literature on SME internationalization and the role of subsidies

The International Management (IM) literature assumed through times different perspectives in what concerns firms internationalization. Over the past five decades, scholars have presented various descriptive models of export behavior and export performance and hundreds of different variables have been advanced in the literature as determinants of export performance. Whatever is the perspective or model used, we argue that subsidies could be one of such important variables: we present three examples.

One of the most used approaches of IM literature towards internationalization was the Resource –Based-View of the firm (Barney, 1991 or Wernerfelt, 1984) which focuses on how sustained competitive advantage is generated by the unique bundle of resources at the center of the firm (e.g., Conner and Prahalad 1996); subsidies received by firms could be one of such resources. Moreover, this approach assuming firms are sets of assets focuses on internal characteristics such as capital, knowledge or workforce; in this perspective subsidies could also help firms to obtain such inputs more easily and then help firms to export[1].

At another perspective, Johanson and Vahlne (2009) stated that it is the liability of “outsidership” rather than the liability of “foreignness” that gives rise to internationalization difficulties. They use “outsidership” to mean that the firm is not a member of relevant networks and that internationalization can be seen as a way to become an insider in relevant networks in the focal foreign market. Those authors see internationalization as a by-product of efforts to establish or improve on a position in a foreign network; in this line, subsidies could be a support to such strategy by providing that firms with the resources necessary to hire specialized workforce able to perform network efforts with success.

Nevertheless, given the complexity of internationalization processes, the need for a new perspective in explaining firm internationalization has arisen in recent years. In fact, each previous perspective proposed so far only explained partly the phenomenon but internationalization is a complex phenomenon. Such complexity involves the decision maker, the network´s role, the firm characteristics, the culture and environment surrounding firms and much more factors. Therefore, to understand internationalization, it is necessary to understand the factors that make it happen and the factors that hamper it. This leads to the internationalization integrative models (e.g., Prashantham 2005) in which the importance of foreign market knowledge has been

[1] Even if some authors (e.g., Tecce et al. 1997) argue that such resources must be built inside the firm and not bought outside it.

stressed along several channels: market knowledge, network knowledge, cultural knowledge and entrepreneurial knowledge; moreover, in such models the importance of foreign market knowledge is mixed with the absorptive capacity of firms in learning about foreign markets. In fact, organizational learning has always been viewed as being a decisive factor of the entrepreneurial process (e.g., Lumpkin and Lichtenstein 2005).

Although not explicitly analyzed in IM literature, production subsidies could help firms reducing their handicaps, thus contributing to a higher ability to face internationalization; in fact, subsidies granted: (i) to create new specific jobs fulfilled with experts in market knowledge or cultural knowledge, (ii) to help supporting specific production costs, (iii) to help supporting some costs for imported materials and bought for future exported products of higher quality or (iv) even to pay for some employees´ training, they may all contribute to improve firms´ absorptive capacity and their ability to overcome foreign market entry costs. In such a way, subsidies could enhance domestic firms to internationalize and exporters to develop their performances.

Moreover, in international economics literature, some heterogeneous firms´ trade models (e.g., Melitz, 2003) suggest that export subsidies can indeed increase productivity by inducing a reallocation of labor from less to more productive firms, even if an exclusive focus on productivity can be counterproductive and a broader analysis is necessary. In fact, export subsidies may present also some dangers namely when they are misused by managers or when their grant relies on subjective mechanisms based on arbitrary decisions, case in which the competition among firms in order to obtain them may generate negative impacts[2].

Despite the importance of public policies to promote exporting activities, there are, however, few empirical studies that have investigated this issue. A first wave of such empirical studies relied on industry level–data[3] and only recently firm-level data begun to be used for such analysis. In 2000, Alvarez and Crespi studied the activity of the Chilean export promotion agency with direct firm-level sample data and found a positive effect of such public policies on firms´ exports (both in the extensive margins and in intensive margin). Bernard and Jensen (2004) studied the determinants of exporting activity in the US, investigating amongst other things, whether export promotion expenditures at the state level influenced the decision of US plants to export or not; their findings suggest little evidence that such policies are able to encourage participation of US domestic manufacturers in the global market. By contrast, Martincus and Carballo (2008) and Helmers and Trofimenko (2009) still using exports subsidies, find some positive effects on export performances of such subsidies, using firm level data for Peru and Colombia, respectively.

