Size matters? Counterintuitive findings on export subsidies

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Abstract

We believe that the lack of convincing evidence on the positive impact of export subsidies on export performance may be due to the fact that country- and industry-level analyses ignore the firm-specific nature of export subsidies and do not allow for potential misuse of public funds. This paper evaluates the impact of firm-specific export subsidies on exporting behavior in the Colombian manufacturing sector. Subsidies in Colombia show a great degree of variability – from as little as 2 to over 20 percent of export sales, with many firms reporting subsidies amounting to more than a quarter of export sales. Drawing on the experiences in other developing countries and on the descriptive accounts of the discretionary allocation of public funds in Colombia, we regard disproportionately high subsidy rates as a proxy for the firm’s ties to government officials and believe that funds may be co-opted for non-productive use. Our aim is thus to quantify the differential effectiveness on export performance (export intensity and the probability of exporting) of four subsidy amounts: small, medium, large and disproportionately large. Controlling for unobservable firm characteristics and persistence in exporting behavior, we find that although export subsidies induce plants to increase their export intensity and to participate in foreign markets, it is the smallest subsidies (representing 1.2 to 7.2 percent of export sales) that generate the largest impact. Firms that receive such subsidies increase their export intensity by 3.5 percentage points and are much more likely to remain in the export market. The impact of disproportionately large subsidies is nil or negative, depending on specification, which we cautiously interpret as a sign of misused public funds.

JEL Classification: L2, H2, F2, O3

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1. Introduction

“[S]ubsidies may play an important role in the economic development programs of developing country Members”.

Article 27.1, SCM Agreement

“A great part of the economy is decided in the corridors of the Ministry of Economy and of the Central Bank... It is more profitable to spend time in these corridors than in the manufacturing plant...”

Quoted in Nogués (1989)

Export subsidies are illegal under WTO regulations. They can trigger retaliatory actions from trading partners, misalign prices and distort the allocation of resources. Even when effective, their impact is small and the direct fiscal costs of keeping them in place can be unjustifiably large. Yet, export subsidies remain common.¹

The case in favor of export subsidies is based on the argument that they can help a country to achieve export expansion and diversification of the economy towards manufacturing. They encourage a firm to undertake an activity that is costly, yet, assuming positive spillovers from exporting to other firms, socially desirable.

One of the practical arguments against the use of export subsidies is that they are very easy to abuse (Nogués, 1989), which renders subsidies ineffective in achieving their original goals. First, there are government officials pandering to the “connected” firms. For example, Mobarak and Purbasari (2006) use firm-level data for Indonesia and a unique data set identifying the firm’s degree of connectedness to President Suharto to investigate the impact of nepotistic relationships on the probability of obtaining import licenses for raw-materials and for commodities for sale in local markets. By conservative estimates, being connected triples the likelihood of receiving a license relative to the firm’s competitors, and having a member of the Suharto family on the firm’s board of management quadruples the likelihood.

¹ See the WTO World Trade Report 2006 for an overview of the current presence and relevance of export subsidies in the developing world.
Second, the transferred government grant is left for the discretionary use by the firm. If appropriate auditing mechanisms are absent, as in most developing countries, firms may fail to spend the additional resources on activities fostering exports. Noguès (1989), for example, describes a case in which a shipbuilding company drew on government export promotion funds for several years before it became known that the company had not even started its production. Rodrik (1993) cites an article from The Economist (August 14, 1993, 37-38), in which a Kenyan firm, the sole recipient of a license to export gold and jewelry, received $54 million in export subsidies (amounting to 5 percent of Kenya’s total exports). Not only did the firm get a subsidy of 35 percent instead of the legally allowed 20, but the foreign buyers of its products either did not exist, or had never heard of the firm.

Third, the export promotion schemes are often complex and this leaves them open to potential misuse and abuse. Consider a sample list of export promotion measures operating in Argentina during the 1980s: special fiscal compensation to exports produced with sugar (a product with important employment effects in two provinces), additional reimbursement for exports going to new markets, additional reimbursement for exports shipped through southern ports, additional reimbursement for exports coming from Tierra del Fuego, additional reimbursement for exports shipped by the customs of Salta and Jujuy, additional reimbursement to specific enterprises who sign a contract with the government for marginal increase of exports, additional reimbursement for turnkey exports… Leaving aside defaulting on commitments or re-exports through a promoted port, a firm may establish barely functioning, but legal factories in promoted regions. The only production that takes place there is the sticking of labels. Tax reimbursement claims are, however, made for the entire value of the output.

Such a complex system of subsidies and a questionable system to control their allocation and use go a long way toward explaining why researchers have failed to find convincing evidence in favor of export subsidies. To borrow from Rodrik (1993), “the
received wisdom on export subsidies is that they have not been effective.” We believe that this may, at least partially, be explained by the fact that most of the work on the impact of export subsidies has been done using country- and industry-level data when in reality subsidies are negotiable on a case-by-case basis. As such, these analyses have failed to take into account the impact of misallocation or misuse of export subsidies when looking at their effectiveness.

This study is motivated by the substantial variation in government support received by individual firms observed in Colombia during 1981-1991: while the median size of subsidies per peso of export sales was around 8-10 percent, subsidies per peso of exports could be as small as two and as high as twenty percent, with a number of firms reporting subsidies even in excess of a quarter of their export sales. We interpret such variation in subsidy rates as a sign that the export subsidies may not have been designed in the first place to support the industry or the region as a whole, but to grant assistance to particular firms. Hence, by using firm-level data we may be better able to disentangle the productive and unproductive uses of government resources.

Unfortunately, our data does not allow us to identify any type of political connections between the firms’ executives and the officials in charge of granting subsidies directly. If, however, disproportionately large subsidy rates are in any way reflective of such connections, it is likely that these funds have been co-opted for non-productive use and are unlikely to have an impact on the firm’s exporting behavior. Our aim is thus to quantify the differential effectiveness on export performance (export intensity and probability of exporting) of four subsidy amounts: small, medium, large and disproportionately large (representing over a quarter of export sales). Controlling for unobservable plant characteristics and persistence in exporting behavior, we find that, although export subsidies induce plants to increase their export intensity and to participate in foreign markets, it is the smallest subsidies (representing 1.2 to 7.2 percent of export sales) which generate the largest impact. Firms that receive such
subsidies increase their export intensity by 3.5 percentage points and the odds of these firms to remain in the export market are twice as high as those of non-subsidized firms. The impact of disproportionately large subsidies is nil or negative, depending on the specification, which we interpret as an indication of misused public funds.

