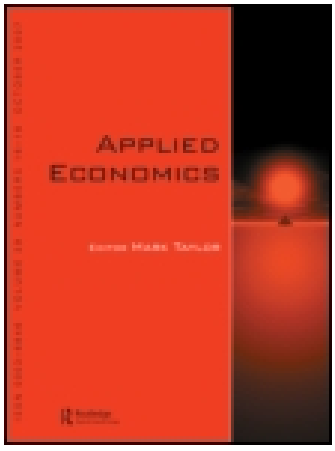

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Public programmes to promote firms' exports in developing countries: are there heterogeneous effects by size categories?

Christian Volpe Martincus [a] , Jerónimo Carballo [b] & Pablo M. Garcia [b]

[a] Inter-American Development Bank , Stop W0612, 1300 New York Avenue, NW, Washington, DC 20577, USA

[b] Inter-American Development Bank , 1300 New York Avenue, NW, Washington, DC 20577, USA

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Public programmes to promote firms' exports in developing countries: are there heterogeneous effects by size categories?

Christian Volpe Martincus[a,*], Jerónimo Carballo[b] and Pablo M. Garcia[b]

[a]*Inter-American Development Bank, Stop W0612, 1300 New York Avenue, NW, Washington, DC 20577, USA*
[b]*Inter-American Development Bank, 1300 New York Avenue, NW, Washington, DC 20577, USA*

Several countries have implemented programmes to support their firms' internationalization efforts. Their impacts are likely to be heterogeneous over firm size categories because these programmes are primarily intended and expected to benefit smaller companies. Whether this is or not the case is still an open question. In this article, we aim at filling this gap in the literature by providing evidence on the effects of trade promotion programmes on the export performance of firms within different size segments using a rich firm level dataset for Argentina over the period 2002 to 2006. We find that these effects are indeed larger for smaller firms.

I. Introduction

Many countries around the world have established public agencies that perform activities to promote their firms' exports. These agencies are endowed with annual budgets ranging from a few hundred thousand dollars as in Uruguay to more than hundred millions as in Spain (Jordana *et al*., 2010). Allegedly, their activities aim at correcting market failures associated with information spillovers originated in successful searches of business opportunities abroad (see, e.g. Rauch, 1996).[1] In particular, supporting small- and medium-size enterprises (SMEs) in their incursion in international markets is a common goal of export promotion agencies as declared by their lead officials and even in their legal statements of purposes. Indeed, these companies are more likely to be affected by barriers to exporting, in general, and those related to imperfect information, in particular, and accordingly appear as the primary beneficiaries of public trade promotion programmes. Hence, the valued added by such programmes to the firms' own internationalization efforts can be expected to differ depending on their size. In other words, heterogeneous effects of export assistance actions over firm size categories can be anticipated. Is this really the case? Although there are some previous attempts to uncover the distributional impacts of export promotion programmes (see, e.g. Volpe Martincus and Carballo, 2010a), there is virtually no study that systematically examines whether there is a relationship between the size of the firms as conventionally

*Corresponding author. E-mail: christianv@iadb.org
[1] Some authors argue, in addition, that informational asymmetries provide a rationale for trade policy (see, e.g. Mayer, 1984; Grossman and Horn, 1988; Bagwell and Staiger, 1989).

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measured in public policy (i.e. number of employees) and the size of these impacts.[2] This article aims at filling this gap in the literature. We assess whether the effects of trade-supporting activities by Argentina's national agency Fundación ExportAR (2007) on firms' export performance vary with their size and, specifically, whether these effects are larger for smaller companies, in accordance to both what it could be expected *a priori*, given the differential deterring impacts of export obstacles for firms featuring different scales of production and what policymakers usually declare regarding whom these activities are primarily intended to benefit. In doing this, we use a rich dataset including highly disaggregated export as well as export assistance and employment data for (almost) the whole population of Argentine exporters over the period 2002 to 2006.[3]

Relevant, accurate and timely information is a key input to effective marketing decisions. Given the diversity of business environments, the multiplicity of factors to be considered when selling abroad, and, in particular, the need to deal with elements not involved in domestic operations, this is especially true for firms transcending national boundaries (Czinkota and Ronkainen, 2001; Leonidou and Theodosius, 2004). A shortfall of information can accordingly cause major marketing difficulties and can, therefore, erect a barrier to increased international activities (Suárez-Ortega, 2003). In fact, lack of information is one of the most relevant export barriers both in terms of frequency appearance and degree of severity (see, e.g. Leonidou, 1995). In particular, many firms tend to find it hard to locate and analyse foreign markets, which involves both knowledge of the sources of information and ability to retrieve complete and updated international market data; learn about foreign business practices and foreign consumer preferences; identify business opportunities abroad; contact and communicate with overseas customers; and access appropriate distribution and advertising channels (see, e.g. Rabino, 1980; Albaum, 1983; Czinkota and Ricks, 1983; Katiskeas and Morgan, 1994; Leonidou, 2004). Most of these information problems are perceived to have high to very high impact on exporting (see, e.g. Keng and Jiuan, 1989; Katsikeas and Morgan, 1994; Suárez-Ortega, 2003; Leonidou, 2004).

Export promotion agencies run a variety of programmes intending to help firms overcome these informational barriers. This is precisely the case with ExportAR Foundation (hereafter, ExportAR).[4] This agency underneath the Ministry of Foreign Relations, International Trade and Worship has about 85 employees and an annual budget of approximately 4.5 million dollars (Jordana *et al.*, 2010). These resources are used to finance a series of activities aimed at supporting firms in selling their goods in foreign markets, including training on the export process to firms that are new to the trade business; market intelligence to generate relevant background information and uncover specific commercial opportunities abroad; organizing and co-financing the participation of Argentine firms in international marketing events such as trade fairs, exhibitions and missions; arranging meetings with potential foreign buyers; and supporting the association of small companies to operate more effectively in external markets. In general, trade assistance is provided to all firms that request it. Nevertheless, those participating in specific programmes, mainly international marketing events, are screened on the basis of their export potential as measured through their international operations, experience accumulated in export markets and products offered.[5] Overall, smaller firms are declaredly prioritized.

Precisely, smaller firms face greater limitations than larger firms in trading across borders (see, e.g. Roberts and Tybout, 1997; Bernard and Jensen, 1999, 2004; Wagner, 2001, 2007). These differences across firm sizes are likely to be at least partially related to heterogeneity in access to and ability to use information.[6] More concretely, information gathering and

[2] Volpe Martincus *et al.* (2010) estimate quantile treatment effects of trade promotion programmes managed by PROCHILE, thus examining how their impact varies over the distribution of the relevant export outcomes.
[3] Section III includes a precise description of our dataset and its coverage.
[4] An appendix explaining the institutional organization of ExportAR and describing the export promotion programmes managed by this agency is available from the authors upon request.
[5] Firm location might also play a role in explaining the probability to be assisted. Even though ExportAR has presence in all provinces, most of the offices are not owned by this agency and are not staffed with own personnel and, importantly, they do not always directly provide all the services offered at headquarters. In addition, spatial coverage is very dissimilar across regions. On the other hand, it can be conceivably thought of companies located in Buenos Aires, which is the largest economic centre and the region with better physical and communication infrastructure in the country, as enjoying a locational advantage in terms of access to relevant business information from alternative sources and therefore, as needing less support to trade across borders.
[6] Other factors that may also play a role are, for example, the ability to cope with other sunk costs of entry, such as those originated in setting up an export department or redesigning products for foreign customers, and differences in access to management capability and financial resources in capital markets.

communication with foreign markets seem to be greater obstacles for smaller than for larger firms (see, e.g. Katsikeas and Morgan, 1994). Thus, for instance, collecting information requires performing market studies which entail fixed costs. Larger firms are in a better position to absorb these costs because they can distribute them over a greater number of units and can accordingly elicit by themselves the information needed to formulate an effective export market strategy from such studies (Wagner, 1995, 2001).[7] Furthermore, others' information on the companies, which are critical inputs for business decisions such as that concerning reliability as a provider and the quality of their products, is likely to be poorer for smaller firms.

Given that information-related impediments are likely to have differential deterring effects for firms with different sizes, we can conceivably think that given trade-supporting actions may potentially have heterogeneous impacts on firms' export performance over size categories. However, so far there is no empirical evidence on whether this is indeed the case. More precisely, the existing empirical literature includes both studies that have examined the effects of public policies on firms export behaviour without discriminating among firms with different sizes (see, e.g. Girma *et al*., 2007; Görg *et al*., 2008; Volpe Martincus and Carballo, 2008) and analyses of these effects that exclusively focus on small- and medium-size companies generally based on small samples (see, e.g. Denis and Depelteau, 1985; Howard and Borgia, 1990; Moini, 1998; Gencturk and Kotabe, 2001; Álvarez, 2004; Francis and Collins-Dodd, 2004; Wilkinson and Brouthers, 2006), but no systematic examination of the potential existence of different effects for firms in different size segments as conventionally defined in public policy, i.e. in terms of employment levels.[8] In this article, we precisely aim at providing insights on these effects. Hence, we contribute to the existing literature by primarily assessing, for the first time to our knowledge, whether and how public export promotion programmes on firms' export performance vary with firm size, either for a developed or a developing country. This analysis allows ascertaining whether such public interventions are overall well targeted, as policymakers tend to evaluate differently two programmes with the same average positive effect but whose benefits are mostly accruing to smaller firms in the first case and to larger firms in the second case. Henceforth, this information is extremely relevant from an economic policy point of view as it can help guide the allocation of resources invested in export promotion and thereby enhance the design of existing policies.