Not disposing of direct data on export promotion subsidies, other studies opt to analyze the effects of overall production-related subsidies on firms´ export performance. Gorg et al. (2008) found, for Irish firms that production subsidies were not capable to motivate domestic firms to become exporters; nevertheless, they found subsidies, with a minimum level, being able to enhance the performance of already exporters. Girma et al. (2009b) had found similar results for Chinese as they noticed production subsidies stimulate exports of already exporting capital intensive firms. In 2009, applying a matching approach to investigate the causal effect of production subsidies on export activities, Girma et al. (2009a) also found no impact of subsidies on the probability a domestic firms to start exporting but they also found weak evidence for a positive impact of subsidies on the growth of the share of exports in total sales, in West Germany but no evidence in East Germany.

[2] See Mitra (2000) for an example of this situation.
[3] See Helmers and Trofimenko (2009) for a review of such literature.

3. Data

In Portugal, production-subsidies are financial assistance that firms receive from government, local authorities or from European Union aiming to lower firms´ production costs and the prices of produced goods or even to provide a proper payment for factors of production. In accounting terms, Government grants are assistance by government in the form of transfer resources to a firm, in return for past, present or future compliance of certain conditions related to the operational activities of the company. It is important to remark that these production subsidies are not specifically created to promote exports.

Our data source is the Portuguese National Statistics Institute (INE) balance sheet information (IAE). IAE provides information of firms' balance sheets,[4] and uses a survey sample[5] of all manufacturing Portuguese firms, from 1996-2003. We used as variables: number of employees, turnover, production-subsidies, imports, exports, number of employees specifically devoted to R&D activities, share of foreign capital, capital, labour costs and earnings. Firms are classified according to their main activity, as identified by INE standard codes (CAE), which are correlated with Eurostat Nace 1.1 taxonomy. Despite being unbalanced, our database contains information for an average of 4,500 firms per year. Capital is proxied by tangible fixed assets at book value (net of depreciation). All nominal variables are measured in 1996 Euros and are deflated using 2 digit industry-level price indices provided by INE; for capital stock we use the same deflator for all sectors.

Given that we were interested in a firm-level productivity measure and since it is highly probable that profit-maximizing firms immediately adjust their input levels, each time they notice productivity shocks, productivity and input choices are likely to be correlated and thus Total Factor Productivity (TFP) estimation involves problems. Thus, in line with several authors (e.g., Maggioni, 2009), TFP is estimated using the semi-parametric method of Levinsohn and Petrin (2003). This method recognizes the simultaneity bias as firms observe the productivity shocks but econometricians do not. Thus, we compute TFP as the residual of a Cobb-Douglas production function in which: the firm value added is the independent variable; capital, labour and unobservable productivity level are the dependent ones. Besides, this method assumes that intermediate inputs present a monotonic positive relationship with productivity and thus could be used as proxies for TFP. Given data availability, we use intermediate inputs as the deflated values of "supplies and services consumed from thirds" at book value. We estimate production function for every 2-digit sector separately.

4. Evidences on exports and subsidies

Table 1 shows that, in the period 1996-2003, 26% of Portuguese firms received production-related subsidies, at least for one year. Of the firms receiving subsidies 80% were already exporters and only 20% non-exporters; this fact suggests that subsidized firms are already in a superior path. The status of subsidized firm is highly stable; in fact, subsidies´ support was highly persistent as 31% of all subsidized firms reported to have obtained operating subsidies in each and every year of the study and more than half of firms had subsidies for at least 6 years out of 8 (Table 2).

[4] Since 2004, INE has changed its methodology and works with the universe of Portuguese manufacturing firms but before 2004 the only data available is the one we use.

[5] Our database includes all manufacturing firms with more than 100 workers and a representative sample of the

Table 1 – Production-Subsidies in Portuguese firms (1996-2003)

Firms with subsidies	Firms without subsidies	Total of firms observed
2,831 (26%)	7,922 (74%)	10,753 (100%)

Source: Own calculations

Table 2 – Subsidies persistency in Portuguese firms (1996-2003)

Number of years with subsidy	8	7	6	5	4	3	2	1
% of firms subsidized	31%	9%	9%	10%	10%	12%	9%	10%

Source: Own calculations

Subsidies represented, on average for that period, 1,4% of sales for subsidized firms but there was a considerable time heterogeneity as reflected in Table 3. A sectoral heterogeneity was also observed as firms belonging to sectors like: food and beverage, furniture and recycling sectors obtained the higher values of subsidies per sales and in most cases the higher values of subsidies per employees (Appendix A).

