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## Does Export Promotion Help?

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## Abstract ♦

Entering new export markets is primarily a discrete choice. Even though several empirical papers have used modeling strategies consistent with this fact, no study has examined the effects of public policies aimed at affecting this decision within this setting. In this paper we assess the impact of trade promotion activities on export outcomes using trade support and highly disaggregated export data for the whole population of exporters of a small developing country, Uruguay, over the period 2000-2007 to estimate a binary outcome model which allows for unobserved heterogeneity. We find that trade supporting activities have helped firms reach new destination countries and introduce new differentiated products.

**Keywords:** Export Promotion, Firm Exports, Latin America, Uruguay
**JEL-Code:** F13, F14, L15, H32, H40, L25, O17, O24, C23.

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# 1 Introduction

A simple portfolio argument suggests that, if covariance of firm sales across countries is not perfect, then spreading these sales over a larger number of countries will be associated with more stable total sales and so this can be expected to result in lower likelihood of failure, in general, and of exiting international markets, in particular (see, e.g., Hirsh and Lev, 1971; and Bernard and Jensen, 2002).[1] Given the severe information problems deterring export activities, adding new destination countries or new export products may be challenging, however, especially for firms with limited export experience based in developing countries. Trade promotion activities ameliorate these information problems and might therefore affect the probability that firms start exporting to a new country or selling a new good abroad. Is this really the case? Even though some previous studies report evidence on the effect of these activities on the growth of firms' export margins (see, e.g., Volpe Martincus and Carballo, 2008), no formal evaluations have been performed of their direct impact on the probability of incorporating a new country or introducing a new export product.[2] In taking explicitly into account the discrete-choice nature of the decision to enter new countries or product markets, such an evaluation could provide valuable new insights on how trade promotion actions specifically affect the extensive margin of firms' exports and thereby their overall export performance, including their ability to survive in foreign markets. This requires specifying and estimating an econometric model with discrete outcomes, which allows for heterogeneous responses to treatment over observationally identically persons. This paper aims precisely at filling this gap in the literature, estimating a discrete-choice, latent index model using trade support and highly disaggregated export data for the whole

[1] Supporting empirical evidence for this argument has been reported in recent papers. Thus, Eaton et al. (2007a) estimate transition matrices for Colombian exporters and find that firms exporting to more than three countries are more likely to keep selling abroad the next year. In the case of Uruguay, Cox estimations based on a model including (the natural logarithm of) total exports, unobserved firm heterogeneity, and year fixed effects suggest that firms that export to two countries are approximately 50% less likely to exit international markets than firms that only export to one country, whereas firms that trade with three countries have roughly a 70% lower probability of doing so. Similar results are obtained when controlling for the number of products exported. These estimates are available from the authors upon request.

[2] For an overview of the literature on the impact of export promotion policies at different levels of aggregation (i.e., country, regions, and firms) see Volpe Martincus and Carballo (2008).

population of exporters of a small developing country, Uruguay, over the period 2000-2007.[3]

Incomplete information creates frictions in matching between buyers and sellers across national borders and can therefore become an important obstacle to developing export activities (see, e.g., Rangan and Lawrence, 1999; Rauch and Casella, 2003; and Huang, 2007). Information gaps are particularly pronounced in the case of differentiated products. These products differ along multiple dimensions in such as way that their prices do not convey all relevant information to guide resource allocation (see, e.g. Rauch, 1996). As a consequence, their international trade is especially favored by factors reducing the aforementioned gaps such as common language, colonial ties, and co-ethnic business networks (see Rauch, 1999; and Rauch and Trindade, 2002).

Heterogeneity in the degree of information incompleteness is also likely to prevail across different export activities. More precisely, information problems tend to be more severe when firms attempt to export to a new country or sell a new product abroad than when they simply expand their export activities in countries they already export to or increase their sales of already exported products. When exporting to a new destination, firms must learn, among other things, about the alternative ways and respective costs of shipping their merchandises, the tariffs, non-tariff measures, and technical regulations applied on their goods, both for the home country and for competing countries; domestic consumer preferences relevant for the saleability of the good to be traded; the distribution channels, in general, and potential business partners, in particular; the mechanisms to make their products known to the public; and the main marketing strategy of incumbent firms. Gathering this information requires performing market-specific studies, whose costs are at least partially fixed in nature. As highlighted in recent international trade models with firm heterogeneity, these costs can prevent firms with productivity levels below certain thresholds entering such export markets (see, e.g., Melitz, 2003; and Melitz and Ottaviano, 2008).

Several trade promotion actions aim at reducing the frictions generated by incomplete information and thereby the fixed costs associated with exporting. Thus in general, export promotion agencies provide firms with training on the export process as well as with

[3] For detailed descriptions of Uruguay' trade patterns see, e.g., Vaillant and Bittencourt (2001), Giordano and Quevedo (2006), and Snoeck et al. (2008).

information on foreign markets; organize, coordinate and sometimes co-finance their participation in trade fairs, shows, and missions; and help companies establish specific business contacts (see Jordana et al., 2010). These activities could be rationalized as public interventions correcting market failures if the search for business partners is assumed to be subject to free-riding through information spillovers (see, e.g., Rauch, 1996).

Hence, by helping overcome information barriers, trade promotion programs may facilitate the expansion of exports along the extensive margin in terms of both countries and products, and, in the latter case, especially those of differentiated goods. More specifically, these programs may aid firms adding an entirely new market, i.e., a market they never had trade relationships with before. Notice that this is not the same as an overall increase in the number of markets in which firms operate as studied in Volpe Martincus and Carballo (2008), since such an increase might result from simultaneously adding several markets and dropping others, potentially some already having been served in the past. In fact, in Uruguay only about 30.0% of the exporting companies registering expansions in the number of destination countries and products exported have actually penetrated a new market between 2001 and 2007.[4] The aforementioned specific extensive margin dimension is particularly interesting in itself for at least three reasons. First, as mentioned above, this is precisely where information problems hit more forcefully and accordingly where export promotion can make the largest difference. Second, when doing it, firms tend to add new markets gradually rather than in large clumps (see, e.g., Eaton et al., 2007; Lawless, 2009; Schmeiser, 2009).[5] In particular, most firms incorporate only one market at a time. For instance, in the case of Uruguay, among exporting companies with new destination (products) in a given year, more than 60.0% (approximately 50.0%) add just one country (product).[6] Third, sales to new destinations and those of new goods may be influential in determining firms' export performance and even aggregate export outcomes. Thus, in Uruguay, new products account for almost 10.0% of total exports of firms with continuous presence in international markets over the

[4] Companies may even incorporate a new market while experiencing a reduction in the total number of markets they are present in.
[5] This pattern is consistent with the model developed by Eaton et al. (2008) augmented to allow for serial correlated productivity shocks. According to this model, variations across firms in market entry are primarily explained by differences in efficiency.
[6] Further, even though there are firms that enter more than one market simultaneously, correlation in the decisions to penetrate separate markets can be expected to be weak after conditioning by firms' size, their previous export market coverage, and general macroeconomic conditions (see Eaton et al., 2007; and Lawless, 2009).

period 2000-2007 and 3.8% of the country's total exports. After five years, the shares of these products increase to 27.6% and 6.7, respectively.[7] Hence, a deeper understanding of the channel through which trade promotion programs affect exports can be reached by assessing their influence on firms' penetration of new markets. This is what this paper aims at. It therefore addresses one main question: Do export supporting activities performed by trade promotion organizations in developing countries actually help firms in adding new destination countries or new export products?[8]

Answering this question involves performing a counterfactual exercise, i.e.., in order to determine the effect of export promotion programs one needs to estimate how firms would have behaved had they not participated in that program. Since this potential behavior is not observed, it must be estimated from the data using information on non-participating firms to build an appropriate control group. More precisely, establishing causal impacts instead of simple correlations requires controlling for all firm characteristics that may potentially affect both usage of export promotion programs and export outcomes. Standard methods such as matching are based on the identifying assumption that selection into trade promotion activities is only based on observed (by the econometrician) attributes. Since there might be several unobserved factors that may play an important role in determining assistance status and also export performance, this may turn out to be a very restrictive assumption. Furthermore, the decision whether to add a new destination country or a new export product is primarily a discrete choice and the interest accordingly lies in the probability that such events actually occur (see, e.g., Roberts and Tybout, 1997). Thus, in our case the outcome variables of interest are dichotomous. This raises additional specific econometric issues for program evaluation (see, e.g., Athey and Imbens, 2006). To address these issues we use the estimator proposed by Aakvik et al. (2005), which allows for unobserved factors that may affect selection into programs and export outcomes and thus heterogeneous responses to programs (i.e., firms respond differently to the same program). We thereby contribute to the existing literature assessing, to our knowledge for the first time, the impact of export

[7] In Chile, new products accounted on average for 15.0% of total exports over the period 1992-2001, while in Russia more than 13.0% of exports are due to continuing exporters entering new destinations between 2003 and 2004 (see Álvarez et al., 2007; and Schmeiser, 2009, respectively).

[8] An assessment of these activities from the point of view of social welfare requires contrasting the costs they incur with the benefits they generate. This is beyond the scope of this paper, which focuses only on the benefits of these actions in terms of export performance.

promotion programs on probably the most relevant dimension of firms' export extensive margin, i.e., the decision to enter new country or product markets, while taking into account its discrete choice nature.[9] In doing this, we exploit a new database primarily consisting of an annual list of companies assisted by Uruguay's main export promotion agency, URUGUAY XXI, and firm-level export data disaggregated by product and destination country covering the whole population of this country's exporters over the period 2000-2007. Noteworthy, we thus focus on the impact of trade support on already exporting firms. Unfortunately, due to data constrains, we cannot evaluate whether URUGUAY XXI helps non-exporters become exporters.[10] While admittedly this is a limitation of our study, for the reasons listed above, we believe that much is to be gained by investigating the effects of export promotion activities on exporters' entry into new markets. Further of interest from both academic and trade policy points of view, we look at the experience of a small developing country, where obstacles hindering expansion of exports along these margins are likely to be stronger. In particular, products of firms from these countries might be perceived as less technologically advanced and of poorer quality than those from developed countries (see, e.g., Chiang and Masson, 1988; Han and Terpstra, 1988; Hudson and Jones, 2003).[11]

We find that export supporting activities by URUGUAY XXI have been effective in helping Uruguayan firms reach new destination countries, especially non-OECD, Latin American and Caribbean markets, and in introducing new differentiated products. In contrast, no significant impacts are observed when no distinction in terms of the degree of differentiation of the goods is performed. This result can be explained by the fact that, in this case, we are implicitly pooling over goods whose trade involves information problems of varying intensity, so we are accordingly likely mixing effects of trade support actions of varying intensity, i.e., strong for differentiated products as referred above and weak or null for homogeneous products.

[9] There are few antecedents in the use of binary outcome models to evaluate export promotion activities. Thus, Spence (2003) examines the effect of U.K. overseas trade missions estimating a standard logit model with data on 190 companies. She shows that firms whose sales are spread over a larger number of countries and accordingly have been exposed to the entry process in various markets are more likely to establish contacts and obtain leads during trade missions. Alvarez (2004) estimates a standard probit model to assess the impact of the trade promotion instruments used by PROCHILE on the probability of becoming a permanent exporter using a sample of 295 Chilean manufacturing small and medium sized enterprises. He finds that trade shows and trade mission do not affect this probability, but exporter committees do.

