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An economic evaluation of public programs for internationalization: The case of the Diagnostic program in Spain

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ABSTRACT

This paper evaluates the Diagnostic Program in Spain which is a publicly funded program to promote internationalization of companies located in Andalusia (south of Spain). The methodology used is the propensity score-matching. The treatment group consists of companies which participated in the Program until 2008. The control group has companies which planned to participate in the Program but had not done so up to that date. The response variable measures the ratio of export to total sales for each company. Four covariates have been taken into account: activity, location, sales and number of employees. The analysis leads to the conclusion that the companies that participated in the Program improved their ratio of exports to total sales by about 10 percentage points.

1. Introduction

Taxpayers and policymakers are interested in the proper management of public funds. Particularly they are interested in knowing the effectiveness of programs that are financed with public funds, including export promotion programs. This paper develops a quantitative approach to estimate the effectiveness of such programs financed by public funds.

Internationalization theory was built upon the intellectual foundations of transaction cost established by Coase (1960) and first applied to multinational enterprises by Buckley and Casson (1976) and Hennart (1982). These latter two works suggest that firm-specific advantages determine a firm's domestic and international success, with the environment acting as a constraining or facilitating force. Madhok (1998) stressed the influence of Coase's view that transaction cost-based arguments have been dominant in addressing multinational firms' mode of foreign market entry decisions.

For half a century, studies on the linkages between multinationality and performance have been ever-present in international business publications, with important reviews of these works published by Hitt, Frankilin, and Zhu (2006) and Verbeke and Brugman (2009), with this latter paper also listing the twenty most-cited papers in this field.

Besides transaction cost arguments, more recent reports in the literature have considered the role of firms' capabilities (Madhok, 1998), the effects of foreign exchange rate and the volatility of the corporate choice of foreign entry mode (Baek & Kwok, 2002), the impact of uncertainty on the timing and dimensioning of investment (Fisch, 2008), and the impact of corporate and national cultures on decentralization decisions (Williams and van Triest, 2009).

Further to the above, internationalization can be considered as a gradual and evolutionary process in which companies progressively increase their involvement in international business. It is a beneficial process for the company and for the national and local economy. Internationalization may generate economies of scale in local companies and promote the transfer of technology and

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management knowledge and thus generate growth and employment (Austrade, 2002). These benefits explain the implementation of export promotion activities and programs financed with public funds, as the benefits will justify the costs associated with this government expenditure. The lack of foreign market information as a reason for the failure of a firm to gain a foothold in that market is another argument in support of public funding for such initiatives. It is therefore important to know whether and to what extent promotion policies undertaken by governments are profitable or not, i.e. it is necessary to assess internationalization development processes to see if the application is effective or can be improved through altered program design. So it is relevant to carry out evaluations of those policies given that, as explained by Brewer (2009), research from the 1980s through until the new millennium remains somewhat inconclusive regarding the effectiveness of export promotion programs.

As stated in Seringhaus (1990), evaluation of the impact of promotion programs on export became a concern in the late 1970s. Since then, most literature on the economic evaluation of public programs of internationalization has been based on surveys of recipients' assessment or on quantitative studies, particularly in cost-benefit analysis. Among the former, i.e. those based on surveys, is the important work of Albaum (1983), which notes that valuations were generally unfavorable, as the study revealed a lack of understanding between government and small businesses about the role and the value of such programs. The work of Seringhaus (1990), values the information obtained from the surveys, but doubts its reliability. The study of Wilkinson and Brouthers (2006) used surveys conducted with a four-item scale to measure the level of satisfaction among respondents. The use of surveys to assess the export programs has been questioned by many authors. As noted in Brewer (2009), these surveys may be unsatisfactory due to various reasons such as reluctance of the company to criticize the program that in many cases has no cost for them. The diverse opinions of respondents, as evidenced in Crick and Czinkota (1995), or pressure from export program providers (Seringhaus & Rosson, 1990), may bias or invalidate the results. Thus, as stated in Francis and Collins-Dodd (2004), use of these surveys can be criticized as lacking in objectivity.

Among the quantitative studies, the early work of Pointon (1978) is worth noting. This author evaluates the impact of British export promotion programs in terms of additional exports they generate. Also worth noting is the work in Coughlin and Cartwright (1987) in which the elasticity of export promotion in the USA is analyzed by estimating the effect of a given unit of expense that results in additional export units. In a similar way, the evaluation conducted by Marandu (1995) analyses the effect of export promotion programs on export performance directly. From a macroeconomic point of view, some studies have attempted to estimate the relationship between aggregate export promotion spending and aggregate export performance. In this category may be cited the studies of Camino (1991), Armah and Epperson (1997) and Richards, Van Ispelen, and Kagan (1997).

