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Is Export Promotion Effective in Developing Countries?

Firm-Level Evidence on the Intensive and the Extensive Margins of Exports

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Abstract ♦

How effective are export promotion activities in developing countries? What are the channels through which export promotion affects firms' exports, the intensive margin or the extensive margin? Empirical evidence in this respect is scarce. We aim at filling this gap in the literature by providing evidence on the impact of export promotion on export performance using a unique firm-level dataset for Peru over the period 2001-2005. We find that export promotion actions are associated with increased exports, primarily along the extensive margin, both in terms of markets and products. This result is robust across alternative specifications and estimation methods.

Keywords: Export Promotion, Firms, Export Margins, Peru
JEL-Code: F13, F14, L15, L25, O17, O24, C23.

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1 Introduction

Firms face multiple obstacles when entering export markets and imperfect information is one of the most prominent. Diverse institutional arrangements, both informal and formal, have been created to ameliorate the implied costs.[1] Export promotion agencies belong to this group of institutions. Some contributions to the growing international trade literature based on firm level data assess the impact of export promotion on export performance. However, most of these contributions focus on developed countries, in many cases on highly specific, geographically and/or sectorally limited samples or highly aggregated data, and do not explicitly disentangle the channels through which this effect, if any, takes place, namely, the intensive or extensive margins. This paper aims at filling this gap in the literature. We provide evidence on the impact of export promotion on the intensive and extensive margins of firms' trade in a middle-income developing country, Peru, over the period 2001-2005 using a unique dataset including information on exports by product and destination market.

Peru's national export promotion agency, PROMPEX, helps firms in their internationalization efforts.[2] Thus, PROMPEX trains inexperienced exporters on the export process, marketing, and negotiations; performs and disseminates analyses on country and product market trends; provides specific information on trade opportunities abroad as well as specialized counseling and technical assistance on how to take advantage of these opportunities; coordinates and supports (and in some cases co-finances) firms' participation in international trade missions and trade shows, and arranges meetings with potential foreign buyers in particular; organizes these kind of trade events; and sponsors the creation of consortia of firms aiming to strengthen their competitive position in external markets.

These activities performed by PROMPEX are likely to alleviate the information problems that affect exports. Information requirements associated with exporting are indeed important (see, e.g., Johanson and Vahlne, 1977). Among other things, firms must

[1] Thus, ethnic Chinese networks serve as nodes for information and have been found to increase trade by helping to match buyers and sellers, i.e., helping producers to find the right distributors for their consumer goods or assemblers to find the right suppliers for their components (see Rauch and Trindade, 2002). Similar findings have been reported for vertical keiretsu, i.e., providers looking for export opportunities benefit from having an assembler abroad whose characteristics they know (see, Belderbos and Sleuwaegen, 1998; and Head and Ries, 2001).

know the formal export process at home, the alternative ways to ship the merchandise and the corresponding costs, the potential markets abroad and their demand profile, the conditions to enter these markets, the channels to generate awareness of their products and those through which these products can be marketed. Diverse models describing the internationalization process of firms have been proposed in the business economics literature (see, e.g., Johanson and Vahlne, 1977; Bilkey, 1978; Wiedersheim-Paul et al., 1978; and Reid, 1981). Specifically, firms pursuing cross-border economic opportunities must engage in a costly process of identifying potential exchange partners (search) and assessing their reliability, trustworthiness, timeliness, and capabilities (deliberation) (see Rangan and Lawrence, 1999). Search becomes more difficult, the more geographically dispersed economic opportunities and potential trading partners are, while the importance of deliberation increases with the cost of reversing allocative actions or their effects (see Rangan and Lawrence, 1999). Hence, information discontinuities make it difficult for firms to find a suitable trade partner, i.e., they create matching frictions and this inadequate information about international trading opportunities may hinder exports (see Rauch and Casella, 2003; and Portes and Rey, 2005). Further, due to potential free-riding originating from information spillovers, investment in search for foreign buyers may be sub-optimally low (see Rauch, 1996).[3]

By attenuating information problems, actions executed by export promotion agencies such as PROMPEX can reduce transaction costs thus fostering trade (see, e.g., Gil-Pareja et al., 2005; Nitsch, 2005; Lederman et al., 2006; and Rose, 2007). Assessing whether this is actually the case implies evaluating the effects of a large scale public policy. In order to identify such effects one needs to determine first how exports would have been in the absence of support, which is essentially a counterfactual analysis. Since firms receiving assistance can hardly be considered random draws constructing a valid control may be a challenging task.

Many export promotion agencies perform evaluations resorting to interviews with firm managers (see IDB-INT, 2007). This kind of evaluation has several weaknesses (see

[2] Currently, export promotion in Peru is performed by PROMPERU Exportaciones. Since our sample period finishes in 2005, throughout the paper we use the official name of the institution at that time.

[3] According to McDermott (1994), customer lists are the most common target of corporate spies. Moreover, as reported by Egan and Moody (1992), buyers from developed countries prefer renewable, short-term (annual) contracts, rather than long term contracts to prevent free-riding.

Klette et al., 2000). A few recent papers have used firm-level data to evaluate more rigorously the impact of public policies on firm export behavior. Álvarez and Crespi (2000) use a sample of 365 Chilean firms out of a population of 7,479 exporting firms over the period 1992-1996 to examine the impact of the activities performed by Chile's export promotion agency, PROCHILE. They find that instruments managed by this agency had a positive and direct effect on the number of markets and indirectly, after a period of four years, on diversification of products. Bernard and Jensen (2004) show that average state expenditures on export promotion per firm do not have a significant influence on the probability of exporting in a sample of 13,550 US manufacturing plants over the period 1984-1992. More recently, Görg et al. (2007) analyze a sample of 11,730 manufacturing firm-year observations in Ireland over the period 1983-2002 (i.e., an average of 587 firms per year) and conclude that grants aiming at increasing investment in technology, training, and physical capital, when large enough, are effective in increasing total exports of already exporting firms but not in encouraging new firms to enter international markets.

Our paper addresses two main questions: Has export promotion significantly affected Peruvian export performance? Has export promotion enhanced export performance along the intensive and/or the extensive margin of firm exports?

In this paper, we apply two main microeconometric techniques, difference-in-differences and matching difference-in-differences, to identify the effect of export promotion activities by PROMPEX. In doing this, we use a unique firm-level dataset containing data on exports by product and destination markets and employment over the period 2001-2005, as well as information on location and starting date.

We contribute to the existing literature in multiple ways. First, we explore, to our knowledge for first time, both the intensive and extensive margins of exports at the firm level in a developing country, simultaneously considering in the latter case the country and product spaces. Second, also for the first time to our knowledge, we assess the effectiveness of public interventions specifically designed to foster exports on this kind of dataset. The available data allow us to uncover the channels through which firm exports are affected, either the intensive and/or the extensive margins. This is extremely important both from an analytical and economic policy point of view. Since activities

performed by export promotion agencies mainly aim at ameliorating information problems, it can be expected that these activities have a larger impact when these problems are more important. More concretely, the effect of their actions is likely to be larger on the introduction of new products or for reaching new markets than on selling more of an already exported product or to a country which is already a destination market for the firm. This would be especially the case for firms from a developing country such as Peru, 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 (see, e.g., Chiang and Masson, 1988; Hudson and Jones, 2003).[4] It is also particularly true for highly differentiated products, for which prices cannot convey all the relevant information for international trade (see Rauch, 1999). Moreover, diversification is indeed one of the key objectives of these activities as declared in the statement of purposes of most agencies and it is therefore the natural measure by which to evaluate the impact of their interventions (see Volpe Martincus et al., 2007). Thus, PROMPEX aims at "…opening of new international markets…". Third, our dataset covers the whole population of exporters and, among them, that of supported firms. More specifically, most previous studies only refer to manufacturing firms. Even though this might not be a problem for developed countries, it is potentially a reason of concern in analyses focusing on developing countries such as Peru, where primary goods exports account for approximately 40% of total exports (see CEPAL, 2005; and Giordano et al., 2006). Fourth, our analysis can shed light on the rationale and effects of export promotion in comparable developing countries.[5]

We find that export promotion activities performed by PROMPEX over the last years have been effective in helping firms to increase their exports by facilitating an expansion of the extensive margin, i.e., the number of products exported and the number of countries served. In contrast, these activities do not seem to have had a consistent significant impact on firms' intensive margin of exports. These results, which are robust across alternative specifications and estimation methods, are consistent with both the

[4] This might happen if firms from these countries only have small market shares as consumers attach informational value to quantity and may interpret low market shares as a signal of low quality (see Caminal and Vives, 1996).