Table 3 – Subsidies by year and employee

Year	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Weight of subsidies on sales (%)	1,8%	1,8%	1,4%	1,3%	1,1%	2,2%	0,9%	0,8%
Subsidy by employee (€)	232	243	280	258	291	178	185	189

Source: Own calculations

Subsidies, for subsidized firms, are much concentrated. For Portuguese firms, international trade and subsidies are much more concentrated than employment or sales, as measured by the Theil index for inequality assessment (Table 4).

Table 4 – Concentration of Portuguese firms' employees, sales, trade and production subsidies (average 1996-2003)

Variable	**Theil Index**
Employees	0.68
Sales	1.43
Exports	2.33
Imports	2.52
Subsidies	2.35

Source: Own calculations

Subsidies and exports are positively related as observed in Table 5. We use as dependent variables in column (1) and line (1) a dummy for exporter status in each year and in column (1) and line (2) a variable for export shares in total sales; each of those variables are regressed on a constant, a dummy for subsidized firms,

sectoral codes and size. In column (2) similar regressions are performed but firm fixed effects are added. We perform regressions using logit models for export status dummy and fractional logit models for export shares[6]. All regression coefficients are positive and statistically significant, even when controlling for firm fixed effects and sectoral and time effects. These positive coefficients mean that subsidized firms, when compared with non-subsidized firms, are more probably exporters (first line of regressions) and among exporters subsidized firms present a higher share of exports relative to total sales (second line of regressions). The consistency of such coefficients is confirmed by the fact that, although not reported, such correlation is observable for each and every year between 1996 and 2003. However, those positive coefficients do not mean the existence of any causality relationship between subsidies and exports.

Table 5 – Subsidies and exports (average 1996-2003)

	Independent variable: Subsidized firms (dummy)	Independent variable: Subsidized firms (dummy) (firms fixed effects)
Dependent variable: Exports (Dummy)	0.566 (0.00)	0.131+ (0.10)
Dependent variable: Exports (Share)	0.271 (0.00)	0.112 (0.09)

Source: Own calculations.

5. Evaluating the effects of subsidies on exports

In order to investigate the causal effects of production-related subsidies on the probability to export and on export shares of total sales, we must use a different methodology, beyond regression analysis. In fact, the alleged positive relationship may be the result of both causality directions: (i) on one hand, a production-subsidy may help firms to support fixed costs related with the beginning of exporting activities or to deal with particular markets´ difficulties; moreover, subsidies have the ability of reducing some variable costs of already exporters thus inducing an increase in export shares in total sales; (ii) at the other hand, new exporting firms or firms reaching to export to particular destinations may gain the right to collect some subsidies that governments use to reward such performances. Thus, the causality may run in both directions; not to mention the fact that there may exist other firms´ characteristics beyond subsidies and exports that can influence simultaneously both: Girma et al. (2009a) mention as a clear example of such variables the influence of R&D activities on this issue.

Other important fact to remember when dealing with such methodological issues is that subsidies are not granted to firms at random but instead their allocation is (or should be) the result of a conscious selection from governments. In fact, we can admit two opposite selection methods: (i) one relies on the fact that subsidies are granted conditional on the observation of some criteria[7] that firms must fill, like: certain products exported, certain types of workforce employed, certain markets achieved, certain types of firms or sales from certain regions of the country; (ii) the other selection method relies on the possibility of subsidies to be granted on the basis of firms´ connectedness and proximity with Government or public officials and related members. Although opposites both introduce a selection criteria on subsidized firms thus requiring other methods than simple regression analysis in order to properly evaluate the effects of subsidies on firms´ performances.

[6] We use fractional logit models given the fact that the share of exports in total sales is a percentage variable with a high probability at zero due to the large share of firms with no exports. See Papke and Wooldrige (1996)

[7] Sometimes the complexity or opacity of those criteria can create situations of negative effects of subsidies on firms´ performances given the fact that some of them feel discouraged from applying for subsides (see Helmers and Trofimenko, 2009, for further discussion).