These studies have been criticized by several authors. Seringhaus (1986) considers that such methods should be evaluated with scepticism, questioning the definition of costs or the assumption that all exports made in a year are related to the government promotional expenditure in the previous year. As stated in Cadwell (1992), it is impossible to relate state export promotion activity to overall state exports or to exports by companies that have been helped because there are many factors that come into play at the company level. Also, Gençtürk and Kotabe (2001) highlight the impossibility of linking the result of these efforts to a single element. In the same way, Gillespie and Riddle (2004) motivate their rejection of an analysis based on the relationship between total exports and the application of these programs.

Therefore, it is valid to question the subjectivity of responses to survey research and to stress the limitation of the analysis of quantitative approaches. These difficulties associated with research on such programs and the failure of researchers to arrive at a common opinion on the results, according to Brewer (2009), have led to a reduction of such studies in recent years.

As pointed out also in a review of this research field by Freixanet (2012), recent studies are few. This last-mentioned paper listed most of the studies which evaluate specific programs, and examined both their content and their methodology. The author arrived at two main groups of papers; the first of which includes articles on theoretical development and methodology, highlighting the contributions by Gillespie and Riddle (2004) and Diamantopoulos, Schlegelmilch, and Tse (1993). The second group includes empirical studies, which can be further broken down into three categories. Macroeconomic evaluations studies, such as that by Armah and Epperson (1997), studies dedicated to the effects of export promotion programs in specific companies, such as that by Spence (2003), and other studies involving more ambitious research evaluating export promotion programs collectively. This last category comprises studies that evaluate the programs by using very different methodologies. For instance, cost–benefit analysis, or research evaluating the general perception of usefulness of the programs based on surveys.

Cansino, López-Melendo, Pablo-Romero, and Sánchez-Braza (2012) argued that an additional method to evaluate export promotion programs collectively is by using causal inference. One available statistical methodology to evaluate the effects of public programs for internationalization is that of the propensity score-matching technique. This approach allows one to improve significantly the economic evaluation of such public programs, making it a useful instrument for policymakers interested in knowing the results associated with these policy measures.

This methodology overcomes many of the difficulties in the economic evaluation of these programs. Compared to the subjectivity of the surveys, it contributes to an objective evaluation of the effects of such public policies by allowing, unlike previous quantitative analyses, one to determine the increase in the export figures attributable to these programs. Techniques based on statistical causal inference have been largely and successfully developed in medicine, criminology and finance. Particular mention is made of the evaluation of public training programs (Cansino & Sánchez-Braza, 2009, 2011a, 2011b; Card, Kluve, & Weber, 2010 and Kluve, 2010).

Specific applications of causal inference to evaluate the impact of public programs for internationalization remain scarce. A few economic evaluations using this methodology, such as those by Álvarez and Crespi (2000), Bernard and Jensen (2004), Görg, Henry, and Strobl (2008), Volpe and Carballo (2008, 2010), and Girma, Gong, Görg, and Yu (2009), have been conducted in the past decade, but the evidence from existing evaluations remains inconclusive.

The reason for the unclear conclusions may be due to difficulties related to measuring and comparing the impact of the export promotion programs. Freixanet (2012) noted the following principal difficulties: (i) Differences in export performance outcomes as operationalized in various studies (some of the studies oriented to intermediate results and others oriented to final results), (ii) The necessary time lag between the start of a program and the materialization of its effects, (iii) The number of variables that affect export performance and that may counteract programs' effects, and (iv) The content and objectives of each program may be very different, and therefore a global evaluation can prevent the detection of differences that may be important.

To overcome these difficulties, it is useful to contrast groups consisting of samples stratified ex ante with a sufficient number of

companies representing different typologies: industry, size or internationalization involvement (Brouthers & Wilkinson, 2000; Katsikeas, Piercy, & Ioannidis, 1996; Seringhaus, 1986).

The aim of this study is thus to evaluate the economic impact of the Diagnostic Program (DP) employed in Spain by using a statistical causal inference approach. The technique used is that of propensity score-matching. The DP is a publicly funded program aimed at Andalusian companies in the early stages of the process of internationalization or prior to the start of this process. Even companies which are already exporting can participate in the DP, receiving guidance about appropriate ways to improve exports.

Regarding the structure of the paper, following the introduction, Section 2 details general aspects of the DP. Section 3 outlines the methodology used and Section 4 describes the database and defines the covariates used. After specifying the analysis framework, Section 5 presents the results and Section 6 discusses the lessons learned. Finally, Section 7 summarizes the main conclusions.

