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Do Export Promotion Agencies Promote New Exporters?*

Marcio Cruz†

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Abstract

Do export promotion agencies (EPAs) impact the probability of non-exporting firms to export? In the last decade many countries have introduced EPAs to support their firms in order to deal with asymmetric information problems and make feasible additional gains from trade. Some recent studies have found that the support of EPAs has been effective with respect to the intensive and extensive margins of trade. Nevertheless, due to the lack of information on non-exporting firms, few of them analyze their impact on the probability of promoting new exporters. This paper evaluates the impact of the Brazilian Trade and Investment Promotion Agency (Apex-Brasil) on firms' export status using a unique firm-level dataset which covers the full manufacturing sector in Brazil. In order to identify the impact of Apex's assistance on firms' export propensity this paper relies on a procedure of matching difference-in-difference estimators. The empirical results show evidence of the program's positive impact on the probability of promoting new exporters. Also, the effect is heterogeneous according to firms' size categories and sectors. Although the evidence of positive effect is robust, the low propensity to export for both the treated and the control groups reinforces the importance of other firms' determinants (e.g. productivity) widely emphasized by trade literature.

JEL Classification: D04, D22 F13, F14

Keywords: Export Promotion Agencies; New Exporters; Impact Evaluation; Brazil.

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1 Introduction

Recent literature on international trade has focused on understanding the determinants of exporting at the firm level, in an environment characterized by heterogeneous firms. Since the seminal paper of Melitz (2003) and following a sharp increase in the availability of access to firm- and plant-level data, many empirical studies have supported an approach that emphasizes two main components to explain why only some firms become exporters: their heterogeneous productivity and sunk costs of entry into foreign markets.

An important feature surrounding this literature is the fact that exporters are typically larger, more productive and pay higher wages, besides other positive characteristics. Therefore, identifying a possible causal relationship between exporting status and productivity has become a topic that has received significant attention in trade literature. The most prevalent view is that most efficient firms self selected themselves into the export market (see Roberts and Tybout (1997); Clerides et al. (1998); Bernard and Jensen (2004)). However, De Loecker (2007) and Lileeva and Trefler (2010) find that improving foreign market access may increase the productivity of some exporting plants.

A usual justification for EPAs' services is the existence of market failures which prevent producers from reaching foreign markets despite the fact that they might have enough productivity to compete abroad. For example, Waugh (2010) demonstrates the existence of "asymmetric frictions" in which developing countries face systematically higher costs for exporting than industrialized ones. Also, Cadot et al. (2011) show evidence of network effects (positive externality) for exporters of similar products to those firms exporting for the same destinations. Furthermore, Eaton et al. (2010) show that the behavior of exporting firms reflects a process of searching and learning in the foreign market, where these firms spend resources on identifying buyers and learn about the potential of their products for that market. A high entry cost for learning about foreign markets and uncertainty due to information frictions can deter potential exporters from doing so (see Allen (2011)).

Therefore, the presence of market failures such as externalities and asymmetric information might support some mechanisms of government-sponsored export promotion as a way to make some additional gains from trade feasible.[1] Although export promotion policies should be taken cautiously[2], they have been applied in many different countries and a significant amount of

[1] Copeland (2007) provides a critical review on the literature and emphasizes two sources of market failure that could justify this kind of interventions: information spillovers and asymmetries of information.

[2] There are important aspects regarding political economy and efficiency to be taken into consideration.

resources have been allocated to that, which justifies the necessity of a more rigorous analysis to understand the results of these agencies.[3]

During the last two decades, a wide variety of literature has covered the impact of export promotion agencies around the world looking into questions related to different margins of trade. (see Espinoza and Crespi (2000), Bernard and Jensen (2004), Volpe Martincus (2010), Lederman et al. (2010), Gil-Pareja et al. (2011), Hayakawa et al. (2011), Cadot et al. (2012), Schminke and Van Biesebroeck (2013)). However, few of them (e.g. Bernard and Jensen (2004) and Schminke and Van Biesebroeck (2013)) are analyzing the impact of EPAs on the pure extensive margin.[4]

In this paper I evaluate the impact of services provided by the Brazilian Trade and Investment Promotion Agency (Apex-Brasil) on the export propensity of non-exporting firms. The paper uses a unique firm-level database covering the full manufacturing sector in Brazil with information on approximately 300,000 firms from 2005 to 2010. In addition to providing detailed information on firms' characteristics, the data allows the identification of firms that received support from Apex. To identify the causal effect of the program on the probability to export, I rely on a procedure of matching difference-in-difference estimators.

This essay contributes to the prevailing literature in several ways. First, it provides policy-relevant evidence on a largely unexamined issue: the impact of EPAs on promoting new exporters, using a uniquely rich dataset for a large economy. Second, it evaluates potential heterogeneous effects with respect to the different size of the firms. Third, it evaluates the impact of the program on promoting new exporters among untreated firms by testing the spillover hypothesis. To my knowledge, the impact of EPAs' assistance on the export propensity of non-exporting firms in developing or emerging countries has not been addressed before.

The results show that Apex's treatment increases the probability of a non-exporting firm to start exporting by 2.3 percentage points (pp) one year after the program is implemented and by about 2.2 pp in the year of program implementation. This means that firms that received the program increased their propensity to export by almost 130% (from 1.75% to 4.05%) when compared with other similar non-exporting firms one year after the treatment. Also, the program seems to be more effective when focusing on micro, small and medium firms, particularly the

[3]It is worth noting that even with few recent findings about the effectiveness of export promotion, the World Association of Investment and Promotion Agencies (WAIPA) has 236 affiliated members from 162 different countries. Most of theses agencies are focusing on attracting FDI and promoting export. Further information is available on www.waipa.org.

[4]The definition of margins of trade refers to the different dimensions (e.g. market, product) of transactions that can be accounted as intensive or extensive. The pure extensive margin refers to the variation on export induced by a non-exporting firm that becomes an exporter. The extensive margin can also account for previously exporting firms that start to export a new product or to a new market, or both. The intensive margin refers to the export performance from a previously exporting firm to a previously exported market or previously exported product (see Chaney (2008)).

former which is defined as firms between 50 and 150 employees.[5] Moreover, I find evidence of a positive, although small effect of the program on untreated firms that belong to the same sector and region of Apex's treated exporting firms.

The remainder of this paper is organized as follows: Section 2 provides a literature review on the impact of EPAs on exports. Section 3 describes the data and the program and provides some descriptive statistics. Section 4 discusses the identification strategy. Section 5 shows the empirical results followed by robustness checks and section 6 concludes the paper.

2 Related Literature and Motivation

The discussions in trade literature about the effectiveness of export promotion policies in the 1980s were marked by criticism of their distance from the private sector.[6] This topic has gained attention again, particularly in the context of developing and emerging economies facing a more open-to-trade environment. As highlighted by Lederman et al. (2010), the number of EPAs has tripled over the past two decades and most of them have focused on assisting exporters in understanding and finding markets for their products.

There are two main approaches that have been used to analyze EPAs' effectiveness. The first one is based on a more aggregated and bilateral trade flow.[7] Overall, these studies find positive impacts of export promotion efforts in different regions. Rose (2007) finds a positive effect of opening a country's embassy on export performance. Ferguson and Forslid (2013) also find a positive effect of opening Swedish embassies abroad on boosting the number of Swedish exporting firms, particularly for medium-sized firms.[8] Gil-Pareja et al. (2011) also provide evidence of a positive impact of regional export promotion offices for Spain. These offices seem to be more effective on promoting export, the more distant they are from their country.[9] Hayakawa et al. (2011) also find a positive effect of promotion agencies on the export increases in Japan and Korea. Their results suggest that establishing an EPA office abroad is equivalent to signing a free trade agreement (FTA) with the same country. Lederman et al. (2010) show the results of an international survey of 88 EPAs and find positive impact of EPA budgets on export, particularly in Eastern Europe, Asia, Latin America and Sub-Saharan Africa.

Yet, the previous approach does not identify the impact at the level of benefited firms.

[5] Firms' sizes are defined according to the number of employees. See section 5.2 for further details.
[6] See Krueger (1980), Hogan et al. (1991) and Lederman et al. (2010)
[7] Hogan et al. (1991) is also an example of this approach.
[8] Those firms may be more sensitive to fixed entry cost related to informational barriers.
[9] They attribute this effect to the incomplete information barriers' problem.

Since the 2000s, there have been numerous papers evaluating impacts of EPAs using firm-level data from different countries and regions.[10] Most of these studies take advantage of a greater availability of data and new econometric techniques used in impact evaluation literature to deal with selection issues in non-experimental programs. All in all, most findings converge with the positive results found by the more aggregated approach.

In the emerging and developing countries context, Espinoza and Crespi (2000) show a positive impact of Prochile (Trade Comission of Chile, responsible for implementing and enhancing Chile's trade policy) on firms' export performance in Chile, particularly on extensive margin due to a scheme called "export committee." Volpe Martincus (2010) shows some evidence of the effectiveness of EPAs in many Latin American countries on the intensive and the extensive margins of trade. His conclusion is reinforced by different studies using firm-level data to analyze the impact of these agencies and export programs in Peru (Promperu), Costa Rica (Procomer), Uruguay (Uruguay XXI), Chile (Prochile), Argentina (Fundancion ExportAR) and Colombia (Proexport).[11] In addition, these studies find that the impact is larger for smaller firms (taking into account the cases of Argentina and Chile) and that bundled services work better.

In addition to these findings for Latin American, Girma et al. (2009) show evidence of a positive but heterogeneous impact of production-related subsidies on exports in China. According to them, the program was more effective among more profitable firms and capital intensive industries. Cadot et al. (2012) also find a positive impact of Famex, a program that provided firms in Tunisia with matching grants for promoting exporters through co-financing half of the cost of export business plans. However, they find a positive impact on export value only in the short run (two periods after the treatment). After this period treated and control groups of firms seem to have similar performance. Nonetheless, the impact seems to be persistent, even after five years for new products and destinations.

In high-income economies, Chen et al. (2011) analyze the case of Canadian Trade Promotion Services using firm-level data from 1999 to 2006 and find a robust positive effect at the intensive margin. Hiller (2012) analyzes the impact of export association membership on export sales and the number of products in Denmark and finds a more significant effect on the intensive margin (export sales).[12]

Most of these studies use standard procedures to deal with selection bias in a non-experimental

[10] Seringhaus and Botschen (1991) also used a small sample from a survey carried with 312 firms in Austria and 271 firms in Canada (271) to compare the difference between the services provided by EPAs in both countries taking into account the fact that they were public based in Canada and private in Austria.

[11] See Volpe Martincus and Carballo (2008), Jordana et al. (2010), Volpe Martincus and Carballo (2010a), Volpe Martincus and Carballo (2010b), Volpe Martincus et al. (2010) and Volpe Martincus and Carballo (2010c).

[12] Hiller (2012) also finds a positive impact on number of products exported.

fashion. They find some positive, though heterogeneous impact of EPAs on firms' export performance, particularly on export value, new markets destination and new products. However, one question that still demands further attention at the firm level is whether EPAs' services impact the probability of non-exporting firms to become exporters. Although some studies are quoted as showing evidence that EPA activities are not effective in promoting new exporters, this is not clear for two reasons: a) they do not identify benefiting firms (e.g. Bernard and Jensen (2004)); b) the support they are analyzing is production-related subsidies that are not necessarily targeting export promotion (e.g. Girma et al. (2009a); Görg et al. (2008); Girma et al. (2009b)).

Bernard and Jensen (2004) find no impact of export promotion on the probability of exporting for firms from the United States. However, they use the log of export promotion expenditures per plant for each state as covariate, which does not allow them to identify the groups of treated and untreated firms. Görg et al. (2008) find little evidence on Irish firms that grants encourage non-exporters to start exporting. Yet, they find that if grants are large enough they can be effective to make already exporting firms more competitive on the international market. Girma et al. (2009a) find a positive correlation between firms that export and those which receive subsidies in Germany, but they find no impact of subsidies on the probability of starting export and weak evidence that subsidies affect the share of exports in total sales. Girma et al. (2009a,b) and Görg et al. (2008) focus on the impact of production-related subsidies, which are not necessarily a typical service provided by EPAs for improving the matching between domestic producers and foreign buyers.

This paper is closely related to Schminke and Van Biesebroeck (2013), who identify firms that receive support from EPAs in Belgium and find positive effect on firms' propensity score to export. However, Belgium is a relatively small country in the European Union (an important common market), where exports account for approximately 80% of its GDP. Thus, there is a lack of evidence on the effectiveness of EPAs on promoting new exporting firms in a large middle income country. Furthermore, when compared to other countries with a similar level of GDP per capita, Brazil shows a relatively low number of exporting firms per capita (see figure 1). It also has one of the lowest average new exporters entry rate when compared to other countries available at the World Bank firm-level export dynamic database (see Canuto et al. (2013) for further discussion on this topic). Therefore, further understanding of policy impacts aimed to promote new exporters in this context is much needed.

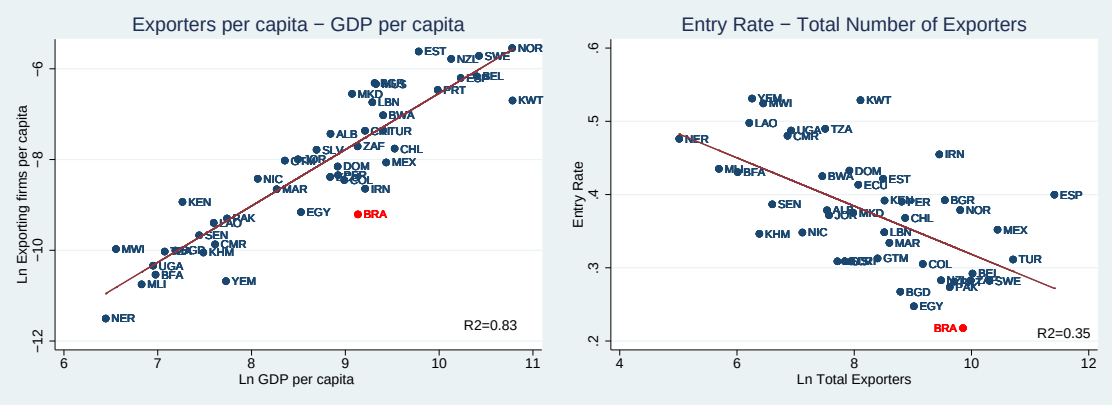

Figure 1: Exporters per capita and export entry rate in Brazil
Source: World Bank Export Dynamics Database (Cebeci et al., 2012)

In this regard, an important question that comes from analyzing a specific policy in a single country is related to external validity. Does this experience in Brazil reflect the expected outcome from similar policies in other countries? Even though policy outcomes can vary over different institutional environments among different countries, it is important to highlight that the export behavior in Brazil is very similar to that in leading export countries such as France and the United States, as described by Arkolakis (2010). Also, I find many similarities with the patterns of Colombian exporting firms (Eaton et al., 2010). However, the comparison of EPAs' impact should incorporate the heterogeneity among the agencies and countries' institutions. Hence, accumulating further knowledge on the effect of these programs in different contexts is critical to fully understand how and in which circumstances they work.