[10] We do not have the required data to examine selection of firms into export markets and how assistance by URUGUAY XXI shapes this selection process (e.g. sales for both exporters and non-exporters and a list of non-exporting firms assisted by URUGUAY XXI).

[11] This would be specifically the case if consumer attach informational value to quantity and accordingly interpret low market shares as a signal of low quality (see Caminal and Vives, 1992).

The remainder of the paper is organized as follows: Section 2 explains the empirical methodology. Section 3 presents the dataset and descriptive evidence on firms' export performance. Section 4 reports and discusses the econometric results, and Section 5 concludes.

## 2 Empirical Methodology

Let $Y_i$ be an export performance indicator of firm *i*. Each firm either participates or not in trade promotion programs. Thus, there are two potential outcomes, $Y_{0i}$ and $Y_{1i}$, where $Y_{0i}$ corresponds to the non-participation state and $Y_{1i}$ corresponds to the participation state. The difference between $Y_{1i}$ and $Y_{0i}$ is the gain or loss in terms of export performance that firm *i* would experience if it participates in export promotion activities relative to what it would register if it has not participated in these activities, i.e., this difference is the causal effect of assistance by the trade promotion agency, in our case, URUGUAY XXI.[12] Since it is impossible to observe $Y_{1i}$ and $Y_{0i}$ for the same firm, such an individual treatment effect can never be observed. This is the so-called fundamental problem of causal inference (see Holland, 1986). The statistical solution to this problem consists of using the population of firms to learn about the properties of the potential outcomes. Usually, an average treatment effect is computed, typically, *the average treatment effect on the treated.* In our case, this would correspond to the average effect for firms that participate in activities organized by the trade promotion organization.[13]

In order to estimate this effect consistently, an unbiased estimate of the expected counterfactual is required. Alternative methods have been proposed in the literature to construct the correct sample counterpart for the missing information on the outcomes realized if firms had not been assisted when no randomized control groups are available (see, e.g., Heckman et al., 1998; Heckman et al., 1999; Klette et al., 2000; Jaffe, 2002; Blundell and Costa Dias, 2002; Lee, 2005; Smith and Todd, 2005a). Matching is one of these methods and consists of pairing each assisted firm with the more similar members of the non-assisted group on the basis of their observable characteristics and then

[12] URUGUAY XXI is Uruguay's Institute for Promotion of Investments and Exports of Goods and Services.
[13] We will use interchangeably assistance, support, treatment, and participation throughout the paper.

estimating the impact of assistance by comparing the exports of matched assisted and non-assisted firms. This method is based on the main identifying assumption that selection into assistance occurs only on observables (see, e.g., Heckman and Robb, 1985; and Heckman et al., 1998).[14] In general, due to data limitations, there may be several characteristics that are not observed by the econometrician and, as a consequence, systematic differences between treated and non-treated outcomes may persist even after conditioning on observables. Assuming that selection on the unobservables is zero can therefore be very restrictive. One way to allow for selection on an unobservable determinant consists of combining matching with difference-in-differences as long as this determinant lies on separable individual and/or time-specific components of the error term (see, e.g., Blundell and Costa Dias, 2002; and Smith and Todd, 2005a).[15] The resulting matching difference-in-differences estimator compares the change in before and after exports of assisted firms with a weighted average of the change of matched non-assisted ones, so that imbalances in the distribution of covariates between both groups are accounted for and time-invariant effects are eliminated. Operatively, differences are matched on the probability of treatment exposure conditional on observed covariates or propensity score and weights depend on the cross-sectional matching estimator used in the first stage. A related approach uses instead a direct weighting scheme on the propensity score (see Abadie, 2005). These procedures rely for identification on the assumption that there are no time-varying unobserved effects influencing selection and exports (see Heckman et al., 1997; and Blundell and Costa Dias, 2002).

This solution works well with continuous export performance measures along the extensive margin such as the (growth of the) number of export destinations and the number of products exported (see, e.g., Volpe Martincus and Carballo, 2008). In this paper, however, we are interested in assessing whether export promotion activities help firms reach new destination countries or introduce new export products. Our outcome variables are therefore eminently dichotomous. Formally, $Y_i$ is a binary indicator that

[14] Formally, matching is based on two assumptions. First, conditional on a set of observables *X*, the non-treated exports are independent of the participation status (conditional independence assumption). Second, all firms have a counterpart in the non-treated population and anyone is a possible participant (common support). Both assumptions together are called "strong ignorability". For additional details see, e.g., Rosenbaum and Rubin (1983), Heckman et al. (1997), Heckman et al. (1998), Angrist and Krueger (1999), Blundell and Costa Dias (2002), and Caliendo and Kopeinig (2008).

[15] See also Heckman et al. (1997) and Heckman et al. (1998).

takes the value of 1 if firm *i* adds a new country and 0 otherwise.[16] With binary outcomes, standard models can lead to predictions outside the allowable range, and giving up the additivity assumptions to avoid potential misspecification without imposing additional assumptions may result in non-identification of the counterfactual distribution of outcomes (see Athey and Imbens, 2006).

In order to estimate the aforementioned effects within a binary framework, we use the procedure proposed by Aakvik et al. (2005), which builds upon Heckman (1981) and the latent variable model developed by Heckman and Vytlacil (1999).[17] More precisely, we specify and estimate an endogenous switching binary response model where selection into export promotion programs and export outcomes are jointly determined and unobservables are generated by factor structures.[18] Firms are thus allowed to participate in these programs on the basis of their idiosyncratic response to assistance and these response are allowed to differ with observed characteristics and also across observationally identical firms (i.e., with different unobserved attributes) (see Aakvik et al., 2005; Auld, 2005).

Formally, the observed outcome can be defined as follows:

$$Y_i = D_i Y_{1i} + (1 - D_i) Y_{0i} \tag{1}$$

where $D_i$ is an indicator codifying information on treatment by URUGUAY XXI which takes the value 1 if firm *i* has been assisted by the agency and 0 otherwise.[19] As we will see in Section 4, since the selection process into trade assistance is in fact a joint decision of the firm and the agency a multiple index model should be specified (see Poirier, 1980).[20] Given the appropriate exclusion restrictions, this analysis can be extended to allow for such a model (see Aakvik et al., 2005).[21]

[16] We should mention herein that, even though the presentation hereafter focuses on the probability of incorporating a new destination, *mutatis mutandis* it also applies to other measures of export performance along the extensive margin (e.g., the probability of adding a new export product).

[17] This approach has been also used in Andrén and Andrén (2002), Elias et al. (2004), Auld (2005), Graversen and Jensen (2006), and Coelli et al. (2007). Unlike matching, this method requires a first stage decision rule given by a threshold crossing model (see Heckman and Vytlacil, 2005)

[18] An econometric model of the form: $Y_i^* = X_i\delta + \lambda_i D_i + \varepsilon_i$ with $\lambda_i = X_i\rho + \vartheta_i$ can be written as $Y_{1i}^* = X_i\beta_1 + U_{i1}$ for $D_i = 1$ and $Y_{0i}^* = X_i\beta_0 + U_{0i}$ for $D_i = 0$ (see Auld, 2005).

[19] This is the classical model of potential outcomes (see Neyman, 1923; Fisher, 1935; Roy, 1951, Cox, 1958, Quandt, 1972, and Rubin, 1978).

[20] This also applies to participation in social programs (see, e.g. Sianesi, 2004, and Aakvik et al., 2005).

[21] This extension is left for future work.

Specifically, the potential outcome for the participation state is $Y_{1i} = \mu_1(X_i, U_{1i})$, whereas that for the non-participation state is $Y_{0i} = \mu_0(X_i, U_{0i})$, where $X_i$ is a vector of observed random variables $U_{0i}$ and $U_{1i}$ are unobserved random variables. Furthermore, $Y_{0i}$ and $Y_{1i}$ are assumed to be defined for any firm and independent across firms, so that there are no interactions among them (see Heckman and Vytlacil, 1999).[22] Moreover, we assume in particular that a linear latent index generates the dichotomous outcome, i.e., $\mu_j(X, U_j) = 1[X\beta_j \geq -U_j]$ where *j=1* for the treated state and *j=0* for the non-treated state, and ***1****{.}* is an indicator function.[23] Thus, we specify the following export outcome equation of the assistance state:

$$Y_{1i}^* = X_i\beta_1 + U_{1i}$$
$$Y_{1i} = \begin{cases} 1 & if \quad Y_{1i}^* \geq 0 \\ 0 & otherwise \end{cases} \qquad (2)$$

and the following export outcome equation for the non-assistance state:

$$Y_{0i}^* = X_i\beta_0 + U_{0i}$$
$$Y_{0i} = \begin{cases} 1 & if \quad Y_{0i}^* \geq 0 \\ 0 & otherwise \end{cases} \qquad (3)$$

where $Y_{1i}^*$ is a latent index of adding a new country when receiving support and $Y_{0i}^*$ is the corresponding latent index when not receiving support. We assume here that $U_{0i} \neq U_{1i}$, so that idiosyncratic gains from assistance are allowed for each firm. In other words, the model allows for treatment effects to vary by unobserved individual characteristics (see Aakvik et al., 2003). This is a random coefficient model if firms act on $U_{0i}$ and $U_{1i}$ (see Heckman 1997).[24]

[22] 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 (see Heckman et al., 1998). In particular, we do not consider information spillovers. It is well known that firms may learn about export opportunities from other firms through employee circulation, customs documents, customer lists, and other referrals (see Rauch, 1996). Evidence on spillovers has been presented in several papers, e.g., Aitken et al. (1997), Greenaway et al. (2004), Álvarez et al. (2007), and, to less extent, Barrios et al. (2003). If these spillovers were to be associated with participation in export promotion activities, i.e., unassisted firms obtain business information from assisted firms, then the treatment effects, as estimated here, would be underestimated. Given the number of companies actively participating in these activities (see Table 1), this risks can be expected to be low.

[23] The linear index assumptions are imposed to reduce the dimensionality of the estimation problem. These assumptions are not critical to the empirical approach (see Aakvik et al., 2005).

[24] If $U_{0i} = U_{1i}$, then the effects of the unobservables are the same in both states. In this case, firms with the same observed *X* will have the same treatment effect. This is the so-called common coefficient model (see Aakvik et al., 2003).

We further assume that a latent variable model generates the indicator variable $D_i$. Concretely, the decision rule for participation in export promotion activities is governed by the following process:

$$D_i^* = Z_i\beta_D + U_{Di}$$
$$D_i = \begin{cases} 1 & if \quad D_i^* \geq 0 \\ 0 & otherwise \end{cases} \tag{4}$$

where $D_i^*$ is a latent index that determines whether a firm is assisted or not and can be viewed as the net utility associated with participation in export promotion programs (see Aakvik et al., 2005; and Coelli et all, 2007). $Z_i$ is a vector of observed random background variables that determine selection into these programs. Note that $X_i$ and $Z_i$ are not necessarily the same vectors. In particular, those variables included in $Z_i$ but not included in $X_i$, i.e., variables that determine selection into assistance but do not directly affect export outcomes, provide an identifying exclusion restriction (see Aakvik et al., 2003). As we will see below we assume normality and one-factor structure, i.e., correlation is generated through an individual specific random factor that does not vary over outcomes. Under these assumptions, no such exclusion restrictions are required to identify the mean treatment effects (see Aakvik et al., 2005). In particular, parametric identification obtains from the distributional assumptions without exclusion restrictions because of the non-linearities (see Auld, 2005). In the empirical implementation below, we do use an instrumental variable, namely, the share of firms assisted averaged over the sectors firms are actively exporting. This variable will be discussed in more detail in Section 4. Thus, we will not only rely on functional forms for identification. Finally, $\beta_D$ is a set of parameters and $U_{Di}$ are unobservables.