2. The diagnostic program

The DP was devised by Extenda (see below) to promote the internationalization of small- and medium-sized companies in Andalusia, and forms part of a wider range of plans for the internationalization of Andalusian companies.

Extenda is an entity of the Andalusian regional government, whose aim is to carry out activities that promote the internationalization of the regional economy by means of internationalization plans, which have been progressively developed since 1999. The first Plan (1999–2002) was followed by the 2003–2006 Plan and the Plan for Internationalization of Andalusian Companies for the period 2007–2010. The fourth Internationalization Strategic Plan of the Andalusian Economy 2010–2013 is currently in force.

The Plan of 2007–2010 addresses a number of problems in the Andalusian export scenario, among which the existence of only a small number of companies involved, and an imbalance in the export activities of many of them, stand out. Another weakness identified is the high concentration of exports to countries in the European Union and the limited presence of Andalusian companies in emerging high-growth areas like Asia.

This Plan identifies three business segments. The first includes non-exporting companies that nevertheless have the capacity to do so. As a rule, they have a good product with potential to be sold abroad as a result of their experience and strength in the domestic market. A second segment includes those companies already exporting their goods and services. Occasionally these companies have adjusted part of their production structure to suit export activities (packaging, labelling, etc.). However, they generally lack a clear internationalization strategy. Finally, the third segment is formed by internationalized companies that are operating in a wide range of markets, and that maintain a physical presence (offices, etc.) in those markets in many cases. They have an international strategy and an organizational structure that supports international business.

In terms of the classification given above, the Plan of 2007–2010 is aimed at strengthening the first two segments. In the first case, the objective is to encourage companies to acquire the necessary knowledge for the internationalization process. As regards the second segment, it is vital to provide better identification of markets, to broaden the range of products, to introduce products into new markets and to reconsider the structure of the company in order to boost international business. This plan also prioritizes actions based on adjusting the potential of the companies to the actual demand as opposed to the traditional methods of promotion of internationalization such as attendance at trade fairs.

In this framework, the DP is directed at the Andalusian companies during the preliminary or initial stages of the internationalization process. Extenda's approach consists of providing the individualized assistance of an expert consultant specialized in international development. The planned duration of the development of this initiative is three months. This process is aimed at helping companies to identify or to verify their potential, and to adopt decisions concerning supply, positioning, target markets, segments and possible channels of market access. The process concludes with the definition of an action plan which sets targets of internationalization to be achieved in a given period of time.

The only essential requirement to be met for the participation in the DP is to have an establishment such as a head office, local office, manufacturing centre or service centre in Spain. The participating company contributes 500 € to the cost of DP. The average cost of the DP to the entity that finances it is around 7000 €.

For the present research, Extenda provided a database with historical information about the participating companies until 2008. In this study, the year 2008 has been taken as reference. It also includes data from companies which had planned to participate in the DP but had not done so by the reference year. An identification code is assigned to each company in order to ensure data privacy. The Extenda database includes information about the year each company implemented the DP, the province where it is located and sales, employment and exports levels in 2008. The database also shows the activity of each company adjusted to the National Classification of Economic Activities.

3. Evaluation by using propensity score-matching: model approach

The use of propensity score-matching in the evaluation of public policies allows researchers to estimate the causal effect induced by a public policy (the cause) on one or more variables of interest (the effect). The aim is to isolate the effect of this policy on the variable of interest by maintaining control over other factors that affect this variable. If the conditions are not the same then the effects cannot be attributed exclusively to the cause. The development of public policy evaluation has benefited from the use of causal inference, one of the results of which is the Potential Outcome Model (POM), which allows us to compare participants and non-participants in public programs. A prolific development of the POM with regard to program evaluation is due mainly to Rubin (1974, 1978). This paper follows the Rubin Causal Model (RCM).

According to Rubin (1974) and Holland (1986), this model would require the definition of a treatment indicator D_i, as a binary variable, for any company that potentially could participate in the program. A value of $D_i = 1$ indicates that the company has participated, and $D_i = 0$ indicates that it has not. The indicator lets researchers identify the status of the companies to distinguish between treated (treated or participating group) and untreated (control group).

In the present case, the treated group consists of 77 companies. These are the companies that participated in the DP until 2008, according to the Extenda database. The control group contains 86 companies. These are companies which had planned to participate in the DP but had yet not done so by the reference year.

After specifying the indicator, it is necessary to determine the response variable, defined as the variable of interest, the effect on which is to be measured for the evaluated policy. In the case of the DP, the response variable used is the ratio of exports to total sales. This choice follows that in Alonso and Donoso (2000) and Madrid and García (2004). The response variable is used to measure the level of internationalization of companies.