3 Data and Descriptive Statistics

This paper is based on a unique firm-level dataset that resulted from merging three different sources of information in Brazil: 1) the *Relações Anual de Informações Sociais* (RAIS), a matched employer-employee dataset from the Ministry of Labor;[13] 2) the SECEX/MDIC dataset, which provides firms' exporting status; and 3) the APEX data, identifying the firms which received the treatment from Apex-Brasil.[14] The data was merged using a unique identifier at the firm level.[15] The data from Apex covers the period between 2007 and 2010. I used RAIS and SECEX/MDIC from 2005 to 2010 in order to capture the previous characteristics of exporting firms and the

[13] RAIS is a register of all formal firms in Brazil. It provides information about the size of the establishment, geographic distribution and workers, such as wage, education, age and gender.

[14] *Secretaria de Comércio Exterior* (SECEX) from the Ministry of Development, Industry and Trade (MIDC). A list of exporting firms by year is publicly available on www.mdic.gov.br.

[15] RAIS provides information at the plant level with a 14-digit identifier that can be converted to the firm level using 8 digits, which was used in this paper. The location of the firm is defined as the location of the larger plant.

impact of the treatment.

In addition to the counterfactual that is missing,[16] another issue is that export and import activities can be carried by traders. Indeed, promoting the relationship between producers and traders might be one of the targets of EPAs,[17] but traders are accounted as services that are not directly related to the firms that produce the goods that are exported, so results could be misleading. I concentrate on the manufacturing sector where I assume that trade (export and import) is more likely to be accounted for producers, though manufacturing firms also may trade goods they do not produce (see Bernard et al. (2012) and Crozet et al. (2013)). I use the sectoral definition of CNAE 2.0[18] (Portuguese acronym for National Economic Activity Classification) that is equivalent to the International Standard Industrial Classification of All Economic Activities (ISIC, Rev.4.).

RAIS provides yearly information for approximately 250,000 manufacturing firms per year, which can work as an annual census for the formal manufacturing sector in Brazil. This is critical because we can observe all formal firms over time, disregarding their export status. Since my identification uses lagged variables in the first stage, I first impose a restriction in the dataset according to which firms should appear in RAIS at periods $t-1$ and t.[19] For example, there are 257,473 manufacturing firms in RAIS in 2007. Among these firms 224,232 also appear in 2006 and so on.[20]

The basic services provided by Apex-Brasil are related to matching domestic sellers and foreign buyers (e.g. through participation in trade fairs) and providing standard information on foreign markets, including standard qualification for exporting. There are two alternative ways to have access to these services: a) through an industry association (this scheme, called "Sectoral Project," is more common if a firm is going to participate in trade fairs) or b) directly with Apex (this is more common for special projects related to participation in sports and cultural events, such as Formula Indy, Carnaval and the Peiex[21] project).

There are spatial and sectoral heterogeneities among treated firms. Table 1 shows the regional distribution of firms according to their treatment and export status from 2007 to 2010. The Southeast[22] concentrates most of the economic activity in Brazil. It has approximately 42% of the

[16] We can observe only one status of the firm as being treated or untreated.
[17] According to Apex, this is among their goals.
[18] I used CNAE 2.0, 2 digits, from 10 to 33, which defines manufacturing.
[19] I am assuming that this is an existence condition for the firm.
[20] This number for the other years is 267,303 firms in 2008, 273,582 firms in 2009 and 292,680 firms in 2010.
[21] The Peiex (Portuguese acronym for Industrial Extension Project for Exporting) is an export capacity-building program program focusing on enhancing Brazilian SMEs competitiveness by providing coaching and consultancy on best management practices.
[22] Composed by the states of São Paulo, Rio de Janeiro, Minas Gerais and Espírito Santo.

population, 50% of manufacturing firms and contributes to almost 58% of GDP. The treatment distribution follows the distribution of exporting firms relatively close, more concentrated in the states of São Paulo, Minas Gerais and Rio Grande do Sul.[23]

State	Number of firms-year			Share (%)		
	Total	Exporters	Apex	Total	Exporters	Apex
Rondônia	5,948	218	11	0.63	0.46	0.06
Acre	1,243	23	-	0.13	0.05	-
Amazonas	4,497	515	21	0.48	1.09	0.11
Roraima	533	56	-	0.06	0.12	-
Pará	9,880	710	47	1.04	1.51	0.25
Amapá	668	16	9	0.07	0.03	0.05
Tocantins	2,634	11	6	0.28	0.02	0.03
Maranhão	4,961	68	-	0.52	0.14	-
Piauí	5,300	69	10	0.56	0.15	0.05
Ceará	25,511	577	594	2.70	1.22	3.18
Rio Grande do Norte	8,053	110	87	0.85	0.23	0.47
Paraíba	7,967	158	80	0.84	0.34	0.43
Pernambuco	23,026	372	268	2.43	0.79	1.43
Alagoas	3,544	73	77	0.37	0.15	0.41
Sergipe	4,371	60	109	0.46	0.13	0.58
Bahia	25,954	629	752	2.74	1.33	4.02
Minas Gerais	119,941	3,249	2,731	12.67	6.89	14.61
Espírito Santo	19,949	710	211	2.11	1.51	1.13
Rio de Janeiro	46,857	1,816	563	4.95	3.85	3.01
So Paulo	281,284	22,306	5,254	29.72	47.31	28.12
Paraná	87,092	3,945	1,717	9.20	8.37	9.19
Santa Catarina	92,977	3,904	1,130	9.82	8.28	6.05
Rio Grande do Sul	107,333	6,536	4,456	11.34	13.86	23.85
Mato Grosso do Sul	7,424	164	36	0.78	0.35	0.19
Mato Grosso	14,020	357	38	1.48	0.76	0.20
Goiás	29,935	477	344	3.16	1.01	1.84
Distrito Federal	5,679	24	135	0.60	0.05	0.72
Total	946,581	47,153	18,687	-	-	-
Average (year)	236,645	11,788	4,672	-	-	-

Table 1: Descriptive statistics (Export- Treated and Untreated firms (2007-2010)

Note: If the number of treated firms by Peiex is excluded, there are 12,759 treated firms over this period, 3,190 by year on average and the share of treated firms goes down from about 2% to 1.32%. Among these firms, 57.4% are in the Southeast, 33% in the South and 7% in the Northeast.

Table 2 shows the sectoral distribution of manufacturing firms according to their export and treatment status. It is noticeable that three sectors (food, wearing apparel and metal) represent about 40% of the total manufacturing firms. On the other hand, only machinery and equipment have a share larger than 10% among exporters, followed by rubber and plastic, chemicals and food. Among the firms which received Apex's treatment, wearing apparel takes the largest share, followed by leather and food. When taking into account the total number of firms, none of the sectors has more than 5% of their firms receiving Apex's support. Graph 4 (in section 7.4 of the appendix) shows the yearly number of (treated and untreated) exporting firms.

[23]In the case of Minas Gerais and Rio Grande do Sul the difference is driven by the support of Peiex, a program focusing on improving competitiveness of smaller firms (see Cruz et al. (2013)).

Sector (CNAE 2.0)		Number of firms-year			Share (%)		
		Total	Export	Apex	Total	Export	Apex
10	Food	111,209	3,499	1,588	11.75	7.42	8.50
11	Beverages	6,946	398	254	0.73	0.84	1.36
12	Tobacco	514	105	0	0.05	0.22	0.00
13	Textiles	32,163	1,743	890	3.40	3.70	4.76
14	Wearing apparel	163,472	2,687	3,835	17.27	5.70	20.52
15	Leather	44,489	2,616	1,814	4.70	5.55	9.71
16	Wood and cork	54,416	2,457	343	5.75	5.21	1.84
17	Paper	14,158	732	182	1.50	1.55	0.97
18	Printing	42,627	339	188	4.50	0.72	1.01
19	Refined petroleum	1,566	245	61	0.17	0.52	0.33
20	Chemicals	26,652	3,497	816	2.82	7.42	4.37
21	Pharmaceutical	3,054	698	95	0.32	1.48	0.51
22	Rubber and plastics	48,569	3,686	1,007	5.13	7.82	5.39
23	Non-metallic	75,631	1,965	850	7.99	4.17	4.55
24	Basic metals	15,146	1,383	337	1.60	2.93	1.80
25	Metal products	108,889	3,079	1,043	11.50	6.53	5.58
26	Computer, electronic	10,952	2,133	533	1.16	4.52	2.85
27	Electrical equipment	14,060	1,893	278	1.49	4.01	1.49
28	Machinery and equip.	42,500	6,488	1,441	4.49	13.76	7.71
29	Motor vehicles	17,167	2,423	450	1.81	5.14	2.41
30	Other transport	3,185	338	56	0.34	0.72	0.30
31	Furniture	56,999	1,670	1,344	6.02	3.54	7.19
32	Other manufact.	25,667	2,651	1,181	2.71	5.62	6.32
33	Repair machinery	26,550	428	101	2.80	0.91	0.54

Table 2: Sectoral distribution - Manufacturing, Exporting, Treated firms (2007-2010)

Tables 1 and 2 show that the distribution of manufacturing firms according to their exporting and Apex's treatment status are very heterogeneous among sectors and regions. This heterogeneity should be taken into account, since there are common shocks (e.g. exchange rate, labor market, interest rate, infrastructure, etc.) that might have a heterogeneous impact across firms in different sectors and location. Next, I compare firms' characteristics that vary over time and provide some descriptive statistics for those variables that have been highlighted as important in explaining export performance in the trade literature.

Table 3 shows the number of firms' observations (N), from 2007 to 2010, their mean, the standard deviation (sd), the median (p50) and the percentiles (p10) and (p90), for a set of variables used for the empirical analysis. The number of employees is available on RAIS as the number of contracts the firm has in a year t. This variable considers the period a worker was hired by the firm over the year. In this case a worker is weighted as 1 only if she was hired over 12 months in a year. Otherwise she is weighted proportionally to the time she was hired. Firm's age is a proxy for the age of the firm that takes into account the maximum period of employees' experience working at firm i available in RAIS over time. Employee's age is the average age of employees. Schooling is the employees' average years of schooling.[24] "Wage" is the average

[24]In RAIS, education attainment is a categorical information that is converted to years of schooling based on a methodology available on the PNAD (National Household Sample Survey) carried by the IBGE (Portuguese

monthly wage by firm. This information is available in current domestic currency and it was converted to Reais (R$) of 2010.[25]

As it is known from trade literature (see Roberts and Tybout (1997), Bernard and Jensen (2004), Melitz and Trefler (2012)), exporting firms are larger, older, employ more educated workers and pay higher wages.[26] If we compare them with Apex's treated firms we can see that their characteristics concerning these variables are much closer to exporters than to the average manufacturing firm.[27] This finding reinforces some potential selection issues to identify the impact of the program.

Another variable that tries to capture time-varying information on management quality is a dummy identifying firms that hired workers from other exporting firms in Management positions. In order to create this variable I used a unique worker identifier (RAIS at employee level) that allows for the tracking of a worker over time.[28] Firstly, I identify employees working in an exporting firm i at period *t-1* that were not working in the same firm at period t. Then I check the firm they were working at period t and based on their CBO classification (Portuguese acronym for Brazilian Classification of Occupation) I classified them as managers according to different layers.[29] Based on this information, I generated three dummy variables (at firm level) that take the value 1 when a firm k at period t hired an employee who was working at an exporting firm i at period *t-1*. This procedure is in line with the findings of Mion and Opromolla (2011), who show that hiring an employee with previous experience in exporting firms impacts the probability of export, but only if she has a management position. This also can be considered as a proxy for an effort from the firm towards having access to the foreign market. Again for these variables the Apex-treated firms are more similar to the average exporting firms.

Also, Caliendo and Rossi-Hansberg (2012) and Caliendo et al. (2012) show that the organization of firms under a form of hierarchies based on knowledge matters on their performance and export status. In order to capture this information I build a similar variable using the CBO classification. Firms are divided in five layers that represent different levels of management hierarchy.[30] We can see that the mean and the median regarding number of layers is larger for

acronym for Brazilian Institute of Geography and Statistics).

[25] In order to convert the annual value to 2010 I used the IPCA-IBGE (Consumer Price Index produced by IBGE used by the Brazilian Central Bank as official reference to inflation target). The exchange rate in December 2010 was approximately R$ 1.00 for US$ 1.67 (source: Central Bank of Brazil).

[26] These findings in Brazil are highlighted by Kannebley Jr et al. (2010).

[27] It is even more similar when we compare with treated firms excluding Peiex-treated firms, which are smaller firms.

[28] The identifier I used to track workers is available from 2006.

[29] These variables are respectively called Manager exp L1, Manager exp L2 and Manager exp L3, which corresponds to the following occupations: CEOs and directors (L1), senior staff with higher level of experience (L2) and supervisors (L3).

[30] In order to build this index and the management's dummies, I used RAIS at employee level (which provides

exporting firms. Apex's treated firms also have more layers.