We assume that unobserved heterogeneity follows a factor structure and enters into the selection as well as the outcome equations (see Heckman, 1981; Aakvik et al., 2003; and Aakvik et al., 2005). Formally, error terms in Equations (2)-(4) are assumed to follow:

$$U_{Di} = \alpha_D\theta_i + \varepsilon_{Di} \tag{5}$$

$$U_{1i} = \alpha_1\theta_i + \varepsilon_{1i} \tag{6}$$

$$U_{0i} = \alpha_0\theta_i + \varepsilon_{0i} \tag{7}$$

where $\theta_i$ is an unobserved firm-specific time invariant factor and $\varepsilon_D, \varepsilon_1, \varepsilon_0$ are independent with respect to each other and of the exogenous variables in the model (see Aakvik et al., 2003). The parameter $\alpha_D$ is the factor loading for the selection outcome, $\alpha_1$ is the factor loading for the outcome equation with treatment, and $\alpha_0$ is the factor loading for the outcome equation without treatment.[25] These $\alpha's$ capture potential correlations among the error terms in Equations (2)-(4). To identify the model, we assume that $\alpha_D$=1 and $(\varepsilon_D, \varepsilon_1, \varepsilon_0, \theta) \sim N(0, I)$, i.e., follow the standard normal distribution (see Aakvik et al., 2005).[26]

In this framework, the effect of the assistance by the agency on assisted firms is given by:

$$\begin{aligned}\Delta^{TT}(x, z, D=1) &= E(\Delta \mid X=x, Z=z, D=1) \\ &= Pr(Y_1 = 1 | X=x, Z=z, D=1) - Pr(Y_0 = 1 | X=x, Z=z, D=1) \\ &= \frac{1}{F_{U_D}(z\beta_D)}\left[F_{D,1}(z\beta_D, x\beta_1) - F_{D,0}(z\beta_D, x\beta_0)\right] \\ &= \frac{1}{E\left(\Phi\left(z\beta_D/\sqrt{2}\right)\right)}\int\left[\Phi(x\beta_1 + \alpha_1\theta) - \Phi(x\beta_0 + \alpha_0\theta)\right]\Phi(z\beta_D + \theta)\phi(\theta)d\theta\end{aligned} \tag{8}$$

Since $\theta$ is not observed, we integrate it out assuming that $\theta \perp\!\!\!\perp (X, Z)$, which is the standard random effects assumption. This random effects setup can therefore be viewed as a solution to a missing conditioning variables problem in matching (see Aakvik et al., 2005).[27]

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[25] Notice that this estimation strategy is designed to correct for the correlation between the unobservables in the outcome and selection equations. Hence, if measurement errors in the export outcome and/or the assistance variables only introduce additional sources of correlation between the unobservables in the respective equations, it can be shown that under certain circumstances, estimates obtained with these kinds of econometric approaches are consistent in the presence of such errors (see, e.g., Kenkel and Terza, 2001).

[26] In this case, the correlations among the unobservables in the model are given by: $Corr(U_D, U_1) = \sigma_{D1} = \frac{Cov(U_D, U_1)}{\sqrt{Var(U_D)}\sqrt{Var(U_1)}} = \frac{\alpha_1}{\sqrt{2}\sqrt{1+\alpha_1^2}}$

$Corr(U_D, U_0) = \sigma_{D0} = \frac{Cov(U_D, U_0)}{\sqrt{Var(U_D)}\sqrt{Var(U_0)}} = \frac{\alpha_0}{\sqrt{2}\sqrt{1+\alpha_0^2}}$

$Corr(U_0, U_1) = \sigma_{01} = \frac{Cov(U_0, U_1)}{\sqrt{Var(U_0)}\sqrt{Var(U_1)}} = \frac{\alpha_0\alpha_1}{\sqrt{1+\alpha_0^2}\sqrt{1+\alpha_1^2}}$ and

$Cov(U_D, \theta) = 1$, $Cov(U_1, \theta) = \alpha_1$, and $Cov(U_0, \theta) = \alpha_0$. Identification of $\alpha_0$ (from $Cov(U_D, U_0)$) and $\alpha_1$ (from $Cov(U_D, U_1)$) immediately imply identification of $\alpha_0\alpha_1 = Cov(U_0, U_1)$. This latter covariance needs neither be estimated nor normalized because it does not enter the likelihood and thus has no effect on the parameter estimates. This follows because only the bivariate distribution $(D, Y_0)$ and $(D, Y_1)$ is required to form the likelihood and to calculate conditional means $(Y_1 - Y_0)$ (see Aakvik et al., 2005). The joint distribution of $(Y_1, Y_0)$ is needed to compute the distributional treatment parameters (see Auld, 2005).

[27] This random effects factor model and the matching model of Rosenbaum and Rubin (1983) are affine. If the econometrician knew $\theta$, then the matching conditions of the latter would be satisfied and propensity score matching could be used to estimate the treatment effect on the treated (see Aakvik et al., 2005).

The likelihood function for this one-factor model integrating out $\theta$ has then the following form:

$$L = \prod_{i=1}^{N} \int Pr(D_i, Y_i | X_i, Z_i, \theta) \varphi(\theta) d\varphi$$

where $Pr(D_i, Y_i | X_i, Z_i, \theta_i) = Pr(D_i | Z_i, \theta_i) Pr(Y_i | D_i, X_i, \theta_i)$. We estimate the parameters by maximum likelihood. Finally, in order to assess the significance of the treatment effect, we compute bootstrapped standard errors based on 500 replications.

## 3 Data and Descriptive Statistics

In our empirical analysis we look at the experience of a small developing country, Uruguay. Specifically, we use annual firm-level export data in US dollars disaggregated by product (at the 10-digit HS level) and destination country over the period 2000-2007 from the Uruguayan customs. The sum of the firms' exports almost adds up to the total merchandise exports as reported by the Central Bank of Uruguay, with the annual difference never exceeding 1.1%. Hence, our data cover virtually the whole population of Uruguayan exporters. Furthermore, along with these data, we have a list of the firms that have been assisted by URUGUAY XXI in each year, kindly provided by this entity. This list primarily includes firms that have interacted closely with the agency on a presential basis. The typical cases are companies that participated in international fairs and missions, potentially including those attending to complementary training activities.[28] 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.[29] Given that support primarily involves a subset of actions more likely to lead to 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.

Table 1 presents basic aggregate export and treatment indicators. Uruguayan exports have grown almost 100.0% between 2000 and 2007. A large fraction of this aggregate

[28] These services are provided in a relatively customized way (see Jordana et al., 2010).
[29] Unfortunately, data on these assistances are not consistently available over the sample period.

export growth has been due to significant expansions along the intensive margin, i.e., larger average exports per country and larger average exports per product. The total number of destination countries and that of products have also increased over these years (32.8% and 13.0%, respectively), while the number of firms selling their products abroad has risen significantly, by 46.6% from 2000 to 2007. The fraction of exporters that have received support from URUGUAY XXI *according to the criterion defined above* has fluctuated around 2.0% over the sample period.[30]

Table 2 presents a characterization of the average Uruguayan exporter over the sample period. This representative firm has total exports around 1.7 million dollars and sells 4.4 products to 3.0 countries. The aforementioned figures are lower than those corresponding to the United States in 2000, 8.9 and 3.5, respectively (see Bernard et al., 2005). Notice that average exports and number of destination countries have increased over recent years, whereas the opposite holds for average number of products.

Table 3 reports the shares of firms that add new destination countries and new export goods over our sample period. The shares suggest that, over the sample period, 50% of Uruguayan firms start exporting to a new country. Information barriers to entry are likely to differ across countries. In particular, these barriers are expectedly higher in more sophisticated markets such as those of the OECD countries. Uruguayan data accordingly indicate that only 43% of the companies incorporate a new OECD country among the destinations over the period we focus on.

On the other hand, almost 60% of the exporting firms introduce a new export product. As with countries, trade of different goods faces obstacles of varying degrees of intensity, which are correlated with their degree of differentiation. We thus explore separately the probability of adding a new differentiated product. In doing this we use the definition of differentiated products developed by Rauch (1999), i.e., goods that are neither traded in

[30] To put this low coverage into perspective, the annual budget of the agency needs to be considered. This budget is relatively small. It amounted to USD 600,000, from which approximately are devoted to trade promotion. As a reference, PROCOMER, Costa Rica's main export promotion organization, has an annual budget of about USD 12 million and assists more than 250 companies each year, whereas PROCHILE, the Chilean counterpart is annually endowed with USD 33 million and serve more than 2,000 firms within a year (see Jordana et al., 2010). In addition, notice that, while the sub-sample of treated firms is relatively small, the total sample is large. This implies that the pool of control observations is large, which makes our particular dataset suitable to estimate the treatment effect on the treated as done here (see Frölich, 2004). Further, as shown in the Appendix to this paper, there are no difficulties in finding firms comparables to the treated ones within the non-treated group. The classical problem of sensitivity of results associated with small sample sizes are not likely to be pronounced here (see Smith and Todd, 2005b). Nevertheless, given that the estimated effect will be identified based on the potentially different export outcomes of these relatively reduced number of assisted companies and that the aforementioned problems cannot be fully ruled out, caution should be exercised when drawing conclusions from the point estimates presented in the next section.

organized exchanges (like homogeneous goods) nor have reference prices quoted in specialized publications (like reference-priced goods). (e.g., shoes, electrical machinery, etc). Specifically, we follow the liberal classification because it is more stringent in typifying goods as differentiated, which we believe is more appropriate for a developing country such as Uruguay.[31] Figures reported in Table 3 suggest that the shares of companies adding differentiated products are significantly smaller than the overall one, 39% and 45%, respectively.

The probability of adding new destinations and new products may also depend on the previous export experience of firms along the respective extensive margins. This is explicitly investigated in Table 4. There we report there two transition matrices, one for countries and one for products. The values behind the main diagonal indicate that the likelihood of entering a new country or product export market in a given period varies substantially with the number of countries firms exported to and the number of goods exported in the previous period, respectively. In particular, in line with previous evidence, when changing market coverage, firms whose export transaction are initially more concentrated tend to add (or subtract) only one market, whereas those whose trade operations are initially more diversified are more likely to enter (or leave) multiple markets at the same time, but only exceptionally in more than four (see Eaton et al., 2007; Lawless, 2009). This is consistent with the latter being more regularly affected by changes to trade costs and demand across a range of markets, including the less popular ones, i.e., those where a few domestic firms export to (see Lawless, 2009). In the next section, we econometrically evaluate whether trade promotion activities performed by URUGUAY XXI's activities have also contributed to shape this dimension of Uruguayan firms' export extensive margin.

[31] Due to some ambiguities, Rauch (1999) proposes two alternative classifications, conservative and liberal. The former minimizes the number of commodities that are classified as either organized exchange or reference-priced and the latter maximizes this number. Combining this latter goods typology with a sectoral classification which identifies as manufacturing categories (those HS codes that correspond to) categories 5 to 8 of the Standard Industrial Trade Classification (SITC) (see Hummels and Klenow, 2005), we can see that, in the case of Uruguay, differentiated goods are primarily manufactured products (approximately 83.4%).