The use of this ratio is preferable to that of absolute export levels, because the data for the latter have different meanings depending on the sector in which the company operates. The use of this ratio also avoids distortions arising from the comparison of very large values. Moreover, the use of the ratio avoids the need to determine the costs that the company must incur to carry out export activities, particularly the allocation of indirect costs.

After selecting the response variable, it must be considered that there will be potential responses associated with the status of the company (having or not having participated in the program). These potential responses will be denoted as Y_{0i} (value of the response variable if the ith company has not completed the program), and Y_{1i} (value of the response variable if the ith company has completed the program). The program's causal effect on the response variable is determined by the difference $Y_{1i} - Y_{0i}$, allowing in this way the evaluation of the effectiveness of the program. However, it is not possible to observe both responses simultaneously because it is a counterfactual event.

According to Holland (1986), this fact, recognized as the fundamental problem of identification in causal studies, makes it impossible to determine the individual causal effects of a program. The counterfactual nature of the potential responses requires searching for a second best alternative, which involves estimating the average causal effects from a comparison between treated and untreated companies.

The average treatment effect on the treated companies, *ATET*, is defined as the difference between the average values of the response variable focusing on the participating companies in the program.

$$\hat{\alpha}_{ATET} = E(Y_1 - Y_0|D = 1) = E(Y_1|D = 1) - E(Y_0|D = 1) \quad (1)$$

Now the treatment and the control groups should be determined. In the case of random experiments, the companies are randomly assigned to treatment and control groups. The randomization of the assignment makes it possible to compare the treatment and control groups by ensuring the independence of the potential responses.

Although several attempts (Angrist & Lavy, 1999; Gertler, 2004) were made, however, the realization of these experiments, widely used in other sciences, can hardly be implemented in the case of the social sciences because of possible economic, moral or ethical, or temporal difficulties (Stock & Watson, 2003).

Therefore, the estimation of causal effect must be inferred from the observational data in a non-experimental context in order to conduct the research that reproduces the scenario of an experiment based on what are known as observational methods (LaLonde, 1986). In this case, it must be taken into account the fact that the validity of the estimated average effect may diminish if the companies included in the treatment and control groups differ in characteristics other than those derived by virtue of their participation in the program. Therefore, these characteristics must be controlled by considering the effects that they can produce on the values of the response variable. Insofar as the features not involved in the program can be seen and the companies (participants and control) differ only in them, the control of these differences can be carried out.

The selection of observable variables enables us to isolate the effect of a predetermined characteristic or covariate (or a vector of covariates), maintaining the independence between the variable D and the response variable Y (Heckman & Hotz, 1989). For this purpose, it is necessary to define the vector X of covariates whose values do not depend on D. The covariates used in this evaluation are explained in Section 4.

According to the characteristics of the policy to evaluate, the method of propensity score-matching has been selected from the methods of selection on observables variables. Rosenbaum and Rubin (1983) define the propensity score as the probability of a member of the sample to participate in the policy evaluated, conditioned on the values taken by a vector of covariates X. This probability can be expressed in the following terms:

$$\varepsilon(X) = P(D = 1|X) \quad (2)$$

where $\varepsilon(X)$ is the probability of participating in the program conditioned on X. This is the propensity score.

Following Hahn (1998), the calculation of the propensity score, given some observed characteristics, plays a crucial role in controlling the bias to obtain the estimator of the impact of the program. By using the propensity score, we proceed as if we only had a one-dimensional covariate. In this way, the evaluation can gain operability by avoiding manipulation of the large number of covariates which may include the vector X (Austin, 2011; Thoemmes & Kim, 2011).

On this basis, all observations that show a similar (or close) propensity score also have a similar distribution of the vector of covariates X. In this way, the values of the response variables of the companies from the group of participants and the control group with a similar (or close) value of propensity score can be compared. Thus, the contaminant effect of covariates is isolated, making it possible to calculate an average effect of the program (Hirano, Imbens, & Ridder, 2003; Lili, Sun, & Wang, 2010).

Since the propensity score $\varepsilon(X)$ is a function of X, this probability depends on the assumption about its distribution function, which must be estimated from the sample data. According to the hypothesis concerning the shape of this distribution function, we can specify different models of binary response choice. Among all of the possible options for non-linear distribution, we refer to logit and probit models, which are often the most used.

There are no defined selection criteria for choosing one or the other model for the estimation of the propensity score. Usually, this choice is made for purely operational reasons. So, we proceed to estimate both models, and then based on the values obtained, we choose the one that maximizes the value of the likelihood function. Once the propensity score has been estimated, this value must be assigned to each company (treated and control).