Thus, by assuming subsidies (whatever form they have) are not randomly granted to firms means one cannot assess their effects simply by a simple comparison between subsidized and non-subsidized firms. In line with Girma et al. (2009a), we argue that this situation closely claims for the use of matching methods. In fact, the ideal method for evaluating subsidies´ effects would be to compare two situations for the same firm: (i) its performances in some year – e.g., exports in that year – in the case it had received a public subsidy with, (ii) the performance on the same moment had it not received such support, which would be the counterfactual situation. Given that the information about the counterfactual will never be available, several authors (in line with Heckman et al. 1998) argue that an adequate way to obtain an appropriate evaluation on the effects of the subsidies is to build a "control group" of firms that did not receive subsidies in that year but were as similar as possible with those firms receiving subsidies in that moment (the treated ones or starters).

By using matching techniques, we hope to build consistent counterfactuals to every subsidy "starter", while using a generic non-subsidized firm as the comparison group would not allow us to make causal inferences, since the observed differences after subsidies begin could exist previously in a pre-subsidy period and remain after it. Assuming the possibility of building such group of control firms, then we would match every treated firm with one or several control firms (the most similar to the first) and therefore we would assume that differences between their performances, in the future, to be the result of such treatment (subsidy) which one firm received (the treated) and the other (control) did not.

We are interested in two complementary analyzes: at one hand, we want to evaluate the impact of subsidies on the probability of non-exporting firms to begin exporting; at the other hand, we are interested in evaluating the effects of subsidies on the exporting performance of firms already exporters.

In order to apply such methodology to the study of the causal effect of subsidies on starting to export, we consider as the treated group of firms, for every year from 1998 to 2002, the firms which, in each year, fill the following cumulative conditions: (i) without subsidies two years before, (ii) without subsidies in the year before, (ii) with subsidies in the year considered, (iv) never exported until that year. The control group for each year is made by the firms which had not subsidies in the whole period 1996-2002 and which did not export until the analyzed year. Appendix B presents the number of treated and control firms that were used.

At the other hand, in order to study the causal effect of subsidies on the share of exports in total sales, we consider as treated group of firms, for every year from 1998 to 2002, the firms which, in each year, fill the following cumulative conditions: (i) without subsidies two years before, (ii) without subsidies in the year before, (ii) with subsidies in the year considered, (iv) with exports in the previous year. The control group is made by the firms which have not subsidies in the whole period 1996-2002 and which exported in the previous year. Appendix C presents the number of treated and control firms that were used for this test.

In order to apply matching procedures we must start by estimating the propensity score. This particular propensity score is performed using a probit regression of a dummy variable equal to 1 if a firm is subsidized (treated) in that year and 0 otherwise. Such dummy is, as a base model, regressed on several variables lagged one year[8]; these variables are assumed to be relevant[9] in the selection of firms to be subsidized: number of employees, total factor productivity, wages, a dummy for the existence of R&D workforce, a foreign capital dummy, earnings, sales, two digit sectoral dummies. To free up the functional form of the propensity

[8] In order to respect the Conditional Independence Assumption.
[9] Given that we are using general production subsidies and not specific ones we opt to consider as determinants for subsidy selection common variables mostly used on the previous empirical works on this subject (e.g., Girma et al., 2009 or Gorg et al. 2008).

score we also included higher order polynomials and interaction terms. Nevertheless, in the search of the higher quality match, different specifications were used for different years and that option revealed to be more adequate than using only a single specification for all time cohorts of treated and control firms.

When performing these estimations in each year, we observed the importance of the different covariates for the dependent variables; although with some heterogeneity, we noticed some regularities as firms´ sector, previous importer status and foreign capital share were most frequently important factors in explaining firms´ probability of receiving subsidies (Appendix D). Otherwise, the efficiency level, the presence of R&D within the firm and wages were not significant in explaining the probability of a firm to receive a subsidy.

After propensity scores are obtained, several algorithms could be used to establish the match between treated and control firms. We tested, with similar results, the use of two of those weighting schemes: kernel matching and nearest neighbour matching¸ given their better properties on variance, we will present results based on the Epanechnikov kernel.[10]

In order to evaluate the matching quality we implemented a balancing test proposed by Becker and Ichino (2002) and a standard *T*-test for equality of means. The quality of the matching is confirmed as in Appendixes D and E it is evident the high percentage reduction in bias between treated and controls achieved after the matching, thus ensuring we choose the right specification for propensity score. We also ensure the common support condition which means that we drop subsidy starters which presented in each year a propensity score higher (lower) than the maximum (minimum) score of non-subsidized firms.