Total Firms	**N**	**mean**	**sd**	**p50**	**p10**	**p90**
Size (Employees)	946,455	30.21	291.67	6.00	1.00	41.25
Firms' age	946,581	12.06	9.10	9.91	3.16	23.08
Employee's age	946,455	34.43	7.26	33.65	26.00	43.74
Schooling	946,422	8.79	2.06	9.04	5.79	11.04
Wage	946,455	885.39	635.49	742.33	503.50	1,386.43
Layers	917,765	2.23	1.18	2.00	1.00	4.00
Manager exp L1	946,581	0.002	0.04	0.00	0.00	0.00
Manager exp L2	946,581	0.002	0.04	0.00	0.00	0.00
Manager exp L3	946,581	0.005	0.07	0.00	0.00	0.00
Export-spillovers	946,581	26.10	53.91	4.00	0.00	77.00
Multi	946,581	0.01	0.08	0.00	0.00	0.00
Import Dummy	946,581	0.06	0.23	0.00	0.00	0.00
Export Dummy	946,581	0.05	0.22	0.00	0.00	0.00
Apex	946,581	0.02	0.14	0.00	0.00	0.00
Exporters						
Size (Employees)	47,151	296.67	1,230.53	61.17	6.83	550.08
Firms' age	47,153	21.73	13.93	18.63	6.24	41.91
Employee's age	47,151	34.34	4.55	34.00	29.13	39.89
Schooling	47,151	9.61	1.85	9.78	7.14	11.68
Wage	47,151	1,698.85	1,324.47	1,326.14	706.51	3,027.30
Layers	46,654	4.03	1.20	5.00	2.00	5.00
Manager exp L1	47,153	0.02	0.12	0.00	0.00	0.00
Manager exp L2	47,153	0.02	0.13	0.00	0.00	0.00
Manager exp L3	47,153	0.04	0.19	0.00	0.00	0.00
Export-spillovers	47,153	49.19	72.94	19.00	2.00	154.00
Multi	47,153	0.11	0.32	0.00	0.00	1.00
Import Dummy	47,153	0.60	0.49	1.00	0.00	1.00
Apex	47,153	0.17	0.38	0.00	0.00	1.00
Apex's treated firms						
Size (Employees)	18,685	257.62	1,451.88	30.08	3.42	413.58
Firms' age	18,687	18.91	13.29	15.71	4.99	38.08
Employee's age	18,685	33.96	5.06	33.50	28.18	40.12
Schooling	18,683	9.28	1.71	9.43	7.06	11.11
Wage	18,685	1,163.50	761.54	955.94	568.73	1,975.07
Layers	18,531	3.52	1.36	4.00	2.00	5.00
Manager exp L1	18,687	0.01	0.10	0.00	0.00	0.00
Manager exp L2	18,687	0.01	0.10	0.00	0.00	0.00
Manager exp L3	18,687	0.02	0.14	0.00	0.00	0.00
Export-spillovers	18,687	32.10	52.80	10.00	0.00	103.00
Multi	18,687	0.02	0.15	0.00	0.00	0.00
Import Dummy	18,687	0.34	0.48	0.00	0.00	1.00
Export Dummy	18,687	0.44	0.50	0.00	0.00	1.00

Table 3: Characteristics of manufacturing, exporting and Apex's treated firms (2007-2010)

In addition, as emphasized by Koenig (2009) there might be geographically driven shocks that affect export performance, such as neighbourhood-effect, spillovers and other externalities (think of the case of Silicon Valey as a good example, but it can be negative such as a big player that transfers their production to another region). I am trying to capture these dynamics through the

yearly information for about 8 millions of employees on manufacturing sector - 7,756 millions in 2010) and first, counted the number of employees according to their CBOs. Then I generated a dummy variable by firm-layer and summed them up for building a proxy for the level of hierarchy of each firm, which is presented in the variable "layer." For further details see Cruz et al. (2013).

variable "Export-spillovers."[31] This variable accounts for the number of other exporting firms in the same micro-region (a geographic definition from IBGE that divides Brazil in 555 regions) and sector (CNAE 2 digits) excluding the own firm.[32] It is noticeable that among exporting and treated firms the number of other exporters in the same micro-region is larger than for non-exporters.

The variable multi comes from CEB-BCB (Brazilian acronym for National Census of Foreigner capital in Brazil elaborated by the Brazilian Central Bank) and it is a register of foreigners' share in Brazilian firms from 1995 to 2000. It is a dummy variable that takes the value of 1 if firms have more than 50% of their assets held by foreigners. Since this information is not updated it should be interpreted cautiously. Nonetheless, it is useful to identify well established multinational firms, those which are more likely to have a wider network, be more productive and export.[33]

Finally, trade literature emphasizes that importing is very common among exporting firms. Table 3 shows that almost 60% of exporting firms in Brazil also import. Apex's treated firms have a lower share (17%) than exporters,[34] but this share is much larger than the average among manufacturing firms (6%).

4 Identification Strategy

A critical question in any program evaluation is how to identify its effect on the variable of interest. In the case of firms that received support from Apex-Brasil, since we can only observe their actual outcome we have no counterfactual. Therefore, we do not know what the performance of these firms would be if they had not received this support, which is a typical problem of missing information.[35]

An alternative solution is to create a control group with firms that have not participated in the program and use them as counterfactual. However, this procedure also leads to another missing information problem due to the fact that there might be important firms' characteristics that simultaneously impact treatment status and the outcome, but cannot be observed in the data[36]

[31] Bernard and Jensen (2004) also use a similar variable as a control and call it Spillovers: Exporter(state-industry), which accounts for the share of exporting plants in the state and industry.

[32] It means that if a firm i is an exporting firm in time t and it is located in the micro-region k with n number of exporters, this variable considers *(n-1)* exporters i in region k.

[33] There are approximately 1,700 firms identified as multinational according to this criteria. Among them, 80% export and less than 6% received Apex support (almost all of them under non-Peiex program), which would be expected.

[34] This share becomes very similar if Peiex's treated firms are excluded.

[35] Indeed, if we were able to answer this question we could identify the difference between both outcomes (with and without treatment) as the impact of the program. For a review about recent development in program evaluation literature see Imbens and Wooldridge (2009).

[36] A widely accepted solution is to carry a randomized control trial (RCT) in which firms are randomly chosen

(e.g. firms can improve the quality of their management and this may increase their likelihood of receiving the assistance and becoming an exporter at the same time). Apex's assistance and other programs evaluated in EPA literature I am aware of are mostly non-experimental.[37] Therefore, a critical issue to evaluate EPAs' programs is potential bias due to self-selection driven by unobservable time-varying characteristics of the firm that can confound the estimator.

I rely on a combination of techniques of propensity score matching (PSM) and difference-in-difference (DID) to deal with potential observable and unobservable selection bias, following Heckman et al. (1997).[38] The matching literature suggests we can rely on a set of potential comparison units for those where we observe a similar set of pretreatment covariates, X_i (Rubin, 1977).[39] However, as the number of covariates increases, it gets more difficult to find similar pairs among the untreated units to implement exact matching. An option to deal with this dimensionality issue is by matching units on their vector of pretreatment covariates, X_i, through their propensity score (PS) for receiving the program (Rosenbaum and Rubin, 1983)[40]. To implement the PSM, first I ran a probit to identify the PS of a firm i to receive Apex's treatment at period t based on $X_{i(t-1,\ ...,\ t-n)}$ covariates.

$$T_{it} = \gamma + \theta X_{i(t-1,\ ...,\ t-n)} + \eta_{it} \tag{1}$$

I used the PS from equation (1) for matching treated and untreated firms that existed over t_{-2}, t_{-1} and t_0.[41] I analyzed the probability of these firms to receive Apex assistance in t_0 based on their characteristics on t_{-2} and t_{-1}. The option for having firms' characteristics with two periods before the treatment for matching firms aims to capture available information on the dynamics of both groups of firms, treated and control, which also imposes a parallel trend in the covariates using for matching. The matching procedure adopted was the nearest neighbour following the Greedmtch matching algorithm (see Parsons (2001)), discarding control observations with PS smaller (or larger) than minimum (or maximum) PS value of treatment group.

from the population to be part of treated and control groups (see Duflo and Kremer (2005)). However, this procedure demands ex-ante design that is not always feasible.

[37] In these cases, a standard procedure is relying on econometric techniques geared to deal with this kind of data generated process, such as propensity score matching (PSM), difference-in-difference estimator (DID), Instrumental Variables (IV), Regression Discontinuity Design and possible combinations among them (Blundell and Dias, 2009).

[38] For more examples of the application of this method in applied literature, see Volpe Martincus and Carballo (2008), Volpe Martincus and Carballo (2010a), Chen et al. (2011) and Cadot et al. (2012).

[39] According to Rubin (1977) if for each unit we observe a vector of covariates X_i and $Y_i \perp T_i | X_i, \forall i$, then the population treatment effect for the treated, $\Phi|_{T=1}$, is identified: it is equal to the treatment effect conditional on covariates and on assignment to treatment, $\Phi|_{T=1,X}$, averaged over the distribution $X|T_i = 1$.

[40] For further details on matching procedure, see Dehejia and Wahba (2002).

[41] The exception are the variables ManagerexpL1, ManagerexpL2 and ManagerexpL3. For those variables I used information from t_{-2} in order to identify workers that were in an exporting firm and moved to another firm in t_{-1} in an occupation classified as manager.

Matching requires a clear definition of population of interest and outcome (Caliendo and Kopeinig, 2008). In the case of APEX, firms join the program in different years and this decision, as well as its outcome might be strongly affected by macro variables, such as exchange rate and economic growth, among others. In addition, as we see in the descriptive statistics there is sectoral heterogeneity, which results in different economic environments. Heckman et al. (1997) suggest that two important features to reduce bias in nonexperimental programs are to use the same questionnaire for both groups and having participants and controls placed in a common economic environment.[42]

In order to deal with this issue I adopted two different procedures. First I used a propensity score as a partial balancing score complemented by exact matching on year and sector (see Lechner (2002) and Todo (2011)).[43] Second, I followed Heckman et al. (1997) and matched the sample, year by year. Both procedures generated similar results. I kept the first one due to the fact that I have a unique covariate's balance analysis. Under this procedure, the baseline model[44] was a pooled probit from 2007 to 2009 using firms' characteristics from *t-1* and *t-2* as covariates. I used exact matching for year and sector (CNAE 2 digits). For example, a firm belonging to sector j at period t was matched with another firm (control group) at sector j with the nearest PS in period t. Furthermore, I used firms that appear for the first time in the sample as receiving Apex treatment.[45] The results of the probit and the descriptive statistics of the matched sample is available in section 7.2 of the Appendix.[46]

A critical assumption in the PSM procedure is the fact that it controls for potential bias relying on observable covariates X_i. However, the performance of exporters as well the probability of firms' self selection into the program might be lead by unobservable firms' characteristics. Assuming they are time-fixed characteristics, we can identify the average treatment effect by DID. I used a panel fixed effect model[47] (using log for continuum covariates) to obtain a DID estimator (see Imbens and Wooldridge (2009)):

$$Y_{it+n} = \rho_i + \beta_{jt} + \Phi D_{it} + \psi X_{it} + \epsilon_{it+n} \tag{2}$$

[42]The dataset used in the paper was obtained through a similar questionnaire between firms (e.g. RAIS).

[43]I also tested exact matching for year, sector and region which provides similar results.

[44]I tested different matching approaches. The mainly difference is regarding the ratio (control firms/treated firms), variables for exact matching was implemented (i.e. year, region, sector) and time lag for the covariates. The results are consistent for different matching procedures and are available under request.

[45]Results using all apex treated firm are available under request.It means that if a firm was receiving apex for 2 years without becoming an exporter it was considered as treated both period.

[46]I also provide further assessment of the matching quality in section 5 and in section 7.2 of the Appendix.

[47]Lechner (2011) suggests the use of a linear specification as an alternative of identification for the non-linear outcome such as exporting status.

Where Y_{it+n} is the outcome of interest (export status in $t+n$), D_{it} stands for the treatment status in period t, ρ_i controls for unobserved time-invariant heterogeneity, β_t controls for sectoral (j) calendar year (t) fixed effect. X_{it} is a vector of firms covariates described in section 3, including the following variables at the firm level: number of employees, age of the firm and its square, average wages of employees, years of schooling of employees, number of exporters in the same sector and same region at period t, three dummy variables identifying if the firm had hired managers in different levels of hierarchy with previous experience in exporting firms (Manager exp L1, L2 and L3), a proxy for firms organization (number of layers), sector and location of the firm. Different specifications including these variables were used as a robustness check.

Assuming there is a time gap for the program to impact the propensity to export, I kept the baseline of the outcome as Y_{it+1}. Due to the fact that my population of interest is non-exporting firms[48] and the outcome variable is binary, the first difference with respect to the pre-treatment year is the value of the own dependent variable in period *t-n*. In addition to the non-linearity[49] of the endogenous variable (which is binary), the longitudinal structure of the data and the fact that firms join the program in different years bring additional issues regarding the definition of the counterfactual group, particularly to evaluate its effect in t+n, in the presence of contemporaneous effect.

For example, let us assume that the impact of D_{it} on Y_{it} is positive and significant. If a firm receives the program in 2008, it may affect its probability of exporting in 2008. If this same firm was non-exporting in 2006 and 2007, but became an exporter in 2008, it could take part of the untreated group of firms in 2007. When estimating the effect on Y_{it+1}, the contemporaneous effect of D_{it} on Y_{it} would be captured by ϵ_{it+n}, which would lead to a downward bias. While there is a clear timing definition of pre- and post-treatment for the treated units, the same does not happen with untreated firms. For this reason, the matching procedure allows for exploiting the panel data structure by having a conterfactual group exclusively composed of firms that did not receive the program and defining a common pre- and post-treatment period using equivalent firm-year observation.

[48] Defined here as those firms that did not export in either period *t-1* or *t-2*.

[49] For further details about the use of LPM to estimate causal effect in non-linear models, see Lechner (2011). See also Puhani (2012) and Ai and Norton (2003).

5 Results

This section presents the empirical results as follows: First I show the estimation for the average effect of Apex's programs on promoting new exporters. The population of interest is manufacturing firms that were non-exporters neither in t_{-2} nor in t_{-1}. Second, I test for heterogeneous effect according to firms' size. Finally, I test the spillover effect hypothesis of Apex treatment on untreated firms.