[5] In particular, our study aims at providing PROMPEX and other Latin American and Caribbean export promotion agencies with a set of analytical instruments to evaluate their actions. An assessment of these agencies and their activities from the point of view of social welfare requires contrasting the costs they imply 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.

relative severity of the informational problems involved in exporting along the different margins and the purpose of this kind of agencies, as discussed above.

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

2 Empirical Methodology

Causal inference about the effect of public programs requires determining how participants would have performed if they had not participated. Specifically, in order to assess the effectiveness of export promotion in Peru, we need to compare export performance of firms, both overall and along the intensive and extensive margins of trade, under treatment by the national export promotion agency, PROMPEX, with that under no treatment. We discuss below a set of non-experimental estimators of these outcome differences.[6]

Formally, let D_{it} be an indicator codifying information on treatment by PROMPEX. Specifically, D_{it} takes the value 1 if firm *i* has been assisted by the agency in year *t* and 0 otherwise. Further, let X_{it} be a vector of covariates corresponding to observable firm characteristics. Let Y_{ikct} be (the natural logarithm of) firm *i*'s exports of product *k* to country *c* in year *t*, and Y_{it} accordingly be firm *i's* total exports in year *t.*[7] The presentation hereafter focuses on firms' total exports, but *mutatis mutandis* also applies to measures of export performance along the extensive margin (number of products exported and number of countries to which firms export) and the intensive margin (average exports per country, average exports per product, and average exports per country and product).

Let $E\left(Y_{it}^1 \mid X_{it}, D_{it}=1\right)$ be the expected (average) exports of those firms that have been assisted by PROMPEX, and $E\left(Y_{it}^0 \mid X_{it}, D_{it}=1\right)$ be the expected exports of these firms had they not been assisted by PROMPEX. In this case:

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

[6] We will use interchangeably assistance, treatment, and participation throughout the paper.
[7] The use of (natural) logarithm is partially motivated by the scale problem originated in the fact that our binary variable *D* does not capture the size of the assistance (see Lach, 2002).

The parameter γ measures the average rate of change in exports between the actual exports of those firms that have received a service from PROMPEX and the exports of these had they not received a service from PROMPEX (see Lach, 2002). This is what the evaluation literature calls the average *effect of the treatment on the treated.* Clearly, when $\gamma \rangle 0 \left(= 0\right)$ the export promotion service stimulates (does not have any impact on) firms' exports.

In order to estimate γ consistently, an unbiased estimate of the expected counterfactual is required. This can be done by averaging exports of some group of firms. The most obvious candidate is the mean exports of those firms that have not been served by PROMPEX. Note, however, that there may be non-random differences between assisted and non-assisted firms that may lead to potentially different exports. Failure to account for these differences would clearly produce a selection bias in estimated impacts (see, e.g., Heckman et al., 1998; Klette et al., 2000). We therefore need to control for firm heterogeneous characteristics to get comparable groups of firms.[8]

Alternative methods have been proposed in the literature to construct the correct sample counterpart for the missing information on the outcomes had the firms not been treated 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). *Difference-in-Differences* is one of these methods.

The main idea behind difference-in-differences is to use repeated observations on individuals, in our case firms, to control for unobserved and unchanging characteristics that are related to both exports and assistance (see Angrist and Krueger, 1999). More concretely, the difference-in-difference estimator is a measure of the difference between the difference in exports after the treatment as compared to exports before treatment for assisted firms and the corresponding difference for non assisted firms (see Smith, 2000;

[8] 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). Further, we do not consider information spillovers either. It is well known that firms may learn about export opportunities from other firms through employee circulation, customs documents, customer lists, and other referrals (see Rauch, 1996). Evidence on spillovers has been presented in several papers, e.g., Aitken et al. (1997), Greenaway et al . (2004), and Álvarez et al. (2007). Thus, Aitken et al. (1997) and Greenaway et al. (2004) report significant spillovers from multinational enterprises (MNEs) to domestic firms in Mexico and the United Kingdom, respectively. More precisely, MNE activity is positively related to export propensity of local firms. Álvarez et al. (2007) find that the probability that firms introduce given products to new countries or different products to the same countries increases with the number of firms exporting those products and to those destinations, respectively. If these spillovers would be associated with participation in export promotion activities, i.e., untreated firms obtain business information from treated firms, then the treatment effects, as estimated here, would be underestimated. We thank the editor for pointing this out.

Jaffe, 2002). Assuming that the conditional expectation function $E(Y \mid X, D)$ is linear and that unobserved characteristics, μ_{it}, can be decomposed into a firm-specific fixed-effect, λ_i; year, common macroeconomic effect, ρ_t; and a temporary firm specific effect, ε_{it}, leads to the following error-components specification:

$$Y_{it} = X_{it}\theta + \gamma D_{it} + \lambda_i + \rho_t + \varepsilon_{it} \qquad (2)$$

This specification allows selection into treatment on unobservable characteristics thus permitting for correlation between time-invariant firm-specific and time-specific effects and the binary variable indicating assistance by PROMPEX, D_{it}. Identification of the effects is therefore based on the assumption that selection into the treatment is independent of the temporary firm-specific effect.

We estimate this equation on the whole sample and, to create a common before-treatment period, on alternative sub-samples, namely, the sub-samples formed by those firms that were never treated before or those that were not treated in the previous period (see Lach, 2002).

Estimation of Equation (2) can be potentially affected by severe serial correlation problems (see Bertrand, et al., 2004). First, estimation of this kind of equations relies on non-trivial time series. Second, exports (and number of products and countries as well) tend to be highly positively serially correlated (see, e.g., Roberts and Tybout, 1997; Bernard and Jensen, 2004). We therefore allow for an unrestricted covariance structure over time within firms, which may differ across them (see Bertrand et al., 2004).

Moreover, participants in those activities organized by PROMPEX may tend to have experienced an increase (or decrease) in export earnings, so that the process determining D_{it} involves lagged dependent variables (see, e.g., Angrist and Krueger, 1999). Thus, if participation in activities organized by PROMPEX is more likely when a temporary fall in export receipts occurs just before going to the agency, then higher export growth should be expected among the treated, even without participation. In this case, the difference-in-differences estimator is likely to overestimate the impact of treatment and would be inconsistent (see Blundell and Costa Dias, 2002). The simplest strategy to deal with this issue is to include lagged export earnings as a regressor. The problem is, however, that in this case the within transformation aiming at eliminating the fixed

effects generates a correlation between the lagged dependent variable and the error terms in the transformed equation thus implying that the estimate of the coefficient on D_{it} is biased (see, e.g., Nickell, 1981; Baltagi, 1995).[9] Several GMM dynamic panel estimators have been developed in the last years to solve this problem. In particular, to check the robustness of our results, we implement the estimator proposed by Blundell and Bond (1998) ("System GMM") along with the relevant specification tests, i.e., the Arellano and Bond test for second order autocorrelation and the Hansen test for overidentifying restrictions.[10]

Furthermore, the linearity assumption, i.e., introducing covariates linearly as in Equation (2), may lead to inconsistency as a consequence of potential misspecification (see Meyer, 1995; Abadie, 2005). A method recently used in the literature to estimate treatment effects that does not impose the linear functional form restriction in estimating the conditional expectation of the outcome variable is the *matching difference-in-differences* (see, e.g., Arnold and Javorcik, 2005; Görg et al., 2007). This method combines matching and the difference-in-differences explained above.

Matching 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 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).[11]

In general, due to data limitations, there may be several characteristics are not observed by the econometrician and, as a consequence, systematic differences between treated and nontreated outcomes may persist even after conditioning on observables. Assuming that selection on the unobservables is zero can therefore be very restrictive. However, selection on an unobservable determinant can be allowed for if matching is

[9] Further, observed covariates such as employment may be affected by the outcome variable, i.e., these may be endogenous.

[10] We prefer this estimator over that proposed by Arellano and Bond (1991) because, for short panels with a large number of cross sectional units like in our case, highly persistent series make lagged levels weak instruments for the difference thus leading to finite sample bias in this latter estimator.