Given that our purpose is to evaluate the effects of subsidies on the probability of a domestic firms of start exporting and on the export share of total sales of already exporters, we compute[11] the average treatment effect on the treated (ATT) as follows: (i) for the first case, we are interested in the differences between the percentage of export starters (the outcome variable) among the subsidized firms (treated) and the same percentage for non treated firms; (ii) for the second case, ATT means the difference in the change of the export share of total sales (the outcome in question) between the treated firms (new subsidized in each year) and the same outcome for matched non treated firms (firms that remain non-subsidized in that year). We assess ATT both for the year in analysis (year $_t$) and for the next three years. When performing that second ATT we are controlling for unobservable, time-invariant differences between treated and untreated firms, thus, in practice we implement a difference-in-differences matching estimator, as suggested by Blundell and Costa Dias (2000) and Heckman et al. (1998). So, we compare the change in exports´ performance between the group of new subsidized and the most similar group of non-subsidized firms. Results for the pooled sample of all years´ causal effects of subsidies on starting to export are reported in Table 6.

Table 6 - Causal effects of subsidies on starting to export, 1998-2002

	ATT (prob.exp $_t$)	ATT (prob.exp $_{t+1}$)	ATT (prob.exp $_{t+2}$)	ATT (prob.exp $_{t+3}$)
Pooled sample	-0.026^{+}	-0.152*	-0.052^{+}	0.007^{+}
	(0.077)	(0.086)	(0.087)	(0.016)

Source: Own calculations.

Notes: We report bootstrapped standard errors (500 replications). If nothing mentioned coefficients are significant at 1%.**: mean significant at least at 5%. * means coefficients are significant at least at 10%. $^{+}$ means coefficients are not significant.

[10] We use a bandwith of 0,001. Moreover, the results show little sensivity on the weighting regime used or on the bandwith interval.
[11] We use psmatch2 command (version 3.0) for Stata 10.1

We find no evidence of subsidies to enhance internationalization of domestic firms; on the contrary, there is some evidence suggesting that subsidies imply a decrease in exports probability of firms, especially one year after the subsidy is received. Although not reported, we have also tested similar effects for each of the single years of the sample but the no effects are noticed. These poor effects of subsidies could be the result of the fact that they are not designed specifically to enhance exports; moreover, the possible positive effects on employment or sales may be insufficient to spread to other variable, thus impeding firms´ internationalization.

Results for the causal effects of subsidies on the share of exports in total sales are reported in Table 7.

Table 7 - Causal effects of subsidies on export shares, 1998-2002

	ATT (Exp Share $_t$)	ATT (Exp Share $_{t+1}$)	ATT (Exp Share $_{t+2}$)	ATT (Exp Share $_{t+3}$)
Pooled sample	0.013^{+} (0.076)	0.074^{+} (0.011)	-0.073^{+} (0.131)	-0.119^{+} (0.137)

Source: Own calculations.

Notes: We report bootstrapped standard errors (500 replications). If nothing mentioned coefficients are significant at 1%.**: mean significant at least at 5%. * means coefficients are significant at least at 10%. $^{+}$ means coefficients are not significant

There is no evidence, that subsidies cause any increase in exports´ share of total sales. This absence of effects occurs both for the year subsidies start and for the following three years. Moreover a non-reported analysis for each individual year of the sample shows that no effect is detected.

In a complementary analysis and given that subsidies present a considerable heterogeneity in what respects: values per employee, average levels by year (Table 3) and average level by industrial sector (Appendix A), we argue that it would be of considerable interest to perform an analysis of subsidies´ effects using not a binary treatment approach as we do, but instead a continuous treatment approach, varying between zero and a certain maximum amount. However, the use of a generalized propensity score is hampered by the highly skewed distribution of subsidies per employee and even by the dominant share of non-subsidized

Nevertheless, in order to study the impact of subsidy level on the causality nexus for the probability of exporting and for the export share in total sales, we repeated all previous tests but with one difference: we add an additional condition to treated firms – treated firms have to receive, in each year, a subsidy per employee higher than the double of each year´s average subsidy per employee – in order to evaluate only highly subsidized firms and not all subsidized firms. This computation meant a reduction in the number of “treated firms” by an average of 40% given the initial number. The results of such causality effects of high subsidies on the usual two dependent variables are expressed in Table 8 but no kind of effects are detected.