We specifically address three main questions: are trade promotion programmes effective in improving firms' export performance? Are impacts of these programmes heterogeneous across firm size categories? Are these impacts larger for smaller firms? In answering these questions, we apply variants of the difference-in-differences approach on a rich firm-level dataset primarily containing data on exports by product and destination countries and employment over the period 2002 to 2006 for virtually the entire population of Argentine exporters.

We find that export promotion programmes administered by ExportAR have been effective in favouring the growth of Argentine firms' exports, primarily along the country-extensive margin, i.e. the number of destination markets. Importantly, these programmes do not seem to have affected all firms to the same extent. More specifically, as expected, smaller companies derive larger benefits from these public initiatives than larger firms in terms of improved export performance. Thus, trade-supporting actions are associated with increased rate of growth of total exports and number of countries in the case of small- and medium-size companies, but they do not seem to have any distinguishable impact on the export outcomes of large firms. These results are robust across alternative specifications of the estimating equations and to using different econometric methods.

The remainder of this article is organized as follows: Section II explains the empirical methodology. Section III presents the dataset and descriptive evidence. Section IV reports and discusses the econometric results, and Section V provides a conclusion.

II. Empirical Methodology

We aim at estimating the effects of trade promotion assistance provided by ExportAR on Argentine firms' export performance and assessing whether these

[7] Hirsch and Adar (1974) show that large firms can afford to assume more risks than small ones. Further, their risks from foreign operations are less than those of small firms because the large firms benefit from economies of scale in foreign marketing. Hence, the risk premium demanded by large firms from foreign marketing is less than the premium insisted upon by small firms. As a result, the former tend to export a larger fraction of their output.

[8] Most of these studies show that smaller sized firms seem to benefit from export assistance programmes. However, it should be mentioned that this literature is far away from having reached a clear consensus, as some authors claim that evidence on effectiveness of export promotion activities is limited and inconclusive (see, e.g. Seringhaus, 1986; Kotabe and Czinkota, 1992).

effects are heterogeneous across firms within different size categories. In order to identify such effects, one would need to compare a firm's export behaviour when receiving export support with that when not receiving such a support. Since export outcomes under both states cannot be simultaneously observed for the same firm, the individual treatment effect can never be observed. This is the so-called *fundamental problem of causal inference* (Holland, 1986). Furthermore, notice that the policy intervention under examination is not a randomized trial. We, therefore, resort below to nonexperimental methods that reproduce the missing counterfactual under reasonable conditions, thus allowing estimating the aforementioned effects.

Formally, let Y_{it} be (the natural logarithm of) firm i's total exports in year t.[9] Each year firm i may either participate in export promotion programmes ('1') or not participate in these programmes ('0'), but not both. Hence, firm i has two potential export outcomes: Y_{it}^1 and Y_{it}^0, which correspond to the participation and nonparticipation states, respectively. Further, let D_{it} be an indicator codifying information on assistance by ExportAR. Specifically, D_{it} takes the value 1 if firm i has been assisted by the agency in year t and 0 otherwise.[10] In this case, firm i's observed export outcome can be expressed as follows[11]:

$$Y_{it} = D_{it} Y_{it}^1 + (1 - D_{it}) Y_{it}^0 \quad (1)$$

and the impact of trade support is therefore given by: $\Delta Y_{it} = Y_{it}^1 - Y_{it}^0$ Since it is impossible to observe Y_{it}^1 and Y_{it}^0 for the same unit, the population of firms is generally used to learn about the properties of the potential outcomes and compute an average treatment effect. More specifically, when participation in the programmes under consideration is voluntary, it seems more relevant to determine their effects on those who participated and accordingly an average treatment effect on the treated is estimated

$$\gamma = E\left(Y_{it}^1 | D_{it} = 1\right) - E\left(Y_{it}^0 | D_{it} = 1\right) = E(\Delta Y_{it} | D_{it} = 1) \quad (2)$$

The parameter γ measures the average rate of change in exports between the actual exports of those firms that have been assisted by ExportAR and the exports of these had they not been assisted by ExportAR (Lach, 2002). Clearly, when $\gamma > (= 0)$, export promotion stimulates (does not have any impact on) firms' exports.

In the empirical exercise below, we use the firms that do not receive a service from ExportAR as the control group to derive the counterfactual and accordingly estimate γ. The main issue to deal with when proceeding so is that there may be nonrandom differences between supported and nonsupported firms that are potentially correlated with export performance (Galiani *et al*., 2008; Volpe Martincus and Carballo, 2008). Failure to account for these differences would clearly produce a selection bias in estimated impacts (see, e.g. Heckman *et al*., 1998; Klette *et al*., 2000). Thus, firm heterogeneous characteristics need to be controlled for getting comparable groups of firms and a consistent estimate of γ.[12] Notice that many of these characteristics (e.g. sector of activity, location of headquarters, etc.) are likely to be fixed over time, especially over relatively short horizons such as those considered here. When repeated observations on firms are available, this time-invariant heterogeneity can be properly accounted for using the *difference-in-differences* estimator. This estimator is a measure of the difference between the before and after change in exports for assisted firms and the corresponding change for nonassisted firms (Smith, 2000; Jaffe, 2002). The latter change serves here as an estimate of the true counterfactual, i.e. the export behaviour that the firms in the treatment group would have experienced if they had not received trade promotion support, which allows identifying temporal variations in outcomes that are not due to exposure to treatment (Abadie, 2005). Hence, by comparing the aforementioned changes, the difference-in-differences estimator permits controlling for observed and unobserved time-invariant firm characteristics as well as time-varying factors common to both treated and

[9] The use of (natural) logarithm is partially motivated by the scale problem originated in the fact that our binary variable D does not capture the size of the assistance (Lach, 2002). The presentation hereafter focuses on firms' total exports, but *mutatis mutandis* also applies to measures of export performance along the extensive margin (number of destination countries and the number of products exported) and the intensive margin (average exports per country, average exports per product and average exports per country and product).

[10] We will use interchangeably assistance, support, treatment and participation throughout this article.

[11] This is the potential outcomes framework due to, among others, Fisher (1935), Roy (1951) and Rubin (1974).

[12] In this exercise, we ignore general equilibrium effects so that outcomes for each firm do not depend on the overall level of participation in the activities performed by the agency (Heckman *et al*., 1998). Further, we do not consider information spillovers either. It is well known that firms may learn about export opportunities from other firms through employee circulation, customs documents, customer lists and other referrals (Rauch, 1996). Evidence on spillovers has been presented in several papers, e.g. Aitken *et al*. (1997), Greenaway *et al*. (2004), Mañez *et al*. (2004), Álvarez *et al*. (2007) and Koenig *et al*. (2010). If these spillovers would be associated with participation in export promotion activities, i.e. untreated firms obtain business information from treated firms, then the treatment effects, as estimated here, would be underestimated.

control firms that might be correlated with participation in export promotion programmes and export outcomes (see, e.g. Galiani *et al*., 2008).

In general, in order to calculate SE and perform weighted estimations aiming at addressing potential biases of this estimator, a regression approach is used to implement it (Ravallion, 2008). Thus, allowing for covariates X and assuming that the conditional expectation function $E(Y|X, D)$ is linear and that unobserved characteristics, μ_{it}, can be decomposed into a firm-specific fixed effect, λ_i; a year, common macroeconomic effect, ρ_t; and a temporary firm specific effect, ε_{it}, leads to the following error-components specification:

$$Y_{it} = X_{it}\theta + \gamma D_{it} + \lambda_i + \rho_t + \varepsilon_{it} \quad (3)$$

This specification allows selection into treatment on unobservable characteristics, thus permitting for correlation between time-invariant firm-specific and time-specific effects and D_{it}, the binary variable indicating assistance by ExportAR. Identification of the effects is, therefore, based on the assumption that selection into the treatment is independent of the temporary firm-specific effect.[13] We estimate this equation on the whole sample and, to create a common 'baseline' before-treatment period, on two alternative sub-samples, namely, the sub-samples formed by those firms that were never treated before or those that were not treated in the previous period (Lach, 2002).

Estimation of Equation 3 can be potentially affected by severe serial correlation problems (Bertrand *et al*., 2004). First, estimation of this kind of equations relies on nontrivial time series. Second, exports (and number of countries and products as well) highly tend to be positively and serially correlated (see, e.g. Roberts and Tybout, 1997; Bernard and Jensen, 2004). We, therefore, allow for an unrestricted covariance structure over time within firms, which may differ across them (Bertrand *et al*., 2004).