[11] 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 are called together "strong ignorability". Under these conditions, experimental and non-experimental analyses identify the same parameter. For additional details see, e.g., Rosenbaum and Rubin (1983), Heckman et al. (1998), Heckman et al. (1997), Heckman et al. (1999), Angrist and Krueger (1999), Blundell and Costa Dias (2002), and Caliendo and Kopeinig (2005).

combined with difference-in-differences as long as this determinant lies on separable individual and/or time-specific components of the error term (see Blundell and Costa Dias, 2002).[12]

Specifically, the matching difference-in-differences estimator compares the change in before and after exports of assisted firms with that 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. This procedure also relies 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).

Formally, the matching DID estimator is given by:

$$\hat{\gamma}^{MDID} = \sum_{i \in \{I^1 \cap S^*\}} \left\{ \Delta Y_{it} - \sum_{j \in \{I^0 \cap S^*\}} W_{ij} \Delta Y_{jt} \right\} w_{ij} \tag{3}$$

where I^0 (I^1) is the set of control (treatment) firms; S^* is the common support; W is the weight placed on comparison observation j for individual i and w accounts for the re-weighting that reconstructs the outcome distribution for the treated sample. The weights W depend on the cross-sectional matching estimator employed. In this regard, note, first, that in order to reduce the dimensionality problem of matching, we use a result from Rosenbaum and Rubin (1983), according to which it can be performed on the propensity to participate given the set of observable characteristics X or propensity score: $P(X_i) = P(D_i = 1 | X_i)$. Non-participants are then paired with participants that are similar in terms of $P(X)$ according to a specific metric. Since the specific matching algorithms may affect estimation results, we consider three alternative methods which use different metrics: the nearest neighbor, the radius, and the kernel estimators.[13]

The propensity score is in fact based on fitting a parameter structure (probit or logit). It is therefore necessary to test whether the estimated propensity score is successful in balancing the values of covariates between matched treatment and comparison groups. We assess the matching quality using five alternative tests: the stratification test; the standardized differences test; the t-test for equality of means in the matched sample; the test for joint equality of means in the matched sample or Hotelling test; and the pseudo R^2

[12] See also Heckman et al. (1997), Heckman et al. (1998), Abadie (2005), and Smith and Todd (2005a).
[13] See, e.g., Smith and Todd (2005a) for a formal definition of these estimators.

and the joint significance test (see, e.g., Smith and Todd, 2005b; Caliendo and Kopeinig, 2005; and Girma and Görg, 2007).

In order to assess the significance of the treatment effect, we compute analytical and bootstrapped standard errors. Note, however, that estimation of propensity scores and matching itself both add variation beyond the normal sampling variation (see Heckman et al., 1998; and Smith, 2000). Analytical errors may then deviate considerably from their sample counterparts. Further, the non-smoothness nature of some matching methods and the lack of evidence that the estimator is asymptotically linear may invalid bootstrap inference. We therefore also compute sub-sampling based standard errors, which provide more reliable variance estimates of treatment effects even in small samples (see Abadie and Imbens, 2006).

3 Data and Descriptive Statistics

Our dataset consists of three main databases. First, we have highly disaggregated export data at the firm level over the period 2001-2005. Data are reported annually at the firm-product-market level, i.e., we know how much a given firm has exported of a certain product to a certain market in a particular year. Specifically, each record includes the firm's tax ID, the product code (10-digit HS), the country of destination, and the export value in US dollars. Second, PROMPEX kindly provided us with a list of the firms assisted by the agency in each year of the period 2001-2005. Finally, we have data on employment, location, and starting date from the National Tax Agency, SUNAT.[14] Firms are also identified by their tax ID in this case, so that the three datasets could be easily merged.

Table 1 describes the evolution of Peruvian exports from 2001 to 2005 and its decomposition in terms of key aggregate variables along with the information on assistance by PROMPEX. Exports grew approximately 150% between 2001 and 2005. Even though there have been increases in the number of countries to which firms export and the number of products exported, most of this expansion is accounted for by a larger

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

intensive margin, i.e., larger average shipments by product and country, and more firms becoming exporters. The number of exporters increased by almost 40% from 2001 to 2005. The proportion of exporters assisted by PROMPEX has fluctuated between 9.98% and 11.76% over the period, which, given the larger presence of Peruvian firms in export markets, implies a significant increase in the absolute number of firms being served.

Table 2 characterizes the average Peruvian exporter over the sample period. The exporting firms have on average 80 employees, are 10 years old, and are mostly located in the Lima region (more than 80%). In recent years, both the average size and the average age have declined, which, as we will see below, is due to the fact that a larger fraction of smaller and younger firms have entered international markets. The average exporter sells 7.5 products to 2.6 countries. These 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, while the average number of products has grown, the average number of markets has remained relatively stable over the five-year period we are considering. This pattern is consistent with many firms starting to export to just one market, which tends to reduce the mean number of markets, and the incumbent firms increasing the number of destinations where they sell their products, which pushes in the opposite direction. Furthermore, in several cases, entrance into export markets is directly associated with the addition of products to Peru's export bundle. Thus, for instance, new exporters accounted for 25.8% of the new export products introduced in 2005. Moreover, the variables capturing different dimensions of the intensive margin (average exports per product, market, and product-market) have registered significant increases between 2001 and 2005.

Figures 1 and 2 provide a detailed visual representation of the distribution of firms' exports for the initial and the final sample years, 2001 and 2005, respectively. Figure 1 clearly shows that most Peruvian firms export just a few products to a few markets. More specifically, in 2005 around 60% of the firms exported to just one country –regardless the number of products-. This proportion is significantly higher than that reported for French manufacturing firms, 34.5%-42.6% (see Eaton et al., 2004; and Mayer and Ottaviano, 2007), and that informed for Irish firms, 34.0% (see Lawless, 2007), but similar to the

that of the United States (see Bernard et al., 2005). Further, while in Peru, just three exporters trade with more than 50 countries, i.e., 0.5% of the total number of exporters, in France, firms with such a geographically diversified export pattern accounted for 1.5% of the exporting companies (see Eaton et al., 2004). Moreover, 35.0% of the Peruvian exporters just sell one product abroad –regardless the number of destination countries-. This proportion is again similar to that registered in the United States (see Bernard et al., 2005). Furthermore, almost 30.0% of the firms exported just one product to one market, almost 60% just less than 5 products to less than 5 countries, and approximately 80.0% less than 10 products to less than 10 markets. Notice, on the other hand, that the main diagonal of Figure 1 is empty, meaning that there are firms that export relatively few products to many markets, firms that export many products to relatively few markets, but not firms that simultaneously export many products to many markets.

Figure 2 reveals that overall exports are largely accounted for by firms whose exports are concentrated in less than 40 products and less than 40 destination countries. These firms jointly account for approximately 80.0% of the total exports in 2005. In particular, exporters who sell just one product to one country represent 3.5% of total exports, whereas firms exporting up to 10 products to up to 10 countries explained 24.5% of this total. If we consider the number of destination countries pooling across the number of products traded, we observe that the share of total exports from firms that export to just one country is 4.8% of total exports, while that from firms who sell to less than 10 markets is 38.92%. These shares are higher than those of the United States in 2000, 3.70%, and 18.3%, respectively (see Bernard et al., 2005). On the other hand, the share corresponding to firms that export just one product to one or several countries is 7.34%, again clearly higher than that reported for the United States in 2000, 0.6% (see Bernard et al., 2005).

The existing empirical evidence suggests that larger firms are more likely to export (see, e.g., Roberts and Tybout, 1997; Bernard and Jensen, 2004), tend to export more (see, e.g., Görg et al., 2007), and have a higher export intensity (see, e.g., Barrios et al., 2003). Table 3 presents basic statistics on the relationship between size and exports for Peru. Specifically, this table breaks down the export and treatment indicators into four size categories defined in terms of employment: up to 10 employees (micro), between 11

and 50 employees (small), between 51 and 200 employees (medium), and more than 200 employees (large).[15] We observe that, on average, larger firms export more; they export to more markets and more products, although in the latter case the relationship does not seem to be clearly monotonic. In particular, micro firms export on average more products than small firms. This might reflect the fact that a larger fraction of the formers are traders. Thus, according to data for 2005 provided by SUNAT, 46% (36%) of all exporting micro firms (all assisted micro firms) are classified into the wholesale and retail trade sector, while just 30% (16%) of the small firms (assisted small firms) are in this sector.[16]

Table 3 highlights some additional interesting patterns. First, micro and small firms account for approximately 13% of total Peruvian exports. Second, the fraction of exporters that are micro firms has grown from 61.96% in 2001 to 66.78% in 2005. Third, these firms also represent the largest category in the group of firms assisted by PROMPEX, i.e., 40.46% in 2001 and 45.56% in 2005 and together, micro and small firms, account for almost 70% of the firms served by PROMPEX over the sample period.