At the second stage, the value of *ATET* may be obtained by comparing the participating and the control companies with a similar or close propensity score assigned value. According to the characteristics of the DP, this comparison has been made by using matching techniques (Heckman, Ichimura, & Todd, 1998; Dehejia & Wahba, 2002; Abadie & Imbens, 2006).

Matching allows us to form pairs of companies with similar observable characteristics, with the only difference being their participation or not in the evaluated policy. If the pairing of companies includes all predetermined variables, the matching provides an unbiased estimate of the effects of carrying out the program. In short, comparing companies with similar characteristics with respect to these predetermined variables, the effect thereof over the response variable is void (Scott & Bergstrand, 2009).

Thus, each treated-group company is given a company (or several) from the control group with a similar or close value of the propensity score (Dehejia & Wahba, 2002). This done, the calculation of the *ATET* estimator is obtained from the expression:

$$\hat{\alpha}_{ATET\,\text{PSMATCHING}} = \frac{1}{n_1}\sum_{i=1}^{n_1}(Y_i - Y_{m(i)}) \quad (3)$$

where n_1 is the total number of participating companies, and the expression $(Y_i - Y_{m(i)})$ shows the difference between the observed values of the response variable of participating companies and assigned control ones.

Exact matching will often not be possible. Therefore, we must define criteria of proximity to set matching conditions. There are different ways to apply the matching on the estimated values of propensity score (Stuart, 2010). In stratification matching, several intervals are established on the basis of their propensity score. The overall impact is then obtained by calculating a weighted average of the interval effects, with weights proportional to the number of treated units in each interval. From Becker and Ichino (2002), one disadvantage of this procedure is to discard those observations in intervals in which there is no data in the treated or group control.

Another matching estimator is nearest-neighbour matching. One individual from the comparison group is chosen as a matching partner for a treated individual that is closest in terms of propensity score. Becker and Ichino (2002) point out that this matching application may lead one to compare data with very different results. According to those authors, the Kernel matching estimator offers a solution to these problems. It uses weighted averages of all individuals in the control group using a bandwidth. Weights depend on the distance between each individual from the control group and the treated group in terms of propensity score. The Kernel function assigns weights that are inversely proportional to this distance. Given its applicability, this is the matching method chosen for the current study.

4. Data and covariates

For this research, Extenda provided a database with historical information about the participating companies through until 2008. The Extenda database includes information about the year each company implemented the DP, the province where it is located and sales, employment, exports levels and the activity of each company adjusted to the National Classification of Economic Activities. Therefore, information included in this database is limited. Nevertheless, according to previous literature, the quality of this information is high. As such, all available variables in the database have been included as covariates. They were measured before the treated group participated in the PD program. Other variables, such as publicity and promotion costs or target markets have been also considered in previous studies (Geldres & Etchebarne, 2011). The identification code assigned to each company for the purpose of ensuring data privacy has kept us from obtaining this information. However, we believe that these missing variables are not critical covariates that could make an impact on the adequacy of the propensity score estimation.

The activity determines both the structure of the company and its management (Díez de Castro, Galán, Landa, & Leal, 1995). Depending on the product, such aspects as the assets of the company, the technology applied, the location, the product marketing, the customers and suppliers, and national and international competition, can be defined. Different products require different business management strategies both in the internal market and internationally.

Following the National Classification of Economic Activities, activity covariates have been divided into three categories: extractive and manufacturing companies, construction companies and service companies.

The influence of the location covariate is determined by transportation costs. The closer the company is located to a communication hub, the less transportation costs associated with export it will have. This consideration is especially important for major commercial ports, given the importance of these in the transport of goods.

Pampillón and Izquierdo (1997) show how the provision of high-quality infrastructure reduces transport time, and has a resulting economic impact, such as in operational costs or in other aspects such as financial or inventory management derivatives. Suárez (2007) considers that transportation costs constitute one of the elements that make up the final price of goods, and may determine the level of competitiveness the product achieves in its destination market. Meanwhile, Márquez, Martínez, Pérez, and Wilmsmeier (2007) point out that Spanish exports continue to depend on price competitiveness for positioning in foreign markets, and that transportation costs are becoming a key factor in the make up of Spanish exports.

Location covariate values are established according to the existence or not of a major commercial port in the province, which favors the export activity of companies in the province. In this way, an important role is played by factors such as surrounding infrastructures, along with the social and economic importance such ports have on productivity.