# 4 Econometric Results

In this section we evaluate the effectiveness of export promotion programs on the probabilities of entering new country and product export markets using the methodology outlined in Section 2. More precisely, we examine the impact of export promotion assistance by URUGUAY XXI on four alternative dichotomous export outcomes: the probability of adding a new destination country; the probability of adding a new OECD country; the probability of adding a new export product; and the probability of adding a new differentiated export product. We first discuss the determinants of selection into trade promotion programs. Then we explain how these variables affect the export outcomes. Finally, we report and comment on the estimation results.[32]

## *4.1 What Determines Selection into Export Promotion Programs?*

Several factors may affect selection into activities organized by URUGUAY XXI. As discussed above, this selection is in fact a joint decision of the firm and the agency. Thus, the latter declaredly prioritizes small, relatively inexperienced firms (see Jordana et al., 2010). There may be also self-selection into export support. On the one hand, the aforementioned companies are those expected to require and ask for this support (see, e.g., Volpe Martincus and Carballo, 2009). On the other hand, relatively larger and more experienced firms may be more likely to be aware of and use export promotion services (see, e.g., Reid, 1984; Kedia and Chhokar, 1986; and Ahmed et al., 2002). We therefore include three measures of previous export experience, namely, total exports, number of countries the firm exports to, and number of products exported, all lagged on year, as determinants of the probability of participating in trade promotion programs (see Ashenfelter, 1978; Becker and Egger, 2007).Noteworthy, As we will discuss below these export indicators are implicitly capturing productivity differences across (groups of) firms. Henceforth, we are at least partially controlling for the possibility that the agency picks “winners”.

[32] Estimation results when outcome variables are continuous are reported in the Appendix for the sake of comparison. In particular, we discuss therein the estimation of the propensity score and present estimates of the average assistance effect on the (growth rate of the) number of destination countries and the number of products exported of assisted firms.

Furthermore, Uruguayan exporters can be clearly classified into firms exporting to the region, firms exporting outside the region, and firms exporting to both destinations (see Snoeck et al., 2008). Demand for assistance may vary depending on the firms' main destination countries. Distance can be considered a proxy for familiarity and thus information (see, e.g., Grossman, 1998; Anderson, 2000; Portes et al., 2001; Loungani et al., 2002; Guiso et al., 2005; and Huang, 2007). Firms usually have more information about nearby markets than about markets that are far away because interactions for business or tourism tend to be more frequent and media coverage is likely to be better (see Portes et al., 2001). Hence, firms mainly exporting to neighboring countries may be less likely to need and accordingly request export promotion assistance. On the assistance supply side, the agency may assign different levels of priority to markets at varying distances and henceforth degrees of information incompleteness. Specifically, more distant markets, where lack of information is expectedly a more deterring obstacle, can be targeted. Alternatively, given the budget constraints faced, the trade promotion organization may focus on close countries as the costs of boosting exports in their markets are in principle lower. According to URUGUAY XXI's officials, the former prevails. To control for these geographically related factors, we include as determinant of selection the (lagged) share of MERCOSUR in firms' total exports.[33] Notice that, as MERCOSUR is the main trade arrangement Uruguay takes part of, using these shares we simultaneously account for preferential market access.

Moreover, firms selling abroad goods with different degree of differentiation are likely to have different needs in terms of support. More specifically, firms exporting differentiated products face more severe information problems and so are more likely to resort to and also to be selected for services provided by the agency. Hence, we include the lagged share of differentiated products in the firms' total exports.

In addition, previous use of URUGUAY XXI's programs may affect current participation. For instance, firms satisfied with these programs are more likely to come back to the agency for additional assistance. Accordingly, we also control for previous treatment status by incorporating a binary variable indicating whether the firm received

[33] MERCOSUR is a trade agreement established in 1991 whose member countries are Argentina, Brazil, Paraguay, and Uruguay.

assistance in the previous period (see Görg et al., 2008). We also include year-fixed effects to control for macroeconomic factors affecting participation rates.

Finally, URUGUAY XXI appears to prioritize specific sectors in particular years (see Jordana et al., 2010). This sector targeting affects the probability of individual firms being selected into export promotion. We account for this possibility including the ratio of the number of exporters participating in export promotion activities to the total number of exporters in each (2-digit HS) sector averaged over the sectors in which the firm is active in international markets. The raw ratio exhibits substantial variation across sectors. Its minimum and maximum values are 0.00 and 0.47, respectively. We expect that the aforementioned time-varying variable influences the probability that an individual firm receives trade support, but not its export outcome after assistance, i.e., it affects the probability that the company firm enters new country and product export markets only through export promotion assistance. Admittedly, the variable in question may instead be seen as capturing that the agency targets sectors with high export growth potential, which would make it invalid as instrument. However, as mentioned before, the firm-level lagged export outcomes should control for the possibility that URUGUAY XXI picks up best performers. To informally assess whether this is nonetheless an issue in our case, we have also estimated a model specification including the average annual growth rate of exports at the sectoral level (as defined above) over the five previous years as an additional determinant of selection into trade support programs. Comfortably, unlike the previous one, this variable turns out to be insignificant.[34] We therefore use this sector targeting indicator as our identifying exclusion restriction in the selection model. Noteworthy, this strategy is similar in spirit to the use of regional treatment intensity as an instrument for identification when evaluating active labor market policies proposed by Lechner and Frolich (2006).[35]

[34] The correlation between the two variables is -0.01. These results are not shown here, but are available from the authors upon request.

[35] Sianesi (2004) uses local participation rates to account for unobserved local factors that are relevant for both program-joining decisions and individuals' potential labor market performance.

*4.2 Observed Covariates and Export Outcomes*

We have seen in Section 3 that the probability of adding new countries and new products varies with the number of countries firms exported to and the number of products they exported in the previous period, respectively (see Table 4). This informally suggests that previous export experience, as measured by total exports, number of destination countries, and number of products, can be an important determinant of the ability to enter new country and product export markets.[36] Several studies present evidence supporting this relationship. Thus, Spence (2003) argues that firms that have been exposed to the entry process in various countries have acquired skills that allow them to obtain relevant and direct information about a market in an efficient way and are likely to have a proactive attitude towards exports that helps them overcome export barriers and build business relationships. In particular, firms' export diversification patterns can be viewed as indicative of their productivity levels. Existing empirical literature suggests that most exporting firms sell to only one foreign country (see, e.g., Eaton et al., 2004; Bernard et al., 2006; Volpe Martincus and Carballo, 2008). Furthermore, the number of firms serving multiple markets declines with the number of destinations (see, e.g., Eaton et al., 2004). This is precisely the case of Uruguay (see Figure 1). Moreover, firms trading with only a few countries are likely to do it with the most popular ones. Conversely, firms exporting to many countries are more likely to reach less popular destinations. These patterns can be interpreted as reflecting that firms with relatively low marginal costs can profitably trade with a larger number of foreign countries (see Eaton et al., 2007; and Eaton et al., 2008).[37] Similarly, if adding new export products requires incurring specific sunk costs, then exporting more products would be consistent with higher levels of efficiency (see Bernard et al., 2006).[38]

Destination and types of goods traded may also contribute to shape export outcomes. Exigencies when exporting to well-known neighbor countries are likely to be smaller for

[36] Volpe Martincus and Carballo (2009) examine the heterogeneous effects of export promotion programs across groups of firms with different levels of international experience. Exploring these heterogeneous effects in our setting is beyond the scope of this paper and is left for future research.

[37] Eaton et al. (2007b) show that French firms that sell to more markets and serve less popular markets systematically sell more in France.

[38] Bernard et al. (2006) find evidence suggesting that firms' productivity is correlated positively across products, i.e., single-product firms with relatively high productivity in their product are more likely to add a new product to their mix of goods than relatively low-productivity firms producing the same initial product.

Uruguayan firms than those faced when exporting to distant, more sophisticated 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. Properly shaping the marketing strategy 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). On the other hand, entry costs can also be conceivably high in developing country markets. Thus, Rauch and Watson (2003) argue that the cost of search for alternative suppliers is much higher in developing countries than in developed ones due to inferior communication and transport infrastructure. For the same reasons, costs are also likely to be high when searching for potential business partners, in general, and customers, in particular.

Differentiated goods are heterogeneous both in terms of their characteristics and their quality. This interferes with the signaling function of prices thus making it difficult to trade them in organized exchanges. In short, information problems are more severe when trading differentiated products as opposed to when trading more homogeneous goods. As stated above, this is especially important for firms from a developing country such as Uruguay, whose products, due to national reputation effects, might be perceived by buyers as less technologically advanced and of poorer quality than those from developed countries.

Hence, geographical export orientation and degree of differentiation of goods exported are also likely to account for relevant factors determining the ability of the firms to penetrate new country and products markets, in general, and OECD country and differentiated product markets, in particular. These factors are captured in our export outcome equations by the (lagged) share of MERCOSUR and that of differentiated products in firms' total exports. These variables isolate the influence of preferential market access and (at least partially) sectoral specificities, respectively.[39]

[39] As referred to in Footnote 19, differentiated products are primarily manufactures. Hence, the share of differentiated products implicitly allows discriminating between manufacturing and agricultural and mining exporters. Further, this share differs markedly across the two-digit sectors. Detailed tables are available from the authors upon request.

Past assistance status can influence current export outcomes, too. This would be the case if participation in export promotion activities has lagged impacts. Thus, for instance, business contacts established during a trade mission in a given year may lead to sales the next year. This is controlled for by the binary variable indicating whether the firm has used trade promotion services the previous year. Finally, we also include in this case year fixed-effects to account for macroeconomic conditions that may condition individual firms' export outcomes.[40] In closing this sub-section, we should recall herein that our estimation strategy accounts for firm-specific unobserved heterogeneity (see Equations (5) to (7) in Section 2).[41]

### *4.3 Estimation Results*

Tables 5-8 present the parameters of the selection equation, the export outcome equation for non-assisted firms, and the export outcome equation for assisted firms, based on the model with unobserved heterogeneity. Specifically, for each equation the parameter values, the mean marginal effects, and respective standard errors are reported.[42] These standard errors are clustered by firms, thus correcting for potential serial correlation.[43] Finally, the implied assistance effect on assisted firms is shown.

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[40] The empirical literature suggests that other firm-level time-varying factors (e.g., employment, age, innovation activities) may also contribute to explain firms' export performance (see, e.g., Roberts and Tybout, 1997; Bernard and Jensen, 2004). Unfortunately, we do not have data on these additional factors in our dataset.

[41] As noticed above, the number of assisted companies is small relative to the population of exporters. Thus, one might argue that the untreated sample potentially include many firms that are not looking for adding new markets. More formally, there might be an unobserved firm-specific factor shaping the dynamics of the export extensive margin. This unobserved heterogeneity should therefore be controlled for by our estimation procedure. Moreover, as seen before, the probability of incorporating new markets appear to be highly correlated with previous market coverage and this is explicitly accounted for in the econometric model being estimated. Further, as an additional informal check exercise in this direction, we have first constructed matched samples including only the 5 or 10 most similar non-supported firms for each supported one as identified based on their propensity scores (see the Appendix). Second, we have estimated a non-parametric test of differences in proportions of companies in both groups that enter new markets as well as the Mantel-Hanszel test (see Aakvik, 2001). Consistent with the evidence presented below, these tests clearly indicate that the proportions are significantly larger for the assisted group in all export outcome dimensions considered in this study. These results are not reported here but are available from the authors upon request.