Table 4 reports average export indicators by age groups. Two thirds of the exporters are relatively young firms, i.e., 10 years old or less. In particular, in 2005 9% of the exporters were new firms and around 50% of the exporters were between 2 and 10 years old. These firms accounted for approximately 55% of the firms assisted by PROMPEX. On average older firms export more and to more countries. As with the case of size, the relationship between age and the average number of products exported is less clear-cut.

Finally, Table 5 presents information on average total exports, number of countries served, number of products exported, employment, and age, discriminating between new exporters and permanent exporters, i.e., firms that have exported every year in our sample period. As anticipated, there has been an increase in the number of new exporters, which are, on average, smaller and younger than established exporters. Further, the new exporters themselves have become younger and smaller in terms of their labor force over time. New exporters export around 5 products to a few countries. More precisely, more than 80% of the new exporters ship their products to just one external destination and

[15] This is the classification used by INEI (1999).
[16] The fraction of firms in the wholesale and retail trade sector declines to 20% among medium-sized firms and to 9% among large exporting firms. The corresponding shares among supported firms are 12% and 1%, respectively.

approximately 50% just sell one good.[17] Incumbents, on the other hand, export more, to more countries and more products. The average number of markets served and of products exported by these firms has been growing in recent years.

Does assistance by PROMPEX explain these export performance patterns of Peruvian firms? The next section presents and discusses econometric evidence on the impact of PROMPEX's activities on the intensive and extensive margins of Peruvian firms' exports thus providing a formal answer to this question.

4 Econometric Results

Table 6 reports difference-in-difference estimates of the average treatment effects on the treated, i.e., the average effect of assistance by PROMPEX on assisted firms for six firm's export performance indicators, namely, total exports, the number of countries served, the number of products exported, average exports per country and product, average exports per product, and average export per country, for two alternative specifications, with and without firm level time-varying covariates (employment and age). The adjusted-R^2*s* of these regressions range between 0.74 and 0.83, with an average of 0.79.

Although similar in order of magnitude, the estimates are, as expected, smaller when these firm level time-varying covariates are included. Overall the estimates clearly suggest that participation in activities performed by PROMPEX is associated with an increased rate of growth of firm's total exports, number of countries to which the firm exports, and number of products exported. In particular, the rate of growth of exports is 17.00% (($e^{0.157}$-1)x100=17.00) higher for firms assisted by PROMPEX, while those of the number of countries and the number of products are 7.79% (($e^{0.075}$-1)x100=7.79) and 9.86% (($e^{0.094}$-1)x100=9.86) higher, respectively. Thus, for instance, the sample average (logarithm) annual growth rate of the number of products is 36.51%, so this would imply

[17] On average, PROMPEX has assisted 75 of these firms per year, which is about 14% of the total number of firms served by the agency. It is interesting to notice that, from these new exporters assisted by PROMPEX, between 14 (2001) and 22 (2005) are firms created the same year they exported for the first time.

that treated firms would have a rate 3.60% percentage points higher than non-treated firms.[18]

On the other hand, the impact on the remaining variables is weaker and evidently less robust. Export promotion only seems to stimulate larger exports per country. This might be explained by the fact that the agency can help to obtain new business contacts in regions other than those they are exporting to in the countries that are already among their destination markets.

Hence, export promotion seems to favor an expansion of firms' exports, essentially along the extensive margin, i.e., an increase of the number of countries served and that of the number of products traded, thus enabling the introduction of new destinations and export goods.[19] In contrast, the activities of the agency do not seem to have a robust significant impact on the intensive margin of exports. This result pattern coincides with our priors. Informational problems tend to be more severe when entering a new market or starting to export a new product than when expanding operations on products already traded or in a country already served. Export promotion actions aiming at ameliorating these informational problems are therefore likely to have a stronger effect in the former case.

We should notice that the estimated coefficients on employment (labor) and age are both positive and significant in all regressions, which implies that larger and more experienced firms tend to have better export performance along the dimensions considered here.[20]

We then replicate these estimations on two alternative samples: first, we exclude those firms that have been assisted by PROMPEX in the previous year, e.g., for 2002 we consider only the firms that did not get assistance from PROMPEX in 2001, for 2003 we

[18] We have also performed fixed-effects Poisson estimations using directly exports, number of products, and number of markets, instead of their natural logarithms as dependent variables. Results are similar to those presented here and can be obtained from the authors upon request.

[19] In general, it can be expected that, over time, growth in the number of total destinations (products) will be associated with introduction of new trade partners (products). In particular, this is indeed the case in our sample. At least 96% of the firms that register growth in the number of total destinations (products) introduce new ones. Admittedly, looking strictly at new destinations (products) is interesting in itself. Therefore, following the suggestion of one of the referees, we have examined the impact of assistance by PROMPEX on this dimension of export performance. Formally, we regress the (natural logarithm of the) number of new destinations (products), which is itself a first-differentiated measure, on the treatment indicator and year-fixed effects. Alternatively, we compute the number of new destinations (products) with respect to a base year (in our case, 2000) and estimate the treatment effect as indicated in Equation (2) (i.e., including firm fixed effects) with (the natural logarithm of) this variable instead of the total number of destinations (products) on the left hand side. Both sets of results reveal that export promotion has facilitated incorporation of new destinations (products). These results can be obtained from the authors upon request.

[20] The empirical literature suggests that other firm-level time-varying factors (e.g., innovation activities) may also contribute to explain firm's exports. Unfortunately, we do not have data on these additional factors in our datasets.

only include firms that were not attended by PROMPEX in 2002, and so son; second, we exclude those firms that have been assisted by PROMPEX (at least once) in the past, thus for 2002 we select those firms that did not receive support from PROMPEX in 2001, for 2003 we use data for firms not being helped by PROMPEX in 2001 and 2002, and so on (see Lach, 2002). This allows us to generate a common before treatment period and to consider a more homogeneous set of firms in this period. While the original sample corresponds to the period 2001-2005 and has 24,837 observations, these restricted samples only cover the period 2002-2005 and have 18,769 and 18,037 observations, respectively. Estimation results are shown in Table 7. In general, the estimated coefficients are larger than the original ones. Further, the R^2s are similar to those reported for our benchmark estimations. These results confirm our findings. Export promotion has been effective in facilitating an increase of firms' exports along the extensive margin, both in terms of destination countries and products, but not along the intensive margin.

In Table 8 we present difference-in-difference estimates of the impact of export promotion actions on alternative indicators of firms' export performance, namely, total exports per product or country, number of destination countries per product, number of products per destination country, and exports per product and destination country. Formally, we estimate the following equations:

$$Z_{ikt} = X_{it}\theta + \gamma D_{it} + \lambda_{ik} + \rho_t + \varepsilon_{ikt} \quad (4)$$

$$Z_{ict} = X_{it}\theta + \gamma D_{it} + \lambda_{ic} + \rho_t + \varepsilon_{ict} \quad (5)$$

$$Y_{ikct} = X_{it}\theta + \gamma D_{it} + \lambda_{ikc} + \rho_t + \varepsilon_{ikct} \quad (6)$$

where $Z_{ijt} = \left\{Y_{ijt}, n_{ijt}^{-j}\right\}$ with $j = \{c, k\}$ and $\lambda_{ik}(\lambda_{ic}, \lambda_{ikc})$ denotes firm-product (firm-country, firm-product-country) fixed effects.[21] The results indicate that export promotion has had a positive and significant effect on all these variables. In particular, it has proven to be an effecting mean of expanding exports of given products through diversification of markets. More specifically, the growth rate of exports per product is 7.00% higher for firms assisted by PROMPEX and this is mainly explained by a higher growth rate of the number of countries to which these products are exported (4.8% higher).

[21] Equations (4)-(6) have been estimated with the algorithm developed by Cornelissen (2006) which allows dealing with a large number of fixed-effects.

As discussed in Section 3, export performance in the previous year may explain current participation in activities of export promotion. If this were true, then our estimates would be biased. We therefore check the robustness of our results to controlling for lagged export variables. In doing this, we include in each equation the corresponding dependent variable lagged one period and estimate the resulting equations using the estimator proposed by Blundell and Bond (1998).[22] The one-step estimates along with the respective robust standard errors and the relevant specification tests are presented in Table 9. Notice that the test statistics suggest that our estimates are consistent.[23] Importantly, the conclusion we drew from previous estimations remains valid. Export promotion in Peru seems to be mainly associated with larger exports through extended extensive margins along the product and country dimensions. Furthermore, while in this case there is evidence of a positive effect on average exports per country, no impact on the other measures of intensive margin of exports is observed.