Importantly, so far we have assumed a common treatment effect, i.e. $\gamma = \gamma_i \ \forall i$. However, as discussed in Section I, effects can be anticipated to systematically vary with firm size. More formally, they are likely to be heterogeneous by observed covariates. We test whether this is the case using the nonparametric test proposed by Crump *et al*. (2008). This test is based on a sieve approach to nonparametric estimation for average treatment effects (see, e.g. Hahn, 1998; Imbens *et al*., 2006; Chen *et al*., 2008). Given the particular choice of the sieve, the null hypothesis of interest can be formulated as equality restrictions on subsets of the parameters. Specifically, in our case, the null hypothesis is that the average treatment effect conditional on the covariates is identical for all subpopulations. If heterogeneity were to be detected, then the correct specification of the estimating equation would be (Djebbari and Smith, 2008)

$$Y_{it} = X_{it}\theta + (\gamma + \gamma_X X_{it})D_{it} + \lambda_i + \rho_t + \varepsilon_{it} \quad (4)$$

In Section IV, we estimate Equation 3 and, since we do find evidence of impact heterogeneity, we also estimate Equation 4 for both the whole sample and the two sub-samples with common pre-intervention states.

III. Data and Descriptive Evidence

Our dataset combines three main databases. The first database has annual firm-level export data disaggregated by product (at the 10-digit Harmonized System (HS) level) and destination country over the period 2002 to 2006 from Argentine customs. Second, ExportAR kindly provided us with a list of the firms assisted by the agency in each year of the period 2002 to 2006. It is worth mentioning that this list primarily includes firms that have interacted closely with the agency. The typical cases are companies that participated in international fairs and missions, potentially including those attending to complementary training activities.[14] Thus, for instance, firms just visiting the agency's website to access public reports on foreign trade or simply requesting specific information (e.g. tariff on a given good) *via* phone calls or e-mails are not identified as assisted firms.[15] Finally, we have data on employment and location from the National Administration of Public Revenues (AFIP by its Spanish acronym).[16] These databases have been merged using the firms' tax IDs. We have been granted

[13] If there were time-varying firm-specific factors leading to improved export performance that are not observable to us and these were overrepresented among assisted firms, then our procedure would overestimate the causal effects of trade promotion. Regrettably, we cannot rule out this possibility.

[14] Given that support primarily involves a subset of actions that, at least in the short run, are more likely to result in foreign sales (as opposed to other promotion initiatives such as, for example, the provision of generic information), estimated effects reported below should be more properly interpreted as an upper bound on the true impact of export promotion.

[15] Unfortunately, data on these assistances are not consistently available over the sample period.

[16] These data can then be seen as a census of formal Argentine employment. There is of course some risk of misreporting, which would generate measurement errors. As long as these are systematic across firms, they will be eliminated by the time differentiation implemented in the estimation methods used in this article.

access to the combined dataset after these IDs had been removed and replaced with generic firm identifiers. This dataset covers almost the whole population of Argentine exporters. In particular, the sum of these firms' exports virtually adds up to the total merchandise exports as reported by the National Institute of Statistics and Censuses (INDEC by its Spanish acronym), with the annual difference being always less than 4.0%, and the total number of destination countries and products exported are virtually the same.

Table 1 presents the evolution of aggregate export indicators from 2002 to 2006. Exports grew approximately 81.0% between 2002 and 2006. Even though there have been increases in the number of countries the firms export to and the number of products exported, most of this expansion is accounted for by a larger intensive margin, i.e. larger average shipments by product and country.

The first panel of Table 2 characterizes the average Argentine exporter over the sample period. The number of exporters rose 19.2% from 2002 to 2006. These firms have on average 92 employees. The average exporter sells abroad 9.2 products to 3.6 countries. These figures are similar to those of the US in 2000 but larger than those of Peru in 2005, 8.9 and 3.5 and 7.5 and 2.6, respectively (Bernard *et al.*, 2005; Volpe Martincus and Carballo, 2008). The proportion of exporters assisted by ExportAR has moved up from 1.5% to 4.2% over the period, which, given the larger presence of Argentine firms in export markets, implies a significant increase in the absolute number of firms being supported.

Second to fourth panels of Table 2 present basic statistics on the relationship between size and exports for Argentina. Specifically, this table breaks down the export and assistance indicators into three size categories defined in terms of employment: up to 50 employees (small), between 51 and 200 employees (medium) and more than 200 employees (large).[17] We observe that, on average, larger firms export more; they export to more countries and more products.[18] These firms explain together more than 75% of aggregate exports. In turn, small firms account for approximately 73% of the exporters and account for 7.8% of Argentine total exports. In addition, these firms represent the largest category in the group of firms assisted by ExportAR, i.e. 56.1% in 2002 and 59.0% in 2006 and together, small- and medium-size firms, explain for more than 80% of the firms supported by this agency over the period.

Table 1. Aggregate export indicators

Year	Total exports	Number of countries	Number of products
2002	25 218	181	11 883
2003	28 996	185	11 289
2004	33 837	196	11 669
2005	38 887	193	12 031
2006	45 504	194	12 128

Source: Own calculations on data from Foreign Trade Monitoring Unit at the Secretariat for Industry, Trade, and SMEs (UMCE-SCIP by its Spanish acronym) ExportAR and AFIP.
Notes: Total exports are expressed in millions of US dollars. Number of products is based on the HS 10-digit classification.

Figures 1 and 2 provide a detailed visual representation of the distribution of firms' exports discriminating over size categories for the final sample year, 2006, thus going beyond the simple averages presented before. Figure 1 shows that most Argentine exporters are small firms selling abroad a few goods to a few countries. In particular, approximately 60% of the exporters are small companies trading less than 10 products to less than 10 countries and, remarkably, about 20% are small firms exporting just one good to one external market. Further, 37.6% of the exporting companies are small ones that only trade with one country and 23.0% are similar firms that only ship one product abroad. In contrast, the fewer large firms have more diversified export patterns along both the country and product dimensions. Thus, in 2006, these companies trade with up 118 countries and up to 510 goods. Figure 2 reveals that these firms account for the larger shares of Argentine total exports. More specifically, in 2006, the 303 large companies that exported more than 10 products to more than 10 countries explained 64.7% of aggregate exports as reported in our dataset.

In this section, we have presented basic evidence of export outcomes for companies engaged in international trade and on the amount and profile of firms assisted by ExportAR. We will next econometrically explore whether and how trade promotion programmes run by this agency have affected these export outcomes both overall and across different firm size categories.

[17] This is the standard classification used in the literature (see, e.g. Álvarez, 2004; Hollenstein, 2005; Observatorio PyME, 2008).
[18] This adds to the evidence reported in the empirical international trade literature suggesting that larger firms are more likely to export (see, e.g. Roberts and Tybout, 1997; Bernard and Jensen, 2004), tend to export more (see, e.g. Görg and Strobl, 2007) and have a higher export intensity (see, e.g. Barrios *et al.*, 2003).

Table 2. Average export and assistance indicators

Year	Number of firms	Average exports	Average number of countries	Average number of products	Number of firms assisted by ExportAR
All firms					
2002	10 216	2468.49	3.34	9.51	155
2003	10 797	2685.51	3.51	8.93	319
2004	11 408	2966.09	3.62	8.99	419
2005	12 173	3194.53	3.78	9.22	423
2006	12 649	3597.41	3.79	9.35	526
Small (*≤50 employees*)					
2002	7868	302.84	2.35	6.89	87
2003	8169	334.13	2.45	6.45	198
2004	8494	369.00	2.51	6.28	242
2005	9004	382.48	2.62	6.38	217
2006	9256	381.43	2.61	6.40	312
Medium (*>50 employees≤200*)					
2002	1698	2507.17	5.07	12.67	43
2003	1890	2308.11	5.20	11.96	77
2004	2104	2158.53	5.23	12.00	114
2005	2257	2413.05	5.40	12.05	128
2006	2421	2637.44	5.31	11.78	143
Large (*>200 employees*)					
2002	650	28 581.85	10.86	32.93	25
2003	738	29 679.76	10.93	28.61	44
2004	810	32 297.90	11.13	29.69	63
2005	912	32 891.40	11.21	30.20	78
2006	972	36 613.02	11.24	31.38	71

Source: Own calculations on data from UMCE-SICP, ExportAR and AFIP.
Note: Average exports are expressed in thousands of US dollars.