[42] The mean marginal effects of a continuous regressor $z_k$ in the selection equation is defined as $E_Z\left[\partial P(D=1|Z)/\partial z_k\right]$, where $E_z$ denotes the expectation operation taken with respect to the distribution of $Z$, i.e., the mean marginal effect is the analytical derivative averaged over the unconditional distribution of $Z$. Further, the marginal effect of a binary explanatory variable is computed as $E_Z\left\{\left[P(D=1)|Z_{-j},z_j=1\right]-\left[P(D=1)|Z_{-j},z_j=0\right]\right\}$, where $Z_{-j}$ stands for the elements of $Z$ excluding the binary variable $z_j$, i.e., the marginal effect is the impact of a change from zero to one in the variable in question. Notice, finally, that the expressions for the marginal effects corresponding to the outcome equations $Y_0$ and $Y_1$ (with respect to $X$ instead of $Z$) are defined analogously (see Aakvik et al., 2005; and Auld, 2005).

[43] We also estimate the correlations between unobservables in the selection and outcome equations: (-0.252;0.445), (-0.088;0.204), (0.263;.0.162) (0.141;0.715) where the first component of the pairs is the estimated correlation between the unobservable of the selection equation and that of the export outcome equation for assisted firms and the second component is the estimated correlation between the unobservable of the selection equation and that of the export outcome equation for non-assisted firms.

The first two columns of Tables 5-8 present the estimated coefficients and the mean marginal effects of observed covariates on the probability to participate in trade promotion programs.[44] Estimation results reported therein clearly suggest that selection into these programs is far away from being random. In other words, participants differ significantly from non-participants with respect to observed characteristics. In general, firms that have traded with more countries, and accordingly have faced entry processes in more markets and had to deal with different marketing environments, thus having already accumulated important previous export experience, are more likely to be users of the export promotion services provided by URUGUAY XXI. This confirms previous findings in the literature mentioned above that more experienced firms tend to have a higher probability of being clients of trade promotion agencies (see, e.g., Reid, 1984; Kedia and Chhokar, 1986; and Ahmed et al., 2002). Moreover, firms that have been assisted in the past are more likely to be assisted in the current period. This might reflect a process of gradual building of work relations through repeated interactions leading to increased reciprocal trust over time. In particular, if companies evaluate positively the net benefits of their participation in these public programs, they will be more likely to use them again. Importantly, the estimated coefficient on the mean share of supported firms is positively and statistically significantly different from zero.[45] Hence, this sectoral targeting variable is a significant predictor of selection of individual companies into export promotion activities and thereby satisfies the first requirement of being a valid instrument, namely, to be correlated with the treatment decision. Estimates from single equation probits of adding new countries, new OECD countries, new products, and new differentiated products suggest that this share has no significant effect on these export outcomes after stratifying by participation status.[46] This informally indicates that the aforementioned variable also fulfills the second condition to be an appropriate instrument, i.e., not affecting the outcomes after conditioning on treatment (see Auld, 2005). Finally, other variables such as (lagged) total exports as proxy for size; (lagged)

[44] Note that specific estimated coefficients exhibit slight differences. This is because selection and outcome equations are jointly estimated, and so, even though all selection equations aim at explaining participation in export promotion programs of the same group of firms with the same set of covariates, this selection interacts with different outcomes.

[45] In an alternative specification of the selection equation, we have used the share of assisted firms in the main (2-digit) export sector instead of the average over all sectors in which the firm is present in international markets. Estimation results are almost identical to those reported here and are available from the authors upon request.

[46] These estimates are not shown here but are available from the authors upon request.

product export diversification; and (lagged) geographical and product specialization patterns as measured by the shares of OECD countries and differentiated goods in firms' total exports, do not seem to be significant factors in explaining selection into export promotion assistance.

Columns 3 to 6 of Tables 5-8 show the estimated parameters and marginal effect vectors along their respective standard errors from the export outcome regressions for non-assisted and assisted firms, respectively. The (lagged) number of destination countries is positively associated with the probability of entering a new country export market both for companies participating and non-participating in export promotion programs (see Table 5). This is consistent with our expectations. Prior experience in penetrating and operating in other countries may ease further geographical diversification. The share of neighboring countries in assisted firms' total exports has a positive effect on the probability of adding a new country. This might suggest that firms that have accumulated export experience in the region are more likely to be able to sell their goods outside the region if they are supported with trade promotion actions. The results from a similar exercise, where the outcome variable is specifically incorporating a new non-MERCOSUR country to the set of destinations instead of a country in general, indicate that this is indeed the case.[47] The opposite holds for firms that do not received assistance. In addition, the share of differentiated products in the firms' total exports is negatively related to the probability of adding a new country, in particular if that country is a developed one (see Tables 6 and 7, respectively). This can be explained in terms of Uruguay's comparative advantage patterns. Concretely, ability to enter new countries, especially OECD markets where competition is fiercer, will be stronger for firms operating in sector where the country has a comparative advantage with respect to the rest of the world. This is clearly the case in non-differentiated agricultural and agriculture-related products. In fact, Uruguayan exports to developed countries are primarily concentrated in non-differentiated, non-manufacturing products (see, e.g., Giordano and Quevedo, 2006; Snoeck et al., 2008). Conversely, firms specialized in differentiated manufacturing goods will find it more difficult to disembark in those sophisticated markets. Furthermore, under non current participation, previous participation has a

[47] These estimation results are not reported but are available from the authors upon request.

positive impact on the likelihood of reaching a new country, which could amount to lagged effects of trade support activities.[48] Moreover, firms that are not diversified in terms of products are less likely to enter new OECD countries if they do not participate in export promotion activities (see Table 6).

Using these estimates and Equation (8), we compute the assistance effects on assisted firms and, as mentioned in Section 2, we assess their significance using bootstrapped standard errors based on 500 replications. The effect is positive and statistically different from zero on the probability of adding a new country. Specifically, the treatment effect on treated firms is 40.1 percentage points, i.e., this probability is 0.40 higher for firms supported by URUGUAY XXI. As stated in Section 3, this point estimate should be taken with caution, since it is likely to represent an upper bound of the real overall impact of trade support.

The impact is insignificant on the probability of entering a new OECD country. Thus, export promotion assistance seems to be effective in helping firms expand their exports in the country-extensive margin by primarily favoring penetration of non-OECD country markets. In fact, the assistance effect on assisted firms is 0.412 (significant at the 5% level) when the outcome variable is the probability of incorporating a new non-OECD country.[49] Notice that within the non-OECD set we can find either countries in the region, i.e., Latin America and the Caribbean, or countries outside this region.[50] In order to determine whether there are differential effects, we have performed separate estimations for both groups of countries. Interestingly, positive significant impacts are only observed in the former case.[51] Even though search costs stemming from deficient communication and transport infrastructure are clearly high in Latin America and the Caribbean, these costs are likely to be smaller than those involved in trading with more sophisticated markets such as those of OECD countries. If this is the case, then our results would indicate that trade supporting actions seem to contribute to overcoming the non-trivial obstacles affecting entry into regional markets, but they are not effective enough to help

[48] In the case of assisted firms, the effect of lagged assistance may be difficult to disentangle due to persisting status.
[49] Detailed results from this estimation are not reported here, but are available from the authors upon request.
[50] Recall that regional markets are not explicitly targeted by URUGUAY XXI.
[51] We have used two alternative definitions of Latin America and the Caribbean, including and excluding the MERCOSUR trading partners. Estimation results obtained with these alternative definitions are very similar. These results are not reported, but are available from the authors upon request.

firms cope with the more severe information problems faced when attempting to start operating in developed countries' markets.[52]

Tables 7 and 8 look at the product dimension.[53] Firms selling a larger number of products abroad are more likely to introduce new export goods, particularly new differentiated export goods, regardless their trade support status. This finding together with that on the country-margin suggest that there are gains from existing diversification in terms of further diversification along the same dimension (country or product). In the presence of country- and product-specific sunk costs, this could be the result of positive correlation of productivity across countries and products and, specifically, learning-by-doing processes across them. This is consistent with firm-level export patterns observed in several Latin American countries. In general, there are many firms that export relatively few products to many markets, many firms that export many products to relatively few markets, but only few firms, if any, that simultaneously export many products to many markets (see, e.g., Volpe Martincus and Carballo, 2008).

Similarly, firms for which differentiated products account for larger shares of their external sales have a higher probability of adding new differentiated goods to their export bundles. Interestingly, companies trading with more countries are more likely to expand the set of products they sell abroad if they are assisted by URUGUAY XXI. Hence, trade promotion may help firms use the experience they have accumulated in different country markets to diversify into new product export markets.

Using again Equation (8), we calculate the assistance effects on assisted firms. This effect is not significant when considering adding a new product as export outcome without distinguishing according to the degree of differentiation of the products. However, the impact is positive and statistically significantly different from zero when we focus on differentiated goods. In particular, the assistance effect on assisted firms is 38.20 percentage points, i.e., the probability of introducing these goods is 0.382 higher for firms participating in trade promotion programs. This result coincides with our priors. Firms may introduce new homogeneous, reference-priced, and differentiated products. The intensity of the information problems involved varies across these cases. Export

[52] This is probably related to the limited amount of resources available to the organization to perform such activities.
[53] As a robustness check, we have performed all estimations substituting manufacturing for differentiated products among both outcome and explanatory variables. Findings are similar to those presented here and are available from the authors upon request.

promotion activities should have a stronger effect when these problems are most acute, which is precisely the case when companies attempt to start trading a new differentiated good. [54]

## 5 Concluding Remarks

When entering new country- or product-export markets firms must incur sunk costs. Specifically, the decision to enter these markets is highly demanding in terms of data. Actions performed by export promotion agencies aim at helping firms obtain information thereby reducing the investment firms have to make in this area and ameliorating the frictions to trade across borders. In particular, since investment in collecting these needed data may be suboptimally low because of information spillovers, these actions may help counter the disincentives to search generated by potential free-riding. At least theoretically, these trade support programs should favor export diversification, one of the main goals with which these agencies have been tasked. Is this really the case? Does trade promotion assistance actually translate into new trade relationships? This paper has aimed at answering this question thus contributing to the limited literature on the impact of public programs on trade performance. In doing this, we use information on usage of export promotion services and highly disaggregated export data for the whole population of exporters of a small developing country, Uruguay, over the period 2000-2007, to estimate a latent variable, discrete choice model, which enables us to explicitly take into account the dichotomous nature of the decision to enter new markets while allowing for unobserved heterogeneity.

We find that trade promotion actions in Uruguay have contributed to the internationalization process of firms, along both the country and product dimensions. More precisely, these actions seem to be associated with a higher probability of incorporating new destination countries, especially within the Latin American and Caribbean region, as well as a higher probability of introducing new differentiated goods.

[54] Álvarez et al. (2007) show that exporting firms seem to learn from other exporters. As a robustness check, we have re-estimated our models alternatively including binary explanatory variables accounting for previous export experience by other Uruguayan exporters in country, product, and country-product dimensions. Specifically, these variables take the value of one if at least another Uruguayan firm has previously exported to the same destination country, the same product, or the same product to the same destination country, respectively. Estimation results after including these additional control variables do not differ from those shown here and are available from the authors upon request.

However, they do not seem to affect the likelihood of exporting to new OECD countries or new products in general.