A disproportionately large subsidy may be, of course, a poor criterion on which to judge the degree of nepotism between firms and government officials. And the mere observation that these subsidies fail to generate the desired increase in exports may be insufficient to draw conclusions regarding the intended use of government funds when those are allocated at the discretion of the government officials. With that in mind, we believe that our contribution to the literature is two-fold. First, by testing the hypothesized link between export subsidies and export behavior using plant-level data, we show that small is beautiful when it comes to export subsidies, at least in a country with a limited capacity to monitor the disbursements of funds and their intended uses. More importantly, we demonstrate that the use of export subsidies in Colombia, and potentially across most developing countries, varies from plant to plant. By concentrating on industry- and country-wide studies, the literature has so far disregarded potential misuse of resources and this may account for the lack of persuasive evidence on the effectiveness of export subsidies in developing countries.

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2 Diaz and Escudero (2002) report that there has been abuse of the subsidy scheme in Colombia. Although the system was replaced by another one in 1983 exactly because of the fraud opportunities provided by the earlier, we doubt that the new system was bulletproof. According to Transparency International’s Bribe Payers Survey (1999) when asking the Gallup question “What means do you see governments using to secure unfair business advantages for companies from their own countries?” 45% of respondents mentioned “differential taxes, tariffs, custom barriers and subsidies.” In 1998 Colombia’s TI Corruption rank was 79 (out of the participating 85 countries) with a score of 2.2 (a perfect 10 describes a totally corruption-free country). In comparison with other countries, for which we have richer descriptive evidence of misused export subsidies, Kenya’s index was 2.5 and Argentina’s 3.0. As such, our strategy is not entirely ungrounded.

3 Export subsidies in Korea, for example, were also granted on a case-by-case basis at the discretion of the government officials. Yet Korea represents one of the most successful examples of export promotion policies. One should note, however, that in Korea government officials set firm-specific export targets in exchange for subsidies and remained in nearly daily contact to ensure that those targets were met.
2. Related Literature

Active government export promotion uses a wide range of measures including exemptions from domestic sales taxes, taxes on income or value added, draw-back, and export credit and insurance programs. The government’s aim is to provide domestic firms with a competitive advantage on world markets by subsidizing exports. At the same time, the government also seeks to increase national welfare which means that the pay-off generated from subsidizing domestic firms should exceed the costs of the subsidy.

While there is disagreement on whether export promotion policies are justified in terms of their impact on overall welfare, the link between export promotion and export performance has remained unchallenged. In its most simplistic form, this relationship has been presented in Hoffmaister (1991): a profit-maximizing firm allocates production between the domestic and the export markets and the optimal allocation rule depends on the relative prices in the two markets. A subsidy increases the price and, hence, the attractiveness of exports relative to domestic output. An empirical prediction following from this relationship is that a subsidy will induce an increase in export volumes.

This link between export subsidies and export volumes may, however, be weakened if subsidies are assigned at the discretion of the officials distributing the funds. According to the rent-seeking literature (Krugman, 1984), selective and differentiated policies will result in

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4 In the standard, perfectly competitive, two goods model, there is no reason to expect export subsidies to achieve welfare gains. If the country under consideration is large enough to influence international prices, export subsidies can cause negative terms of trade effects, and make the welfare loss unavoidable (Feenstra, 2005). Bhagwati and Ramaswami (1963), however, provide an argument in favor of active government-led export promotion in the presence of domestic distortions and show that a subsidy to the infant industry is necessarily superior to any tariff. Similarly, Feenstra (1986) develops a multiple-goods model, where subsidies can increase domestic welfare if the exported goods are complementary. Itoh and Kiyono (1987) go a step further to show that the same result can be obtained in a more general setting, however they point out that it is targeted export subsidies that may be welfare-increasing, while sweeping untargeted subsidies unambiguously lower welfare. Moving away from the perfect competitive market structure, Brander and Spencer (1985) demonstrate that subsidizing domestic firms can raise domestic welfare by allowing a country to capture a large share of the production of profit-earning imperfectly competitive industries (they consider imperfect competition as a form of domestic distortion thereby building on and reinforcing the argument from the 1960s that subsidies may be welfare improving in the presence of domestic distortions). However, Eaton and Grossman (1986) show that the result is not robust to the competition in strategic complements instead of substitutes. The conclusion from this strategic trade literature, revised in Brander (1995), is that the welfare effect of strategic subsidies is very sensitive to market conduct.
non-productive use of resources. First, subsidies may generate a costly competition among firms, whereby stronger lobbying for a subsidy by one firm requires other firms in the industry to lobby harder to get a given amount of support (Mitra, 2000). Alternatively, the firm may spend considerable amounts of resources on lawyers or bookkeepers who would be able to decipher the complicated rules of the export promotion schemes and concoct ways of obtaining access to the government funds. Thus, while the theory predicts that export subsidies will increase exports, many practical issues, such as the political environment, administrative capacity to monitor their distribution and use, etc. may interfere with their impact. The search for evidence on their effectiveness has thus been left to the empirical analyses.

There has been considerable empirical interest in the effectiveness of export subsidies. Studies, targeted at developing countries, include Frank et al. (1975) and Jung and Lee (1986) on South Korea, Nogués (1989) on Latin America, Low (1982) for Kenya, Hoffmaister (1991) on Costa Rica, Arslan and van Wijnbergen (1993) on Turkey, Faini (1994) on Turkey and Morocco, and Moreira and Figueiredo (2002) on Brazil. The results of these studies are conflicting, with the verdict overall coming out negative. In the case of Kenya, Low (1982) documents the failure of the subsidy scheme. He attributes the disappointing effect of the program to the poor implementation by, and the significant discretionary decision-making of, the bureaucrats in charge of allocating government grants. Arslan and van Wijnbergen (1993) attribute improvements in Turkey’s export performance to a depreciation of the exchange rate rather than export subsidies. Nogués (1989) concludes that export subsidies in Argentina only increased allocative inefficiency, reinforced oligopolistic market structures, and provided incentives for rent-seeking. While he acknowledges some positive impact of export subsidies

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5 Spending resources on rent-seeking activities is not the only way to render subsidies ineffective. Subsidies may also be ineffective when allocated to close-to-fake firms who export only to obtain access to the export promotion funds.

6 Rodrik (1993) provides an overview of the subsidy programs in Brazil, Bolivia, India, Kenya, Korea, and Turkey.
in the case of Brazil, he argues that the success relied crucially on accompanying macroeconomic stabilization and import liberalization. Nogués (1989) also points out that Mexico achieved a comparable positive export performance without relying on costly subsidies. Similarly, Hoffmaister (1991) finds a positive effect of a tax credit scheme in Costa Rica on exports, but concedes that, from a cost-benefit point of view, export subsidies have been a disproportionately costly way of achieving the rise in exports. Moreira and Figueiredo (2002) analyze the effect of an export credit scheme (PROEX) in Brazil and find an unambiguously positive effect on exports.

All of the aforementioned studies are based on country- or industry-level data. Their major shortcoming is that they do not allow any conclusion with regard to firm-specific characteristics influencing the success of export subsidy schemes. However, firm-level analysis of export subsidies is scarce for developed and non-existent for developing countries. Bernard and Jensen (2004) test the effect of export subsidies on the exports of US firms by including an “export promotion” variable in their empirical specification analyzing firms’ decision to export. They find that subsidies are neither economically important nor statistically significant. The lack of strong evidence in their case has been attributed to the fact that they use export promotion expenditures at the state level, which may be masking plant-specific differences in terms of access to the information regarding the availability of the funds.