To begin with, table 4 shows the number of firms that switched condition from non-exporting to exporting between 2007 and 2010, by Apex treatment status. The share of firms that received Apex treatment is relatively small in terms of the total number of non-exporting firms. However, when we compare the number of non-exporting firms that switched export status we notice that the share of new exporters that received Apex's support is larger. This reinforces the necessity of a careful procedure to deal with selection due to the fact that some of these firms with higher probability of becoming an exporter may get self-selected into the program.

Number of firms that switched export status					
Year	Total	Non Apex	share (%)	Apex	share (%)
Exporting status: t-1 (non exporter) to t(exporter)					
2007	2050	1927	0.94	123	0.06
2008	1882	1736	0.92	146	0.08
2009	1910	1718	0.90	192	0.10
2010	1823	1621	0.89	202	0.11
Exporting status: (t-2 and t-1 (non exporter) to t(exporter)					
2007	1603	1512	0.94	91	0.06
2008	1471	1365	0.93	106	0.07
2009	1484	1346	0.91	138	0.09
2010	1369	1227	0.90	142	0.10
Exporting status: (t-2 and t-1 (non exporter) to t+1(exporter)					
2007	2025	1892	0.93	133	0.07
2008	1930	1805	0.94	125	0.06
2009	1866	1713	0.92	153	0.08
2010	881	779	0.88	102	0.12

Table 4: Number of firms that switched export status by year

Note: Manufacturing firms that appear in RAIS in periods t and t-1.

5.1 Does Apex assistance promote new exporters?

Due to the fact that Apex's data starts in 2007, I have no information on firms' treatment status for the previous years. Hence, in the baseline specification I focus on firms that received their

first assistance after 2007.[50]

Let us start with a pooled OLS (ordinary least squares) estimation (see table 5). Columns (1) and (2) show the marginal effect of Apex's treatment for the propensity to export in *t+1* on a sample of non-exporting firms.[51] Due to the nonlinearity in the outcome, I compared the predictive margins between control and treated groups at the mean. Under pooled OLS the effect of Apex without additional covariates (column 1) is 3.4 percentage points (pp). The propensity to export in the full sample of non-exporting firms is very low (0.78%) and the estimation suggests that Apex's assistance increases by 4.37 times the chance of a non-exporting firm to become an exporter. If additional covariates are included (column 2) the treatment effect accounts for 2.36 times the chance of becoming an exporter. Columns (3) and (4) show that when controlled for firms' fixed effect (FE) the coefficient of Apex is remarkably smaller than in the pooled OLS. In this case, the treatment Apex increases the propensity to export in 0.9 pp, which is approximately 54% (column 3). When additional covariates are included, it increases the export propensity by 105%.

Columns (5) and (6) show the pooled OLS estimation for the contemporaneous effect (propensity to export in the year that firms received the treatment). Apex's treatment increases the export propensity in period t in 3.4 pp and 2.4 pp respectively for the specifications without and with additional covariates. This accounts for 4.3 and 2.6 times the chance of export, if compared with the control group. For the contemporaneous effect, the FE estimator is slightly smaller when there are no additional covariates at the firm level - columns (5) and (7) - but it is larger when all covariates are included - columns (6) and (8). Moreover, the magnitude of the coefficients for the pooled OLS or FE estimators are relatively similar under contemporaneous effect, which may be expected due to the exclusion restriction.[52] The specifications in columns (7) and(8) account for an increase of about 2.6 and 2.9 times the chance of exporting. Most of the coefficients are positive and statistically significant at 1%.

Under the DID assumption the within FE estimator identifies Apex's effect on the propensity of non-exporting firms to become exporters in period *t+1* - columns (3) and (4) - and period t - columns (7) and (8). It is noticeable that under this condition, Apex's effect in *t+1* is substantially smaller than its contemporaneous effect. In section 4 I explained the reason why

[50] This procedure allows me to exclude firms that received the program in period *t-1* from the control group. In section 7.3 of the Appendix, I present results keeping the treated firms in 2007 under the assumption that those firms did not receive the program in the previous year.

[51] Firms that had not exported in the previous two periods.

[52] Because my population of interest is composed of non-exporting firms, I imposed a parallel trend on previous exporting status. If we assume that the main issue regarding selection bias is due to firms' characteristics that are unobservable to an econometrician and can affect both the outcome and the treatment status, this exclusion restriction itself already aims to deal with the selection issue.

the within estimator for the period *t+1* may be downward biased due to the contemporaneous effect of firms that enter into the program in different years.

Dependent variable:	Export dummy (t+1)				Export dummy (t)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Apex	0.034***	0.020***	0.009***	0.009***	0.028***	0.017***	0.023***	0.022***
	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
lfirmssize		0.001***		0.003***		0.000**		0.004***
		(0.000)		(0.000)		(0.000)		(0.000)
firmsage		-0.000***		-0.000		-0.000		0.001
		(0.000)		(0.001)		(0.000)		(0.001)
firmsage2		0.000		0.000***		-0.000		0.000***
		(0.000)		(0.000)		(0.000)		(0.000)
lwage		0.001***		-0.000		0.001***		0.000
		(0.000)		(0.000)		(0.000)		(0.000)
lschool		0.002***		-0.001		0.002***		-0.001
		(0.000)		(0.001)		(0.000)		(0.001)
shexpsrnet		0.064***		-0.110***		0.073***		0.283***
		(0.005)		(0.018)		(0.004)		(0.022)
ManagerexpL1		0.222***		0.032		0.116***		-0.030
		(0.019)		(0.032)		(0.017)		(0.029)
ManagerexpL2		0.172***		0.039		0.140***		0.076**
		(0.020)		(0.035)		(0.019)		(0.032)
ManagerexpL3		0.366***		0.063***		0.276***		0.072***
		(0.012)		(0.024)		(0.011)		(0.023)
Import		0.073***		0.020***		0.063***		0.033***
		(0.003)		(0.004)		(0.002)		(0.004)
layer		0.003***		0.001**		0.002***		0.000
		(0.000)		(0.000)		(0.000)		(0.000)
Fixed Effect	.	.	.	.	.	.	.	.
Firms	-	-	YES	YES	-	-	YES	YES
Year*Sector	YES	YES	YES	YES	YES	YES	YES	YES
State	YES	YES	-	-	YES	YES	-	-
Number of id	270,969	270,354	270,969	270,354	270,969	270,354	270,969	270,354
R-squared	0.010	0.159	0.004	0.007	0.007	0.114	0.011	0.022
Observations	655,021	653,267	655,021	653,267	655,021	653,267	655,021	653,267

Note: Linear Probability Model (LPM) using pooled OLS and panel fixed effect. Treated firms in 2007 are excluded from the sample. Standard errors clustered at firm level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Impact of Apex on the probability to export (full sample without matching)

Now I show the results using the matched sample based on the PSM method and a linear probability model (LPM) with firm and time-sector fixed effect to identify the impact of Apex's assistance on the probability of becoming an exporter (see table 6). Apex's treatment increases by approximately 2.3 percentage points (pp) the probability of a non-exporting firm to become an exporter (see column (1) in table 6). What does this effect mean? The propensity to export in period *t+1* for an average matched firm in the control group is 1.75%. Apex's treatment increases this probability to 4.05%. Therefore it more than doubles the chances of a non-exporting firm to become an exporter (it increases its propensity by 130%). I also added other covariates for the period *t-1* and *t* for each firm in the matched sample, as a robustness check. Results seem robust for different specifications (the propensity increases from 1.8% to 4.0%). Another robustness check is based on a sample that excludes firms that received assistance through a specific and relatively new program (Peiex) that is targeting smaller firms to improve competitiveness to

export.[53] When excluding Peiex's treated firms and their matched pairs from the sample, Apex's treatment increases by approximately 1.07 times the export propensity for non-exporters at *t+1* (column 4), from about 5% to 10%. The effect is larger for the specification without additional covariates at firm level (see column 3). In this case, the propensity to export in *t+1* goes from 3.5% to 11.3%.

Dependent variable:	Export dummy (t+1)				Export dummy (t)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Apex	0.023***	0.020***	0.078***	0.067***	0.022***	0.020***	0.062***	0.056***
	(0.005)	(0.005)	(0.015)	(0.015)	(0.004)	(0.004)	(0.013)	(0.013)
lfirmssize		0.009*		0.042***		0.002		0.000
		(0.005)		(0.015)		(0.008)		(0.020)
firmsage		0.033		0.061		0.094		-0.012
		(0.038)		(0.099)		(0.060)		(0.037)
firmsage2		0.000**		0.000		0.000*		-0.000
		(0.000)		(0.000)		(0.000)		(0.000)
lwage		-0.001		0.002		0.003		0.011
		(0.006)		(0.018)		(0.005)		(0.013)
lschool		0.021		0.120**		0.024		0.098
		(0.014)		(0.059)		(0.016)		(0.063)
shexpsrnet		0.002		0.003		0.010***		0.031***
		(0.003)		(0.007)		(0.003)		(0.007)
ManagerexpL1		0.207**		0.188		0.125		0.065
		(0.089)		(0.119)		(0.086)		(0.100)
ManagerexpL2		-0.036		-0.117		0.104		-0.023
		(0.100)		(0.135)		(0.095)		(0.115)
ManagerexpL3		0.010		0.051		-0.015		0.044
		(0.100)		(0.133)		(0.067)		(0.106)
Import		0.001		-0.014		0.025		0.039
		(0.025)		(0.056)		(0.023)		(0.054)
layer		0.003		0.013		-0.001		-0.009
		(0.004)		(0.012)		(0.003)		(0.011)
Fixed Effect	.	.	.	.	.	.	.	
Firms	YES	YES	YES	YES	YES	YES	YES	YES
Year*Sector	YES	YES	YES	YES	YES	YES	YES	YES
Number of id	4,888	4,888	1,128	1,128	4,888	4,888	1,128	1,128
Observations	9,776	9,776	2,256	2,256	9,776	9,776	2,256	2,256

Note: Linear Probability Model (LPM) using panel fixed effect. Standard errors clustered at firm level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Impact of Apex on the probability to export (matched sample)

Due to the exclusion restriction used to define the population of non-exporting firms in periods *t-1* and *t-2*, the dependent variable does not vary in period *t-1*. Hence, Apex's treatment coefficients for the specifications in columns (1), (3), (5) and (7) in table 6 are equivalent to the marginal effect at the mean from a probit using a cross-section for the period of treatment *(t)*.[54] Based on a probit estimation with sector-year fixed effect, we can compare the expected probability for becoming an exporter according to different treatment status conditioned on different sectors.[55]

[53] Peiex started at the end of 2008 and has a large number of firms that began to receive the program in 2009.

[54] Results for Apex's treatment are also relatively similar for the specification with covariates used as robustness check (see columns 2, 4, 6 and 8 in table 6) if a probit specification is used.

[55] When analyzing the marginal effect for different manufacturing sectors in both specifications, with and without firm level covariates (columns 1 and 2), Apex's treatment is positive and significant to: food (3.1 pp), beverage

Is there a contemporaneous effect of Apex's treatment on promoting new exporters? Table 6 shows that the impact in the year these firms received the program is also positive and statistically significant. These results converge with others that find a positive effect of the program in the year of implementation (e.g. Volpe Martincus and Carballo (2008)). The contemporaneous effect of Apex's treatment increases the export propensity by 2.2 pp, from 1.28% to 3.61%. It means that it raises by almost 1.8 times the propensity of a non-exporting firm to become an exporter in period t.

In section 4 I explained the method I used for matching firms based on the propensity of receiving Apex treatment according to their characteristics in periods *t-1* and *t-2*. The identification relies on the assumption that the distribution of the relevant variables is balanced. I analyzed the quality of matching by following common testing procedures used in the program evaluation literature (see Dehejia and Wahba (2002), Caliendo and Kopeinig (2008), Volpe and Carballo (2008) and Diamond and Sekhon (2013)). Graph 2 (see section 7.2 of the Appendix) shows the histogram of the density of propensity score. It is noticeable that the probability to receive Apex's assistance is low, but the distribution of the control group after the matching procedure is similar to the treatment group.

In order to check the similarity between the distribution of the propensity scores I used the Kolmogorov-Smirnov test for equality of distribution functions, following Delgado et al. (2002). The results in table 7 suggest that after the matching procedure the difference in the distribution of the propensity score to access Apex's treatment is not statistically different from zero, which is not the case for the raw data.[56]

	Matching sample			Raw Data		
Smaller group	D	P-value	Corrected	D	P-value	Corrected
Untreated	0.0021	0.985		0.4904	0.000	
Treated	-0.0012	0.995		0.000	1.000	
Combined K-S:	0.0021	1	1	0.4904	0.000	0.000

Table 7: Kolmogorov-Smirnov test for equality of distribution functions

Caliendo and Kopeinig (2008) propose another procedure to test the balance of covariates

(4.5 pp), wearing apparel (1.2 pp), leather (3.0 pp), chemicals (3.7 pp), rubber and plastic (4.5 pp), basic metals (3.5 pp), metal products (2.6 pp), computer (4.2 pp), electrical (4.1 pp), machinery (5.0 pp), motor vehicles (4.9 pp) and furniture (1.1 pp). The value in parentheses refer to the marginal effect at the mean for each sector in the specification in column 1. The result is relatively similar for the specification with additional covariates at firm level (column 2).

[56]The first line (Untreated) tests the hypothesis that the propensity score to the untreated group contains smaller values than for Apex's treated group. It shows that the largest difference between the distribution function is 0.0021, which it is not statistically significant. The second line (Treated) tests the hypothesis that PS for the untreated group contains larger values than for the treated group. It shows that the largest difference in the distribution function in this direction is 0.0012, which is also not statistically significant. The p-value for the combined test approximates 1, which suggests that the PS distribution between both groups is not statistically significant.

by running the probit again on the same covariates used to estimate the propensity score and compare the pseudo R^2, which should be much lower in the matched data. Table 11 (in section 7.2 of the appendix) shows that both conditions are satisfied. The pseudo R^2 decreases from approximately 0.15 to about 0.008. Regarding the covariates used in the matching specification, most of them are not statistically significant at 5%.[57]

Also, Caliendo and Kopeinig (2008) suggest checking the t-test for treated and control group means.[58] Table 12 (in section 7.2 of the Appendix) shows that for most of the covariates I do not reject the null hypothesis that the means of the treated and control groups (with respect to the characteristics of the firms in *t-1* and*t-2*) are similar at 5% of significance.[59] In addition to the mean, it is important that the distribution of the covariates is balanced. Figure 3 (in section 7.2 of the appendix) shows the QQ plots to the covariates used in the matching as procedures to assess balance suggested by Ho et al. (2011). It is noticeable that the matching algorithm worked well, not only on the mean values but also on their distribution.