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**Table 1**

| Aggregate Export and Treatment Indicators | | | | | |
|---|---|---|---|---|---|
| **Year** | **Total Exports** | **Number of Countries** | **Number of Products** | **Number of Exporting Firms** | **Number of Exporters Assisted by URUGUAY XXI** |
| **2000** | 2,281 | 134 | 2,541 | 1,424 | 45 |
| **2001** | 2,040 | 130 | 2,470 | 1,397 | 32 |
| **2002** | 1,855 | 146 | 2,464 | 1,498 | 19 |
| **2003** | 2,225 | 150 | 2,729 | 1,724 | 25 |
| **2004** | 2,968 | 158 | 2,687 | 1,878 | 13 |
| **2005** | 3,420 | 162 | 2,872 | 1,940 | 46 |
| **2006** | 3,986 | 171 | 2,873 | 1,955 | 22 |
| **2007** | 4,518 | 178 | 2,871 | 2,088 | 56 |

Source: Own elaboration on data provided by URUGUAY XXI.
Total exports are expressed in millions of US dollars. Assisted exporters are only those that have interacted closely with the agency in the year in question on a presential basis.

**Table 2**

| Average Exporter | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Variable** | **Pooled** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** |
| **Total Exports** | 1,675.27 | 1,601.64 | 1,460.10 | 1,238.34 | 1,290.70 | 1,580.48 | 1,762.84 | 2,038.88 | 2,163.85 |
| **Number of Countries** | 2.96 | 2.93 | 2.94 | 2.90 | 2.85 | 2.92 | 2.97 | 3.07 | 3.03 |
| **Number of Products** | 4.35 | 4.76 | 4.56 | 4.26 | 4.38 | 4.13 | 4.38 | 4.38 | 4.13 |
| **Average Exports per Country and Product** | 105.57 | 111.55 | 111.35 | 94.54 | 73.44 | 93.46 | 104.31 | 139.71 | 112.13 |
| **Average Exports per Country** | 272.03 | 307.43 | 271.49 | 207.59 | 202.94 | 241.99 | 259.80 | 341.17 | 325.16 |
| **Average Exports per Product** | 286.33 | 254.01 | 255.67 | 238.53 | 210.62 | 266.96 | 308.27 | 346.32 | 366.53 |

Source: Own elaboration on data provided by URUGUAY XXI.
Exports and average exports are expressed in thousands of US dollars.

**Table 3**

| Proportion of Exporter Entering New Export Markets | | |
|---|---|---|
| **Export Margin** | **No** | **Yes** |
| **New Country** | 51% | 49% |
| **New OECD Country** | 57% | 43% |
| **New Product** | 41% | 59% |
| **New Differentiated Product** | 55% | 45% |

Source: Own elaboration on data provided by URUGUAY XXI.
The table reports the percentage share of Uruguayan exporters that enter new country, new OECD country, new product, and new differentiated product export markets over the sample period.

**Table 4**

**Transitions Across Country-Diversification Patterns**

| Number of Countries t\t-1 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | >10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0.735 | 0.377 | 0.169 | 0.100 | 0.043 | 0.026 | 0.020 | 0.000 | 0.015 | 0.010 | 0.007 |
| **2** | 0.177 | 0.350 | 0.255 | 0.125 | 0.069 | 0.040 | 0.010 | 0.008 | 0.000 | 0.010 | 0.007 |
| **3** | 0.055 | 0.164 | 0.255 | 0.188 | 0.154 | 0.070 | 0.056 | 0.039 | 0.008 | 0.010 | 0.002 |
| **4** | 0.019 | 0.054 | 0.178 | 0.227 | 0.186 | 0.110 | 0.091 | 0.062 | 0.053 | 0.041 | 0.003 |
| **5** | 0.008 | 0.032 | 0.079 | 0.162 | 0.194 | 0.213 | 0.127 | 0.116 | 0.053 | 0.021 | 0.016 |
| **6** | 0.002 | 0.015 | 0.022 | 0.090 | 0.128 | 0.206 | 0.157 | 0.062 | 0.061 | 0.062 | 0.013 |
| **7** | 0.001 | 0.001 | 0.019 | 0.037 | 0.098 | 0.140 | 0.157 | 0.178 | 0.115 | 0.052 | 0.018 |
| **8** | 0.001 | 0.001 | 0.009 | 0.021 | 0.045 | 0.085 | 0.071 | 0.155 | 0.099 | 0.144 | 0.010 |
| **9** | 0.001 | 0.002 | 0.008 | 0.020 | 0.029 | 0.040 | 0.147 | 0.101 | 0.191 | 0.072 | 0.023 |
| **10** | 0.000 | 0.001 | 0.001 | 0.012 | 0.011 | 0.022 | 0.066 | 0.078 | 0.069 | 0.093 | 0.041 |
| **>10** | 0.001 | 0.001 | 0.003 | 0.012 | 0.029 | 0.026 | 0.061 | 0.140 | 0.267 | 0.381 | 0.860 |

**Transitions Across Product-Diversification Patterns**

| Number of Products t\t-1 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | >10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.675 | 0.301 | 0.178 | 0.116 | 0.083 | 0.069 | 0.030 | 0.045 | 0.020 | 0.044 | 0.023 |
| 2 | 0.187 | 0.365 | 0.253 | 0.145 | 0.116 | 0.044 | 0.052 | 0.039 | 0.013 | 0.029 | 0.014 |
| 3 | 0.067 | 0.150 | 0.248 | 0.182 | 0.152 | 0.097 | 0.078 | 0.061 | 0.046 | 0.029 | 0.014 |
| 4 | 0.027 | 0.086 | 0.125 | 0.222 | 0.140 | 0.126 | 0.091 | 0.067 | 0.066 | 0.036 | 0.024 |
| 5 | 0.013 | 0.042 | 0.078 | 0.118 | 0.183 | 0.186 | 0.091 | 0.050 | 0.079 | 0.044 | 0.015 |
| 6 | 0.007 | 0.022 | 0.040 | 0.068 | 0.090 | 0.142 | 0.156 | 0.134 | 0.105 | 0.058 | 0.027 |
| 7 | 0.006 | 0.016 | 0.023 | 0.032 | 0.075 | 0.104 | 0.126 | 0.106 | 0.112 | 0.073 | 0.019 |
| 8 | 0.005 | 0.005 | 0.018 | 0.025 | 0.041 | 0.060 | 0.078 | 0.095 | 0.125 | 0.058 | 0.041 |
| 9 | 0.002 | 0.002 | 0.009 | 0.018 | 0.018 | 0.028 | 0.091 | 0.034 | 0.112 | 0.139 | 0.037 |
| 10 | 0.001 | 0.005 | 0.003 | 0.020 | 0.028 | 0.041 | 0.039 | 0.084 | 0.059 | 0.073 | 0.045 |
| >10 | 0.010 | 0.005 | 0.022 | 0.047 | 0.059 | 0.085 | 0.139 | 0.240 | 0.204 | 0.343 | 0.742 |

Source: Own elaboration on data provided by URUGUAY XXI.

The upper panel of the table reports the number of exporters which transited from exporting to *a* destinations in year *t-1* to *b* destinations in year *t*, divided by the number of firms exporting to *a* destinations in year *t-1*. The bottom panel presents analogous figures for products.

**Table 5**

| Effect of Assistance by URUGUAY XXI on the Probability of Entering a New Country Market | | | | | | |
|---|---|---|---|---|---|---|
| **Variables** | **Selection** | | **$Y_0$** | | **$Y_1$** | |
| | **Coefficient** | **Marginal Effect** | **Coefficient** | **Marginal Effect** | **Coefficient** | **Marginal Effect** |
| **Lagged Total Exports** | 0.027362 | 0.000924 | -0.005005 | -0.001994 | -0.084199* | -0.019236 |
| | (0.024374) | (0.000716) | (0.009016) | (0.003363) | (0.049597) | (0.03835) |
| **Lagged Number of Countries** | 0.282366*** | 0.00953*** | 0.460960*** | 0.183478*** | 0.476546*** | 0.109125*** |
| | (0.063297) | (0.00204) | (0.032496) | (0.011836) | (0.168446) | (0.01310) |
| **Lagged Number of Products** | -0.056429 | -0.001902 | -0.020313 | -0.008073 | -0.044709 | -0.010238 |
| | (0.048949) | (0.001551) | (0.020428) | (0.007874) | (0.115795) | (0.029345) |
| **Lagged Assistance** | 0.792450*** | 0.061042*** | 0.222813* | 0.088747* | -0.043582 | -0.010268 |
| | (0.142164) | (0.017041) | (0.121712) | (0.047354) | (0.289835) | (0.071323) |
| **Lagged Share of MERCOSUR** | 0.023195 | 0.000783 | -0.317555*** | -0.126387*** | 0.504632** | 0.115423** |
| | (0.090095) | (0.003143) | (0.038498) | (0.014205) | (0.239116) | (0.05843) |
| **Lagged Share of Differentiated Products** | -0.106676 | -0.003601 | 0.007720 | 0.00307 | -0.419356* | -0.095636 |
| | (0.087966) | (0.002793) | (0.038387) | (0.0140) | (0.222297) | (0.03246) |
| **Sector Targeting** | 5.482187*** | 0.185145*** | | | | |
| | (0.367385) | (0.017724) | | | | |
| **Assistance Effect on Assisted Firms** | | | | | 0.401** | |
| | | | | | (0.166) | |

Source: Own elaboration on data provided by URUGUAY XXI.

The table presents the parameters of the selection equation, the export outcome equation for non-assisted firms, and the export outcome equation for assisted firms, based on the latent variable, discrete choice model with unobserved heterogeneity outlined in Section 2. Covariates are: lagged (natural logarithm of) total exports, lagged (natural logarithm of) number of countries firm exports to, lagged (natural logarithm of) number of products exported, lagged assistance status, lagged share of MERCOSUR in the firms' total exports, lagged share of differentiated products in the firms' total exports, sectoral targeting as measured by the share of assisted firms averaged over the sectors in which the firm is an active exporter, and year fixed-effects (not reported). Standard errors clustered by firms are shown below these estimated parameters. The last row of the table reports the implied assistance effect on the probability of entering a new country market. In this case, standard errors are bootstrapped based on 500 replications. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

**Table 6**

| Effect of Assistance by URUGUAY XXI on the Probability of Entering a New OECD Country Market | | | | | | |
|---|---|---|---|---|---|---|
| **Variables** | **Selection** | | **$Y_0$** | | **$Y_1$** | |
| | **Coefficient** | **Marginal Effect** | **Coefficient** | **Marginal Effect** | **Coefficient** | **Marginal Effect** |
| **Lagged Total Exports** | 0.027571 | 0.000930 | -0.004890 | -0.001424 | -0.071333 | -0.026431 |
| | (0.024407) | (0.000716) | (0.010315) | (0.002792) | (0.047578) | (0.022541) |
| **Lagged Number of Countries** | 0.283213*** | 0.00956*** | 0.395719*** | 0.115387*** | 0.237042* | 0.087624 |
| | (0.063525) | (0.002043) | (0.032099) | (0.009081) | (0.138698) | (0.056836) |
| **Lagged Number of Products** | -0.057248 | -0.001934 | -0.075484*** | -0.021812*** | -0.068084 | -0.025129 |
| | (0.048911) | (0.001553) | (0.022514) | (0.006363) | (0.113028) | (0.045913) |
| **Lagged Assistance** | 0.790427*** | 0.060727*** | 0.267048** | 0.084735** | -0.030953 | -0.011424 |
| | (0.142198) | (0.016934) | (0.115295) | (0.039342) | (0.262778) | (0.107361) |
| **Lagged Share of MERCOSUR** | 0.021981 | 0.000742 | -0.362086*** | -0.105241*** | 0.272845 | 0.101374 |
| | (0.090130) | (0.003143) | (0.044247) | (0.011937) | (0.282275) | (0.104367) |
| **Lagged Share of Differentiated Products** | -0.106109 | -0.003582 | -0.097768** | -0.028336** | -0.872720*** | -0.323364*** |
| | (0.088006) | (0.002793) | (0.042574) | (0.011341) | (0.250306) | (0.102343) |
| **Sector Targeting** | 5.476974*** | 0.185391*** | | | | |
| | (0.366450) | (0.017736) | | | | |
| **Assistance Effect on Assisted Firms** | | | | | 0.137 | |
| | | | | | (0.108) | |

Source: Own elaboration on data provided by URUGUAY XXI.