The influence of size is determined primarily by the capacity to commit resources. Cavusgil and Naor (1987) conclude that exporting companies tend to be larger than non-exporters. Knight and Liesch (2002) emphasize that small- and medium-sized businesses often have fewer resources, capabilities and market power. Wilkinson and Brouthers (2006) pointed out that the ability to identify appropriate partners and distributors must be a key element in the market strategy of small- and medium-sized exporting companies. The internationalization process necessarily involves committing human and financial resources, with this capacity increasing as a function of the size of the company. In fact, opportunities to embark successfully on international business are often determined by the size of the company involved.

The most common classification criteria that can be cited are the number of workers, sales figures, assets and, in the case of listed companies, their market capitalization. Often two or more criteria are used together to determine the size of companies, since the choice of only one characteristic can lead to an unrealistic classification. This fact determines the use of several criteria at a time, especially in the accounting, corporate and tax areas.

In the DP evaluation, two covariates traditionally indicative of the size of the company have been included: sales, and number of employees. The sales covariate adopts two categories: companies with a low level of sales (equal or less than 500,000 euros), and other companies (by definition, large ones). A similar approach is followed with the number of employees covariate. The usual separation is between companies with 10 or fewer employees and those exceeding this figure.

Table 1 summarizes the description of the covariates used and their main descriptive statistics for the total sample. To guarantee the independence condition, all covariates that affect the response variable of the participating group should exist for companies of the control group. The database used includes the same predetermined variables for both groups, and these covariates will be the ones included in the procedure of the propensity score-matching. Table 2 shows the main descriptive statistics for each group.

5. Results

Regressions are carried out in stages in order to take into account the possible multi-colinearity between exogenous variables. Both models (the probit and logit models) have been used. Finally, we opted for a probit specification, since it maximized the log pseudo-likelihood compared to a logit specification for all regressions made. Table 3 summarizes the results obtained from the probit estimation of the propensity score. These results show that Andalusian companies with a higher probability of participating in the DP are those engaged in extractive activities, manufacturing and construction, that are located far from a major commercial port and are small in size.

Table 1
Covariates and descriptive statistics.

Total companies				
Variable	Description	Obs.	Mean	Std. dev.
1. **Activity**. Base category: service sector companies				
Extractive or manufacturing	1 = if extractive or manufacturing company 0 = otherwise	163	0.626	0.485
Construction	1 = if construction company; 0= otherwise	163	0.141	0.349
2. **Location**. Base category: Province without large port.				
Port	1 = if there is a large commercial port in the province; 0 = otherwise	163	0.423	0.496
3. **Sales**. Base category: company with annual sales exceeding € 500,000.				
Low sales	1 = sales ≤ 500,000 €; 0 = otherwise	163	0.178	0.384
4. **Number of employees**. Base category: company with more than 10 employees.				
Number of employees	1 = if number of employees is ≤10; 0 = otherwise.	163	0.325	0.470

Source: Own elaboration.

All the covariates included in the propensity score specifications satisfy the balancing property test with a significance level of 1%. This ensures that observations with the same propensity score have the same distribution of covariates independently of treatment status. The common support options have been imposed, which implies that the test is performed only on the observations whose propensity score belongs to the intersection of both groups, consisting of treatment and control. Common support is described in Fig. 1. The region of common support is between 0.215 and 0.664. In our case, this results in no loss of treated companies.

Finally, in the second stage, once the values of the estimated propensity scores have been assigned to each company, we proceed to estimate the causal effect from the matching technique following the Kernel method. Different degrees of bandwidths have been considered in order to test the sensitivity of the obtained estimators to changes in the level of required proximity between the companies from the treatment and the control groups in terms of the propensity score. The results are shown in Table 4.

The results obtained show that companies participating in the DP have a higher exports/sales ratio than companies that have not been involved in the DP. This difference is, on average, 10 percentage points. The results are significant for the four bandwidths used. Therefore, the estimates suggest that, on average, the DP seems to have significant positive effects on exports for participanting companies: small- and medium-sized companies which have never exported or that have minimal experience of exporting. These results are in line with the results obtained in previous studies (Volpe & Carballo, 2010) in which small and relatively inexperienced companies benefit most from promotional activities.

The validity of these results remains to be confirmed by examining the balancing property. To assess the quality of the propensity score matching, we implement tests for the balancing hypothesis proposed by Rosenbaum and Rubin (1983), Dehejia and Wahba (2002) and Smith and Todd (2005). The rationale behind the tests is to assess whether the matching is able to balance the distribution of the covariates in the treatment and control groups (Caliendo and Kopeinig, 2008). Table 5 displays the results for the case of Kernel matching with a bandwidth of 0.05. It shows that Kernel matching notably reduced the bias between the treated and the control group for most variables. The last two columns demonstrate that all variables show a very insignificant difference between treated and control groups. The *t*-value is far less than unity in all cases. Thus, it can be concluded that the balancing

Table 2
Covariates and descriptive statistics for treated and control groups.