A critical assumption used for identification was the fact that the treated and the control groups would have a similar trend over time if the program had not been available, the so-called parallel trend assumption.[60] Regarding this assumption, an important feature of the identification strategy was the fact that the matching was carried out on firms that had not exported at periods *t-1* and *t-2*. It means that the sample had similar trends concerning the outcome (export status) and firms' covariates for two periods prior to the treatment.

5.2 Is Apex's impact heterogeneous according to firms' size?

When confronted with public policy alternatives, policy makers need to decide not only which policy to be implemented, but also who should be the beneficiaries of these policies. Therefore, in addition to understanding an average effect of a program, it is also important to identify the mechanism at work and the characteristics of those firms for which an intervention is more effective, in case there are heterogeneous effects. My previous estimations suggest that an increase in the number of employees is positively correlated to the propensity of a firm to export. This section aims to evaluate if there is heterogeneity in the effect of Apex according to different firms' size cohorts.

[57] The few exceptions are lag of manager L3 and Import at period t-2. The variables (Manager L3) and Import are used as covariates in the robustness specifications, where I include the time-varying covariates as control.

[58] Imai et al. (2008) argues that although it is widely used, t-test of the difference in the mean may be misleading.

[59] I tested various specifications for the PSM procedure, including changes in the variables for which exact matching was done and covariates included in the model. Overall the positive effect of Apex's treatment on the propensity to export for non-exporting firms remains.

[60] See Arcand and Bassole (2007).

In the case of EPAs, Volpe Martincus and Carballo (2010a) find evidence of heterogeneity with respect to export performance based on different groups defined according to their export value distribution.[61] Also, Volpe Martincus et al. (2012) show that EPAs' impact differs by firm's size categories.[62] However, the heterogeneous effect of EPAs according to different size categories of firms on promoting new exporters is still an open question.

In order to evaluate the heterogeneous effect of Apex I ran the baseline model using different sub-samples, according to different categories of firms' size, based on the number of employees. Firms were classified as follows: Micro ($size < 20$), Small ($20 < size <= 50$), Medium ($50 < size <= 150$) and Large ($size > 150$), where size refers to the number of employees. Due to the fact that I matched firms using their characteristics ex-ante treatment, I classified the firms according to their number of employees in period *t-1*. Although size of the firm was among the covariates in the matching procedure and their average and distribution was very similar between the treated and control groups (see table 12, in appendix), the number of treated and control group firms in each size cohort can differ. I used as a baseline sample a definition based on treated firms (number of employees in period *t-1*). Then I added their respective matched-pairs in the same (size cohort) group.[63] I also used as an alternative sample a classification based on the number of employees for all firms in period `t-1`. Results are relatively similar among these two procedures.

Table 8 shows the results regarding the impact of Apex's treatment on export status in period *t+1*. The effect is positive and statistically significant for micro, small and medium firms. However, the effect is not significant for large firms. Similar results are obtained if large firms are classified as being above 250 employees.[64] As mentioned in the previous section, the results for columns (1), (3), (5) and (7) are equivalent to the marginal effect at the means under a probit specification. If the marginal effects at the means for different industries are compared, it is noticeable that the impact is heterogeneous and seems to be larger and for more industries among medium firms. Also the effect seems positive for some industries that are highlighted as their main target by Apex.[65]

[61] Using Chilean firm level data.
[62] Using Argentinian firm level data.
[63] Those are firms in the control group that were matched with the respective firm in the treatment group.
[64] For micro firms the effect is positive and significant for wearing apparel (1.1 pp), leather (4.3 pp), machinery (6.2 pp). For small firms the effect is positive for rubber and plastic (17.0 pp) and machinery (7.3 pp). For medium firms the effect is positive for food (9.0 pp), beverage (18.3 pp), rubber and plastic (18.3), basic metals (11.5 pp), metal products (10.8), computer (23.8 pp), electrical (12.2 pp), machinery (12.8 pp) and motor vehicles (17.9 pp). If the alternative definition of firms' size is used, also leather, printing, chemicals, pharmaceutical and furniture become significant, while electrical becomes insignificant. I have not found heterogeneous effect between industries for large firms.
[65] See information on sector projects available on www.apexbrasil.com.br. These sectors include: food, beverage, agribusiness, bulding, furniture, culture (e.g. musical instrument, art), design, machinery and equipment, fashion industry (e.g. wearing apparel, leather, shoes), health devices, among others.

Dependent Variable: Export status (t+1)								
Variable	Micro		Small		Medium		Large	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
apex	0.014***	0.013***	0.024**	0.024***	0.067***	0.048**	0.038	0.035
	(0.004)	(0.004)	(0.010)	(0.009)	(0.022)	(0.019)	(0.052)	(0.050)
lfirmssize		0.007		0.024**		-0.002		0.083*
		(0.006)		(0.012)		(0.026)		(0.048)
firmsage		-0.007		-0.013		0.166		0.109
		(0.005)		(0.018)		(0.164)		(0.085)
firmsage2		0.000		-0.000		0.000		-0.000
		(0.000)		(0.000)		(0.001)		(0.001)
lwage		-0.003		-0.017		-0.049*		0.172***
		(0.004)		(0.028)		(0.028)		(0.040)
lschool		0.012		0.033		0.103		-0.121
		(0.014)		(0.039)		(0.096)		(0.334)
shexpsrnet		0.003		-0.002		-0.008		0.027*
		(0.002)		(0.007)		(0.013)		(0.015)
ManagerexpL1		0.036		0.069		0.422***		0.256**
		(0.277)		(0.203)		(0.139)		(0.121)
ManagerexpL2		-0.445***		0.087		0.220		-0.258*
		(0.169)		(0.250)		(0.175)		(0.136)
ManagerexpL3		0.330***		-0.005		-0.152		-0.050
		(0.119)		(0.189)		(0.164)		(0.208)
Import		0.010		-0.027		0.129**		-0.192**
		(0.038)		(0.031)		(0.054)		(0.092)
layer		-0.001		0.003		0.028**		-0.143*
		(0.004)		(0.007)		(0.013)		(0.075)
Fixed Effect								
Firms FE	YES	YES	YES	YES	YES	YES	YES	YES
SectorYear FE	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.053	0.101	0.106	0.114	0.197	0.284	0.264	0.417
Number of id	3,104	3,104	1,062	1,062	566	566	156	156
Observations	6,208	6,208	2,124	2,124	1,132	1,132	312	312

Notes: Linear Probability Model (LPM) using panel fixed effect and the baseline definition of firms' size categories. Standard errors clustered at firm level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The number of id refers to the total number of firms (treated and untreated in each size cohort). In the alternative specification of large firms that includes all firms in the matched sample (treated and untreated firms) above 150 employees, instead of using the definition based on treated firms and using their respective matched pairs as a counterfactual, the coefficient for "Import" is not significant. In addition, many large firms are importers in both periods and many in this sample changed their importing status from *t* to *t+1* in this sample. A similar issue happens with ManagerexpL2 in the sample of micro firms.

Table 8: Heterogeneous effect: Impact of Apex treatment on the probability to export in *t+1* according to firms' size (baseline)

I used the same procedure to estimate the contemporaneous effect. Again, the effect of Apex is positive and statistically significant at 5% for micro, small and medium firms (see table 9), but not for large firms. Furthermore, the contemporaneous effect is significant only at 10% for small firms.[66]

[66]Regarding micro firms, the contemporaneous (export in period *t*) marginal effect at the means (MEM) are statistically significant for wearing apparel (1.3 pp), leather (7.0 pp), chemicals (4.4 pp), machinery (5.0 pp) and other manufacturing products (5.3 pp) - this group of products is equivalent to division 32 of the ISIC Rev.4, which includes jewellery, bijouterie, musical instruments, sports goods, games, toys and medical instruments. With respect to small firms, there is no statistically significant difference between industries. Among medium firms, the marginal effect at the means (MEM) are significant for wearing apparel (4.8 pp), pharmaceuticals (20 pp), rubber and plastic (16 pp), computer (20 pp) and machinery (15 pp). If the definition of size does not take the matched pairs into account, then non-metalic and other manufacturing products become significant. Although the MEM seems very large the propensity to export in these industries is larger. For example, the treatment raises the propensity to export from 17% to 33% in the rubber and plastics industry. With respect to the large firms I have not found differences between industries that are statistically significant. Also, Apex's effect is significant at 5% in the alternative definition of firms' size.

Dependent Variable: Export status (t)								
Variable	Micro		Small		Medium		Large	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
apex	0.019***	0.016***	0.015**	0.013*	0.046**	0.035**	0.051	0.056
	(0.004)	(0.004)	(0.007)	(0.007)	(0.019)	(0.017)	(0.051)	(0.052)
lfirmssize		0.008*		0.005		0.010		-0.076
		(0.005)		(0.008)		(0.025)		(0.067)
firmsage		-0.006		-0.002		0.177		0.107
		(0.004)		(0.013)		(0.147)		(0.087)
firmsage2		-0.000		0.000		-0.000		-0.000
		(0.000)		(0.000)		(0.000)		(0.001)
lwage		0.000		-0.026		-0.018		0.060
		(0.004)		(0.020)		(0.023)		(0.045)
lschool		0.008		0.051*		0.097		0.141
		(0.011)		(0.027)		(0.075)		(0.356)
shexpsrnet		0.008***		0.006		0.024*		0.036*
		(0.003)		(0.007)		(0.014)		(0.021)
ManagerexpL1		0.097		-0.015		0.208		0.179
		(0.258)		(0.191)		(0.156)		(0.141)
ManagerexpL2		0.163		-0.063		0.186		0.084
		(0.203)		(0.187)		(0.160)		(0.151)
ManagerexpL3		0.166		0.011		-0.036		-0.121
		(0.175)		(0.044)		(0.116)		(0.192)
Import		0.004		0.002		0.156***		-0.106
		(0.033)		(0.009)		(0.059)		(0.097)
layer		-0.007*		0.004		0.020*		0.083
		(0.004)		(0.006)		(0.011)		(0.068)
Fixed Effect								
Firms FE	YES	YES	YES	YES	YES	YES	YES	YES
SectorYear FE	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.057	0.077	0.078	0.086	0.178	0.246	0.185	0.276
Number of id	3,104	3,104	1,062	1,062	566	566	156	156
Observations	6,208	6,208	2,124	2,124	1,132	1,132	312	312

Notes: Linear Probability Model (LPM) using panel fixed effect and the baseline definition of firms' size categories. Standard errors clustered at firm level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The number of id refers to the total number of firms (treated and untreated in each size cohort).

Table 9: Heterogeneous effect: Impact of Apex on the probability to export in t according to firms' size (baseline)

Tables 8 and 9 show the LPM for the subsamples defined according to the size of the firm in t-1 (micro, small, medium and large). Overall, it is noticeable that the effect is positive and statistically significant for firms smaller than 150 employees. The effect seems to be larger for medium firms (between 50 and 100 employees), but it is not statistically different than zero for large firms.[67] These results are in line with the findings of Volpe Martincus et al. (2012) that show evidence of more effectiveness of EPAs' activity for smaller firms.

[67]The effect is not statistically significant when considering other thresholds for large firms (e.g. 250 employees or more).

5.3 Are there spillovers of Apex's treatment on promoting new exporters?

There are at least two important reasons for evaluating the presence of externalities in a public policy: a) Positive/negative externalities can justify public resource allocation in order to deal with potential market failures; b) If a program has a positive effect on untreated firms, then it brings additional challenges for identification, due to the fact that the control group can also be affected by the intervention.

This subsection analyzes the effect of being exposed to Apex treatment on firms that did not receive the program. In order to generate a proxy for exposure measurement I generated a variable with the total amount of Apex's treated firms in the same sector (CNAE 2 digits) and micro-region (official IBGE definition for 549 sub-regions in Brazil) of the firms that did not receive Apex.[68] The assumption is that the potential mechanism of transmission is sector-location related. The population of interest is composed by non-exporting untreated firms[69] belonging to the same sector (CNAE 2 digits) and located in the same micro-region of those that received Apex's assistance. On the other hand, the control group consists of firms that were not in the same sector and micro-region of an assisted firm.[70]

I assume that the intensity and the quality of the exposure matter. Also, I assume a possibility of heterogeneity regarding quality of exposure. Therefore, I tested two alternatives: i) Total number of Apex's treated firms in the same sector and micro-region; ii) Total number of Apex's treated firms in period t that exported in *t+1* in the same sector and micro-region.

The identification strategy used to test the spillover effect is based on a panel fixed effect without matching, under DID assumption. Therefore, I am assuming that the number of firms that belong to the same sector and micro-region and were assisted by Apex are exogenous to the probability of a non-exporting untreated firm to become an exporter, once controlled for firms' fixed effect, sectoral-year fixed effect and share of exporters in the same sector and region. Table 10 shows the impact of being exposed to Apex's treated firms on the export propensity for non-exporting firms, taking into account number of Apex's treated firms by micro-region and CNAE (2 digits). The two variables measuring exposure are the following: a) Exposure to Apex's treated exporting firms; b) Exposure to Apex, which takes into account the total number

[68] It was generated in four different versions including CNAE 2 and CNAE 4 digits interacting with States (27) and Micro-region (549).

[69] This means that those firms did not receive Apex treatment between 2007 and 2010. I am keeping the definition of non-exporting firms as being those firms that did not export in either of the two years before the treatment was considered.

[70] I also tested the effect for the share of treated firms in a given sector-region.

of Apex's treated firms.