As an additional robustness check, we estimate the average treatment effect on the treated firms applying matching difference-in-differences. We first estimate the propensity scores. This requires defining what determines the propensity to participate in the activities organized by PROMPEX. In principle, this agency could attend all the firms that request assistance. However, almost all Latin American and Caribbean export promotion agencies, including PROMPEX, mainly target small, relatively inexperienced firms. Thus, one of PROMPEX's missions is to "support the export capacity development of micro, small, and medium-sized firms through the identification of potential markets to export goods and services, facilitation of the access to these markets, and provision of specialized counseling, technical assistance, commercial advising, and training for that purpose" (see Volpe Martincus and Gallo, 2008). In fact, we have already seen in Section 3 that smaller, younger firms with relatively limited experience in international markets as measured by total exports, the number of products exported, and the number of countries they export to, account for the largest share of firms served by PROMPEX. On the other hand, beyond the agency's targets, it may be also possible that firms self-select

[22] This method also allows us to address potential firm-time-specific measurement errors in explanatory variables such as employment.
[23] We observe that while employment (labor) remains as a significant determinant for most export performance indicators, age becomes insignificant once previous export experience is controlled for. In this regard, it should be stressed that GMM estimates may differ depending on the sets of instruments used. Here all time-varying firm characteristics (employment and age) as well as treatment are considered endogenous and are instrumented by differences lagged 2-4 periods in the level equation, levels lagged 1-2 periods in the difference equation, and the year fixed effects.

into assistance. More precisely, relatively larger and more experienced firms may be more likely to be aware of export promotion services and to use them (see, e.g., Reid, 1984; Kedia and Chhokar, 1986; and Ahmed et al., 2002). We therefore include employment, age, and the aforementioned measures of previous export experience as determinants of the propensity score (see Becker and Egger, 2007).[24] In particular, we consider lagged values of employment and age to control for the fact that the covariates may be affected by assistance (see Caliendo and Kopeinig 2005). Furthermore, over the sample period, PROMPEX has mainly had just one office in Lima, the capital and largest city in the country.[25] Given that Peru is a relatively large country whose geography makes communication across regions difficult, firm location may also play an important role in explaining the probability to be assisted by PROMPEX. Hence, we include in the propensity score specification a binary variable taking the value of one if the firm is located in Lima and 0 otherwise. Finally, previous access to services provided by PROMPEX may affect current participation. For instance, firms satisfied with these services 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 assistance in the previous period (see Görg et al., 2007).

We then match each assisted firm with the more similar non-assisted firms as determined by their respective propensity scores on the pooled sample.[26] In doing this, we consider three alternative matching estimators: 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

[24] Note that, if adding a new destination country (product) requires incurring specific sunk costs of entry, then trading with a larger number of countries (a larger number of products) will reflect higher productivity (see Bernard et al, 2006). Thus, by including those export indicators, we are also implicitly accounting for productivity differences across (groups of) firms and henceforth at least partially controlling for the possibility that the agency picks "winners".

[25] Three representations were inaugurated in the rest of the territory since 2005 (i.e., Chiclayo, Arequipa, and Loreto) (see Volpe Martincus and Gallo, 2008).

[26] In a robustness exercise, we impose the restriction that matched control firms are only from the same year as the assisted firms (i.e., cross-section by cross-section). This allows us to eliminate the possibility that export performance differences across years affect the estimated impact of export promotion activities (see Arnold and Javorcik, 2005). Results under this specification are qualitatively similar to those reported here. This is hardly surprising given the relatively short length of our sample period. These results can be obtained from the authors upon request.

within an area around the propensity score inversely weighted with the difference between their propensity scores and that of the relevant assisted firm).[27]

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 the treatment groups. We therefore examine the quality of the matching using a battery of tests commonly implemented in the evaluation literature (see, e.g., Smith and Todd, 2005b; Caliendo and Kopeinig, 2005; Arnold and Javorcik, 2005; Lee, 2006; and Girma and Görg, 2007).

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, 2005).[28] In our case, all differences turn out to be small and statistically insignificant.[29]

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

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

where $\overline{X}^{1}\left(\overline{V}^{1}\right)$ is the mean (variance) in the group of assisted firms before matching, $\overline{X}^{0}\left(\overline{V}^{0}\right)$ the analogues for the control group, and $\overline{X}^{1,M}\left(\overline{V}^{1,M}\right)$ and $\overline{X}^{0,M}\left(\overline{V}^{0,M}\right)$ are the corresponding values for the matched sample, and estimate the resulting change in the before and after biases (see, e.g., Sianesi, 2004; Caliendo and Kopeinig, 2005; Girma and Görg, 2007). Matching should be associated with decreased standardized biases (see Rosenbaum and Rubin, 1983; Sianesi, 2004; and Caliendo and Kopeinig, 2005). This is in fact what we observe in the first panel of Table 10. The diminution of the bias is substantial for most of the variables. The average reduction ranges from 83.6% to 84.9%, 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

[27] The parameters (e.g., caliper, bandwith) used in these estimations are specified in the text below the tables showing the results (Table 11 and Table 12). 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 provided by Sianesi (2001).
[28] We implement the procedure developed by Becker and Ichino (2002) over 9 bands of the propensity score.
[29] Detailed tables can be obtained from the authors upon request.

Girma and Görg, 2007). As shown in the first panel of Table 10, the standardized differences after matching are clearly below 20% 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 10 indicate that, after matching, differences are not statistically different from zero and accordingly covariates are balanced across groups. Fourth, we implement the Hotelling t-squared test (see, e.g., Lee, 2006; and Girma and Görg, 2007). This implies assessing whether the above individual differences are jointly insignificant, i.e., testing the joint null hypothesis that the mean of all variables included in the matching are equal for supported and control groups. Following Girma and Görg (2007), we divide the sample by propensity score quintile and perform the test for each interval. The relevant test statistics along the corresponding *p-values* are presented in the second panel of Table 10. The evidence is also favorable in this case. No significant differences are detected so balancing conditions are fulfilled within each propensity score quintile.

Fifth, 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 third panel of Table 10 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 an *F-test* of the null hypothesis of joint insignificance of all regressors. This hypothesis should not be rejected after matching (see Caliendo and Kopeinig, 2005). 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 99% of the distances in propensity scores within matched pairs being less than 1.50%, with a standard deviation of 0.33.

Our matching difference-in-difference estimates along with three alternative standard errors (analytical, bootstrapped, and based on subsampling) are reported in Table 11. Note that, since we are including lagged values of treatment and additional covariates, estimations are performed on the period 2002-2005. For the sake of comparison, we therefore report difference-in-differences estimates for this period. The estimated impact of export promotion activities on the different export indicators is very similar across methods and is also consistent with our original difference-in-differences estimates. In Table 12 we show the results from similar exercises performed on the sample excluding firms that have been assisted before, i.e., where firms assisted in a particular year are removed from the sample the following years.[30] Thus, for 2002 we select those firms that did not receive support from PROMPEX in 2001, for 2003 we use data for firms not being helped by PROMPEX in 2001 and 2002, and so on. These results also corroborate our main findings. Hence, there is strong systematic evidence to support the conclusion that those activities have promoted firms' export growth mainly by facilitating an increase of the number of products exported and the number of countries served.

5 Concluding Remarks

Over the last years several developing countries have established or re-founded institutions aiming at supporting the expansion of export activities. Evidence on the effectiveness of these institutional efforts is rather scarce and highly partial. This paper has aimed at filling this gap in the literature by assessing the effects of export promotion activities in a middle-income developing country, Peru, over the period 2001-2005. In doing this we have used a unique dataset including firm-level data on exports by product and country of destination, employment, starting date, and location for the whole population of Peruvian exporters.

The firms are likely to face more severe informational problems when they attempt to enter new export markets or to sell new products abroad than when they pursue expanding exports of goods they have been trading and/or to countries that are already

[30] We replicate these estimations on a sample excluding only those firms that have been assisted the previous year and obtain similar results. These results are available from the authors upon request. Notice that the sample definition used in these exercises directly accounts for past treatment status, which accordingly is not included in the corresponding propensity score specification.

among their destination markets. Accordingly, one should expect that export promotion activities will tend to have a larger impact on the extensive margin of exports, i.e., the number of products exported and the number of countries to which firms export, than on the intensive margin, i.e., average trade flows. Our data allow us to precisely distinguish these two dimensions of firms' exports and thus to formally test this hypothesis.