Görg et al. (2006) analyze the role of firm-specific subsidies in encouraging export activity in Ireland for a large sample of firms over the period 1986-2002. The authors employ propensity score matching and find that large subsidies increase plants’ exports. They do not find any evidence for subsidies influencing the decision to export.

One should note that these two studies have been conducted on a set of countries with a business environment different from a developing country and a much better administrative capacity to control the distribution of funds. Moreover, these studies do not take explicitly
political economy factors into account that may influence allocation decisions. Much richer firm-level evidence on R&D subsidies, however, points out that political factors indeed play a role in allocation decisions (Klette et al. (2000) provide an overview of the literature). Blanes and Busom (2004), for example, investigate factors that determine Spanish firms’ access to R&D subsidies and find considerable discretion on the part of policy makers in the allocation decisions. This study supports the earlier finding by Svensson (1998) who uses a sample of 13 OECD countries and 24 industries to investigate the weight of political relative to economic factors in explaining the relative magnitude of R&D subsidies received by each industry and finds that both variables affect the allocation decision.

The role of politics in the allocation of other subsidy types is limited to Bergström (1998) and Bagella et al. (2003). Bergström analyzes the allocation of regional production subsidies to individual firms in Sweden for two repeated cross-sections in 1989 and 1992. Using information on the relative importance of a firm’s industry and a firm’s size as proxies for a firm’s lobbying capacity, Bergström finds that the likelihood of a firm receiving a subsidy depends positively on its lobbying capacity. Similarly, Bagella et al. use a sample of around 4000 Italian firms from three panel waves to investigate the likelihood of receiving government support. They find that the firm’s lobbying capacity (proxied by the firm’s size, affiliation, and industry’s employment share) is an important determinant of obtaining government support.

We believe that the omission of political economy factors, whose importance has been flashed out in the latter studies, and ignoring the fact that some subsidies may be misallocated or misused may bias the estimates of the effectiveness of subsidies downwards or render them statistically insignificant.
3. The Regulatory Framework for Export Subsidies in Colombia

Traditionally, subsidy schemes in Latin American countries aimed at broadening the export base through the promotion of so called non-traditional exports (Nogués, 1989). Normally, the broadening of the export base was combined with incentives to upgrade exports in terms of their value-added. In that sense, Colombia’s export subsidy scheme is no exception.

In Colombia, until 1991, the Ministry for Economic Development (Ministerio de Desarrollo Económico) was in charge of foreign trade policy formulation, including the design, implementation, and monitoring of the programs aimed at export promotion. Certain operations were delegated to the Colombian Central Bank, as for example the issuance of the Tax Rebate Certificate CERT. Since our data set covers the period 1981-1991, we only discuss the scheme in place until 1991 and omit any subsequent changes. Until 1991, export promotion in Colombia was centered around five major measures:

1) Tax Reimbursement Certificate CERT (Certificado de Reembolso Tributario)
2) Plan Vallejo
3) Transport Compensation Mechanism MCT (Mecanismo de Compensación al Transporte)
4) Free Zones
5) Export credit schemes and guarantees and business services provided by PROEXPO

In 1991, the Ministry for Economic Development ceded its trade policy authority to the newly established Ministry of Foreign Trade - MINCOMERCIO (Ministerio de Comercio, Industria y Turismo).
Only the first three of these five measures are of interest to our work as they involve subsidies or tax reimbursements, rebates or exemptions. The other two support schemes, the Free Zones and PROEXPO, are of a broader nature and not discussed here\textsuperscript{8}.

The Tax Reimbursement Certificate CERT (Certificado de Reembolso Tributario) is the most important export promotion measure. It involves the reimbursement of domestic indirect taxes, charges and other levies as a percentage of the FOB value of exports and a subsidy element. The amount reimbursed is calculated as a percentage of the value of the exported goods depending on the goods exported and the destination country\textsuperscript{9}. It was created in 1983, replacing the CAT (Certificado de Abono Tributario), principally in the aim to increase non-traditional exports. The replacement of the CAT was motivated mainly by frauds in form of attempts to obtain the certificate through fictive exports (Díaz and Escudero, 2002) and by pressure from the GATT and several foreign governments (Piñeros and Calderon, 2000). The CERT can be used for (i) taxes on profit, (ii) tariff duties, (iii) sale taxes (VAT), (iv) other taxes, and (v) other duties and charges set by the entities that collect them. To obtain the CERT, firms have to apply to the Ministry for Economic Development through a financial intermediary (as for example a commercial bank). The official criteria according to which the CERT is attributed to firms are as follows:

\begin{itemize}
\item Firms have to be listed in the national register of exporters of goods and services;
\item The amount resulting from the exported goods have to be transferred back to Colombia;
\end{itemize}

\textsuperscript{8} The Free Zones provide a special economic environment for export-oriented firms, and financial support in form of credits and guarantees while PROEXPO provides institutionalized business support (mainly marketing and promotional activities).

\textsuperscript{9} Juridical persons were granted a rebate of 40\% of the value of domestic indirect taxes, charges and other levies. Natural persons and limited liability companies were granted 18\% according to the Law 48 (Article 3) in 1983.
− The customs declaration has to be handed in to the Ministry through the National Customs Agency (DIAN);
− The application has to be handed in within six months after the transfer of the amount resulting from exporting has taken place.

While there are, in principle, no limitations to which products are eligible for the CERT, there are a number of exports which are excluded from the use of the CERT. These include: re-export of goods, temporary exports, exports of samples and of products in non-commercial quantities, exports of petroleum and its derivatives, and exports of café.

The Plan Vallejo was established in 1967 and eventually modified in 1985. Under the Plan Vallejo, firms are entitled to import entirely or partially duty-free primary goods and inputs, machinery, intermediate goods, equipment and spare parts with the objective of being used in the production of export goods or in the delivery of services which are directly related to the production of export goods or to an exporting activity. Primary goods and inputs can also be completely exempted from the payment of VAT. Capital goods can be partially or fully exempted from VAT or are granted postponed payment of VAT. The formal requirements to apply for this promotion scheme are very similar to the CERT, including the listing in the National Register of Exporters of Goods and Services.

The MCT has been created in 1983 to stimulate exports of industrial goods to countries to which there is no direct cargo route. In this way, the MCT is intended to help exporters to enter new and so far unexplored markets. The MCT grants exports to such countries the refund of a share of the shipment costs. It has a validity of five years, where the percentage rate of the shipment costs refunded amounts to 26 percent during the first three years and to 13 percent during the last two years.