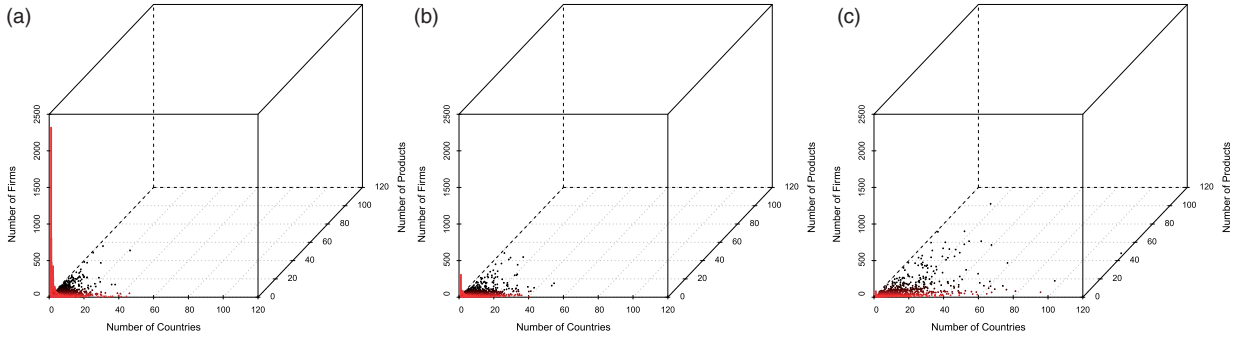

Fig. 1. Distribution of firms across product-market export patterns (2006) (a) Small; (b) Medium and (c) Large
Source: Own calculations on data provided by UMCE-SICP, ExportAR and AFIP

IV. Econometric Results

In this section, we first present the estimation results when pooling over all firms. In particular, we report the average assistance effect of trade support programmes on assisted firms when applying the difference-in-differences estimator on both the whole sample and the two sub-samples with common pre-intervention states for the two groups of firms. Second, we assess whether there is impact heterogeneity and evaluate the effectiveness of these programmes for the three firm size categories previously identified, small, medium and large. Finally, we go through several robustness check exercises.

Average assistance effect

The top panel of Table 3 reports difference-in-difference estimates of the average treatment effects on the treated, i.e. the average effect of assistance by ExportAR on assisted firms for six firm's export performance indicators, namely, total exports, the number of destination countries, the number of products exported, average exports per country and

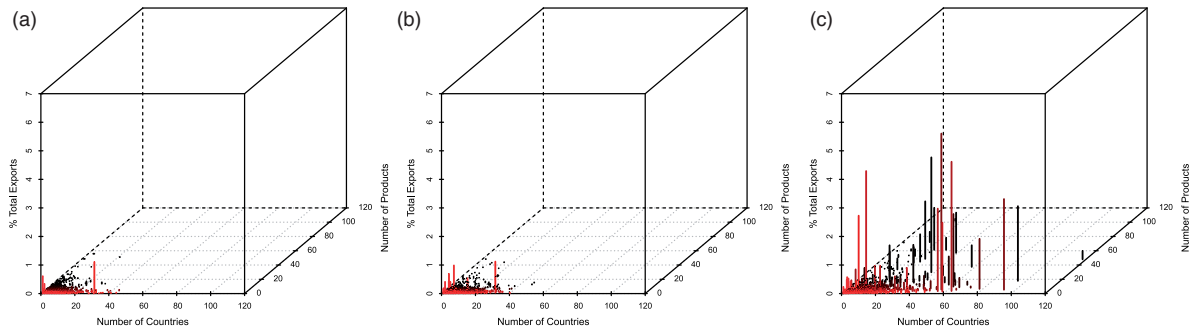

Fig. 2. Distribution of export shares across firms with different product-market export patterns (a) Small; (b) Medium and (c) Large
Source: Own calculations on data provided by UMCE-SICP, ExportAR and AFIP

product, average exports per country and average export per product, for two alternative specifications, with and without time-varying (1 year lagged) binary variables accounting for the firm's size category.[19] Admittedly, there may be other firms' attributes that are not observable to us that might also play a role in determining export outcomes (as well as service usage). This can be the case with capital intensity, qualification profile of personnel, innovation capabilities, foreign ownership, access to financing, managerial attitudes and, more generally, productivity.[20] Notice, however, that as long as these attributes change slowly over time, they can be considered controlled for by the firm fixed effects in a short sample period like ours.

The estimated treatment effects are similar in order of magnitude across specifications, but, as expected, they are smaller when these firm-level time-varying covariates are included. Overall, the estimates clearly suggest that participation in export promotion programmes managed by ExportAR is associated with an increased rate of growth of firm's total exports, number of countries the firms export to and number of products exported. In particular, according to the specification including the binary variables that control for the companies' size, the rate of growth of exports is 14.1% ($(e^{0.132}-1)\times 100=14.1$) higher for firms assisted by ExportAR, while those of the number of countries and the number of products are 10.4% ($(e^{0.099}-1)\times 100=10.4$) and 9.7% ($(e^{0.093}-1)\times 100=9.7$) higher, respectively. Thus, for instance, the sample average (logarithm) annual growth rate of total exports is 11.9%; so, this would imply that treated firms would have a rate 1.7% points higher than nontreated firms. In contrast, the impact on the remaining export outcomes is substantially weaker and evidently less robust. These results are consistent with our priors. Export promotion activities aimed at attenuating information problems are likely to have a stronger effect when these problems are acuter, namely, when entering new markets rather than when expanding operations in already served markets.[21] Moreover, they are broadly similar to those found in Peru (Volpe Martincus and Carballo, 2008).[22]

We then replicate these estimations on two alternative samples: first, we exclude those firms that have been assisted by ExportAR in the previous year; second, we exclude those firms that have been assisted by ExportAR (at least once) in the past.[23] This allows us to generate a common before-treatment period and to consider a more homogeneous set of firms in this period.[24] Results are shown in the second and third panels of Table 3.[25] These results essentially confirm our main findings. Notice, however, that, in this case, the effect on product diversification appears to be weaker and less robust. Hence, export promotion programmes seem to have been effective in facilitating

[19] The adjusted R^2 values of these regressions range between 0.825 and 0.894, with an average of 0.857.
[20] Thus, for instance, Sinani and Hobdari (2008) and Lawless (2009) find that foreign ownership is associated with a higher likelihood to export.
[21] In general, it can be expected that, over time, growth in the number of total destinations (products) will be associated with introduction of new trade partners (products). In particular, this is indeed the case in our sample.
[22] Volpe Martincus *et al.* (2010) present consistent evidence based on data at the country level.
[23] While the original sample corresponds to the period 2002 to 2006 and has 41 224 observations, these restricted samples only cover the period 2003 to 2006 and have 39 286 and 37 217 observations, respectively.
[24] Importantly, given the potential existence of lagged effects of export promotion, the latter sample is likely to produce the cleanest estimates.
[25] The adjusted R^2 values are similar to those reported for our benchmark estimations.

Table 3. Average effect of assistance by ExportAR: difference-in-differences estimates

Export outcome	Without covariates controlling for size	With covariates controlling for size
Full sample, 2002 to 2006		
Total exports	0.193***	0.132***
	(0.0304)	(0.037)
Number of countries	0.137***	0.099***
	(0.0140)	(0.017)
Number of products	0.098***	0.093***
	(0.018)	(0.024)
Average exports per country and product	−0.042	−0.006
	(0.026)	(0.035)
Average eexports per ccountry	0.056**	0.034
	(0.024)	(0.032)
Average exports per product	0.095***	0.039
	(0.028)	(0.034)
Firms not assisted in the previous year, 2003 to 2006		
Total exports	0.228***	0.141***
	(0.054)	(0.051)
Number of countries	0.136***	0.080***
	(0.024)	(0.022)
Number of products	0.104***	0.060*
	(0.032)	(0.033)
Average exports per country and product	−0.0132	−0.0490
	(0.049)	(0.047)
Average exports per country	0.091**	0.011
	(0.046)	(0.044)
Average exports per product	0.123**	0.031
	(0.050)	(0.047)
Firms never assisted before, 2003 to 2006		
Total exports	0.202***	0.177**
	(0.050)	(0.081)
Number of countries	0.180***	0.123**
	(0.062)	(0.068)
Number of products	0.091***	0.069
	(0.033)	(0.095)
Average exports per country and product	−0.004	−0.0150
	(0.047)	(0.147)
Average exports per country	0.018	0.055
	(0.044)	(0.139)
Average exports per product	0.031	0.208
	(0.047)	(0.154)

Source: Own calculations on data from UMCE-SICP, ExportAR and AFIP.
Notes: The table reports estimates of Equation 3. The dependent variables are the natural logarithm of the export performance indicators listed in the first column. The firm-level time-varying covariates controlling for size are two binary variables identifying whether the firm is small (up to 50 employees) or medium-size (between 51 and 200 employees). The large category is the omitted variable. Firm-fixed effects and year-fixed effect included (not reported). Robust SEs, clustered by firm, reported in parentheses below the estimated coefficients.
*, ** and *** denote significance at the 10, 5 and 1% levels, respectively.