We first estimate the average impact of assistance by PROMPEX on assisted firms applying the difference-in-difference method and then check the robustness of our results to correction for potential econometric problems and to the use of alternative estimation strategies by performing system GMM and matching difference-in-differences estimations. These exercises lead to a clear conclusion. Export promotion activities by PROMPEX have effectively helped Peruvian firms to expand their exports, primarily along the extensive margin, both in terms of markets and products, whereas no robust significant effect could be identified on the intensive margins of exports.

The evidence from Peru conveys a relevant message for other developing countries with highly specialized export structures. When properly performed, export promotion may foster product and market export diversification thus helping to generate a more balanced export expansion path.

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Table 1

Aggregate Export and Treatment Indicators					
Year	**Total Exports**	**Number of Destination Countries**	**Number of Products**	**Number of Exporting Firms**	**Number of Exporters Served by PROMPEX**
2001	6956	158	3617	4356	435
2002	7665	151	3915	4699	549
2003	9040	168	3918	5091	532
2004	12730	181	4009	5466	576
2005	17300	179	4188	6027	709

Source: Own calculations on data from PROMPEX.
Total exports are expressed in millions of US dollars.

Table 2

Average Exporter						
Variables	**Pooled**	**2001**	**2002**	**2003**	**2004**	**2005**
Employees	80.02	82.84	87.73	88.95	71.36	72.28
Age	10.01	10.23	10.17	10.27	9.87	9.63
Location (Lima=1; 0 otherwise)	0.81	0.81	0.80	0.81	0.82	0.81
Exports	2094.10	1596.93	1631.22	1775.69	2329.10	2870.13
Number of Countries	2.60	2.65	2.57	2.58	2.64	2.58
Number of Products	7.54	7.10	7.21	7.45	7.61	8.15
Average Exports by Product	448.02	395.53	386.06	422.98	459.92	544.63
Average Exports by Market	385.06	322.58	329.88	356.40	431.43	455.41
Average Exports by Country and Product	149.45	137.33	127.89	141.84	143.98	186.42

Source: Own calculations on data from PROMPEX and SUNAT.
Exports and average exports are expressed in thousands of US dollars.

Table 3

Average Export and Treatment Indicators by Size Category					
Year	**Number of Exporters**	**Average Exports**	**Average Number of Destination Countries**	**Average Number of Products**	**Number of Exporters Served by PROMPEX**
Micro Firms (<=10 Employees)					
2001	2699	154.67	1.67	6.84	176
2002	2967	161.30	1.65	6.79	230
2003	3231	183.32	1.69	7.14	242
2004	3573	234.50	1.70	7.23	250
2005	4025	249.25	1.69	7.78	323
Small Firms (10<Employees>=50)					
2001	835	703.50	2.58	5.29	113
2002	863	704.34	2.61	5.76	122
2003	970	947.58	2.58	6.22	118
2004	975	1267.36	2.70	6.34	133
2005	1029	1215.43	2.62	6.46	134
Medium Firms (50<Employees>=200)					
2001	493	1744.50	4.34	8.13	78
2002	494	1647.74	4.07	7.89	89
2003	504	1576.31	4.14	7.63	76
2004	525	1805.48	4.22	7.42	87
2005	555	2497.97	4.43	8.92	113
Large Firms (>200 Employees)					
2001	329	15475.15	8.39	12.23	68
2002	375	15373.88	7.81	12.91	108
2003	386	17445.91	8.03	12.96	96
2004	393	24706.00	8.89	14.45	106
2005	418	32674.58	8.61	14.83	139

Source: Own calculations on data from PROMPEX and SUNAT.
Average exports are expressed in thousands of US dollars.

Table 4

Average Export and Treatment Indicators by Age					
Year	**Number of Exporters**	**Average Exports**	**Average Number of Destination Countries**	**Average Number of Products**	**Number of Exporters Served by PROMPEX**
1 Year Old					
2001	299	143.64	1.51	5.96	14
2002	347	506.89	1.54	7.48	10
2003	364	153.92	1.66	6.65	13
2004	489	207.21	1.44	6.18	25
2005	541	184.54	1.50	7.72	22
2-10 Years Old					
2001	2581	1451.13	2.39	6.99	229
2002	2781	1245.15	2.29	6.81	299
2003	2900	1342.95	2.30	7.25	293
2004	3029	1438.14	2.38	7.30	295
2005	3350	1726.15	2.28	7.95	359
11-20 Years Old					
2001	670	1478.81	3.09	7.40	97
2002	719	2450.91	2.96	7.48	108
2003	889	2629.92	2.84	8.23	117
2004	1064	3731.84	2.92	8.09	132
2005	1216	4527.61	2.94	8.41	177
>20 Years Old					
2001	806	2700.45	3.55	7.62	95
2002	852	2656.56	3.59	8.15	132
2003	938	2933.35	3.58	7.67	109
2004	884	4867.38	3.81	8.87	124
2005	920	6424.20	3.84	8.77	151

Source: Own calculations on data from PROMPEX and SUNAT.
Average exports are expressed in thousands of US dollars.

Table 5

Characterizing Exporters by Exporter Status						
Year	**Number of Exporters**	**Average Exports**	**Average Number of Destination Countries**	**Average Number of Products**	**Employment**	**Age**
New Exporters						
New Exporters 2001	1815	117.16	1.31	4.17	49.06	8.08
New Exporters 2002	1745	180.72	1.28	4.50	24.55	7.03
New Exporters 2003	1823	82.70	1.34	4.78	23.30	7.29
New Exporters 2004	1898	100.10	1.29	4.76	14.15	6.25
New Exporters 2005	2131	123.32	1.30	5.88	23.06	5.83
Permanent Exporters						
2001	1562	3893.51	4.36	10.19	144.58	14.25
2002	1562	4389.66	4.53	11.01	158.06	15.25
2003	1562	5104.82	4.79	11.38	172.03	16.25
2004	1562	7350.90	5.10	12.17	181.12	17.25
2005	1562	9937.19	5.12	12.13	183.01	18.25

Source: Own calculations on data from PROMPEX and SUNAT.
Average exports are expressed in thousands of US dollars.
New exporters are firms that did not export before. Permanent exporters are firms that export all sample years, 2001-2005.

Table 6

Average Effect of Assistance by PROMPEX on Assisted Firms
Difference-in-Differences Estimates

Export Performance Indicator	Without Covariates	With Covariates		
	Treatment	Treatment	Labor	Age
Total Exports	0.188***	0.157***	0.352***	0.414***
	(0.037)	(0.050)	(0.047)	(0.086)
Number of Destination Countries	0.083***	0.075***	0.106***	0.115***
	(0.015)	(0.020)	(0.015)	(0.027)
Number of Products	0.105***	0.094***	0.081***	0.136***
	(0.019)	(0.030)	(0.020)	(0.040)
Average Exports per Country and Product	0.000	0.010	0.165***	0.163**
	(0.033)	(0.050)	(0.037)	(0.077)
Average Exports per Product	0.084**	0.060	0.271***	0.278***
	(0.033)	(0.040)	(0.041)	(0.079)
Average Exports per Country	0.105***	0.082*	0.246***	0.299***
	(0.033)	(0.040)	(0.040)	(0.079)

Source: Own calculations on data from PROMPEX and SUNAT.
The table reports estimates of Equation (2). The dependent variables are the natural logarithm of the export performance indicators listed in the first column. The firm-level time-varying covariates employment (labor) and age are expressed in natural logarithms. Firm fixed effects and year fixed effect included (not reported). Robust standard errors, clustered by firm, reported in parentheses below the estimated coefficients. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table 7

Average Effect of Assistance by PROMPEX on Assisted Firms
Alternative Samples, 2002-2005
Difference-in-Differences Estimates

Sample 1: Firms that Were not Assisted the Previous Year

Export Performance Indicator	Without Covariates	With Covariates		
	Treatment	Treatment	Labor	Age
Total Exports	0.254***	0.207**	0.326***	0.491***
	(0.084)	(0.081)	(0.064)	(0.116)
Number of Destination Countries	0.111***	0.100***	0.081***	0.110***
	(0.035)	(0.034)	(0.020)	(0.036)
Number of Products	0.133***	0.123***	0.051*	0.150***
	(0.044)	(0.043)	(0.029)	(0.056)
Average Exports per Country and Product	0.009	0.016	0.194***	0.231**
	(0.075)	(0.074)	(0.056)	(0.104)
Average Exports per Product	0.120	0.084	0.275***	0.341***
	(0.075)	(0.072)	(0.058)	(0.107)
Average Exports per Country	0.142*	0.107	0.245***	0.381***
	(0.075)	(0.073)	(0.058)	(0.106)