Table 8 - Causal effects of high subsidies p.e. , 1998-2002

	ATT (prob.exp $_t$)	ATT (prob.exp $_{t+1}$)	ATT (prob.exp $_{t+2}$)	ATT (prob.exp $_{t+3}$)
Propensity to export	-0.115^{+} (0.108)	-0.091^{+} (0.104)	0.071^{+} (0.114)	0.031^{+} (0.04)
Export share	(0.031)$^{+}$ (0.112)	-0.177^{+} (0.154)	0.091+ (0.142)	0.014+ (0.089)

Source: Own calculations

Notes: We report bootstrapped standard errors (500 replications). If nothing mentioned coefficients are significant at 1%.**: mean significant at least at 5%. * means coefficients are significant at least at 10%. $^{+}$ means coefficients are not significant

Additionally, in order to take advantage of a sectoral analysis for the whole period 1998-2002, we performed a separate ATT for each of the 23 two-digit industry sectors available. In what concerns the probability of starting to export for domestic firms, the very limited number of observations for some sectors did not allow us to perform that analysis to all sectors[12]; nevertheless, we noticed that the probability of domestic firms to become exporters was only confirmed for the group of sectors related with the machinery cluster, involving all types of machines (electrical type, office type, motor vehicles and general machinery). Inversely, for food and beverage sector the subsidies reduced the probability of domestic firms to become exporters. For all other sectors no evidence of any kind of effects was noticed.

Regarding the change in export shares of already exporters, the number of observations available allowed us to perform ATT computations for the majority of two digit industrial sectors. Results in Appendix E show that on one hand, there are positive effects of subsidies in export shares for basic metals, general machinery and electrical machinery; at the other hand, some sectors testify negative effects of subsidies on export share of total sales: food and beverages, textiles, pulp and paper, fabricated metal products. However, given the limitations of the dimension of our sample for most groups, additional precaution is needed in what concerns general conclusions.

We have also performed two more complementary tests: (i) in the first, we divided firms based on initial TFP level and we observed[13] that for firms with higher TFP levels, subsidies generated a positive impact on export shares, while for other firms there was no visible effect; we argue that subsidies have higher ability to generate positive impacts on exports when firms possess a superior absorptive ability; (ii) in the second test, evaluating the effects of subsidies, conditional on initial earnings level (Table 9) suggests that grants generate negative effects on the probability of exporting of firms with positive earnings, while in firms with negative earnings no visible positive effects are detected.

Table 9 - Causal effects of subsidies on the probability of exporting, 1998-2002

	ATT (prob.exp $_t$)	ATT (prob.exp $_{t+1}$)
Firms with negative earnings	0.043^{+} (0.115)	-0.163^{+} (0.123)
Firms with positive earnings	-0.192 (0.086)	-0.271 (0.101)

Source: Own calculations

Notes: We report bootstrapped standard errors (500 replications). If nothing mentioned coefficients are significant at 1%.**: mean significant at least at 5%. * means coefficients are significant at least at 10%. $^{+}$ means coefficients are not significant

6. Assessing the effects of subsidies in general firms´ performances

Given that production subsidies observed in our database are not specifically oriented to export enhancing but aim, in general , to promote employment, to support specific industries eventually in specific region and to help specific firms in difficulties, we admit it would be of most interest to analyze their impact on general firm performances.

According to Community European Treaty, state aids to firms have in common the fact that they are granted by a member State or through State resources and they favour certain undertakings or the production of

[12] Given the small number of observations we decided not to present the results in the form of table
[13] These results are not reported.

certain goods, but they may also distort or threaten to distort competition, affecting trade between member States. Thus, state interventions could be necessary in order to reach a better allocation of resources but simultaneously they may harm the competition environment, with negative consequences. In this framework the consequences of subsidies to firms could be either positive or negative and previous studies are not sufficiently decisive to support a clear statement on what´s to be expected on this issue: Bergström (2000), Tzelepis and Skuras (2004) found that subsidized investments under the regional development frameworks (structural fund programs) were ineffective.

Gadd et al. (2009) present a summary on previous research on this subject: on one hand, some positive effects on employment and on the dynamics of turnover and employment are reported for subsidized firms; at the other hand, negative effects on productivity growth rates are also observed in subsidized firms. The very study of Gaad et al. (2009) for Swedish firms, using a propensity score matching approach, concluded that subsidies enhanced employment growth levels of subsidized firms but there was no positive effect on firms´ productivity.

Using our database for Portuguese manufacturing firms we performed other ATT computations for the subsidies effects on several other variables: wages, sales, employment, total factor productivity and imports. Table 10 present subsidies´ effects on domestic firms and Table 11 presents the same effects but on already exporters.