Table 4. Nonparametric test for heterogeneous effects: constant conditional average treatment effect

Export outcome	Test	Chi-squared	Normal
Total exports	Statistics	19.751	3.970
	p-value	(0.003)	(0.000)
Number of countries	Statistics	20.597	4.214
	p-value	(0.002)	(0.000)
Number of products	Statistics	2.213	−1.093
	p-value	(0.899)	(0.137)
Average exports per country and product	Statistics	13.641	2.206
	p-value	(0.034)	(0.014)
Average exports per country	Statistics	17.146	3.217
	p-value	(0.009)	(0.001)
Average exports per product	Statistics	23.196	4.964
	p-value	(0.001)	(0.000)

Source: Own calculations on data from UMCE-SICP, ExportAR and AFIP.
Notes: The table reports the test statistics and the *p*-values of the nonparametric test of the null hypothesis that the average effect conditional on the covariates is identical for all subpopulations proposed by Crump *et al*. (2008), under both the standard normal distribution and the approximation, the chi-squared distribution with degrees of freedom equal to the $K-1$, where K is number of covariates.

an increase of firms' exports along the extensive margin, primarily in terms of destination countries, but not along the intensive margin.[26]

So far we have assumed that trade promotion programmes have a common effect for firms with different sizes and have accordingly just estimated an overallATE. As discussed before, these effects may be heterogeneous over size categories. In the next section, we will explicitly investigate whether this is the case.

Are there heterogeneous effects by firm size category?

In order to assess whether there are heterogeneous treatment effects by observed covariates, we use the nonparametric test proposed by Crump *et al*. (2008). This is formally a test for the null hypothesis that the average effect conditional on the covariates is identical for all subpopulations. The test statistics and the corresponding *p*-values under both the standard normal distribution and the approximation, the chi-squared distribution with degrees of freedom equal to the number of covariates minus one, obtained when applied to our data are presented in Table 4. These tests clearly indicate that there is indeed strong evidence of heterogeneity for all export outcomes, but for the growth of the number of products sold abroad.

We, therefore, turn to estimating Equation 4, which basically expands Equation 3 by adding interactions between the treatment indicator and the binary variables capturing firm size categories. The estimated coefficients on these interactions are presented in the first panel of Table 5. The estimation results suggest that the positive effects of export promotion programmes administered by ExportAR on total exports and number of destination countries are clearly stronger for small- and medium-size firms. Thus, the growth rates of exports and number of countries are 10.7% $((e^{0.102}-1)\times 100=10.7)$ and 10.4% $((e^{0.099}-1)\times 100=10.4)$ higher, respectively, for small firms that have participated in these programmes than for comparable nonparticipating firms. Similarly, these rates are 16.2% $((e^{0.150}-1)\times 100=16.2)$ and 8.9% $((e^{0.085}-1)\times 100=8.9)$ higher, respectively, for medium-size

[26] It is well known that the conventional difference-in-differences estimator is based on the assumption that, in absence of the treatment, the average outcomes for firms participating in export promotion programmes and firms not participating in these programmes would have followed parallel paths over time, i.e. both average outcomes would have experience the same variation over time (Abadie, 2005). This can be informally assessed by performing a so-called 'placebo test'. If we are accurately identifying the impact of these programmes, we should see no difference between the average export outcomes of the treated and control groups in the pre-intervention period. We, therefore, compare the rate of change of each export indicator for firms that have been assisted in at least one sample year with those of nonassisted firms over periods in which the formers have not received yet their first assistance. More specifically, we carry out *t*-tests for differences in means for the logarithmic differences of the variables in question. Reassuringly, the relevant test statistics suggest that these differences are not significant, i.e. supported and never-supported firms seem to behave similarly when no participation in export promotion programmes takes place. A table with these test statistics is available from the authors upon request.

Table 5. Average effect of assistance by ExportAR by size category: difference-in-differences estimates

Export outcomes	Small	Medium	Large
Full Sample, 2002 to 2006			
Total exports	0.102*	0.150**	0.138
	(0.053)	(0.069)	(0.088)
Number of countries	0.099***	0.085***	0.061*
	(0.026)	(0.032)	(0.028)
Number of products	0.071*	0.103**	0.079
	(0.036)	(0.044)	(0.052)
Average exports per country and product	−0.068	−0.038	−0.022
	(0.050)	(0.065)	(0.090)
Average exports per country	0.003	0.065	0.057
	(0.046)	(0.061)	(0.080)
Average exports per product	0.032	0.047	0.059
	(0.048)	(0.065)	(0.090)
Firms not assisted in the previous year, 2003 to 2006			
Total exports	0.077**	0.126**	0.104
	(0.036)	(0.064)	(0.133)
Number of countries	0.099***	0.050	0.064
	(0.034)	(0.044)	(0.046)
Number of products	0.040	0.060	0.073
	(0.051)	(0.065)	(0.069)
Average exports per country and product	−0.062	0.016	−0.033
	(0.071)	(0.079)	(0.138)
Average exports per country	−0.022	0.076	0.040
	(0.068)	(0.071)	(0.119)
Average exports per product	0.037	0.067	0.031
	(0.072)	(0.076)	(0.143)
Firms never assisted before, 2003 to 2006			
Total exports	0.130**	0.252**	0.389
	(0.061)	(0.123)	(0.300)
Number of countries	0.170**	0.233**	0.264
	(0.080)	(0.100)	(0.167)
Number of products	0.025	0.108	0.513
	(0.116)	(0.162)	(0.466)
Average exports per country and product	−0.065	0.027	−0.066
	(0.163)	(0.036)	(0.079)
Average exports per country	−0.040	0.038	−0.144
	(0.158)	(0.040)	(0.493)
Average exports per product	0.105	0.054	−0.124
	(0.179)	(0.064)	(0.194)

Source: Own calculations on data from UMCE-SICP, ExportAR and AFIP.
Notes: The table reports the estimates of Equation 4. The dependent variables are the natural logarithm of the export performance indicators listed in the first column. The firm-level time-varying covariates controlling for size are two binary variables identifying whether the firm is small (up to 50 employees) or medium-size (between 51 and 200 employees). The category large is the omitted variable. Firm-fixed effects and year-fixed effect included (not reported). Robust SEs, clustered by firm, reported in parentheses below the estimated coefficients.
*, ** and *** denote significance at the 10, 5 and 1% levels, respectively.

companies assisted by ExportAR than for companies within the same size category that have not received this assistance.[27] With average growth rates of total exports of 10.8% and 14.7% for small- and medium-size firms, these estimates mean that supported firms in these size segments would have rates 1.2% and 2.4% point higher than nonsupported pairs, respectively. Finally, we should stress herein that, with the exception of a weak impact on the change in the number of goods sold abroad, no significant impacts are observed on the export outcomes of large firms.

[27] Average effects on export outcomes of firms within these two size categories are not statistically significantly different from each other.

As before, we replicate these estimations for the two sub-samples with common pre-intervention states, i.e. on the sample excluding for each year firms that have been assisted in the past, either in the year immediately before or in some other previous year. Results from these estimations are shown in the second and third panels of Table 5. They essentially confirm our main conclusions. Notice that now no significant effects are detected on the export performance of large firms.

Hence, in the previous section, we have seen that trade promotion actions performed by ExportAR help firms expand their total exports, primarily along the country-extensive margin. In this section, we have learned that these positive effects are mainly concentrated in small- and medium-size companies. This is also consistent with what one would expect *a priori*. As mentioned above, imperfect information is a more important deterrent for these kinds of companies, so that public programmes seeking to ameliorate limited information problems are more likely to benefit their export performance as compared with that of larger firms which in principle have the scale and resources to address these problems by themselves.

Robustness

In this section, we examine the robustness of our findings to changes in the definitions of the firm types as well as to corrections for potential econometric problems.

Although standard in the empirical literature, our segmentation of firm sizes admits of course alternatives.[28] We, therefore, explore whether our results are sensitive to slight variations in the thresholds delimiting the size categories. In particular, we re-estimate Equations 3 and 4 using the following specification of these categories: (i) large firms are those whose number of employees exceeds 250 and small firms are those whose number of employees does not exceed 40; (ii) larger firms are those whose number of employees exceeds 150 and small firms are those whose number of employees does not exceed 60; and (iii) small- and medium-size firms are pooled together and large firms are defined are those whose number of number of employees exceeds 250.[29] We report the estimation results based on these alternative size segmentations in Table 6. These results do not significantly differ from those presented before, which makes us confident that our estimates do not depend on the specific values used to discretize the distribution of employment levels.

Unbalance in the characteristics that are thought to be associated with the dynamics of the export outcome variables between the treated and control groups may create unparallel trajectories in these variables, thus contaminating the difference-in-differences estimates (Abadie, 2005). This would happen if a relevant covariate is omitted and thus the parametric models defined in Equations 3 and 4 are misspecified. This would be the case, for instance, with previous export experience. More concretely, participants in export promotion programmes run by ExportAR may tend to have experienced exceptionally low (or high) exports, so that the process determining D_{it} would involve lagged dependent variables. Thus, if participation is more likely when a temporary fall in exports occurs just before going to the agency, then higher export growth should be expected among the treated, even without participation.[30] In this case, the difference-in-differences estimator is likely to overestimate the impact of the programmes and would be inconsistent (Blundell and Costa Dias, 2002).