The table presents the parameters of the selection equation, the export outcome equation for non-assisted firms, and the export outcome equation for assisted firms, based on the latent variable, discrete choice model with unobserved heterogeneity outlined in Section 2. Covariates are: lagged (natural logarithm of) total exports, lagged (natural logarithm of) number of countries firm exports to, lagged (natural logarithm of) number of products exported, lagged assistance status, lagged share of MERCOSUR in the firms' total exports, lagged share of differentiated products in the firms' total exports, sectoral targeting as measured by the share of assisted firms averaged over the sectors in which the firm is an active exporter, and year fixed-effects (not reported). Standard errors clustered by firms are shown below these estimated parameters. The last row of the table reports the implied assistance effect on the probability of entering a new OECD country market. In this case, standard errors are bootstrapped based on 500 replications. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

**Table 7**

| Effect of Assistance by URUGUAY XXI on the Probability of Entering a New Product Market | | | | | | |
|---|---|---|---|---|---|---|
| **Variables** | **Selection** | | **$Y_0$** | | **$Y_1$** | |
| | **Coefficient** | **Marginal Effect** | **Coefficient** | **Marginal Effect** | **Coefficient** | **Marginal Effect** |
| **Lagged Total Exports** | 0.027315 | 0.000921 | -0.035794*** | -0.014032*** | -0.108935* | -0.040824* |
| | (0.024364) | (0.000716) | (0.008969) | (0.003314) | (0.062626) | (0.023927) |
| **Lagged Number of Countries** | 0.283524*** | 0.009561*** | -0.006496 | -0.002542 | 0.272536* | 0.102431* |
| | (0.063452) | (0.002042) | (0.046009) | (0.012736) | (0.157682) | (0.056532) |
| **Lagged Number of Products** | -0.056817 | -0.001923 | 0.501369*** | 0.196543*** | 0.496264*** | 0.186361*** |
| | (0.048861) | (0.001552) | (0.024151) | (0.008473) | (0.132470) | (0.066232) |
| **Lagged Assistance** | 0.792516*** | 0.061038*** | -0.007555 | -0.002964 | 0.065267 | 0.024724 |
| | (0.142420) | (0.017034) | (0.210956) | (0.056336) | (0.267755) | (0.107652) |
| **Lagged Share of MERCOSUR** | 0.021503 | 0.000726 | -0.002759 | -0.001082 | 0.360907 | 0.135573 |
| | (0.090052) | (0.003143) | (0.039786) | (0.014036) | (0.291202) | (0.107243) |
| **Lagged Share of Differentiated Products** | -0.106406 | -0.003591 | 0.155069*** | 0.060524*** | -0.105816 | -0.039637 |
| | (0.087934) | (0.002793) | (0.041017) | (0.0140) | (0.247750) | (0.089138) |
| **Sector Targeting** | 5.476687*** | 0.185487*** | | | | |
| | (0.367243) | (0.017736) | | | | |
| **Assistance Effect on Assisted Firms** | | | | | 0.113 | |
| | | | | | (0.281) | |

Source: Own elaboration on data provided by URUGUAY XXI.

The table presents the parameters of the selection equation, the export outcome equation for non-assisted firms, and the export outcome equation for assisted firms, based on the latent variable, discrete choice model with unobserved heterogeneity outlined in Section 2. Covariates are: lagged (natural logarithm of) total exports, lagged (natural logarithm of) number of countries firm exports to, lagged (natural logarithm of) number of products exported, lagged assistance status, lagged share of MERCOSUR in the firms' total exports, lagged share of differentiated products in the firms' total exports, sectoral targeting as measured by the share of assisted firms averaged over the sectors in which the firm is an active exporter, and year fixed-effects (not reported). Standard errors clustered by firms are shown below these estimated parameters. The last row of the table reports the implied assistance effect on the probability of entering a new product market. In this case, standard errors are bootstrapped based on 500 replications. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

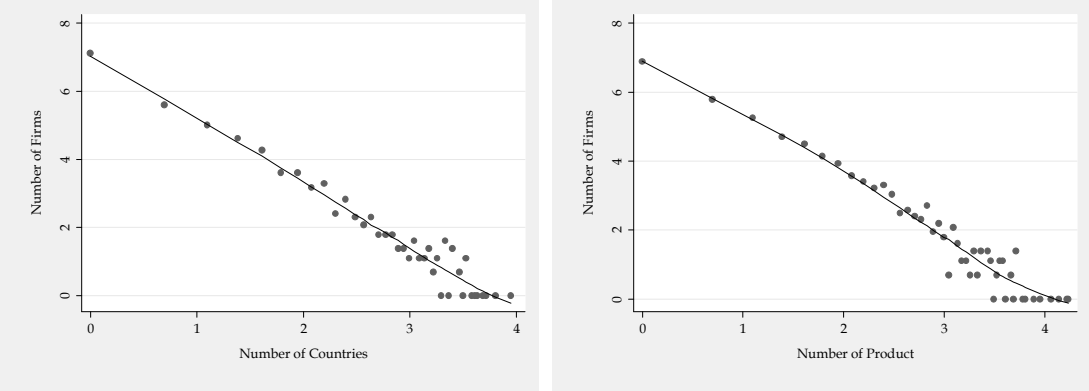
**Table 8**

| Effect of Assistance by URUGUAY XXI on the Probability of Entering a New Differentiated Product Market | | | | | | |
|---|---|---|---|---|---|---|
| **Variables** | **Selection** | | **$Y_0$** | | **$Y_1$** | |
| | **Coefficient** | **Marginal Effect** | **Coefficient** | **Marginal Effect** | **Coefficient** | **Marginal Effect** |
| **Lagged Total Exports** | 0.027502 | 0.000928 | -0.053147*** | -0.020724*** | -0.019773 | -0.007052 |
| | (0.024387) | (0.000716) | (0.009937) | (0.003443) | (0.063282) | (0.022310) |
| **Lagged Number of Countries** | 0.283327*** | 0.009561*** | 0.016077 | 0.006261 | -0.008948 | -0.003203 |
| | (0.063517) | (0.002043) | (0.031160) | (0.010941) | (0.174599) | (0.063214) |
| **Lagged Number of Products** | -0.057153 | -0.001932 | 0.499553*** | 0.195361*** | 0.623703*** | 0.223432*** |
| | (0.048881) | (0.001553) | (0.023446) | (0.008251) | (0.126091) | (0.079710) |
| **Lagged Assistance** | 0.791664*** | 0.060936*** | -0.037812 | -0.014634 | 0.246908 | 0.092314 |
| | (0.142394) | (0.017023) | (0.109442) | (0.042834) | (0.319094) | (0.108201) |
| **Lagged Share of MERCOSUR** | 0.021147 | 0.000713 | -0.031130 | -0.012104 | 0.087139 | 0.031198 |
| | (0.090043) | (0.003143) | (0.041551) | (0.014314) | (0.277482) | (0.101410) |
| **Lagged Share of Differentiated Products** | -0.106503 | -0.003594 | 0.720691*** | 0.281364*** | 0.518833** | 0.185368* |
| | (0.087985) | (0.002791) | (0.041947) | (0.014236) | (0.248933) | (0.104423) |
| **Sector Targeting** | 5.475244*** | 0.185284*** | | | | |
| | (0.366812) | (0.017736) | | | | |
| **Assistance Effect on Assisted Firms** | | | | | 0.382*** | |
| | | | | | (0.095) | |

Source: Own elaboration on data provided by URUGUAY XXI.

The table presents the parameters of the selection equation, the export outcome equation for non-assisted firms, and the export outcome equation for assisted firms, based on the latent variable, discrete choice model with unobserved heterogeneity outlined in Section 2. Covariates are: lagged (natural logarithm of) total exports, lagged (natural logarithm of) number of countries firm exports to, lagged (natural logarithm of) number of products exported, lagged assistance status, lagged share of MERCOSUR in the firms' total exports, lagged share of differentiated products in the firms' total exports, sectoral targeting as measured by the share of assisted firms averaged over the sectors in which the firm is an active exporter, and year fixed-effects (not reported). Standard errors clustered by firms are shown below these estimated parameters. The last row of the table reports the implied assistance effect on the probability of entering a new differentiated product market. In this case, standard errors are bootstrapped based on 500 replications. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

**Figure 1**
**Presence of Uruguayan Exporters across Number of Country- and Product Markets**




Source: Own elaboration on data provided by URUGUAY XXI.
Variables are expressed in natural logarithms.

# Appendix
# Assistance Effects with Continuous Outcome Variables

Firms' export performance along the extensive margin can be measured using the (natural logarithm of the) total number of countries they export to and (the natural logarithm of) the total number of products exported (see, e.g., Volpe Martincus and Carballo, 2008). In order to estimate the corresponding average assistance effects on the assisted firms along this dimension we apply the matching difference-in-differences estimator (MDID) proposed by Blundell and Costa Dias (2002) and semi-parametric difference-in-differences estimator (SPDID) developed by Abadie (2005). In both cases, the initial step consists of estimating the propensity scores, i.e., the probability to participate in trade promotion activities organized by URUGUAY XXI.

In order to reduce the dimensionality problem involved in matching assisted and non-assisted firms, we use a result from Rosenbaum and Rubin (1983), according to which matching can be performed on the propensity to participate in the program being examined given the set of observable characteristics or propensity score: We first estimate the propensity scores using as determinants the variables included in the selection equation estimated in the framework of the model presented in Section 2. We then match each assisted firm with the more similar non-assisted firms as determined by their respective propensity scores. In doing this, we consider three alternative matching estimators: the nearest neighbor, the radius, and the kernel.

In this case, a proper identification of the parameter of interest relies on the assumption that these procedures are able to balance the distribution of the relevant variables in both the control and treatment groups. We therefore examine the quality of the matching using four tests commonly implemented in the evaluation literature (see, e.g., Smith and Todd, 2005b; Lee, 2006; and Girma and Görg, 2007; Caliendo and Kopeinig, 2008; Arnold and Javorcik, 2009).