Dependent variable: Export status in(t+1)						
	Apex's Treated (Exporters)			Apex's Treated (total)		
	Treated*Exporters			Treated		
	(1)	(2)	(3)	(4)	(5)	(6)
Exposure to Apex	0.00030***	0.00025***	0.000201**	-0.00005	-0.00001	0.000043***
	(0.0001)	(0.0001)	(0.00010)	(0.0000)	(0.00004)	(0.00001)
lfirmssize		0.0025***	0.00244***		0.0025***	0.0025***
		(0.0003)	(0.00034)		(0.0003)	(0.00034)
firmsage		-0.00079	-0.00080		-0.00082	-0.00083
		(0.0009)	(0.00088)		(0.0009)	(0.00088)
firmsage2		0.000045***	0.00005		0.00005***	0.000046***
		(0.00001)	(0.00001)		(0.00001)	(0.00001)
lwage		0.00007	0.00003		0.00007	0.00003
		(0.0001)	(0.00013)		(0.0001)	(0.00013)
lschooling		-0.00057	-0.00066		-0.00057	-0.00067
		(0.0006)	(0.00059)		(0.0006)	(0.00059)
shexpsrnet (t)		-0.00105***	-		-0.00106***	-
		(0.0002)	-		(0.0002)	-
shexpsrnet (t+1)		-	0.00325***		-	0.00326***
		-	(0.00024)		-	(0.00023)
ManagerexpL1		0.01905	0.01775		0.01908	0.01777
		(0.0339)	(0.03375)		(0.0339)	(0.03375)
ManagerexpL2		0.04358	0.04202		0.04361	0.04204
		(0.0366)	(0.03653)		(0.0366)	(0.03653)
ManagerexpL3		0.0681***	0.06752***		0.0681***	0.06752***
		(0.0251)	(0.02500)		(0.0251)	(0.02500)
Import		0.0203***	0.0201***		0.02031***	0.0201***
		(0.0035)	(0.00353)		(0.0035)	(0.00353)
layer		0.0005**	0.00052**		0.00052**	0.00052**
		(0.0003)	(0.00026)		(0.0003)	(0.00026)
Fixed Effect	.	.	.	.	.	.
Firms	YES	YES	YES	YES	YES	YES
Year*Sector	YES	YES	YES	YES	YES	YES
R-squared	0.0037	0.0073	0.0104	0.0037	0.0072	0.0104
Number of id	266,769	266,155	266,155	266,769	266,155	266,155
Observations	644,674	642,927	642,927	644,674	642,927	642,927

Note: Linear Probability Model (LPM) using panel fixed effect using the alternative definition of firms' size categories. Treatment variable: Number of treated firms in the same region and same sector in period (t).

Table 10: Impact of Apex treatment on untreated firms in period (t+1) - spillover effect

The effect of being exposed to Apex-treated exporting firms is positive (see column 1 in table 10). The effect seems robust for different specifications with additional covariates (columns 2 and 3), including the share of other exporting firms. I controlled for the share of other exporting firms in the same sector-region at period t (shexpsrnet) in column (2) and the share of other exporting firms in the same sector-region at period *t+1* (shexpsrnet *t+1*). The magnitude of the effect is low, which is consistent with the low dynamic of new exporters in Brazil. Also, the effect is significant only at 10% with additional covariates (equivalent to specification in column 2) when binary treatment status is considered. Therefore, the interpretation of the empirical results on spillover effect should be undertaken cautiously.

6 Conclusion

The number of EPAs has increased sharply in the last decades, particularly in developing and emerging economies. Usually, these agencies focus on providing support to domestic firms in order to deal with incomplete information to access foreign markets and make gains from trade.

This paper shows evidence of positive impact of EPA services on the export propensity of non-exporting firms (the pure extensive margin of trade). Using a procedure of matching DID estimator for controlling potential selection bias I find that: 1) Apex's treatment has a positive effect on promoting new exporters. An average non-exporting treated firm is about 1.3 times more likely to become a new exporter one year after the treatment. 2) There is contemporaneous effect. It means that the average effect of the program on treated firms is positive in the year of treatment. 3) The impact is positive and statistically significant for micro, small and medium firms, but not for large firms. 4) I find evidence of spillovers on untreated firms that are in the same region and sector of Apex's treated exporting firms.

As a robustness check for the empirical results, I carried out some standard procedures for assessing the quality of the covariates' balance in the matched sample. Overall they performed well. In addition, I ran a linear probability model (LPM) using panel fixed effect (also keeping those firms that have not exported in the two previous years) for the full sample and the results seem consistent. Moreover, I checked the robustness for different specifications by controlling for a large number of covariates and the effect is robust. Also, I ran the model using firms that received Apex's treatment in 2007; for these firms there is no information of treatment status in 2006 and the results are also qualitatively similar.

These findings bring additional evidence to a rich literature on the impact of EPAs on export. When properly performed, export promotion may not only boost export value, product and market diversification as already suggested by the previous literature, but also can act in the pure extensive margin. In addition, there is evidence that these programs are more effective among micro, small and medium firms and the existence of spillover effect is not rejected.

7 Appendix

7.1 How does Apex's assistance work?

Apex-Brasil became autonomous in 2003 as a private institution with public interest based on the Brazilian Law n.10,668. Until 2003 it used to be part of SEBRAE (Portuguese acronym for the Brazilian Service to Support Micro and Small Enterprises). Most of the agency's budget comes from public funding with pre-determined sources. However, it has the autonomy to develop partnerships with the private sector in order to support its projects. The government sets the target and the goal to be achieved by Apex-Brasil through a yearly contract between the government and the agency. The agency must present an annual report with the results achieved with respect to the contract. In order to make this process more transparent, the contracts, the budget and the report are publicly available on Apex's webpage.[71]

The basic services provided by Apex-Brasil are related to matching domestic sellers and foreign buyers (e.g. through participation in trade fairs) and providing information on foreign markets, including export regulations and market prospect in partnership with industry associations.[72] Another kind of support is a project called Peiex (Industrial Extension for Exporting Project) in which the agency provides assistance in technical-managerial and technological issues (particularly related to strategic management, human resources, financing, marketing, production and foreign trade through consultant services) in order to increase firms' competitiveness for exporting. There are two alternative ways to have access to these services: a) through an industry association (this scheme is more common if a firm is going to participate in trade fairs) or b) directly with Apex (this is more common for special projects related to participation in sports and cultural events, such as Formula Indy, Carnaval and the Peiex project).

It is important to highlight that these policies have different approaches. In the first one firms have access to Apex's funds through their industry association which signs a two-year renewable contract with Apex. This contract establishes a fund that will be used by these associations to promote participation of their firms in trade fairs, foreign missions and organized business rounds. The second option allows firms to apply for assistance directly with Apex. Apart from participation in specific events that usually attracts larger firms (e.g. Formula Indy and Expo-Shanghai) the assistance provided by Peiex is mostly targeted at improving competitiveness of

[71] See www.apexbrasil.com.br. According to the official government information on "Diário Oficial da União," Apex's predicted budget between 2008 and 2009 was about R$ 436,8 million each year. Taking into consideration an exchange rate of R$/US$ =1.75 (from December 31, 2009 according to the Brazilian Central Bank), this is about US$ 250 million. However, this value decreased to about R$ 286 millions in 2010.

[72] These projects are called "Sector Projects." For further details see www.apexbrasil.com.br.

smaller non-exporting firms.[73]

We can classify Apex's support in four different categories: a) Geographic target: these are programs focusing on promoting the access of Brazilian firms to specific countries; b) Sectoral target: this is the most common approach by Apex in which they develop actions in partnership with industrial associations focusing on promoting trade; c) Management and technological assistance (Peiex); d) Special projects: promoting Brazilian firms during international events hosted in Brazil (e.g. FIFA's Word Cup, Formula Indy and Carnaval)

7.2 The matching procedure

Figure 2 shows the distribution of the propensity score for treated and untreated firms after matching. We observe that density is very similar between both groups.

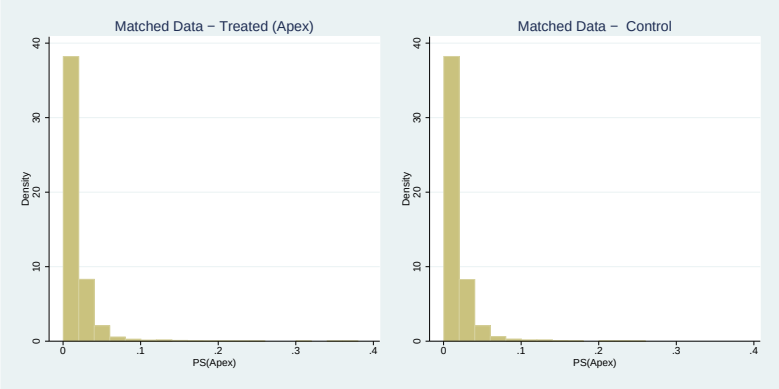

Figure 2: Propensity Score (Distribution) - after matching

Figure 3 shows the distribution the Q-Q plots for the time-varying matched covariates.[74] We observe that the distributions are more similar between both groups after the matching procedure for all covariates.

[73]For further details on the impact of Peiex on firms' organization, see Cruz et. al. (2013).

[74]If the empirical distributions are the same between both groups (treated and control), the points in the Q-Q plots would all lie on the 45 degree line.

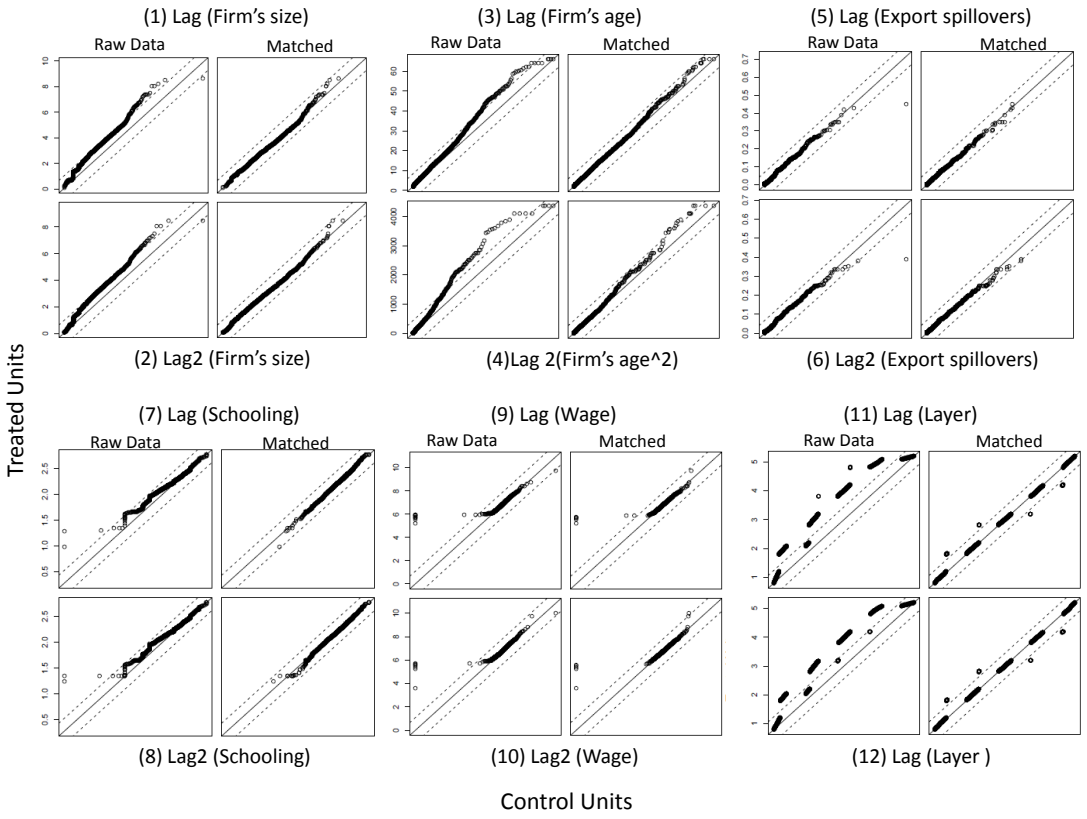

Figure 3: Propensity Score (Distribution) - before and after matching

Table 11 shows the results of the probit[75] to determine the propensity scores (PS) of firms to have access to Apex's treatment. The pseudo R^2 is approximately 0.12 and most of the covariates are statistically significant at 5%.

If we compare the probit results for the raw data with the results for the matched data (see table 12) we observe that after matching most of the covariates are not statistically significant at 5% and the pseudo R^2 is much smaller for the matched sample. Table 12 shows the results for the t-test of the covariates for the treated and control groups after matching. We observe that for most of the covariates we do not reject the hypothesis that the mean differences between both groups are different. Also, if no constraints are imposed with respect to sectoral exact matching or if regions instead of states are used for matching, the difference of the mean for the variables lag of the logarithm of wage (lag˙lwage), dummy for managers (L1 and L3) become insignificant, without relevant changes in the main results.

[75]Results are relatively similar when regions are disaggregated at state level. In this case, the pseudo R^2 is approximately 15% without matching and smaller than 1% after matching.