A strategy that allows achieving some robustness to such kind of misspecification is the so-called *double robust estimation* (see, e.g. Robins and Rotznisky, 1995; Imbens, 2004; Imbens and Wooldridge, 2009; Chen *et al.*, 2009).[31] This consists of combining regression with weighting by the propensity score, in our case, the probability to participate in trade promotion activities organized by ExportAR conditional on observed covariates. These covariates include lagged export outcomes, i.e. lagged total

[28] See, e.g. Wagner (1995), Argentine Law 24.476/1995 (reformed), Burdisso *et al*. (2001), OECD (2005) and Gallup (2007).
[29] We have also performed estimations based on alternative definitions that only change one of the limits, namely, (i) large firms are those whose number of employees exceeds 250; (ii) small firms are those whose number of employees does not exceed 40; (iii) larger firms are those whose number of employees exceeds 150; and (iv) small firms are those whose number of employees does not exceed 60. The estimation results are similar to those reported here and are available from the authors upon request.
[30] In the labour market literature, this is known as Ashenfelter's dip (Ashenfelter, 1978).
[31] Estimators of treatment effects that weight on functions of the probability of treatment are based on the statistic proposed by Horvitz and Thompson (1952) (Abadie, 2005).

Table 6. Average effect of assistance by ExportAR with alternative definitions of size categories: difference-in-differences estimates

Category definition	Small: ≤40 employees; Large >250 employees				Small: ≤60 employees; Large >150 employees				Small and medium pooled together		
Export outcomes	All firms	Small	Medium	Large	All firms	Small	Medium	Large	All firms	Nonlarge	Large
Full sample, 2002 to 2006											
Total exports	0.133***	0.101*	0.149**	0.137	0.130***	0.104*	0.152**	0.140	0.135***	0.156***	0.138
	(0.037)	(0.053)	(0.069)	(0.088)	(0.037)	(0.053)	(0.069)	(0.088)	(0.037)	(0.064)	(0.088)
Number of countries	0.099***	0.099***	0.085***	0.061**	0.098***	0.100***	0.086***	0.062**	0.100***	0.098***	0.061**
	(0.017)	(0.026)	(0.032)	(0.028)	(0.017)	(0.026)	(0.032)	(0.028)	(0.017)	(0.029)	(0.028)
Number of products	0.094***	0.070*	0.102**	0.078	0.092***	0.072**	0.104***	0.080	0.078**	0.123***	0.079
	(0.024)	(0.036)	(0.044)	(0.052)	(0.024)	(0.036)	(0.044)	(0.052)	(0.037)	(0.029)	(0.052)
Average exports per country and product	−0.006	−0.068	−0.038	−0.022	−0.060*	−0.007	−0.004	−0.002	0.076	0.003	−0.022
	(0.035)	(0.05)	(0.065)	(0.090)	(0.035)	(0.050)	(0.065)	(0.09)	(0.052)	(0.044)	(0.09)
Average exports per country	0.034	0.003	0.065	0.057	0.032	0.003	0.069	0.061	0.035	0.054	0.057
	(0.032)	(0.046)	(0.061)	(0.080)	(0.032)	(0.046)	(0.061)	(0.08)	(0.032)	(0.054)	(0.080)
Average exports per product	0.039	0.032	0.047	0.059	0.038	0.033	0.048	0.061	0.040	0.087	0.059
	(0.034)	(0.048)	(0.065)	(0.090)	(0.034)	(0.048)	(0.065)	(0.09)	(0.034)	(0.058)	(0.090)
Firms not assisted in the previous year, 2003 to 2006											
Total exports	0.188***	0.082**	0.134**	0.111	0.188***	0.082**	0.134**	0.111	0.190**	0.083**	0.104
	(0.051)	(0.036)	(0.064)	(0.133)	(0.050)	(0.035)	(0.063)	(0.130)	(0.051)	(0.036)	(0.133)
Number of countries	0.079***	0.098***	0.049	0.063	0.079***	0.098***	0.049	0.063	0.080***	0.099***	0.064
	(0.022)	(0.034)	(0.044)	(0.046)	(0.022)	(0.034)	(0.044)	(0.046)	(0.022)	(0.034)	(0.046)
Number of products	0.059*	0.039	0.059	0.072	0.059*	0.039	0.059	0.072	0.060*	0.040	0.073
	(0.033)	(0.051)	(0.065)	(0.069)	(0.033)	(0.051)	(0.065)	(0.069)	(0.033)	(0.051)	(0.069)
Average exports per country and product	−0.050	−0.063	0.016	−0.034	−0.050	−0.063	0.016	−0.034	−0.049	−0.062	−0.033
	(0.047)	(0.071)	(0.079)	(0.138)	(0.047)	(0.071)	(0.079)	(0.138)	(0.047)	(0.071)	(0.138)
Average exports per country	0.009	−0.018	0.062	0.033	0.009	−0.018	0.062	0.033	0.010	−0.020	0.040
	(0.044)	(0.068)	(0.071)	(0.119)	(0.044)	(0.068)	(0.071)	(0.119)	(0.044)	(0.068)	(0.119)
Average exports per product	0.029	0.035	0.063	0.029	0.029	0.035	0.063	0.029	0.031	0.037	0.031
	(0.047)	(0.072)	(0.076)	(0.143)	(0.047)	(0.072)	(0.076)	(0.143)	(0.047)	(0.072)	(0.143)
Firms never assisted before, 2003 to 2006											
Total exports	0.273*	0.124**	0.241*	0.372	0.265*	0.147**	0.286**	0.441	0.282**	0.186**	0.389
	(0.161)	(0.061)	(0.123)	(0.300)	(0.160)	(0.064)	(0.129)	(0.315)	(0.120)	(0.090)	(0.300)
Number of countries	0.221***	0.214***	0.293***	0.302	0.217***	0.210***	0.288***	0.296	0.225***	0.218***	0.240
	(0.068)	(0.080)	(0.100)	(0.190)	(0.068)	(0.080)	(0.100)	(0.190)	(0.068)	(0.080)	(0.19)
Number of products	0.066	0.024	0.103	0.491	0.063	0.023	0.099	0.468	0.071	0.026	0.513
	(0.095)	(0.116)	(0.162)	(0.466)	(0.095)	(0.116)	(0.162)	(0.466)	(0.095)	(0.116)	(0.466)
Average exports per country and product	−0.015	−0.065	0.027	−0.066	−0.016	−0.069	0.029	−0.070	−0.014	−0.061	−0.066
	(0.147)	(0.163)	(0.036)	(0.079)	(0.147)	(0.163)	(0.036)	(0.079)	(0.147)	(0.163)	(0.079)
Average exports per country	0.052	−0.038	0.036	−0.136	0.047	−0.034	0.032	−0.123	0.058	−0.042	−0.144
	(0.140)	(0.159)	(0.040)	(0.497)	(0.139)	(0.158)	(0.040)	(0.493)	(0.139)	(0.158)	(0.493)
Average exports per product	0.207	0.104	0.054	−0.123	0.202	0.102	0.052	−0.120	0.211	0.107	−0.124
	(0.154)	(0.179)	(0.064)	(0.194)	(0.153)	(0.178)	(0.064)	(0.193)	(0.153)	(0.178)	(0.194)

Source: Own calculations on data from UMCE-SICP, ExportAR and AFIP.
Notes: The table reports estimates of Equations 3 and 4 for alternative definitions of the firm size categories. The dependent variables are the natural logarithm of the export performance indicators listed in the first column. Firm-fixed effects and year-fixed effect included (not reported). Robust SEs, clustered by firm, reported in parentheses below the estimated coefficients.
*, ** and *** denote significance at the 10, 5 and 1% levels, respectively.

exports, lagged number of destination countries and lagged number of exported products.[32] In particular, this estimator may eliminate remaining biases leading to a consistent estimate of the treatment effect as long as the parametric model for the propensity score or the regression function is specified correctly (Robins and Ritov, 1997).[33] Further, precision can be improved when covariates are incorporated to the regression function (Imbens, 2004). Hence, as a robustness check, we also estimate Equations 3 and 4 with weights equal to unity for assisted firms and $\hat{P}(X)/1-(X)$ for nonassisted firms, where $\hat{P}(X) = P(D_i = 1|X_i)$ is a consistent estimate of $P(X)$ and $0 < \hat{P}(X) < 1$ (see, e.g. Hirano and Imbens, 2001; Hirano *et al*., 2003; Chen *et al*., 2009). Estimates of these equations, based on both the whole sample and two sub-samples excluding previously assisted firms, are presented in Table 7. These estimates essentially convey the same message as those shown in Table 5.[34]

As additional robustness checks, we also compare our baseline estimates with those obtained using estimators that impose less parametric restrictions, namely, the semiparametric difference-in-differences estimator proposed by Abadie (2005) and the matching difference-in-differences estimator proposed among others by Blundell and Costa Dias (2002). In both cases, the initial step consists of estimating the propensity scores. In the second step, the before and after differences for assisted and nonassisted firms are re-weighted to account for their differences in the distribution of observed characteristics using the propensity scores.[35] In particular, the second estimator compares the change in exports of assisted firms with that of paired nonassisted firms as determined on the basis of their propensity scores and the significance of the resulting treatment effect is assessed using both analytical and bootstrapped SEs.[36] We present the results from applying the aforementioned methods in Tables 8 and 9, respectively. These results also corroborate our main findings.