According to Rodrik (1993), the following criteria for successful support programs can be filtered out from the literature on export support schemes: “[They] apply simple and
uniform rules, rather than selective and differentiated ones; they endow bureaucrats with few
discretionary powers; they contain safeguards against frequent, unpredictable, alterations of
the rules; they keep firms and other organized interest groups at arms’ length from the policy
formulation and the implementation process”. Comparing Colombia’s subsidy schemes
described above to these criteria, leads to the conclusion that few of these criteria were met.

However, according to Rodrik’s own account of the experiences of six developing
countries with export subsidy schemes, the most successful export subsidy schemes were, in
fact, those which, were highly selective and differentiated by firm, subject to frequent
changes, endowed the bureaucrats with discretionary powers and allowed policy makers and
firms to keep in close contact during policy formulation and implementation. On the other
hand, many of the least successful programs fulfilled many of the characteristics stipulated in
the “best-practice” list above. Rodrik claims that the failure of those programs could be
attributed to a large extent to the fact that governments failed to find the right balance
between giving firms the correct incentives to increase exports and at the same time avoiding
abuse of the scheme.

It is, therefore, difficult to say \textit{ex ante} what the impact of the subsidy schemes on
export performance in Colombia would be. The remainder of this paper is dedicated to
answering this question.
4. Data, Sample Selection and a Preliminary Look at the Data

The source of information for this study is the Annual Manufacturing Survey (AMS) from 1981 to 1991 collected by Colombia’s Departamento Administrativo Nacional de Estadística (DANE). AMS data covers all establishments employing ten or more workers. It provides information on 29 manufacturing industries disaggregated by their location across Colombian districts. Among other things, the AMS reports values of production, domestic and foreign sales, imported and domestically purchased intermediate inputs, wage bills by skill category, capital stocks, ownership, taxes and subsidies. Roberts and Tybout (1996) provide a more comprehensive description of the data.

An exploratory first look at the data reveals several patterns regarding the provision of subsidies in Colombia. Graph 1 shows that with the exception of food production (311), each of the export-oriented industries is heavily subsidized – 70 to 80 percent of all exporters receive government assistance. Graphs 2-4 suggest substantial variation in government support received by individual plants: while the median size of subsidies per peso of export sales is around 8-10 percent, it can be as small as 2 and as high as 20 percent, with many firms reporting subsidies amounting to more than a quarter of export sales. While the variation in subsidy amounts can be explained by widely differing export volumes and export intensities of the plants, it is not obvious why plants within the same industry or region would receive different amounts of assistance per peso of export sales.

The increase in the subsidy rates in 1984 and 1985 (Graph 2) is due to a significant change in the composition of government support during these years. Tax rebates and export prefinancing became unimportant, whereas direct subsidies received greater weight (Ocampo

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10 The industries used in this study and their respective ISIC codes are: 311 (food products), 312 (other food products), 321 (textiles), 322 (clothing and apparel), 323 (leather products, excluding clothing and shoes), 324 (leather shoes), 241 (paper), 342 (printing and publishing), 351 (industrial chemicals), 352 (other chemicals), 356 (plastic products), 362 (glass products), 369 (other products of non-metallic minerals), 381 (metal products), 382 (machinery), 383 (electronic machinery and equipment), 384 (transportation equipment), 390 (miscellaneous manufacturing, such as jewelry, musical instruments, sporting goods, etc.).
11 Percentage of exporters receiving subsidies remains fairly stable across years.
and Villar, 1995). Note that it is also during these two years that the subsidy rates exhibited the largest variability.

The large number of outliers is immediately noticeable. Although we clean the data to exclude erroneous observations and extreme outliers, we use a rather relaxed rule to define outliers and choose to keep the information on the plants receiving unusually generous amounts of subsidies relative to their export sales as depicted in Graphs 2-4. The main reason behind this decision are reports on unclear and often discretionary rules to obtain export subsidies in Colombia. We want to know whether such, potentially inappropriate, discretionary handouts from the government affect the recipient’s exporting behavior (and we anticipate the answer to be negative).

A closer look at Graph 4 suggests that location may play a role in whether a plant is likely to obtain a disproportionately high subsidy – Bogota and Medellin seem to have the highest number of “outliers”. Both areas, of course, are the epicenter of economic activity in the country and have the largest number of plants both exporting and non-exporting. The ratio of exporters to non-exporters, or percentage of exporters receiving subsidies, however, does not make these cities stand out from the rest of the country. Considering that Bogota is the capital city of the country and Medellin is the second largest city, very close to Bogota geographically, one may not eliminate the possibility that it is in these cities where the decisions on public funding are of most politicized and discretionary nature.

Since our data set contains only information on direct subsidies linked to plant’s export sales and no information on other types of assistance such as R&D grants that could affect exporting behavior indirectly by improving a plant’s productivity, being an exporter is a pre-requisite for drawing benefits. With this in mind, we choose to focus on the sub-sample

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12 We define an outlier according to the rule “Q1-2*IQR” or “Q3+2*IQR”.
13 There are 41 observations of non-exporting plants receiving export subsidies: 12 of them never become exporters, 1 is a future exporter, 19 are exporting firms temporarily selling only in the domestic market and 9 are
of 549 exporters (plants who report non-zero export sales at least once during the sample period), amounting to the total number of 4490 observations.

There are two channels through which government support may impact exporting behavior. First, subsidies may induce volume adjustments among incumbent exporters. Alternatively, they may induce non-exporters to enter the world market by loosening the financial constraints faced by the firm. Hence, our outcomes of interest are export intensity and exporting decision.

The AMS reports the exact amounts of subsidy receipts which allows us to examine the impact beyond the subsidy receipt incidence. We divide subsidy volumes by total export sales to create a measure of the government assistance per peso of export sales. We then group subsidy rates into four pre-defined categories – small, medium, large and disproportionately large – assuming that these categories may have different impacts on exporting behavior.\(^\text{14}\) The category “disproportionately large” contains 145 observations with the subsidy rates beyond 25 percent. The other three categories are constructed following Görg et al. (2006). To avoid problems associated with small numbers of observations, we consider the entire distribution of export subsidy rates over our sample period and create three equally sized groups by putting together the rates that fall below the 33.3 percentile (small), within the 33.3 to 66.6 percentile (medium) and above the 66.6 percentile (large). In terms of actual amounts, this corresponds to categorizing subsidy rates under 7.2 percent as small, between 7.2 and 11.1 as medium and those above 11.2 percent (but under 25 percent) as large.\(^\text{15}\) Graph 5 shows what these categories represent in terms of peso amounts. Categories

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\(^{14}\) Grouping a continuous variable into discrete categories, although necessary for certain econometric analyses employed in this paper, implies a loss of potentially important information. In Section 6 we report the findings from a specification in which we use the subsidy rate as a continuous variable.

\(^{15}\) We check the robustness of our findings to the use of alternative groupings (Section 6).
“small” and “disproportionately large” correspond in fact to the smallest and very similar amounts and category “medium” represents largest peso amounts.