Sample 2: Firms that Were Never Assisted in the Previous Years

Export Performance Indicator	Without Covariates	With Covariates		
	Treatment	Treatment	Labor	Age
Total Exports	0.295***	0.250***	0.315***	0.505***
	(0.095)	(0.092)	(0.070)	(0.122)
Number of Destination Countries	0.134***	0.121***	0.084***	0.112***
	(0.042)	(0.041)	(0.021)	(0.037)
Number of Products	0.122**	0.113**	0.043	0.141**
	(0.053)	(0.052)	(0.031)	(0.058)
Average Exports per Country and Product	0.040	0.016	0.187***	0.251**
	(0.091)	(0.090)	(0.060)	(0.108)
Average Exports per Product	0.173**	0.138	0.272***	0.364***
	(0.088)	(0.086)	(0.063)	(0.112)
Average Exports per Country	0.162*	0.129	0.230***	0.392***
	(0.087)	(0.085)	(0.063)	(0.111)

Source: Own calculations on data from PROMPEX and SUNAT.
The table reports estimates of Equation (2). The dependent variables are the natural logarithm of the export performance indicators listed in the first column. The firm-level time-varying covariates employment (labor) and age are expressed in natural logarithms. Firm fixed effects and year fixed effect included (not reported). Firm fixed effects and year fixed effect included (not reported). Robust standard errors, clustered by firm, reported in parentheses below the estimated coefficients. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table 8

Average Effect of Assistance by PROMPEX on Assisted Firms
Alternative Indicators
Difference-in-Differences Estimates with Covariates

Export Performance Indicator	Without Covariates	With Covariates		
	Treatment	Treatment	Labor	Age
Total Exports per Product	0.082***	0.068***	0.541***	0.332***
	(0.021)	(0.022)	(0.047)	(0.053)
Number of Destination Countries per Product	0.049***	0.047***	0.089***	0.063***
	(0.009)	(0.009)	(0.009)	(0.011)
Total Exports per Destination Country	0.042**	0.028**	0.492***	0.265***
	(0.020)	(0.014)	(0.036)	(0.043)
Number of Products per Destination Country	0.032***	0.028***	0.085***	0.067***
	(0.005)	(0.005)	(0.018)	(0.021)
Exports per Product and Destination Country	0.033**	0.031**	0.382***	0.227***
	(0.014)	(0.014)	(0.029)	(0.035)

Source: Own calculations on data from PROMPEX and SUNAT.
The table reports estimates of alternative specifications of Equations (4)-(6). The dependent variables are the natural logarithm of the export performance indicators listed in the first column. The firm-level time-varying covariates employment (labor) and age are expressed in natural logarithms. Regressions corresponding to total exports per product and number of destination countries per product include firm-product fixed effects. Regressions corresponding to total exports per destination country and number of products per destination country include firm-country fixed effects (no reported). The last regression includes firm-product-country fixed effects (not reported). Year fixed effect included in all cases (not reported). Robust standard errors reported in parentheses below the estimated coefficients. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table 9

Average Effect of Assistance by PROMPEX on Assisted Firms
Blundell and Bond Estimates

Export Performance Indicator	Without Covariates		With Covariates			
	Treatment	LDV	Treatment	LDV	Labor	Age
Total Exports	0.365*	0.627**	0.203**	0.447**	0.521**	0.091
	(0.214)	(0.252)	(0.081)	(0.222)	(0.220)	(0.353)
Number of Destination Countries	0.235**	0.479*	0.224**	0.174	0.209**	0.099
	(0.116)	(0.270)	(0.105)	(0.387)	(0.091)	(0.211)
Number of Products	0.119*	0.578***	0.169***	0.499**	0.063**	-0.181
	(0.065)	(0.181)	(0.046)	(0.222)	(0.029)	(0.145)
Average Exports per Country and Product	0.214	0.204	-0.505	0.629***	0.227*	-0.161
	(0.168)	(0.920)	(0.463)	(0.228)	(0.133)	(0.212)
Average Exports per Product	0.331	0.607	0.093	0.359	0.569**	-0.109
	(0.306)	(0.414)	(0.075)	(0.281)	(0.239)	(0.061)
Average Exports per Country	0.246*	0.601**	0.105*	0.480*	0.403*	-0.307
	(0.141)	(0.281)	(0.062)	(0.267)	(0.221)	(0.396)
	Sec. Or. Aut.	**Hansen**	**Sec. Or. Aut.**		**Hansen**	
Total Exports	1.530	8.170	1.150		14.280	
	[0.125]	[0.147]	[0.249]		[0.113]	
Number of Destination Countries	1.380	5.590	0.180		10.960	
	[0.168]	[0.232]	[0.854]		[0.278]	
Number of Products	1.060	12.76	0.700		3.060	
	[0.290]	[0.309]	[0.487]		[0.880]	
Average Exports per Country and Product	0.170	2.450	1.620		16.280	
	[0.862]	[0.484]	[0.105]		[0.234]	
Average Exports per Product	1.460	4.440	1.300		5.250	
	[0.144]	[0.218]	[0.195]		[0.386]	
Average Exports per Country	1.500	6.770	1.180		7.870	
	[0.133]	[0.239]	[0.237]		[0.163]	

Source: Own calculations on data from PROMPEX and SUNAT.

The table reports estimates of the treatment effect obtained with the estimator proposed by Blundell and Bond (1998). The dependent variables are the natural logarithm of the export performance indicators listed in the first column. LDV: Lagged dependent variables (based on 2000 values). The firm-level time-varying covariates employment (labor) and age are expressed in natural logarithms. Year fixed effect included (not reported). Robust standard errors reported in parentheses below the estimated coefficients. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table 10

Indicators of Matching Quality

Panel 1: Standardized Bias and t-Test

	Sample	Mean		Percentage Bias	Percentage Bias Reduction	t-test	
		Treated	Control			t	p-value
Covariates	**Nearest Neighbor**						
Treatment	Matched	0.58	0.58	0.00	99.90	0.00	1.00
Total Exports	Matched	12.77	12.86	-3.20	93.80	-1.01	0.31
Number of Destination Countries	Matched	1.33	1.30	3.20	94.80	0.87	0.38
Number of Products	Matched	1.81	1.76	4.40	90.60	1.29	0.20
Labor	Matched	3.54	3.53	0.80	97.30	0.24	0.81
Age	Matched	2.23	2.18	4.60	62.00	1.36	0.17
Location	Matched	0.85	0.84	4.20	55.70	1.27	0.19
Covariates	**Kernel**						
Treatment	Matched	0.58	0.58	0.00	99.90	0.00	1.00
Total Exports	Matched	12.77	12.68	3.50	94.00	1.05	0.29
Number of Destination Countries	Matched	1.33	1.26	4.30	93.50	1.17	0.24
Number of Products	Matched	1.81	1.72	5.40	85.70	1.59	0.11
Labor	Matched	3.54	3.45	4.50	87.90	1.27	0.20
Age	Matched	2.23	2.20	2.90	84.50	0.89	0.37
Location	Matched	0.85	0.83	4.80	40.40	1.44	0.15
Covariates	**Radius**						
Treatment	Matched	0.58	0.58	0.00	99.90	0.00	1.00
Total Exports	Matched	12.77	12.72	2.20	96.20	0.66	0.51
Number of Destination Countries	Matched	1.33	1.28	6.30	90.50	1.41	0.18
Number of Products	Matched	1.81	1.73	6.60	82.40	1.52	0.11
Labor	Matched	3.54	3.47	3.60	90.50	1.00	0.32
Age	Matched	2.23	2.20	2.60	85.90	0.81	0.42
Location	Matched	0.85	0.83	4.80	40.10	1.45	0.15

Panel 2: Hotelling t-squared Test

Quintile	Nearest Neighbor		Kernel		Radius	
	F-test	P-value	F-test	P-value	F-test	P-value
First	0.98	0.43	0.71	0.63	0.71	0.63
Second	1.73	0.12	1.67	0.15	1.67	0.15
Third	0.79	0.58	0.92	0.48	0.92	0.48
Fourth	0.70	0.60	1.25	0.39	1.25	0.39
Fifth	0.34	0.89	1.02	0.45	1.02	0.45

Panel 3: Pseudo-R2 and F-test of joint significance

Estimator	Pseudo R2		F-test of joint significance			
			Before		After	
	Before	After	F-test	P-value	F-test	P-value
Nearest Neighbor	0.25	0.01	2,196.10	0.00	10.32	0.15
Radius	0.25	0.01	2,196.10	0.00	8.79	0.27
Kernel	0.25	0.00	2,196.10	0.00	6.89	0.44

Source: Own calculations on data from PROMPEX and SUNAT.