The general conclusion is that subsidies generate more positive effects on firms already exporters and fewer effects on domestic firms; such positive effects are observed in exporters´ employment, sales and TFP. For domestic firms, subsidies seem to decrease wages and to increase firms´ ability to import. Moreover for both group of firms, subsidies seem to reduce firms´ earnings some years after subsidies are granted[14].

We argue that, for domestic firms some subsidies could be directed to partially support costs of some imported materials; such effects are observed, one year after subsidies´ granting. However, in spite of such positive effect it does not produce any impact on those firms´ exporting abilities. At another level, subsidies generate wage decreasing in the same domestic firms. Overall, for these firms the impact of subsidies is restricted to employment and imports but does not impact efficiency and profitability, by the contrary it seems to reduce earnings some years after.

Table 10 - Effects of subsidies, pooled 1998-2002, for domestic firms

	Wages	Sales	Employees	TFP	Imports	Earnings
Year $_t$	-0.042*	0.004^{+}	0.046*	0.243^{+}	-0.781*	0.025^{+}
	(0.022)	(0.056)	(0.022)	(0.485)	(0.52)	(0.092)
Year $_{t+1}$	-0.053*	0.048^{+}	0.031*	-0.048^{+}	0.321*	-0.042^{+}
	(0.027)	(0.075)	(0.015)	(0.067)	(0.211)	(0.087)
Year $_{t+2}$	-0.032^{+}	-0.042^{+}	0.062^{+}	-0.962^{+}	0.542*	-0.031^{+}
	(0.034)	(0.091)	(0.052)	(0.923)	(0.321)	(0.102)
Year $_{t+3}$	0.001^{+}	0.123^{+}	0.011^{+}	-0.124^{+}	0.043^{+}	-0.212*
	(0.012)	(0.231)	(0.142)	(0.165)	(0.054)	(0.159)

Source: Own calculations

Notes: We report bootstrapped standard errors (500 replications). If nothing mentioned coefficients are significant at 1%.**: mean significant at least at 5%. * means coefficients are significant at least at 10%. $^{+}$ means coefficients are not significant

[14] Given data limitations we could not test this hypothesis any further; anyway, we can argue that subsidies harm firms´ profits three years after being received what could be derived from the subsidies´ persistency creating in some firms negative behaviors conducing to less efficiency.

Overall, effects (both positive and negative) seem to be more robust for domestic firms than for already exporters. Moreover, such superior strength of subsidies´ effects also seems to perform more clearly in the following year after subsidy reception than in the same year it occurs.

Table 11 - Effects of subsidies, pooled 1998-2002, for firms initially already exporters

	Wages	Sales	Employees	TFP	Imports	Earnings
Year $_t$	0.017^{+}	0.032^{+}	0.064*	0.035*	-0.028^{+}	0.016^{+}
	(0.052)	(0.027)	(0.041)	(0.022)	(0.112)	(0.112)
Year $_{t+1}$	0.002^{+}	0.057*	0.036*	0.034^{+}	0.042^{+}	-0.062^{+}
	(0.017)	(0.033)	(0.013)	(0.027)	(0.081)	(0.143)
Year $_{t+2}$	0.005^{+}	-0.036^{+}	-0.006^{+}	0.054*	-0.078^{+}	-0.052^{+}
	(0.013)	(0.028)	(0.019)	(0.037)	(0.065)	(0.142)
Year $_{t+3}$	0.014^{+}	0.062	0.037^{+}	0.024^{+}	0.001^{+}	-0.332*
	(0.017)	(0.034)	(0.028)	(0.027)	(0.121)	(0.189)

Source: Own calculations

Notes: We report bootstrapped standard errors (500 replications). If nothing mentioned coefficients are significant at 1%.**: mean significant at least at 5%. * means coefficients are significant at least at 10%. $^{+}$ means coefficients are not significant

7. Concluding remarks

International Business and Management literature has not yet studied the role of production subsidies to firms´ ability to export; however, whatever model or approach we use, subsidies may perform a role in facilitating internationalization; in fact, given that internationalization success requires foreign market knowledge and its absorption and appropriation by firms, subsidies could facilitate the internationalization process. This paper investigates, for the first time for Portuguese firms, the links between general production-subsidies and exports. Although being positively related those variables´ connections may suffer from endogeneity and sample selection. Thus, in order to really uncover their relationship we apply a propensity score matching approach to reveal the causal effects of subsidies on exports.