Table 1 provides summary statistics for each category. Table 2 provides mean and median characteristics of the plants in each category. Plants with smallest subsidy rates appear to be more productive, more capital- and skilled labor intensive, pay higher wages to both skilled and unskilled workers, pay a higher wage premium over the region’s average, and use a higher share of imported raw materials. The plants receiving disproportionately large subsidies are remarkably similar to the plants with large subsidies across all but one characteristic – export intensity. From Graph 6 and 7 it is obvious that the plants with disproportionately high subsidy rates are the ones with the smallest share of exports in total sales. The comparison of subsidy receivers with exporters that do not receive government assistance (either because they did not claim it or they did not receive it for some other reason) indicates a much higher export intensity and labor productivity for the second group.

16 Reversing the argument, we can say that it is plants with the most backward linkages (higher share of domestically purchased inputs) that are receiving more assistance from the government.
5. Empirical Strategy

In this paper we strive to answer the following two questions: (1) whether government support measured as the value of subsidies per peso of export sales induces changes in export intensity, and (2) whether government support affects export participation decisions. Both of these hypotheses can be nested in the same general specification that models future exporting behavior as a function of current government support:

\[ Y_{y+1} = \alpha + \beta_S \text{SMALL}_{y+1} + \beta_M \text{MEDIUM}_{y+1} + \beta_L \text{LARGE}_{y+1} + \beta_V \text{VERYLARGE}_{y+1} \]

\[ + \delta X_{y+1} + \eta_j + \phi_t + \mu_{y+1} \]  

Export intensity (share of exports in total sales) or export incidence (equal to 1 for firms reporting positive export sales and 0 otherwise), depending on specification, for firm i in industry j and year t is regressed on the following broad and sequential measures of government support: SMALL, MEDIUM, LARGE and VERY LARGE. Coefficients on these variables measure incremental returns to attracting government support of various intensity levels compared to receiving no subsidies (the benchmark category is plants with zero subsidies).

All of the right-hand-side variables are lagged one period to alleviate potential reverse causation. Since receiving export subsidies is conditional on exporting, the \( \beta \) coefficients in the specification with the export incidence as the dependent variable would be interpreted as the impact of the subsidies on the decision to remain in the foreign market in the next period. It is also important to note that since all exporters are, in principle, eligible for export subsidies, the \( \beta \) coefficients can be interpreted as the impact of obtaining the subsidy now compared to postponing this decision and exporting without subsidies (it is not clear from the

\[ \text{Unlike R&D or production subsidies that can potentially increase both exports and domestic sales, an export subsidy implies a change in relative prices. An export subsidy increases the price of exports relative to the price of goods produced for the domestic market and, hence, makes exports more attractive relative to domestic sales, implying a reshuffle in priorities rather than a pure increase in volumes.} \]
data or available institutional details whether some exporting firms simply do not apply for or are not granted government support).

We expect $\beta$ coefficients to be positive and significant on all but the “very large” categories. That is, we speculate that disproportionately large subsidy rates are the result of nepotistic connections between firms and authorities in charge of allocation of subsidies and, hence, ineffective. For reasons discussed in earlier sections, we are also cautious to make predictions regarding the relative magnitude of the other coefficients. One may, of course, hypothesize that larger government assistance should induce larger changes in plants’ exporting behavior, which would suggest an increasing magnitude of the coefficients: $\beta_S < \beta_M < \beta_L$. However, in case larger subsidies are indicative of some tampering of the allocation rules or direct fraud, we cannot make such expectations.

We draw on the extensive literature on firms’ export decision to select our controls. $X_{ijt}$ is a vector of variables that have been suggested as potentially important determinants of exporting behavior and includes measures of plant’s size (logarithm of employment and logarithm of total sales), firm age, skill intensity (the ratio of the number of white collar workers, managers, and technicians to the total number of workers), capital per worker, labor productivity (real output per worker), wage premium (the ratio of the plant’s average wage in a given year to the average wage paid that year in the region where the plant is located), share of imported raw materials, market share (firm’s sales as a percentage of total industry’s sales), as well as ownership structure (proprietorship, limited partnership, collective, corporation, joint partnership, joint stock company, cooperative), location (eight metropolitan areas and “the rest of the country”), industry and year fixed effects.

Our empirical strategy is guided by several methodological and practical considerations. First, we are concerned that exporters that apply for and/or obtain subsidies may be substantially different, both in observable and unobservable characteristics, from the exporters that do not. Secondly, exporting behavior is highly persistent and a lagged
dependent variable belongs on the right hand side of equation (1). Thirdly, the dependent variable in one of the specifications is binary (export incidence) and the use of fixed effects, the most common solution to the problem of unobserved heterogeneity, and inclusion of the lagged dependent variable are not trivial in a non-linear context. In what follows, we discuss each of the aforementioned issues and describe in detail how we deal with each one of them.

First of all, the estimates in specification (1) will be biased if there are other factors that affect both the subsidy receipts and the exporting behavior of a plant. A somewhat extreme example of such unobservable factor would be “dishonesty” or “propensity to bend the rules” of the firm’s manager, whereby a manager who is willing to set up a fictive factory for exports may also be the one nurturing relationships with government officials and likely to obtain subsidies. To the extent that these factors are time-invariant, they can be purged by simply first differencing equation (1) or introducing fixed plant effects, $\xi_i$. Plant fixed effects $\xi_i$ remove from the estimation equation the influence of any unobserved plant-specific effects, as well as any time invariant explanatory variables, such as industry or location dummies.

Secondly, exporting behavior is highly persistent (Giovannetti and Hossein, 1995, Bernard and Jensen, 2004, Roberts and Tybout, 1997). Plants that export today are more likely to export tomorrow. Similar persistence is observed in export volumes and export intensity. This calls for a lagged dependent variable on the right-hand-side of equation (1). The problem arising from the inclusion of the lagged dependent variable stems from the fact that the dependent variable is a function of the error term $\mu_{ijt}$, and the lagged dependent variable will also be a function of $\mu_{ijt}$ thereby rendering OLS biased and inconsistent (the consistency of the Fixed Effects estimator depends on the number of periods being large). Judson and Owen (1996), however, provide reassuring evidence that the bias on the coefficients other than that on the lagged dependent variable may be small for the Fixed
Effects estimator. Hence, Fixed Effect estimates on our variables of interest will still be informative and we choose to report them.

The Fixed Effects estimates suffer nevertheless from the fact that they do not take into account the endogeneity of the lagged dependent variable. We therefore estimate the model with a generalized method of moments (GMM) estimator, based on Arellano and Bond (1991). The GMM estimator takes into account the endogeneity of the lagged dependent variable and, in addition, accounts for the possibility that the explanatory variables are partially endogenous (endogenous to the past and current values of the dependent variables, but not to the future values). This may be particularly important in our setting where a subsidy size is likely to depend on the past and current exporting behavior (after all, the receipt of a subsidy is conditional on being an exporter and its size may very well depend on the export volumes or export intensity, depending on whether the government aims to reward established and large exporters or motivate smaller exporters to sell more in foreign markets).