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 the Hotelling t-squared test statistics for the joint significance of these mean differences over quintiles, estimates of the pseudo-R^2 from the probit model, and the F-test statistics of joint significance 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 treatment status, lagged (natural logarithm of) employment (labor), lagged (natural logarithm of) age, and a dummy variable for location (Lima=1 and 0 otherwise).

Table 11

Average Effect of Assistance by PROMPEX on Assisted Firms
Sample: All Firms, 2002-2005
Difference-in-Differences and Matching Difference-in-Differences Estimates

Export Performance Indicator	Standard Error	DID	NN	Radius	Kernel
Total Exports		0.196***	0.196	0.175	0.177
		(0.059)			
	Analytical		(0.057)***	(0.046)***	(0.046)***
	Bootstrapped		(0.054)***	(0.035)***	(0.035)***
	Subsampling		(0.055)***	(0.039)***	(0.037)***
Number of Destination Countries		0.092***	0.052	0.064	0.064
		(0.026)			
	Analytical		(0.023)**	(0.018)***	(0.018)***
	Bootstrapped		(0.023)**	(0.017)***	(0.016)***
	Subsampling		(0.023)**	(0.019)***	(0.019)***
Number of Products		0.116***	0.148	0.127	0.128
		(0.032)			
	Analytical		(0.032)***	(0.025)***	(0.025)***
	Bootstrapped		(0.028)***	(0.020)***	(0.021)***
	Subsampling		(0.031)***	(0.023)***	(0.023)***
Average Exports per Country and Product		0.013	-0.004	-0.016	-0.015
		(0.052)			
	Analytical		(0.054)	(0.044)	(0.044)
	Bootstrapped		(0.050)	(0.038)	(0.035)
	Subsampling		(0.054)	(0.039)	(0.040)
Average Exports per Product		0.079	0.048	0.048	0.049
		(0.052)			
	Analytical		(0.054)	(0.043)	(0.043)
	Bootstrapped		(0.049)	(0.037)	(0.035)
	Subsampling		(0.050)	(0.040)	(0.038)
Average Exports per Country		0.103**	0.144	0.111	0.112
		(0.052)			
	Analytical		(0.052)***	(0.043)***	(0.043)***
	Bootstrapped		(0.047)***	(0.034)***	(0.032)***
	Subsampling		(0.053)***	(0.038)***	(0.035)***

Source: Own calculations on data from PROMPEX and SUNAT.
The table reports difference-in-differences and matching difference-in-differences estimates of average treatment effect on the treated.
Difference-in-difference (DID) estimation: The dependent variables are the natural logarithm of the export performance indicators listed in the first column. Natural logarithm of employment and natural logarithm of age included in the specification with firm-level time-varying covariates (not reported). Firm fixed effects and year fixed effect included (not reported). Robust standard errors, clustered by firm, reported in parentheses below the estimated coefficients.
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 bandwith of 0.04. Standard errors reported in parentheses. Bootstrapped standard errors based on 500 replications. Subsampling standard errors based on draws of sub-samples of size equivalent to 85% of the size of the original sample.
* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. In the case of the matching difference-in-differences estimates, the significance indicator is reported with the standard errors corresponding to each method used to compute these errors.

Table 12

Average Effect of Assistance by PROMPEX on Assisted Firms
Sample Excluding Firms Assisted the Previous Years, 2002-2005
Difference-in-Differences and Matching Difference-in-Differences Estimates

Export Performance Indicator	Standard Error	DID	NN	Radius	Kernel
Total Exports		0.207**	0.307	0.245	0.255
		(0.081)			
	Analytical		(0.080)***	(0.055)***	(0.056)***
	Bootstrapped		(0.096)***	(0.053)***	(0.053)***
	Subsampling		(0.100)***	(0.056)***	(0.057)***
Number of Destination Countries		0.100***	0.092	0.084	0.087
		(0.034)			
	Analytical		(0.033)**	(0.024)***	(0.024)***
	Bootstrapped		(0.035)***	(0.024)***	(0.021)***
	Subsampling		(0.038)**	(0.024)***	(0.025)***
Number of Products		0.123***	0.182	0.142	0.148
		(0.043)			
	Analytical		(0.044)***	(0.030)***	(0.030)***
	Bootstrapped		(0.045)***	(0.028)***	(0.031)***
	Subsampling		(0.055)***	(0.032)***	(0.032)***
Average Exports per Country and Product		0.016	0.033	0.019	0.020
		(0.074)			
	Analytical		(0.078)	(0.057)	(0.057)
	Bootstrapped		(0.088)	(0.058)	(0.057)
	Subsampling		(0.091)	(0.060)	(0.060)
Average Exports per Product		0.084	0.125	0.103	0.107
		(0.072)			
	Analytical		(0.077)	(0.055)*	(0.055)*
	Bootstrapped		(0.086)	(0.054)**	(0.055)*
	Subsampling		(0.098)	(0.060)*	(0.061)*
Average Exports per Country		0.107	0.214	0.161	0.168
		(0.073)			
	Analytical		(0.074)***	(0.053)***	(0.053)***
	Bootstrapped		(0.081)***	(0.048)***	(0.049)***
	Subsampling		(0.093)**	(0.057)***	(0.054)***

Source: Own calculations on data from PROMPEX and SUNAT.
The table reports difference-in-differences and matching difference-in-differences estimates of average treatment effect on the treated for the period 2002-2005.
Difference-in-difference (DID) estimation: The dependent variables are the natural logarithm of the export performance indicators listed in the first column. Natural logarithm of employment and natural logarithm of age included in the specification with firm-level time-varying covariates (not reported). Firm fixed effects and year fixed effect included (not reported). Robust standard errors, clustered by firm, reported in parentheses below the estimated coefficients.
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 bandwith of 0.04. Standard errors reported in parentheses. Bootstrapped standard errors based on 500 replications. Subsampling standard errors based on draws of sub-samples of size equivalent to 85% of the size of the original sample.
* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. In the case of the matching difference-in-differences estimates, the significance indicator is reported with the standard errors corresponding to each method used to compute these errors.

Figure 1
Distribution of Firms across Product-Market Export Patterns
2001 (left) and 2005 (right)

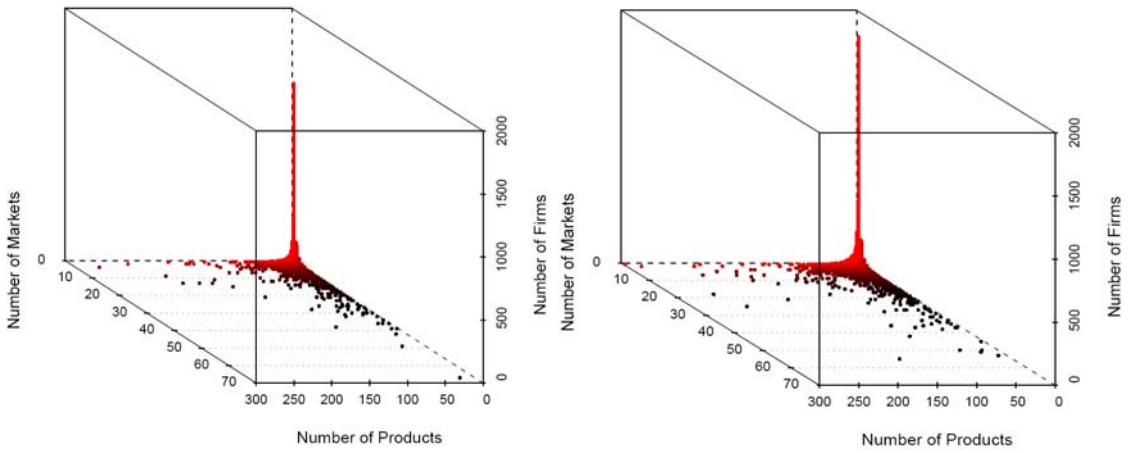

Figure 2
Distribution of Export Shares across Firms with Different Product-Market Export Patterns
2001 (left) and 2005 (right)