Variable	Treated group			Control group		
	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.
1. **Activity**						
Extractive or manufacturing	77	0.727	0.448	86	0.535	0.502
Construction	77	0.156	0.365	86	0.128	0.336
2. **Location**						
Port	77	0.338	0.476	86	0.500	0.503
3. **Sales**						
Low sales	77	0.104	0.307	86	0.244	0.432
4. **Number of employees**						
Number of employees	77	0.273	0.448	86	0.372	0.486

Source: Own elaboration.

Table 3
Estimation of the propensity score by using the probit model.

Variable	
Constant	−0.374
	(0.268)
Extractive or manufacturing	0.796***
	(0.256)
Construction	0.737**
	(0.344)
Port	−0.415**
	(0.218)
Sales	−0.484
	(0.326)
Number of employees	−0.188
	(0.272)
Obs.	163
Log. pseudolik.	−102.613
Pseudo-R^2	0.0898
Wald Chi^2 (*p*-value)	21.97
	(0.001)

Note: Standard errors robust to heteroskedasticity in brackets. *, **, and *** indicate coefficient significance at the 10%, 5%, and 1% levels, respectively.

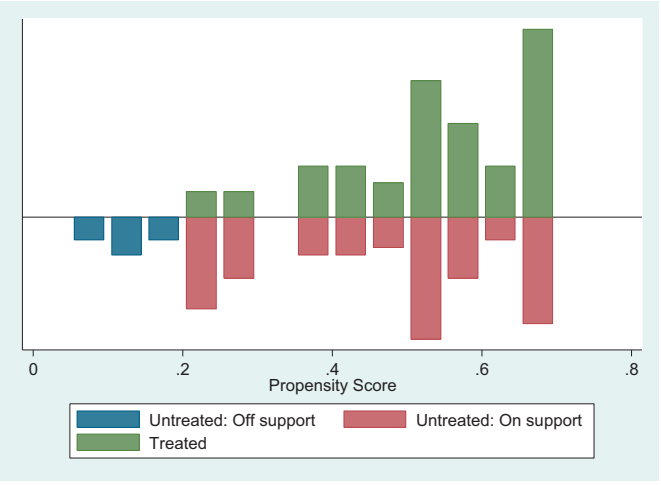

Fig. 1. PS estimation. Common support.

Table 4
Kernel-matching estimators.

Bandwidth	$\hat{\alpha}_{ATET}$	Standard errors	*t*-statistic	Prob.
0.05	0.096	0.049	1.957	0.000
0.10	0.100	0.042	2.378	0.000
0.15	0.101	0.041	2.465	0.000
0.20	0.103	0.041	2.504	0.000

property is fulfilled and the differences between the treatment and control groups have been reduced sufficiently by using propensity score matching. The results for the case of Kernel matching with a bandwidth of 0.10, 0.15 and 0.20 are very similar.

6. Lessons learned

The benefits of internationalization explain the implementation of the export promotion programs financed by public funds, but it is interesting to know if such programs are effective. Evaluations conducted since the 1970s have been questioned for several reasons. Basically, the subjective nature of assessments based on surveys has been criticized, and attempts to quantitatively measure these programs using a single variable, the overall export volume (considering this variable in different ways), have also been questioned. The diversity of factors affecting the success or failure of a program makes it unlikely that the results of the program can be linked directly to a single variable, so these factors must be considered and controlled in some way.

The use of statistical causal inference in the evaluation of public policies allows studies to be carried out in which the causal effect induced by the public policy can be examined by maintaining control over other factors that affect this variable. Thus, difficulties related to measuring the impact of the export promotion program due to the diversity of variables that affect export performance may be solved.

Andalusian companies with a higher probability of participating in the DP were those engaged in extractive activities, manufacturing and construction, that are located far from a major commercial port and are small in size. It may be that not all Andalusian companies are interested in participating in the DP, but those that do participate tend to have a reasonably well-defined profile. Some companies are not interested in participating in this program because they are already exporting successfully, or because this is not within their short-term planning, or perhaps because they are small-sized companies with insufficient production levels.

The fact that companies participating in the DP have a specific profile makes it necessary to monitor the characteristics of the control group to be used, so that the two groups are comparable. In this sense, as stated in Freixanet (2012), the use of contrast groups is recommended for measuring and comparing the impact of the export promotion programs. Nevertheless, studies using this methodology are still scarce due to the difficulty of finding databases with appropriate information to construct these groups.