Instead of employing Arellano and Bond’s difference GMM estimator, which uses first-differences rather than levels for the estimation, we opt for the system GMM estimator which augments the Arellano-Bond technique with levels information (Arellano and Bover, 1995, Blundell and Bond, 1998). The system GMM estimator uses lagged differences to instrument the current levels of the endogenous regressors and lagged levels to instrument for current differences. This estimator has the advantage of purging all plant-level effects through the use of first differences and allows to instrument for all potentially endogenous right-hand-side variables and can be assumed to possess superior finite sample properties through the additional moment conditions. The validity of this approach relies crucially on the assumption that the lagged differences of the explanatory variables are uncorrelated with the residuals (Roodman, 2006). We test the validity of the additional instruments through a Difference Sargan comparison between the difference GMM and system GMM estimators as proposed by Bond et al. (2001) and do not reject the null hypothesis of validity. To increase
efficiency, we use the two-step estimator and employ the small sample correction proposed by Windmeijer (2005).\textsuperscript{18}

The specification with the decision to export as the dependent variable deserves special attention. It is fairly straightforward to find a non-linear alternative to the OLS specification analyzing the impact of the subsidy size on export intensity. One can use either Logit, which has an advantage of having been developed to incorporate fixed effects (but not the lagged dependent variable), or Probit, which has been developed to incorporate a lagged dependent variable (with random rather than fixed effects). Revealing upfront that we use Logit as our preferred specification, even when it implies discounting the issue of persistence in exporting behavior, we explain below the grounds for this decision.

The first practical limitation is the computational difficulties of estimating the Fixed Effects Probit. It is true that, in the linear-regression case, one can estimate Fixed Effects models by including plant level dummies, but that is a unique feature of the linear regression estimator that does not carry over to non-linear estimators. The statistical problem is that, as the number of groups tends to infinity, the number of estimated parameters increases at the same rate and this renders coefficients inconsistent. This problem could be overcome if we had a “large” number of observations per group. Statisticians at Stata attempted a number of simulations to analyse how serious coefficients and standard errors are biased if the theoretical arguments are ignored and dummy variables rather than fixed effects are included (Wiggins, 2003). The bias was found to be extremely high and insensitive to the addition of new groups. Only increasing the number of observations per group to 50 could generate satisfactory results. Given that the average number of periods for which a plant in our study appears in the panel is 7.2 and the large number of plants (549) does not mitigate the bias, we

\textsuperscript{18} We used xtabond2 procedure in Stata for the estimation and tests (Roodman, 2005).
cannot anticipate sensible results from a Probit specification including dummy variables for plants.

Similarly, the GMM estimator is inappropriate for the case, when the dependent variable is binary. Among the practical limitations of these estimators is that although they provide estimators of the primary slope parameters, they usually do not provide estimators for the full set of model parameters and thus preclude computation of marginal effects, probabilities or predictions for the dependent variable. Indeed, some estimation techniques which estimate only the slope parameters and only “up to scale” provide essentially only information about signs of coefficients and classical (“yes or no”) statistical significance of variables in the model (Greene, 2004).

One can, of course, capture plant heterogeneity in the standard Probit model by introducing Random Effects. The main advantage of this method is that it has been developed for the situations in which the outcome probability is dependent on the outcome in the previous time period, a serious concern in the context of this study. Stewart (2006) illustrates the use of the Maximum Simulated Likelihood estimator for the Random Effects Dynamic Probit model with autocorrelated errors. Choosing a Random Effects specification would thus allow us to see how the coefficients from the standard Probit change as we account, step-by-step, for the unobserved plant heterogeneity and the persistence in exporting behavior.

There are two important controversies regarding the use of the Random Effects estimator. The first is the underlying assumption of the Random Effects model that the unobserved firm-specific effects are independent of (and not simply uncorrelated with) the

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19 Honoré and Kyriazidou (2000) develop a semiparametric procedure to estimate the parameters in the unobserved effects logit model with a lagged dependent variable. Apart from computational difficulties and a very strong assumption of strictly exogenous explanatory variables, this approach rules out discrete explanatory variables such as time dummies (an important factor in the context of our analysis given a changing structure of subsidy schemes) and, more importantly, the categories of subsidies (the main variables of interest in this analysis).
observed independent variables. This is a very strong assumption and will most likely be violated in the context of this study as firm characteristics are apt to be correlated with managerial ability, product attributes and other unobserved factors.

From the practical point of view, the use of Random Effects (especially the Random Effects Dynamic Probit with autocorrelated errors\(^{20}\)) is problematic in the unbalanced panel setting. Typically, unbalanced panels are dealt with either by performing estimation on a balanced sub-panel or on the averages of the data. The use of the latter is discouraged since it eliminates dynamics in the model. The first method is also problematic, since the firms’ entry and exit is most probably not random and this generates a concern about the sample selection. The most straightforward test for selection is to include the lead of the selection indicator as an additional regressor and test for its significance. If, conditioning on the other regressors, the lead variable is not significant in explaining exporting behavior, we may conclude that selection is ignorable and we may conduct the analysis on a sub-panel of the data. We conduct this test and find the coefficient on the lead variable to be significant at five percent level.

In the light of the aforementioned difficulties, we accept the potentially biased coefficients in the specification of Fixed Effects Logit with a lagged dependent variable as a palatable risk when compared to the most likely mis-specified Random Effects Probit, especially if its dynamic specification is to be conducted only on a sub-panel of 271 plants that we observe for eleven periods. Although we report the coefficients from the Probit regressions, we advise the reader to keep in mind potential biases in these specifications and consider patterns (that are largely supporting the findings from the Logit) rather than exact magnitudes.

\(^{20}\)The canned Stata procedure (redpace) for this estimation can be used exclusively on a balanced panel.
6. Results

An exploratory first look at the data allows us to gather a general idea of the different exporting behavior patterns that plants in the various subsidy categories follow. The results are grouped by the dependent variable: Table 3 for export intensity and Table 4 for the 0-1 variable describing the incidence of exporting. Ignoring potential misspecification, the first column of Tables 3 and 4 reports a positive impact of subsidies on plant’s exporting behavior: receiving subsidies, regardless of their size, induces plants to increase their export intensity and improves their chances of exporting in the next period. An important feature of the first column in both tables is the negative relationship between the subsidy rate and the size of the induced changes – the impact decreases with each subsequent category and the decrease is particularly large for the disproportionately large subsidy rates. Let us look at the incidence of exporting. The coefficients in the Logit regressions are stated in terms of odds ratios, which means that the odds of a firm with a subsidy of 1.2 to 7.2 percent exporting in the next period are 30 times higher than those of a firm without a subsidy. The odds of a firm with a disproportionately large subsidy exporting are only 10 times higher than those of a firm without a subsidy.