	Raw Data				Matched Data		
Variables	Coef.	(se)	$P-val$		Coef.	(se)	$P-val$
lag(nbr employees)	0.164	(0.018)	0.000		-0.063	(0.040)	0.116
lag(Firms' age)	0.006	(0.002)	0.007		0.005	(0.005)	0.255
lag(Firms' age)$\hat{2}$	0.000	(0.000)	0.093		0.000	(0.000)	0.638
lag(Schooling)	0.201	(0.067)	0.003		-0.094	(0.162)	0.562
lag(Wage)	0.072	(0.031)	0.022		0.117	(0.082)	0.155
lag(Share Export)	0.345	(0.505)	0.495		0.624	(1.149)	0.587
lag(Manager exp L1)	0.267	(0.080)	0.001		0.198	(0.147)	0.177
lag(Manager exp L2)	0.011	(0.091)	0.905		0.119	(0.170)	0.485
lag(Manager exp L3)	0.507	(0.056)	0.000		0.280	(0.107)	0.009
lag(Import)	0.117	(0.044)	0.008		-0.144	(0.089)	0.106
Lag(Layers)	0.122	(0.012)	0.000		0.020	(0.028)	0.475
lag2_lfirmssize	-0.060	(0.018)	0.001		-0.008	(0.039)	0.843
lag2_lschooling	0.006	(0.063)	0.927		-0.135	(0.152)	0.376
lag2_lwage	-0.028	(0.030)	0.341		0.025	(0.082)	0.761
lag2_shexpsrnet	0.003	(0.512)	0.996		-0.964	(1.166)	0.408
lag2_Import	-0.016	(0.048)	0.740		0.232	(0.099)	0.019
lag2_Layers	0.019	(0.013)	0.131		0.005	(0.028)	0.848
Multi	-0.568	(0.199)	0.004		0.608	(0.616)	0.324
State							
13-Amazonas	0.084	(0.338)	0.804	13	0.238	(1.046)	0.820
15-Pará	0.075	(0.342)	0.825	15	-	-	-
21-Maranhão	-0.011	(0.400)	0.979		0.045	(1.250)	0.971
23-Ceará	1.000	(0.284)	0.000		-0.212	(0.883)	0.810
24-Rio Grande do Norte	0.684	(0.296)	0.021		-0.066	(0.910)	0.942
25-Paraíba	0.626	(0.299)	0.036		0.035	(0.920)	0.969
26-Pernambuco	0.818	(0.285)	0.004		-0.030	(0.887)	0.973
27-Alagoas	1.105	(0.296)	0.000		0.075	(0.904)	0.934
28-Sergipe	1.168	(0.292)	0.000		0.104	(0.898)	0.908
29-Bahia	1.217	(0.283)	0.000		0.016	(0.883)	0.985
31-Minas Gerais	1.003	(0.282)	0.000		-0.034	(0.881)	0.969
32-Espírito Santo	0.294	(0.295)	0.318		0.754	(0.941)	0.423
33-Rio de Janeiro	0.454	(0.285)	0.112		0.083	(0.889)	0.925
35-São Paulo	0.564	(0.282)	0.046		-0.046	(0.882)	0.958
41-Paraná	0.967	(0.282)	0.001		-0.030	(0.882)	0.973
42-Santa Catarina	0.530	(0.283)	0.061		-0.106	(0.884)	0.904
43-Rio Grande do Sul	1.266	(0.282)	0.000		-0.005	(0.882)	0.996
50-Mato Grosso do Sul	0.413	(0.312)	0.185		-0.145	(0.940)	0.877
51-Mato Grosso	0.067	(0.325)	0.838		0.315	(1.034)	0.761
52-Goiás	0.782	(0.284)	0.006		-0.017	(0.885)	0.985
53-Distrito Federal	1.345	(0.288)	0.000		-0.185	(0.889)	0.835
Year							
2008	-0.345	(0.023)	0.000		0.013	(0.061)	0.836
2009	0.327	(0.016)	0.000		0.031	(0.040)	0.448
Sector							
cnae11	0.364	(0.064)	0.000		-0.012	(0.140)	0.931
cnae13	0.186	(0.044)	0.000		0.013	(0.105)	0.902
cnae14	0.471	(0.027)	0.000		0.073	(0.063)	0.248
cnae15	0.317	(0.035)	0.000		0.046	(0.082)	0.570
cnae16	0.018	(0.045)	0.689		-0.005	(0.113)	0.963
cnae17	-0.070	(0.068)	0.299		0.009	(0.162)	0.958
cnae18	-0.187	(0.053)	0.000		-0.026	(0.135)	0.847
cnae19	0.110	(0.136)	0.417		0.001	(0.283)	0.998
cnae20	0.238	(0.044)	0.000		-0.003	(0.099)	0.973
cnae21	-0.158	(0.123)	0.199		-0.139	(0.275)	0.612
cnae22	-0.023	(0.042)	0.581		-0.006	(0.099)	0.952
cnae23	-0.002	(0.039)	0.958		-0.024	(0.097)	0.808
cnae24	0.157	(0.056)	0.005		-0.036	(0.128)	0.778
cnae25	0.035	(0.033)	0.292		-0.035	(0.079)	0.657
cnae26	0.198	(0.064)	0.002		-0.015	(0.140)	0.916
cnae27	-0.037	(0.067)	0.585		0.026	(0.158)	0.869
cnae28	0.109	(0.043)	0.011		-0.035	(0.098)	0.720
cnae29	-0.188	(0.073)	0.011		-0.058	(0.181)	0.750
cnae30	-0.085	(0.145)	0.557		-0.016	(0.344)	0.963
cnae31	0.325	(0.033)	0.000		0.012	(0.076)	0.880
cnae32	0.341	(0.045)	0.000		0.038	(0.104)	0.711
cnae33	-0.296	(0.078)	0.000		-0.037	(0.203)	0.854
Constant	-5.089	(0.321)	0.000		-0.812	(0.961)	0.398
	Prob ¿ chi2 = 0.000				Prob ¿ chi2= 0.2025		
	Pseudo R2 = 0.1507				Pseudo R2 = 0.0079		
	Obs = 565,377				Obs = 6.512		

Table 11: Results of PROBIT and Robustness check (Apex's start)

Variables	Matched Data							Raw Data				
			Mean		SD	Mean	eQQ	Mean		SD	Mean	eQQ
	t-test	p-value	Treated	Control	Control	Diff	Mean	Means	Treated	Control	Diff	Mean
distance	-0.489	0.625	0.017	0.016	0.019	0.000	0.000	0.017	0.006	0.009	0.011	0.011
lag_lfirmssize	1.094	0.274	2.813	2.846	1.253	-0.033	0.080	2.813	2.088	1.051	0.725	0.725
lag_firmsage	-2.034	0.042	12.811	12.338	9.178	0.472	0.472	12.811	11.330	8.191	1.481	1.474
lag_firmsage2	-1.771	0.077	255.385	236.435	408.292	18.950	18.951	255.385	195.453	336.982	59.932	59.353
lag_lschooling	1.326	0.185	2.267	2.273	0.192	-0.006	0.008	2.267	2.224	0.243	0.043	0.045
lag_lwage	-3.059	0.002	6.651	6.617	0.498	0.034	0.037	6.651	6.578	0.559	0.073	0.074
lag_shexpsrnet	-0.323	0.746	0.042	0.042	0.060	0.001	0.002	0.042	0.039	0.057	0.003	0.004
lag_ManagerexpL11	-2.336	0.020	0.017	0.010	0.102	0.007	0.007	0.017	0.001	0.036	0.016	0.016
lag_ManagerexpL21	-1.842	0.066	0.013	0.008	0.089	0.005	0.005	0.013	0.001	0.033	0.012	0.011
lag_ManagerexpL31	-3.389	0.001	0.036	0.022	0.147	0.014	0.014	0.036	0.003	0.054	0.033	0.033
lag_Import1	-0.941	0.347	0.078	0.072	0.258	0.006	0.006	0.078	0.022	0.146	0.056	0.056
lag_Layers	-0.279	0.780	2.887	2.879	1.262	0.009	0.044	2.887	2.140	1.080	0.747	0.747
lag2_lfirmssize	0.775	0.438	2.658	2.683	1.308	-0.025	0.076	2.658	1.994	1.072	0.665	0.664
lag2_lschooling	1.592	0.112	2.250	2.258	0.205	-0.008	0.009	2.250	2.209	0.248	0.041	0.042
lag2_lwage	-2.794	0.005	6.605	6.574	0.486	0.031	0.033	6.605	6.545	0.499	0.060	0.061
lag2_shexpsrnet	-0.204	0.839	0.042	0.042	0.059	0.000	0.002	0.042	0.038	0.055	0.004	0.004
lag2_Import	-2.388	0.017	0.065	0.051	0.220	0.014	0.014	0.065	0.019	0.135	0.046	0.046
lag2_Layers	-0.355	0.722	2.732	2.721	1.276	0.011	0.050	2.732	2.073	1.062	0.659	0.659
multi	-1.342	0.180	0.001	0.000	0.018	0.001	0.001	0.001	0.001	0.038	0.000	0.000
state13	-0.447	0.655	0.001	0.001	0.025	0.000	0.000	0.001	0.004	0.065	-0.003	0.003
state15	-1.414	0.157	0.001	0.000	0.000	0.001	0.001	0.001	0.010	0.099	-0.009	0.010
state21	3.247	0.001	0.000	0.000	0.018	0.000	0.000	0.000	0.005	0.073	-0.005	0.005
state23	0.366	0.714	0.046	0.065	0.246	-0.018	0.018	0.046	0.026	0.158	0.021	0.021
state24	0.366	0.714	0.004	0.005	0.070	-0.001	0.001	0.004	0.009	0.092	-0.004	0.005
state25	-0.209	0.835	0.004	0.003	0.058	0.000	0.000	0.004	0.009	0.093	-0.005	0.005
state26	0.086	0.931	0.021	0.021	0.144	0.000	0.000	0.021	0.025	0.155	-0.004	0.004
state27	-0.325	0.745	0.006	0.006	0.074	0.001	0.001	0.006	0.004	0.060	0.003	0.003
state28	-0.703	0.482	0.009	0.007	0.084	0.002	0.002	0.009	0.005	0.067	0.004	0.004
state29	-0.207	0.836	0.061	0.060	0.238	0.001	0.001	0.061	0.026	0.160	0.035	0.035
state31	0.252	0.801	0.190	0.193	0.395	-0.003	0.003	0.190	0.129	0.336	0.061	0.061
state32	-2.361	0.018	0.004	0.001	0.035	0.003	0.003	0.004	0.022	0.145	-0.017	0.017
state33	-0.988	0.323	0.018	0.014	0.119	0.003	0.003	0.018	0.052	0.221	-0.034	0.034
state35	-0.101	0.920	0.163	0.162	0.369	0.001	0.001	0.163	0.301	0.459	-0.138	0.138
state41	0.113	0.910	0.122	0.123	0.328	-0.001	0.001	0.122	0.090	0.287	0.032	0.032
state42	0.738	0.461	0.041	0.044	0.206	-0.004	0.004	0.041	0.100	0.300	-0.060	0.060
state43	-1.657	0.098	0.260	0.242	0.429	0.018	0.018	0.260	0.108	0.311	0.152	0.152
state50	0.259	0.796	0.002	0.003	0.050	0.000	0.000	0.002	0.008	0.089	-0.006	0.006
state51	-0.817	0.414	0.001	0.001	0.025	0.001	0.001	0.001	0.015	0.120	-0.013	0.014
state52	-0.148	0.882	0.029	0.029	0.167	0.001	0.001	0.029	0.031	0.174	-0.002	0.003
state53	1.203	0.229	0.016	0.020	0.141	-0.004	0.004	0.016	0.006	0.076	0.011	0.010
year2007	0.000	1.000	0.250	0.250	0.433	0.000	0.000	0.250	0.325	0.468	-0.076	0.076
year2008	0.000	1.000	0.098	0.098	0.297	0.000	0.000	0.098	0.333	0.471	-0.235	0.236
year2009	0.000	1.000	0.653	0.653	0.476	0.000	0.000	0.653	0.342	0.474	0.311	0.311
cnae10	0.000	1.000	0.083	0.083	0.275	0.000	0.000	0.083	0.124	0.329	-0.041	0.041
cnae11	0.000	1.000	0.015	0.015	0.123	0.000	0.000	0.015	0.007	0.084	0.008	0.008
cnae13	0.000	1.000	0.031	0.031	0.173	0.000	0.000	0.031	0.033	0.180	-0.002	0.003
cnae14	0.000	1.000	0.291	0.291	0.455	0.000	0.000	0.291	0.171	0.377	0.120	0.120
cnae15	0.000	1.000	0.079	0.079	0.270	0.000	0.000	0.079	0.044	0.206	0.035	0.034
cnae16	0.000	1.000	0.026	0.026	0.160	0.000	0.000	0.026	0.059	0.235	-0.033	0.033
cnae17	0.000	1.000	0.010	0.010	0.102	0.000	0.000	0.010	0.016	0.124	-0.005	0.006
cnae18	0.000	1.000	0.017	0.017	0.128	0.000	0.000	0.017	0.048	0.213	-0.031	0.031
cnae19	0.000	1.000	0.003	0.003	0.058	0.000	0.000	0.003	0.001	0.036	0.002	0.002
cnae20	0.000	1.000	0.042	0.042	0.202	0.000	0.000	0.042	0.026	0.159	0.016	0.016
cnae21	0.000	1.000	0.004	0.004	0.061	0.000	0.000	0.004	0.003	0.054	0.001	0.001
cnae22	0.000	1.000	0.038	0.038	0.190	0.000	0.000	0.038	0.052	0.222	-0.015	0.015
cnae23	0.000	1.000	0.041	0.041	0.199	0.000	0.000	0.041	0.085	0.279	-0.044	0.044
cnae24	0.000	1.000	0.019	0.019	0.137	0.000	0.000	0.019	0.016	0.126	0.003	0.003
cnae25	0.000	1.000	0.080	0.080	0.272	0.000	0.000	0.080	0.119	0.324	-0.039	0.039
cnae26	0.000	1.000	0.018	0.018	0.131	0.000	0.000	0.018	0.010	0.097	0.008	0.008
cnae27	0.000	1.000	0.012	0.012	0.107	0.000	0.000	0.012	0.014	0.117	-0.002	0.003
cnae28	0.000	1.000	0.049	0.049	0.216	0.000	0.000	0.049	0.040	0.197	0.009	0.008
cnae29	0.000	1.000	0.009	0.009	0.094	0.000	0.000	0.009	0.017	0.129	-0.008	0.008
cnae30	0.000	1.000	0.002	0.002	0.046	0.000	0.000	0.002	0.003	0.057	-0.001	0.001
cnae31	0.000	1.000	0.089	0.089	0.284	0.000	0.000	0.089	0.062	0.241	0.027	0.027
cnae32	0.000	1.000	0.036	0.036	0.186	0.000	0.000	0.036	0.024	0.153	0.012	0.012
cnae33	0.000	1.000	0.006	0.006	0.080	0.000	0.000	0.006	0.026	0.160	-0.020	0.020

Table 12: T-Test - matched covariates

7.3 Robustness: Including treated firms in 2007

In section 5 I showed the empirical results and explained that firms that received the treatment in 2007 were excluded from the sample due to the fact that there is no information on their treatment status in 2006. In this section I show the main results including those firms that

received the treatment in 2007, under the assumption that they did not receive previous support from Apex.