By using the propensity score as defined before, we are in principle able to control for firm size and previous export experience. However, there may be additional time-varying characteristics that are correlated with selection into trade promotion programmes and export outcomes, thus generating a violation of the main identifying assumption behind the estimators used in this article. We address below two important cases. First, the export promotion agency may prioritize specific sectors and specific destination countries in particular years. We account for this possibility adding two control variables in the propensity score, namely, for each firm-year we include the shares of exporters participating in export support programmes in the main 2-digit sectors and in the main country market in which the firm is an active exporter, and re-estimating the assistance effects applying the methods that use this

[32] Note that, if adding a new destination country (product) requires incurring specific sunk costs of entry, then trading with a larger number of countries (a larger number of products) will reflect higher productivity (Bernard *et al*., 2006). Thus, by including those export indicators, we are also implicitly partially accounting for productivity differences across (groups of) firms. More generally, we estimate a probit model where the dependent variable is the firms' assistance status and the explanatory variables are constant, lagged (natural logarithm of) total exports, lagged (natural logarithm of) number of destination countries, lagged (natural logarithm of) number of products exported, lagged binary variables capturing size categories in terms of employment (large is the omitted category), a dummy variable for location (City of Buenos Aires = 1 and 0 otherwise) and year fixed effects. The estimated coefficients and the marginal effects of the aforementioned variables suggest that the probability of participating in export promotion activities organized by ExportAR is significantly higher for small- and medium-size firms and lower for those located in the City of Buenos Aires. In addition, it increases with the number of countries to which the companies export and decreases with their total exports and the number of goods they sell abroad. Detailed tables with these estimates are available from the authors upon request.

[33] More precisely, combining regression with weighting can lead to additional robustness by both removing the correlation between omitted variables and by reducing the correlation between omitted and included variables (Imbens and Wooldridge, 2009).

[34] Despite the fact that we are including lagged values controlling for previous export performance, these estimates are also based on the period 2002 to 2006 because we are using export data from 2001 as firms' export outcomes antecedents in 2002.

[35] These procedures also rely for identification on the assumption that there are no time-varying unobserved effects influencing selection into trade promotion programmes and exports.

[36] We use here a result from Rosenbaum and Rubin (1983), according to which matching can be performed on the propensity score instead of on whole set of observable characteristics. This allows significantly reducing the dimensionality problem associated with comparison of multiple characteristics. Notice, however, that the propensity score is in fact based on fitting a parameter structure (probit or logit). It is, therefore, necessary to test whether the estimated propensity score is successful in balancing the values of covariates between matched treatment and comparison groups. We assess the matching quality using five alternative tests: the stratification test; the standardized differences test; the *t*-test for equality of means in the matched sample; the test for joint equality of means in the matched sample or Hotelling's test; and the pseudo R^2 and the joint insignificance test of all regressors included in the propensity score specification (see, e.g. Smith and Todd, 2005; Girma and Görg, 2007; Caliendo and Kopeinig, 2008). These tests are reported in an appendix available from the authors upon request.

Table 7. Average effect of assistance by ExportAR by size category: propensity score-weighted difference-in-differences estimates

Export outcomes	All firms	Small	Medium	Large
Full sample, 2002 to 2006				
Total exports	0.237***	0.214***	0.302***	0.176
	(0.042)	(0.057)	(0.067)	(0.109)
Number of countries	0.162***	0.180***	0.167***	0.140***
	(0.022)	(0.030)	(0.036)	(0.047)
Number of products	0.140***	0.142***	0.180***	0.110**
	(0.027)	(0.040)	(0.042)	(0.061)
Average exports per country and product	−0.055	−0.053	−0.044	−0.147
	(0.041)	(0.054)	(0.068)	(0.107)
Average exports per country	0.085**	0.056	0.135**	−0.004
	(0.037)	(0.048)	(0.062)	(0.105)
Average exports per product	0.098**	0.104**	0.122*	0.033
	(0.038)	(0.051)	(0.064)	(0.100)
Firms not assisted in the previous year, 2003 to 2006				
Total exports	0.148**	0.119**	0.146**	0.203
	(0.046)	(0.062)	(0.073)	(0.384)
Number of countries	0.126***	0.165**	0.114**	0.251
	(0.024)	(0.079)	(0.057)	(0.205)
Number of products	0.065*	0.016	0.087	0.348
	(0.035)	(0.119)	(0.154)	(0.499)
Average exports per country and product	−0.053	−0.062	−0.024	−0.070
	(0.050)	(0.166)	(0.041)	(0.072)
Average exports per country	0.012	−0.046	0.332	−0.348
	(0.049)	(0.160)	(0.386)	(0.568)
Average exports per product	0.044	0.103	0.458	−0.145
	(0.052)	(0.177)	(0.386)	(0.222)
Firms never assisted before, 2003 to 2006				
Total exports	0.147***	0.124**	0.166**	0.163
	(0.062)	(0.053)	(0.083)	(0.144)
Number of countries	0.169***	0.145**	0.121**	0.214
	(0.068)	(0.069)	(0.050)	(0.167)
Number of products	0.069	0.023	0.065	0.148
	(0.098)	(0.089)	(0.099)	(0.141)
Average exports per country and product	−0.021	−0.042	0.0245	−0.0696
	(0.146)	(0.106)	(0.048)	(0.102)
Average exports per country	0.038	−0.06	0.132	−0.084
	(0.140)	(0.097)	(0.086)	(0.068)
Average exports per product	0.108	0.103	0.108	−0.095
	(0.151)	(0.177)	(0.106)	(0.102)

Source: Own calculations on data from UMCE-SICP, ExportAR and AFIP.
Notes: The table reports estimates of Equations 3 and 4 weighted by the propensity score as indicated in the text. The dependent variables are the natural logarithm of the export performance indicators listed in the first column. Firm-fixed effects and year-fixed effect included (not reported). Robust SE, clustered by firm, reported in parentheses below the estimated coefficients.
*, ** and *** denote significance at the 10, 5 and 1% levels, respectively.

score, namely, weighted difference-in-differences, semiparametric difference-in-differences *à la* Abadie (2005) and matching difference-in-differences.

Second, a similar problem would arise if firms' changing mix of products results in different demand of promotion services over time. Firms selling abroad differentiated products tend to face more severe information problems. Thus, firms with an increasing share of these products in their export baskets are likely to resort to support. The same argument can apply to firms exporting to more sophisticated markets such as those of the Organization for Economic Co-operation and Development (OECD) countries. Types of goods traded and destination may also contribute to shape export outcomes. Differentiated goods are heterogeneous both in terms of their characteristics and their quality. This interferes with the signalling function of prices, thus creating trade frictions. This is especially important for firms from a developing country such as Argentina, whose products, due to national reputation effects, might be perceived by buyers as less

Table 8. Average effect of assistance by ExportAR by size category: semiparametric difference-in-differences estimates based on the Abadie (2005) estimator

Export outcomes	All firms	Small	Medium	Large
Full sample, 2002 to 2006				
Total exports	0.143***	0.165***	0.147***	0.116**
	(0.045)	(0.040)	(0.044)	(0.051)
Number of countries	0.162***	0.228***	0.150***	0.109***
	(0.020)	(0.018)	(0.023)	(0.019)
Number of products	0.088***	0.086***	0.120***	0.058*
	(0.028)	(0.025)	(0.028)	(0.031)
Average exports per country and product	−0.012	−0.015	−0.015	−0.005
	(0.046)	(0.040)	(0.041)	(0.057)
Average exports per country	−0.030	−0.063	−0.033	0.007
	(0.044)	(0.045)	(0.037)	(0.049)
Average exports per product	0.044	0.078*	−0.003	0.058
	(0.046)	(0.040)	(0.043)	(0.055)
Firms not assisted in the previous year, 2003 to 2006				
Total exports	0.074**	0.121***	0.080**	0.020
	(0.037)	(0.036)	(0.035)	(0.046)
Number of countries	0.124***	0.191***	0.114***	0.068***
	(0.017)	(0.015)	(0.018)	(0.017)
Number of products	0.058***	0.069***	0.074***	0.032
	(0.024)	(0.021)	(0.024)	(0.027)
Average exports per country and product	−0.012	−0.014	−0.015	−0.008
	(0.039)	(0.034)	(0.034)	(0.048)
Average exports per country	−0.006	−0.007	−0.007	−0.005
	(0.035)	(0.032)	(0.030)	(0.043)
Average exports per product	0.000	0.005	−0.003	−0.001
	(0.039)	(0.035)	(0.034)	(0.048)
Firms never assisted before, 2003 to 2006				
Total exports	0.057***	0.134***	0.060***	−0.022
	(0.022)	(0.019)	(0.020)	(0.028)
Number of countries	0.068***	0.116***	0.061***	0.028***
	(0.010)	(0.011)	(0.010)	(0.010)
Number of products	−0.002	0.024*	0.012	−0.041
	(0.025)	(0.014)	(0.012)	(0.050)
Average exports per country and product	−0.015	−0.016	−0.016	−0.012
	(0.021)	(0.024)	(0.020)	(0.020)
Average exports per country	−0.015	−0.014	−0.015	−0.016
	(0.020)	(0.024)	(0.018)	(0.017)
Average exports per product	−0.022	−0.046	−0.010	−0.009
	(0.026)	(0.036)	(0.020)	(0.021)