Contrary to our best expectations, we found that in Portuguese firms, production subsidies had neither visible impacts on the probability of a domestic firm to become exporter, nor positive impacts on the export intensity of already exporters. Nevertheless, in a more disaggregated analysis we noticed that subsidies had positive effects on the probability of domestic firms to become exporters, only for the group of firms related with the machinery cluster, thus involving all types of producer of machines (electrical type, office type, motor vehicles and general machinery). We argue that such disparities rely on the fact that as production subsidies are not tailored to export enhancement they only generate positive effects when other requirements are achieved. In fact, even when firms have decided to internationalize they may still be vulnerable to several constraints in their process; in this line to know the main barriers firms face is an important contribution to the explanation of the previous results. More probably, subsidies were wrongly designed or were badly conducted by firms impeding better results; the persistency of subsidies in the same firms may be a clue in such facts.

When analyzing the effects of subsidies on firms´ general performances we observe that subsidies help exporters to improve efficiency, sales and employees while for domestic firms, subsidies only enhance efficiency and imports.

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APPENDIX A – Average 1996 - 2003

Sector code	Sector Description	Subsidies / Sales (%)	Subsidies per employee
15	Food, beverages	3.1	2870
17	Textiles	0.6	250
18	Wearing apparel	1.1	263
19	Leather	0.6	223
20	Wood	0.7	338
21	Pulp and paper	0.3	280
22	Printing	2.2	652
24	Chemicals	0.6	567
25	Rubber, plastic	0.4	285
26	Non-metalic mineral product	0.8	307
27	Basic metals	0.3	191
28	Fabricated metal products	0.5	230
29	Machinery	0.6	256
30	Office machinery and computers	0.7	585
31	Electrical machinery	0.3	223
32	TV and communication equipment	0.5	330
33	Medical, precision and optical instruments	0.8	438
34	Motor vehicles	0.9	390
35	Other transport equipment	1.2	802
36	Furniture	4.4	302
37	Recycling	11.2	3204
	Average	**1.4**	**891**

Source: Own calculations

APPENDIX B – Treated and control firms for matching (Export starting)

	TREATED	CONTROL
1998	22	160
1999	17	261
2000	14	172
2001	11	125
2002	15	114

Source: Own calculations

Note: firms without subsidies in each year: 677

APPENDIX C – Treated and control firms for matching (Export share)

	TREATED	CONTROL
1998	108	478
1999	132	491
2000	78	478
2001	75	482
2002	78	483

Source: Own calculations

Note: firms without subsidies in each year: 677

APPENDIX D – Important variables in the probability of receiving subsidies

Years	Variables
1998	R&D (+), Imports (+),
1999	Imports (+), forcap (+)
2000	Sectoral dummies;
2001	Sectoral dummies; Imports (+)
2002	Sectoral dummies; forcap

Source: Own calculations

APPENDIX E – Average 1996 – 2003

Sector code	Sector Description	Growth exp.sha (t)	Growth exp.sha (t+1)
15	Food, beverages	0.002^{+}	**-0.134***
17	Textiles	0.264^{+}	**-0.178***
18	Wearing apparel	-0.469^{+}	-0.078^{+}
19	Leather	-0.103^{+}	0.249^{+}
20	Wood	-0.079^{+}	0.275^{+}
21	Pulp and paper	**-0.338***	**-0.053****
22	Printing	0.029^{+}	-0.005^{+}
24	Chemicals	-0.082^{+}	-0.053^{+}
25	Rubber, plastic	-0.782^{+}	-0.806^{+}
26	Non-metalic mineral product	0.151^{+}	-0.094^{+}
27	Basic metals	0.147^{+}	**0.211***
28	Fabricated metal products	**-2.145***	**-2.219***
29	Machinery	-0.262^{+}	0.652^{+}
30	Office machinery and computers	n.a.	n.a.
31	Electrical machinery	**0.902***	-0.153^{+}
32	TV, communication equipment	-0.015^{+}	-0,152^{+}
33	Medical, precision, optical instruments	-0.015^{+}	-0,152^{+}
34	Motor vehicles	-7.841^{+}	-10.12^{+}
35	Other transport equipment	n.a.	n.a.
36	Furniture	-1.65^{+}	0.082^{+}
37	Recycling	n.a.	n.a.

Source: Own calculations

Note: statistically significant at *** 1%; ** 5%; * 10%