After this crude benchmark analysis, we introduce plant fixed effects to control for unobservable time-invariant plant characteristics that may be affecting plants’ exporting behavior, as well as the size of the subsidy that they receive. The fixed effects estimates reported in column 2 suggest that the bias associated with the omission of the unobserved plant effects in the OLS and Logit regression may be substantial. The magnitude of the coefficients has decreased dramatically, although the decreasing pattern of returns to the subsidy of various size has been preserved. Once again, it is the smallest subsidy rate that generates the biggest impact. Firms with a smaller subsidy increase their export intensity by 5 percentage points, while those with a large subsidy only by 3. The pattern is particularly strong for the incidence of exporting: the odds of a firm with a small subsidy exporting in the
next period are four times the odds of a non-subsidized firm, however, the odds of a firm with disproportionately large subsidy of exporting are exactly the same as those of a firm with no subsidies.

Note that the Fixed Effects Logit is conducted on a much smaller sample of the data. This is due to the fact that some plants export consistently, that is the dependent variable never changes from one period to the next (since we do not have “permanent non-exporters” in our sample, the dependent variable is always equal to one). To ensure that the results in Table 4 are not driven by sample selection, we repeat the analysis with the export intensity as the dependent variable on the same sub-sample and report the findings in the last column of Table 3.

Exporting behavior is known for its persistence. Due to the substantial sunk costs associated with entry into foreign markets, the plants with temporarily low or even negative profits abroad postpone their decision to exit the market. To account for such persistence, we include the lagged dependent variable on the right-hand-side of our estimating equations. The persistence of exporting behavior is clearly present in our data – the coefficients on the lagged dependent variable are large in magnitude and highly significant. The diminishing magnitude of the coefficients in the Logit specification is still present. What has changed from the previous specification is the sometimes small, but still positive impact of all subsidies on exporting. Once the persistence is taken into account, we see that the odds of a firm with subsidies above 11.2 percent exporting in the next period are no different from those of a firm without subsidies (as indicated by a statistically insignificant coefficients on the “large” category). However, the odds of a firm with a disproportionately large subsidy remaining in the market are not even a half of the odds of a non-subsidized firm. Not only do the disproportionately large subsidies not affect the incidence of exporting, but they seem to have a significant negative effect. There are two plausible explanations for this pattern. The first one would go well with the story of a firm starting fictive exports only to obtain access to the
public funds and stopping exporting afterwards. A more harmless explanation is based on an observation that the firms receiving disproportionately large subsidies are also the ones with the smallest export intensity, i.e. the firms that are not really committed to the foreign markets. It is possible that they simply fail to succeed there.

In column 4 of Table 3 we report the coefficients from the GMM specification. Recall that Fixed Effects estimator provides biased estimates on the lagged dependent variable. The bias on the other coefficients in the model should be smaller. Indeed, the coefficient on the lagged dependent variable in the GMM specification is twice the size of the coefficient in column 3, while the coefficients on the other variables are nearly unchanged. It is still the smallest subsidy that has a positive and statistically significant effect on export intensity. While we do not claim that the nearly unchanged coefficients on the variables other than the lagged dependent variable imply that we should expect a similarly small bias on the coefficients on the subsidy categories in the Logit specification in Column 3 of Table 4, we view it as an encouraging sign.

For comparison, in column 6 of Table 4 we report the coefficients from the Random Effects Dynamic Probit. The coefficients in the second panel of Table 4 are restated as marginal effects and can be interpreted as the change in the probability of exporting in the next period for the firms obtaining a small, medium, large or very large subsidy. Thus, the chances of exporting next year are 70 percent higher for a firm obtaining a subsidy of 1.2-7.2 percent than for a non-subsidized firm. We recall the reader to bear in mind the problems with the Probit specification discussed in the previous section, and discourage to place confidence in the magnitudes. Rather, we would like to emphasize that the overall pattern of the decreasing coefficients across the different subsidy sizes has been preserved and, once again, the plants receiving disproportionately high subsidies are no more likely to export tomorrow than the plants receiving no government assistance. The effect of smaller subsidies is positive and highly significant, with the smallest subsidies exerting the most impact.
Overall, stronger results for the decision to export than for export intensity, especially for larger subsidies, can be easily reconciled with a situation in which a firm starts exporting only to obtain access to the public funds and does not attempt to further improve its export performance.

The coefficients on other explanatory variables, although not reported in this paper due to the space concerns, deserve a brief discussion. The factor with the largest impact on exporting behavior is the share of imported raw materials. The choice of imported raw materials over domestic may, however, be reflective of anticipated changes in exporting behavior. Leather goods producers, for example, report that in anticipation of entering the foreign market or at the request from existing buyers, they buy leather from abroad because of its higher quality (Berry and Escandon, 1994). An additional and more likely explanation, however, may lie in the fact that Colombian exporters had access to duty free imported raw materials (Plan Vallejo), an option not available to non-exporters. It is worth noting that the coefficients on the control variables are often insignificant – while exporters are indeed larger, more skilled labor and capital intensive, pay higher wages and possess other characteristics of “better” firms, once we limit our sample to exporters and, especially, introduce plant fixed effects, most of these factors become insignificant in determining plant-level export supply.

We have experimented with alternative groupings of the subsidy rates, changing the limits on the “disproportionately large category” to 20 (or one fifth of the export sales) or 30 percent. This does not change the conclusions of our analysis. More generally, one may dispute the appropriateness of grouping a continuous variable into discrete categories. We repeat our analysis with linear and square terms for the subsidy rates on the right-hand-side of the estimating equation. The coefficients are always positive on the linear and always negative on the square terms. The impact on the export intensity of both terms is statistically insignificant (most likely, the presence of outliers, which we intentionally keep for the analysis, renders the coefficients insignificant and scaling the variable by taking a natural
logarithm of the subsidy rate does not resolve this problem). The coefficients from the non-linear regressions are statistically significant (both at 1 percent level), indicating positive but diminishing returns to the subsidy size.

Overall, our analysis confirms the difficulty, articulated in the literature on export subsidies, to establish a consistent significant positive effect of subsidies on export intensity. Yet, one robust finding of our paper is that relatively small subsidies are required to generate a desirable change in exporting behavior. Increasing subsidies beyond 7.2 percent of export sales does not induce exporters to sell a greater share of their products abroad and reduces the incentives to remain in the foreign market. Provision of subsidies amounting to more than a quarter of the export sales is, based on our findings, unjustifiable. Even if the loss of significance in the coefficient on VERY LARGE is due to a smaller number of observations in this category, the magnitude of the impact on the decision to export has decreased nearly five-fold compared to the subsidies of 1.2-7.2 percent in the Fixed Effects Logit with Dependent Variable and Dynamic Probit specification. As shown in Graph 5, these subsidies correspond to nearly the same peso amounts, which implies that these funds could be put to better use when targeted to a different group of plants.
7. **Conclusions**

This paper attempts to use political economy arguments to explain the discrepancy between the positive impact of subsidies on export performance predicted by theory and anticipated by governments and the disappointing outcomes observed in practice. We believe that an important explanation for this discrepancy lies in the process through which subsidies are allocated – the discretionary powers of the officials allocating subsidies leave the system open to abuse. Drawing on the experiences in other developing countries and on descriptive accounts of the allocation of public funds in Colombia, we regard disproportionately high subsidy rates as a proxy for the firm’s ties to the government officials and believe that the money may be co-opted for non-productive use. As such, they are unlikely to generate significant impact on the firm’s exporting behavior.