In this study, one way to establish an appropriate control group was to choose only those companies that intended to export in the short-term. As an indication of this attitude, we used the fact that the control group companies had already begun efforts to participate in the DP. Furthermore, the use of statistical causal inference can further refine the control group. This approach enabled us to choose companies with similar characteristics to those in the treatment group. Once these characteristics were controlled for, an evaluation of the export promotion policy could be made. However, as pointed in Volpe and Carballo (2010), constructing a valid control group to get a proper counterfactual may turn out to be a challenging task. In our empirical analysis, we accounted for observable differences using available information. However, it should be noted that upward biases are a potential risk inherent to these kinds of evaluation approaches, which unfortunately cannot be fully ruled out (Girma & Görg, 2007). Nevertheless, it should be kept in mind that our procedure resembles the standard approaches used in the evaluation literature.

This study shows that the DP is favorable to those companies which have decided to export, thereby solving problems and improving knowledge about the procedure to export their products. In this sense, the DP may help companies to eliminate or mitigate the initial difficulties associated with exporting. The DP as such focuses on small- and medium-sized inexperienced exporter companies, which more affected by obstacles associated with internationalization. Thus, since internationalization programs are very diverse, with different objectives and targeted at different types of companies, specific evaluations of these programs are appropriate. Although a program may be beneficial for certain types of companies in a specific context, for other companies under different circumstances they may not. Therefore it is recommended that specific evaluation studies are performed and that the results of a particular program are not generalized to others.

Although this method allows the effectiveness of the DP to be evaluated, it is not sufficient to assess its efficiency. For this it is necessary to relate the cost of the DP to an increase in exports attributable thereto, which would be an appropriate focus for future research. In this way, the carrying out of an efficacy analysis must be seen as a link to improve the efficiency of public spending. This is especially relevant in the present context of deficit reduction and budget cuts.

Table 5
Balancing property.

Variable	Unmatched matched	Mean		%reduct		*t*-test	
		Treated	Control	%bias	|bias|	*t*	$p>\|t\|$
Extractive or manufacturing	Unmatched	0.727	0.535	40.4		2.57	0.011
	Matched	0.727	0.741	−2.8	93.1	−0.18	0.853
Construction	Unmatched	0.156	0.128	8.0		0.51	0.612
	Matched	0.156	0.149	1.9	76.0	0.11	0.909
Port	Unmatched	0.338	0.500	−33.2		−2.11	0.036
	Matched	0.338	0.322	3.1	90.5	0.20	0.840
Sales	Unmatched	0.104	0.244	−37.4		−2.36	0.019
	Matched	0.104	0.126	−5.8	84.4	−0.42	0.673
Number of employees	Unmatched	0.273	0.372	−21.2		−1.35	0.178
	Matched	0.273	0.279	−1.3	93.7	−0.09	0.931

Note: The standardized percentage bias is shown before and after matching, together with the achieved percentage reduction in abs(bias). The standardized % bias is the % difference of the sample means in the treated and non-treated (full or matched) sub-samples as a percentage of the square root of the average of the sample variances in the treated and non-treated groups (Rosenbaum & Rubin, 1985).

7. Conclusions

Literature focused on the economic evaluation of publically funded internationalization programs is generally based on surveys that request the recipients' assessment, or studies focused on quantitative approaches, in particular on cost-benefit analyses. Experts in this field value the amount of information obtained from the surveys, but doubt its reliability, noting that such assessments may be unsatisfactory for a variety of reasons, including a reluctance of companies to criticize the program that in many cases has no cost to them.

The economic evaluation of publically funded internationalization programs is an interesting issue for policy makers and may benefit from the use of methods based on statistical causal inference in non-experimental contexts. In the case of the DP, taking into consideration its subject, this paper proposes as a response variable the export figure, defined as the net turnover derived from the supply of goods produced by Andalusian companies to other countries. Specifically, it uses the ratio of exports to total sales of the company, because the use of this ratio is preferable to that of total exports to measure the degree of internationalization.

To control for differences between companies, four categories of covariates were proposed: activity, location, sales and number of employees. On the basis of these variables, logit and probit functions were used to determine the propensity score. The probit model was chosen because it has higher values of likelihood function. Once the propensity score was assigned to each company, the *ATET* estimator was calculated by a matching technique, using the Kernel method with different bandwidths.

The results showed that the value of the response variable was, on average, 10% higher for companies that participated in the DP, and were significant in the four bandwidths used. Therefore, the DP is an effective tool to promote the internationalization of Andalusian companies intending to internationalize or to increase exports. However, given the size of the database provided by Extenda, our conclusions should be considered with restraint. Further research should test these findings on a broader data set when this becomes available.

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