All in all, the results are qualitatively similar. I find a positive effect of Apex's treatment on the export propensity of non-exporting firms in the year they receive the treatment t and one year after the program $t+1$. The marginal effect at the mean (in percentage points) is larger for the sample including treated firms in 2007. Table 13 shows the estimations for pooled OLS and FE, including treated firms in 2007 and also observations for 2006, aiming to capture the within FE effect for 2007.

Table 14 shows the results for the average effect of Apex (including the full sample of treated firms in 2007) with different specifications to show that the magnitude of the coefficient (Apex) becomes slightly smaller (in percentage points) when firms' size and firms' age are included as covariates. Nonetheless, it seems not sensitive to additional covariates. It also shows that overall the effect of the program is larger, when including firms treated in 2007. Tables 15 and 16 show that the results for heterogeneous effects according to firms' size are very similar to findings in section 5.2 if firms treated in 2007 are included in the sample.

Dependent variable:	Export dummy (t+1)				Export dummy (t)			
	model1	model2	model3	model4	model5	model6	model7	model8
APEX	0.060***	0.041***	0.023***	0.024***	0.044***	0.029***	0.035***	0.036***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)
lfirmssize		0.001***		0.004***		0.000***		0.005***
		(0.000)		(0.000)		(0.000)		(0.000)
firmsage		-0.000***		0.000		-0.000***		0.001
		(0.000)		(0.001)		(0.000)		(0.001)
firmsage2		0.000**		0.000***		0.000		0.000***
		(0.000)		(0.000)		(0.000)		(0.000)
lwage		0.002***		-0.000		0.001***		-0.000
		(0.000)		(0.000)		(0.000)		(0.000)
lschool		0.003***		-0.001		0.002***		-0.002***
		(0.000)		(0.001)		(0.000)		(0.001)
shexpsrnet		0.072***		-0.063***		0.078***		0.360***
		(0.004)		(0.015)		(0.003)		(0.020)
ManagerexpL1		0.227***		0.065***		0.133***		0.004
		(0.015)		(0.021)		(0.014)		(0.020)
ManagerexpL2		0.177***		0.049**		0.134***		0.104***
		(0.016)		(0.024)		(0.015)		(0.023)
ManagerexpL3		0.329***		0.078***		0.241***		0.095***
		(0.010)		(0.016)		(0.009)		(0.015)
Import		0.082***		0.034***		0.068***		0.046***
		(0.003)		(0.003)		(0.002)		(0.003)
layer		0.003***		0.001***		0.002***		0.000
		(0.000)		(0.000)		(0.000)		(0.000)
Fixed Effect								
Firms	-	-	YES	YES	-	-	YES	YES
State	YES	YES	-	-	YES	YES	-	-
Year*Sector	YES	YES	YES	YES	YES	YES	YES	YES
Number of id	272,583	272,063	272,583	272,063	272,583	272,063	272,583	272,063
Observations	869,781	867,380	869,781	867,380	869,781	867,380	869,781	867,380

Note: Linear Probability Model (LPM) using pooled OLS and panel fixed effect. Standard errors clustered at firm level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 13: Impact of Apex on the probability to export

Dependent variable:	Export dummy (t+1)				Export dummy (t)			
	model1	model2	model3	model4	model5	model6	model7	model8
APEX	0.044***	0.041***	0.040***	0.040***	0.033***	0.032***	0.030***	0.030***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
lfirmssize		0.028***	0.030***	0.026***		0.012	0.013	0.010
		(0.007)	(0.008)	(0.007)		(0.008)	(0.008)	(0.008)
firmsage		0.048	0.047	0.058		-0.029***	-0.032***	-0.016
		(0.072)	(0.073)	(0.074)		(0.008)	(0.011)	(0.015)
firmsage2		0.000**	0.000**	0.000**		0.000**	0.000**	0.000**
		(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)
lwage			-0.010*	-0.007			-0.001	0.001
			(0.006)	(0.006)			(0.005)	(0.005)
lschool			0.034	0.033			0.034	0.034
			(0.023)	(0.023)			(0.023)	(0.023)
shexpsrnet			0.005*	0.005*			0.014***	0.013***
			(0.003)	(0.003)			(0.003)	(0.003)
ManagerexpL1				0.154***				0.073
				(0.056)				(0.052)
ManagerexpL2				0.010				0.089
				(0.066)				(0.065)
ManagerexpL3				0.040				0.017
				(0.044)				(0.034)
Import				0.046*				0.042*
				(0.024)				(0.023)
layer				0.001				0.000
				(0.004)				(0.004)
Observations	13,028	13,028	13,028	13,028	13,028	13,028	13,028	13,028
R-squared	0.109	0.113	0.115	0.126	0.079	0.081	0.092	0.100
Number of id2	6,514	6,514	6,514	6,514	6,514	6,514	6,514	6,514
Fixed Effect	.	.	.	.	.	.	.	
Firms	YES	YES	YES	YES	YES	YES	YES	YES
Year*Sector	YES	YES	YES	YES	YES	YES	YES	YES

Note: Linear Probability Model (LPM) using panel fixed effect. Standard errors clustered at firm level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 14: Impact of Apex on the probability to export in *t+1*

Dependent Variable: Export status (t+1)								
Variable	Micro		Small		Medium		Large	
	model1a	model1b	model2a	model2b	model3a	model3b	model4a	model4b
APEX	0.034***	0.031***	0.049***	0.048***	0.084***	0.073***	0.017	0.075*
	(0.005)	(0.005)	(0.010)	(0.010)	(0.019)	(0.020)	(0.045)	(0.045)
lfirmssize		0.019**		0.035***		0.035		0.110**
		(0.009)		(0.012)		(0.024)		(0.051)
firmsage		-0.015***		-0.025**		0.489***		0.562***
		(0.005)		(0.010)		(0.095)		(0.099)
firmsage2		-0.000		0.000		0.000		-0.002**
		(0.000)		(0.000)		(0.000)		(0.001)
lwage		-0.006		-0.016		-0.042		0.124***
		(0.006)		(0.012)		(0.028)		(0.044)
lschool		0.032		0.105		0.053		-0.328
		(0.024)		(0.073)		(0.093)		(0.348)
shexpsrnet		0.003		0.008		-0.002		0.030**
		(0.002)		(0.006)		(0.011)		(0.014)
ManagerexpL1		-0.053		0.126		0.270***		0.174*
		(0.165)		(0.102)		(0.091)		(0.093)
ManagerexpL2		-0.181		0.105		0.021		-0.015
		(0.157)		(0.129)		(0.117)		(0.117)
ManagerexpL3		0.120		-0.022		0.015		0.210**
		(0.088)		(0.080)		(0.075)		(0.088)
Import		0.095**		0.001		0.098**		-0.001
		(0.043)		(0.035)		(0.043)		(0.086)
layer		0.003		-0.007		0.008		-0.053
		(0.005)		(0.007)		(0.014)		(0.051)
Observations	7,672	7,672	3,164	3,164	1,716	1,716	476	476
R-squared	0.091	0.109	0.143	0.161	0.218	0.260	0.301	0.407
Number of id2	3,836	3,836	1,582	1,582	858	858	238	238
Fixed Effect								
Firms FE	YES	YES	YES	YES	YES	YES	YES	YES
SectorYear FE	YES	YES	YES	YES	YES	YES	YES	YES

Notes: Linear Probability Model (LPM) using panel fixed effect and the baseline definition of firms' size categories. Standard errors clustered at firm level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 15: Heterogeneous effect: Impact of Apex on the probability to export in *t+1* according to firms' size (baseline)

Dependent Variable: Export status (t)								
Variable	Micro		Small		Medium		Large	
	model1a	model1b	model2a	model2b	model3a	model3b	model4a	model4b
APEX	0.032***	0.029***	0.030***	0.027***	0.044***	0.038**	0.034	0.041
	(0.005)	(0.005)	(0.008)	(0.008)	(0.016)	(0.016)	(0.042)	(0.046)
lfirmssize		0.010		0.021**		0.010		-0.037
		(0.008)		(0.010)		(0.021)		(0.066)
firmsage		-0.010**		-0.012		0.192		0.103
		(0.004)		(0.008)		(0.127)		(0.119)
firmsage2		-0.000		0.000		0.001		-0.000
		(0.000)		(0.000)		(0.000)		(0.001)
lwage		0.000		-0.015		0.003		-0.001
		(0.004)		(0.011)		(0.023)		(0.050)
lschool		0.035		0.040		0.043		-0.116
		(0.026)		(0.035)		(0.071)		(0.371)
shexpsrnet		0.008***		0.016***		0.025**		0.050**
		(0.003)		(0.006)		(0.011)		(0.020)
ManagerexpL1		-0.090		0.100		0.114		0.059
		(0.160)		(0.094)		(0.088)		(0.096)
ManagerexpL2		0.094		0.002		0.118		0.163
		(0.166)		(0.133)		(0.114)		(0.113)
ManagerexpL3		0.127		-0.012		0.017		0.049
		(0.112)		(0.047)		(0.056)		(0.077)
Import		0.029		0.031		0.101**		0.044
		(0.037)		(0.032)		(0.044)		(0.086)
layer		-0.003		-0.004		0.009		0.071
		(0.004)		(0.006)		(0.010)		(0.057)
Observations	7,672	7,672	3,164	3,164	1,716	1,716	476	476
R-squared	0.077	0.092	0.108	0.135	0.166	0.205	0.280	0.354
Number of id	3,836	3,836	1,582	1,582	858	858	238	238
Fixed Effect								
Firms FE	YES	YES	YES	YES	YES	YES	YES	YES
SectorYear FE	YES	YES	YES	YES	YES	YES	YES	YES

Notes: Linear Probability Model (LPM) using panel fixed effect and the baseline definition of firms' size categories. Standard errors clustered at firm level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 16: Heterogeneous effect: Impact of Apex on the probability to export in t according to firms' size (baseline)

7.4 Distribution of Exporters and Apex-treated exporting firms by sector

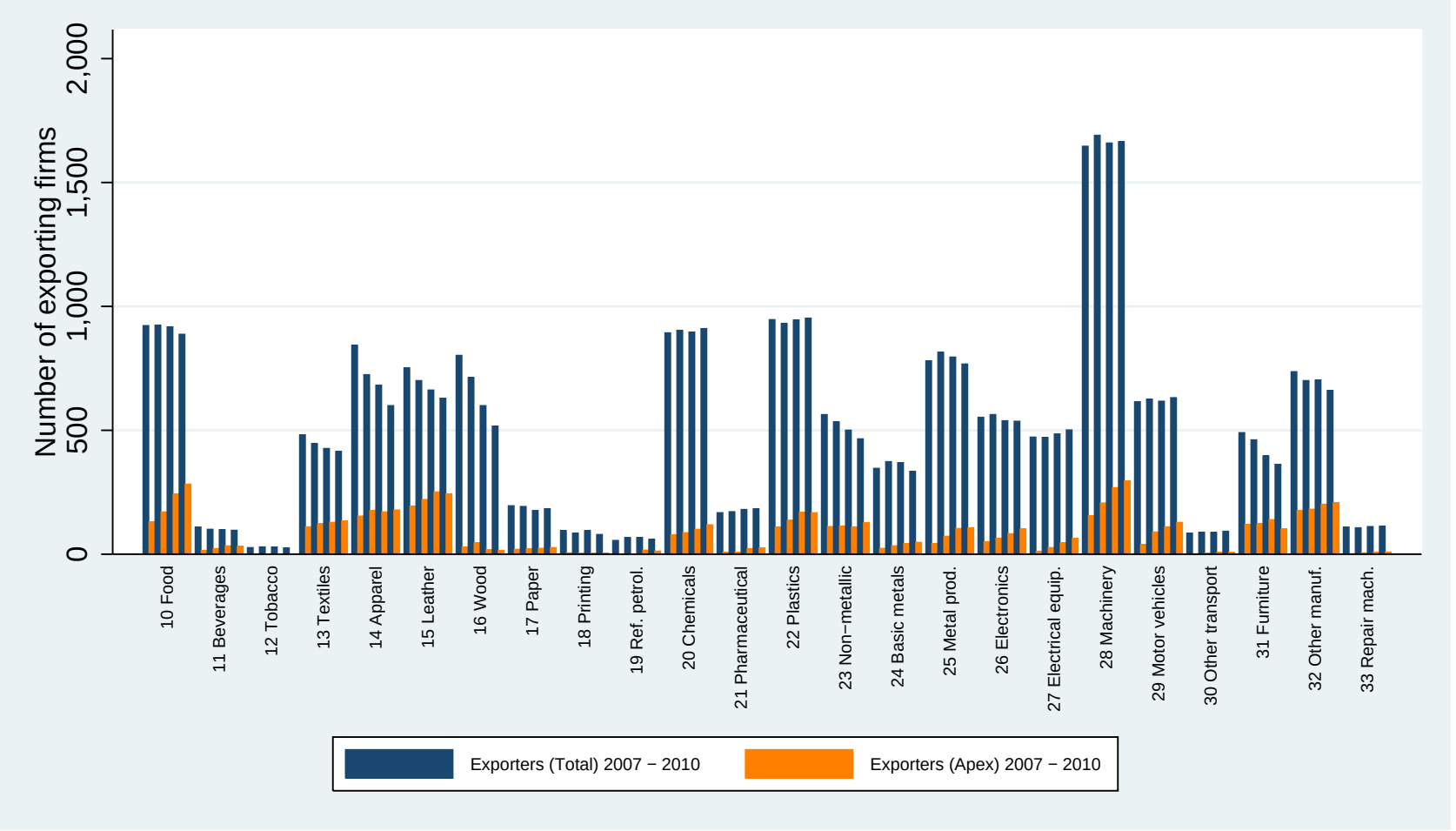

Figure 4: Distribution of exporters and Apex-treated exporting firms by sector (manufacturing)

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