First, we perform the stratification (balancing) test, which consists of splitting observations into equally spaced intervals based on the estimated propensity scores and running simple t-tests of the difference between the treated and control groups in terms of

the variables listed above (see, e.g., Arnold and Javorcik, 2009).[55] In our case, all differences turn out to be small and statistically insignificant.[56]

Second, we compute the standardized bias for each covariate before and after matching using the formulas:

$$SB_{Before} = 100.\frac{\left(\bar{X}^1 - \bar{X}^0\right)}{\sqrt{0.5.\left[V^1(X) + V^0(X)\right]}} \text{ and } SB_{After} = 100.\frac{\left(\bar{X}^{1,M} - \bar{X}^{0,M}\right)}{\sqrt{0.5.\left[V^{1,M}(X) + V^{0,M}(X)\right]}}$$ where $\bar{X}^1\left(\bar{V}^1\right)$ is

the mean (variance) in the group of assisted firms before matching, $\bar{X}^0\left(\bar{V}^0\right)$ the analogues for the control group, and $\bar{X}^{1,M}\left(\bar{V}^{1,M}\right)$ and $\bar{X}^{0,M}\left(\bar{V}^{0,M}\right)$ are the corresponding values for the matched sample, and estimate the resulting change in the before and after biases (see, e.g., Sianesi, 2004; Girma and Görg, 2007; Caliendo and Kopeinig, 2008). Matching should be associated with decreased standardized biases (see Rosenbaum and Rubin, 1983; Sianesi, 2004; and Caliendo and Kopeinig, 2008). This is in fact what we observe in the first panel of Table 4. The diminution of the bias is substantial for most of the variables. The average reduction ranges from 76.7% to 87.0%, depending on the estimator used. Further, even though there is no formal criterion to identify a standardized bias as "large", following Rosenbaum and Rubin (1985) the usual practice is to consider biases above 20% as large (see, e.g., Smith and Todd, 2005b; Lee, 2006; and Girma and Görg, 2007). As shown in the first panel of Table A1, the standardized differences after matching do not exceed this value for all variables.

Third, we additionally conduct a two-sample *t-test* to check whether there are significant differences in the covariate means for assisted and control groups (see, e.g., Girma and Görg, 2007). The test statistics reported in the first panel of Table A1 indicate that, after matching, differences are not statistically different from zero and accordingly covariates are balanced across groups.

Fourth, we estimate the propensity score before and after matching and compare the respective pseudo-$R^2$. This measure indicates how well observed covariates explain the participation probability. If matching was successful, there should be no systematic differences in the distribution of the explanatory variables between treatment and control groups and the pseudo-$R^2$ should be lower after matching (see Sianesi, 2004). The second

[55] We implement the procedure developed by Becker and Ichino (2002) over 9 bands of the propensity score.
[56] Detailed tables can be obtained from the authors upon request.

panel of Table A2 confirms that this is true for our matching. The pseudo-$R^2$ declines dramatically when the probit estimation is performed on the matched sample, which clearly suggests that selected firms (treated and non-treated) are indeed very similar. One can also perform a $X^2$ likelihood-ratio test of the null hypothesis of joint insignificance of all regressors. This hypothesis should not be rejected after matching (see Caliendo and Kopeinig, 2008). This test is also satisfied by our data.

Summing up, there is robust evidence suggesting that our matching procedure has been successful in finding appropriate non-assisted firms to compare with each assisted firm. This procedure results in all distances in propensity scores within matched pairs being less than 0.1%, with a standard deviation of 0.7. Further, recall that, since we estimate the impacts of interest on first differences, we are also controlling for (unobserved) firm-specific time-invariant variables such as main sector of activity, and, at least partially, also for factors such as managerial attitudes, qualification profile of personnel, and innovation capabilities, which may play a role in determining both service usage and export performance.

These propensity score are then used, in a second step, to re-weight the before and after differences for assisted and non-assisted firms in order to account for their differences in the distribution of observed characteristics.

Table A2 reports estimates of the assistance by URUGUAY XXI on assisted firms. In the case of matching difference-in-differences estimation, three alternative matching estimators are considered: the nearest neighbor estimator (each assisted firm is compared to the most similar non-assisted firm), the radius estimator (each assisted firm is compared to all firms within a certain radius around its propensity score), and the kernel estimator (each assisted firm is compared to all non-assisted firms within an area around the propensity score inversely weighted with the difference between their propensity scores and that of the relevant assisted firm).[57] Note that, since we are including lagged values of treatment and additional covariates, estimations are performed on the period 2001-2007. Importantly, the results are consistent across estimation methods. These results suggest that trade promotion actions by URUGUAY XXI are, on average,

[57] A formal definition of these estimators can be found in Smith and Todd (2005a). The parameters (e.g., caliper, bandwidth) used in these estimations are specified in the text below the tables showing the results. Estimates based on alternative specifications of these parameters are similar to those reported here and can be obtained from the authors upon request. We perform matching using the software code provided by Leuven and Sianesi (2003).

associated with an increased rate of growth of exports and number of destination countries. In other words, these activities seem to have been effective in helping firms expand their exports, primarily along the country-extensive margin. In particular, according to Abadie's (2005) semi-parametric difference-in-differences estimator, the rate of growth of exports is 14.00% (($e^{0.131}$-1)x100=14.00) higher for firms assisted by URUGUAY XXI, while that of the number of countries is 12.19% (($e^{0.115}$-1)x100=12.19) higher. Thus, for instance, the sample average (logarithm) annual growth rate of the number of countries is 2.82%, so this would imply that assisted firms would have a rate 0.39% percentage points higher than non-assisted firms.

These results are consistent with our priors. Export promotion activities aiming at attenuating information problems are likely to have a strong effect when these problems are acute, namely, when entering a new market.

**Table A1**

**Panel 1: Standardized Bias and t-test**

| Covariates | Nearest Neighbor | | | | | | |
|---|---|---|---|---|---|---|---|
| | Sample | Mean | | %bias | %bias reduction | t-test | |
| | | Treated | Control | | | t-test | p-value |
| **Lagged Assistance** | Matched | 0.17 | 0.16 | 3.55 | 93.78 | 0.27 | 0.78 |
| **Lagged Total Exports** | Matched | 13.19 | 13.25 | -2.39 | 95.82 | -0.23 | 0.82 |
| **Lagged Number of Countries** | Matched | 1.57 | 1.62 | -6.04 | 92.25 | -0.54 | 0.59 |
| **Lagged Number of Products** | Matched | 1.37 | 1.46 | -8.33 | 66.07 | -0.76 | 0.45 |
| **Lagged Share of MERCOSUR** | Matched | 0.32 | 0.34 | -2.59 | 90.19 | -0.27 | 0.79 |
| **Lagged Share of Differentiated Products** | Matched | 0.41 | 0.40 | 1.33 | 96.76 | 0.13 | 0.90 |
| **Sector Targeting** | Matched | 0.07 | 0.07 | 1.57 | 95.25 | 0.14 | 0.89 |
| **Covariates** | Kernel | | | | | | |
| **Lagged Assistance** | Matched | 0.17 | 0.16 | 5.72 | 89.98 | 0.44 | 0.66 |
| **Lagged Total Exports** | Matched | 13.19 | 12.89 | 11.84 | 79.28 | 1.11 | 0.27 |
| **Lagged Number of Countries** | Matched | 1.57 | 1.39 | 19.49 | 75.01 | 1.27 | 0.17 |
| **Lagged Number of Products** | Matched | 1.37 | 1.34 | 2.41 | 90.17 | 0.22 | 0.82 |
| **Lagged Share of MERCOSUR** | Matched | 0.32 | 0.35 | -5.29 | 79.98 | -0.54 | 0.59 |
| **Lagged Share of Differentiated Products** | Matched | 0.41 | 0.46 | -10.67 | 74.11 | -1.03 | 0.30 |
| **Sector Targeting** | Matched | 0.07 | 0.06 | 2.29 | 93.07 | 0.19 | 0.85 |
| **Covariates** | Radius | | | | | | |
| **Lagged Assistance** | Matched | 0.17 | 0.15 | 8.07 | 85.85 | 0.63 | 0.53 |
| **Lagged Total Exports** | Matched | 13.19 | 12.77 | 16.46 | 71.19 | 1.53 | 0.13 |
| **Lagged Number of Countries** | Matched | 1.57 | 1.33 | 15.22 | 67.67 | 1.23 | 0.17 |
| **Lagged Number of Products** | Matched | 1.37 | 1.32 | 4.37 | 82.19 | 0.41 | 0.69 |
| **Lagged Share of MERCOSUR** | Matched | 0.32 | 0.35 | -7.50 | 71.61 | -0.76 | 0.45 |
| **Lagged Share of Differentiated Products** | Matched | 0.41 | 0.47 | -13.56 | 67.08 | -1.30 | 0.19 |
| **Sector Targeting** | Matched | 0.07 | 0.06 | 3.72 | 88.76 | 0.31 | 0.75 |

**Panel 2: Pseudo-$R^2$ and $X^2$-test of Joint Insignificance of Regressors**

| Estimator | Pseudo $R^2$ | | $X^2$-test of joint significance | | | | % Lost to CS |
|---|---|---|---|---|---|---|---|
| | | | Before | | After | | |
| | Before | After | $X^2$ | p-value | $X^2$ | p-value | |
| **Nearest Neighbor** | 0.142 | 0.000 | 254.2 | 0.000 | 0.000 | 0.9885 | 0.054 |
| **Radius** | 0.142 | 0.001 | 254.2 | 0.000 | 0.573 | 0.4491 | 0.054 |
| **Kernel** | 0.142 | 0.002 | 254.2 | 0.000 | 1.053 | 0.3049 | 0.054 |

Source: Own calculations on data from URUGUAY XXI.

The table reports, for each covariate included in the probit model determining selection into treatment, the percentage bias after matching, the reduction in the standardized bias, and the t-test statistics for the difference in means between treated and control groups after matching, as well as estimates of the pseudo-$R^2$ from the probit model, and the $X^2$-test statistics of joint insignificance of the covariates. Variables included in the propensity score specification are: lagged (natural logarithm of) export earnings, lagged (natural logarithm of) number of products exported, lagged (natural logarithm of) number of countries served, lagged assistance status, lagged share of MERCOSUR in the firms' total exports, lagged share of differentiated products in the firms' total exports, sectoral targeting as measured by the share of assisted firms averaged over the sectors in which the firm is an active exporter, and year fixed-effects (not reported). * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

**Table A2**

**Average Assistance Effect by URUGUAY XXI**
**Continuous Measures of Export Performance**

| Export Performance Indicator | MDID | | | SPDID |
|---|---|---|---|---|
| | NN | K | R | |
| **Total Exports** | 0.134 | 0.128* | 0.121* | 0.135** |
| | (0.132) | (0.067) | (0.066) | (0.064) |
| **Number of Countries** | 0.158** | 0.098*** | 0.092*** | 0.114*** |
| | (0.049) | (0.031) | (0.031) | (0.030) |
| **Number of Products** | 0.037 | 0.050 | 0.051 | 0.050 |
| | (0.055) | (0.034) | (0.034) | (0.033) |

Source: Own calculations on data from URUGUAY XXI.
The table reports matching difference-in-differences (MDID) (see Blundell and Costa Dias, 2002) and semi-parametric difference-in-differences (SPDID) (see Abadie, 2005) estimates of the average assistance effect on assisted firms for three continuous measures of export performance: the natural logarithm of total exports, the natural logarithm of the number of countries the firms export to, and the natural logarithm of the number of products they sell abroad. Matching difference-in-differences estimation: Nearest neighbor (NN) with caliper r=0.04. Radius matching obtained with r=0.04. Kernel matching is based on the Epanechnikov kernel with a bandwidth of 0.04. Bootstrapped standard errors based on 500 replications reported in parentheses. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.