Source: Own calculations on data from UMCE-SICP, ExportAR and AFIP.
Notes: The table reports semiparametric difference-in-differences estimates (Abadie, 2005) of the average assistance effect on assisted firms both pooling over firms and discriminating across their size categories for the six export performance indicators. SE reported in parentheses below the estimated coefficients.
*, ** and *** denote significance at the 10, 5 and 1% levels, respectively.

technologically advanced and of poorer quality than those from developed countries (see, e.g. Chiang and Masson, 1988; Hudson and Jones, 2003).[37] Exigencies when exporting to well-known neighbour countries tend to be smaller for than those faced when exporting to distant, developed country markets. In this latter case, firms must undergo product upgrades as well as marketing upgrades to succeed in exporting goods to these markets.[38] We, therefore, include the lagged ratio of exports of differentiated

[37] Export promotion activities are likely to have different effects on export performance over firms exporting good bundles with different degrees of differentiation and thus facing varying levels of information incompleteness (Volpe Martincus and Carballo, 2010b).
[38] Properly shaping the marketing strategy to meet these markets' requirements is an information-intensive activity. For instance, firms need to learn and understand the preferences of foreign consumers; the nature of competition in foreign markets; the structure of distribution networks and the requirements, incentives and constraints of the distributors (see, e.g. Artopoulos *et al*., 2007).

Table 9. Average effect of assistance by ExportAR by size category: matching difference-in-differences estimates based on the Kernel estimator

Export outcomes	All firms	Small	Medium	Large
Full sample, 2002 to 2006				
Total exports	0.160	0.169	0.124	0.106
	(0.028)***	(0.039)***	(0.047)***	(0.066)
	(0.033)***	(0.036)***	(0.042)***	(0.053)*
Number of countries	0.177	0.195	0.143	0.123
	(0.013)***	(0.018)***	(0.024)***	(0.024)***
	(0.016)***	(0.015)***	(0.021)***	(0.021)***
Number of products	0.074	0.086	0.109	0.072
	(0.017)***	(0.025)***	(0.029)***	(0.037)*
	(0.019)***	(0.027)***	(0.028)***	(0.036)**
Average exports per country and product	−0.009	−0.011	−0.015	−0.007
	(0.028)	(0.040)	(0.045)	(0.070)
	(0.031)	(0.033)	(0.043)	(0.061)
Average exports per country	−0.017	−0.026	−0.038	0.000
	(0.025)	(0.035)	(0.042)	(0.064)
	(0.029)	(0.039)	(0.038)	(0.055)
Average exports per product	0.086	0.083	−0.003	0.051
	(0.028)***	(0.039)**	(0.045)	(0.068)
	(0.031)***	(0.037)**	(0.042)	(0.058)
Firms not assisted in the previous year, 2003 to 2006				
Total exports	0.240	0.214	0.141	0.204
	(0.037)***	(0.067)***	(0.061)**	(0.123)
	(0.039)***	(0.098)**	(0.063)**	(0.136)
Number of countries	0.187	0.181	0.106	0.062
	(0.016)***	(0.028)***	(0.036)***	(0.037)
	(0.018)***	(0.040)***	(0.037)***	(0.055)
Number of products	0.105	0.107	0.112	0.113
	(0.022)***	(0.039)***	(0.048)***	(0.080)
	(0.024)***	(0.052)**	(0.054)**	(0.089)
Average exports per country and product	0.053	−0.073	−0.077	−0.010
	(0.037)	(0.065)	(0.067)	(0.131)
	(0.039)	(0.092)	(0.099)	(0.159)
Average exports per country	0.052	0.033	0.035	0.103
	(0.033)	(0.060)	(0.055)	(0.117)
	(0.035)	(0.085)	(0.085)	(0.135)
Average exports per product	0.135	0.107	0.029	0.092
	(0.036)***	(0.066)	(0.064)	(0.133)
	(0.038)***	(0.097)	(0.096)	(0.153)
Firms never assisted before, 2003 to 2006				
Total exports	0.468	0.383	0.513	0.238
	(0.102)***	(0.117)***	(0.172)***	(0.041)***
	(0.107)***	(0.161)*	(0.177)***	(0.078)***
Number of countries	0.251	0.204	0.272	0.057
	(0.042)***	(0.046)***	(0.102)***	(0.301)
	(0.049)***	(0.061)***	(0.106)***	(0.310)
Number of products	0.113	0.100	0.158	0.374
	(0.052)**	(0.059)*	(0.111)	(0.414)
	(0.055)**	(0.084)	(0.116)	(0.463)
Average exports per country and product	0.104	0.079	0.083	−0.107
	(0.095)	(0.106)	(0.213)	(0.087)
	(0.098)	(0.140)	(0.279)	(0.103)
Average exports per country	0.217	0.179	0.241	−0.196
	(0.092)***	(0.103)*	(0.178)	(0.332)
	(0.095)**	(0.144)	(0.240)	(0.362)
Average exports per product	0.355	0.283	0.355	0.004
	(0.097)***	(0.110)***	(0.189)*	(0.385)
	(0.099)***	(0.146)**	(0.204)	(0.407)

Source: Own calculations on data from UMCE-SICP, ExportAR and AFIP.
Notes: The table reports matching difference-in-differences estimates of the average assistance effect on assisted firms both pooling over firms and discriminating across their size categories for the six export performance indicators. Kernel matching is based on the Epanechnikov kernel with a bandwidth of 0.04. Analytical and bootstrapped SE based on 500 replications are reported in this order in parentheses below the estimated effects. The significance indicator is reported with the SE corresponding to each method used to compute these errors.
*, ** and *** denote significance at the 10, 5 and 1% levels, respectively.

products as defined in terms of the liberal version of the classification proposed by Rauch (1999) to firms' total exports and the lagged ratio of exports to OECD countries also to firms' total exports, and re-estimate the programme effects using the propensity score based-procedures. Estimation results based on these two modified versions of the propensity score are fully consistent with our baseline estimates.[39]

To sum up, there is strong robust evidence that trade assistance programmes managed by ExportAR seem to have promoted Argentine firms' export growth mainly by facilitating an increase in the number of countries they sell to. However, these effects do not distribute uniformly over firm size categories. More concretely, as expected, the positive impacts are primarily observed in small- and medium-size companies.

V. Concluding Remarks

Trade impediments such as informational barriers may affect firms with different sizes differently. In particular, they are likely to have stronger deterring effects on smaller companies because they lack the scale and thus the resources to perform the gathering and disseminating activities by themselves. Public programmes aimed at addressing such information problems implemented in several countries around the world can, therefore, be expected to have larger impacts on these firms' export performance than on that of large firms. In fact, smaller companies are the declared primary beneficiaries of these public interventions. Even though the overall effectiveness of these trade promotion initiatives has been documented and there is some partial and limited evidence on their specific effects on SMEs, the empirical literature is still silent on whether these effects are heterogeneous over firm size categories as conventionally defined by policymakers, i.e. in terms of employment levels. Knowing this is critical to assess to what extent these public activities are well targeted. In this article, we contribute to this literature by carefully examining whether and how export promotion programmes executed by Argentina's national agency ExportAR affect export outcomes of firms belonging to different size segments. In doing this, we have performed conventional difference-in-differences estimation along with several variants of this method on a rich dataset including firm-level data on exports by product and country of destination and employment for virtually the whole population of Argentine exporters.

We find that indeed these public programmes have nonuniform effects over the size distribution of firms. They seem to be well targeted in the sense that significant effects are only registered for small- and medium-size companies. More specifically, support from ExportAR seem to have resulted in increased exports for firms within these size categories and this has mainly taken place through an expansion of the set of destination countries. This is consistent with our priors since information barriers tend to be more severe when attempting to enter new export markets than when pursuing to expand exports to countries that are already among firms' destination markets and, as referred to above, their trade-inhibiting effects are especially strong for smaller business units.

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[39] Detailed tables reporting these estimation results are available from the authors upon request.

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