Controlling for unobservable plant characteristics and persistence in exporting behavior, we test the hypothesized link between export subsidies and export behavior using plant-level data and show that small is beautiful when it comes to export subsidies, at least in a country with a limited capacity to monitor the disbursements of funds and their intended uses. We find that although export subsidies induce plants to increase their export intensity and to participate in foreign markets, it is the smallest subsidies (representing 1.2 to 7.2 percent of export sales) that generate the largest impact. Plants receiving such subsidies increase their export intensity by 3.5 percentage points compared to the plants without government assistance and are much more likely to remain in the export markets. The impact of the disproportionately large subsidies is nil or negative, depending on specification, which we cautiously interpret as a sign of misuse of government resources. We believe that the lack of persuasive evidence on the effectiveness of export subsidies in developing countries may, in part, be explained by the fact that industry- or country-level studies disregard such potential misuse of resources.
References


Piñeros Espinosa Adriana and Calderon Villegas Ana Maria (2000): "Los Incentivos a las Exportaciones en Colombia Frente a los Compromisos Asumidos ante la OMC", Pontificia Universidad Javeriana, Bogotá D.C.


Graph 1: A box plot of export subsidy rates by 3-digit SIC industry with outliers identified as blobs

Graph 2: A box plot of export subsidy rates by year with outliers identified as blobs
Graph 3: A box plot of export subsidy rates by metropolital area with outliers identified as blobs.

Export Subsidy Rates in Colombian Manufacturing by Metropolitan Area

Graph 4

Distribution of Government Assistance (1 for receivers, 0 otherwise) Across Exporters by Industry

Graphs by newsic3
**Graph 5**

Subsidy Amounts by the Category of Subsidy Receipts  
(Small, Medium, Large, Disproportionately Large)

**Graph 6**

Share of Exports in Total Sales  
by the Category of Subsidy Receipts  
(Small, Medium, Large, Disproportionately Large)
Graph 7

Export Sales by the Category of Subsidy Receipts
(Small, Medium, Large, Disproportionately Large)

excludes outside values
Table 1: Summary Statistics for Subsidy Rate Categories

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<th>Mean</th>
<th>Std Dev</th>
<th>Min</th>
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<th>P25</th>
<th>Median</th>
<th>P50</th>
<th>P90</th>
<th>Max</th>
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Table 2: Plant characteristics (mean, standard deviation and median) by Subsidy Category

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<th>Subsidies</th>
<th>Labor Productivity</th>
<th>Log(Total Labor)</th>
<th>Age</th>
<th>Skill Intensity</th>
<th>Capital per Worker</th>
<th>Skilled Worker Wage</th>
<th>Unskilled Worker Wage</th>
<th>Wage Premium</th>
<th>Market Share</th>
<th>Share of Imported Materials</th>
<th>Export Intensity</th>
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<td></td>
<td>3989</td>
<td>8.32</td>
<td>4.79</td>
<td>21.00</td>
<td>0.27</td>
<td>520</td>
<td>1024</td>
<td>574</td>
<td>1.32</td>
<td>0.68</td>
<td>0.14</td>
</tr>
<tr>
<td>Exporters without Subsidies</td>
<td>9.19</td>
<td>4.18</td>
<td>22.72</td>
<td>0.33</td>
<td>1200</td>
<td>1371</td>
<td>759</td>
<td>1.45</td>
<td>0.82</td>
<td>1.44</td>
<td>0.28</td>
</tr>
<tr>
<td></td>
<td>1.57</td>
<td>1.23</td>
<td>13.67</td>
<td>0.21</td>
<td>2048</td>
<td>1442</td>
<td>936</td>
<td>0.94</td>
<td>1.44</td>
<td>1.44</td>
<td>0.28</td>
</tr>
<tr>
<td></td>
<td>8.82</td>
<td>4.29</td>
<td>22.00</td>
<td>0.31</td>
<td>595</td>
<td>828</td>
<td>445</td>
<td>1.19</td>
<td>0.35</td>
<td>0.00</td>
<td>0.25</td>
</tr>
</tbody>
</table>
Table 3: The Effect of Subsidies on Exporting Intensity

<table>
<thead>
<tr>
<th></th>
<th>Exports/Total Sales, $i_{jt+1}$</th>
<th>OLS</th>
<th>FE</th>
<th>FE with lagged Dep. Var.</th>
<th>GMM</th>
<th>GMM on subsample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>OLS</td>
<td>FE</td>
<td>Var.</td>
<td>GMM</td>
<td></td>
</tr>
<tr>
<td>Lagged Dependent Variable</td>
<td>0.433***</td>
<td>0.848***</td>
<td>0.783***</td>
<td>[0.016]</td>
<td>[0.056]</td>
<td>0.058</td>
</tr>
<tr>
<td>Lagged(2) Dependent Variable</td>
<td>-0.015</td>
<td>-0.093*</td>
<td>[0.048]</td>
<td>0.054</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SMALL: 1.2 – 7.2%</td>
<td>0.150***</td>
<td>0.055***</td>
<td>0.013*</td>
<td>0.035**</td>
<td>0.047***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[0.017]</td>
<td>[0.008]</td>
<td>[0.008]</td>
<td>[0.018]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MEDIUM: 7.2 – 11.2%</td>
<td>0.147***</td>
<td>0.050***</td>
<td>0.006</td>
<td>0.005</td>
<td>-0.012</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[0.018]</td>
<td>[0.008]</td>
<td>[0.008]</td>
<td>[0.013]</td>
<td>0.015</td>
<td></td>
</tr>
<tr>
<td>LARGE: 11.2 – 25%</td>
<td>0.139***</td>
<td>0.039***</td>
<td>0.005</td>
<td>0.002</td>
<td>-0.034</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[0.018]</td>
<td>[0.008]</td>
<td>[0.007]</td>
<td>[0.016]</td>
<td>0.022</td>
<td></td>
</tr>
<tr>
<td>VERY LARGE: above 25%</td>
<td>0.100***</td>
<td>0.031**</td>
<td>0.013</td>
<td>0.041</td>
<td>-0.042</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[0.025]</td>
<td>[0.013]</td>
<td>[0.012]</td>
<td>[0.031]</td>
<td>0.035</td>
<td></td>
</tr>
<tr>
<td>Arrelano-Bond Test for AR(1)</td>
<td>0.000</td>
<td>0.000</td>
<td>0.937</td>
<td>0.567</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arrelano-Bond Test for AR(2)</td>
<td></td>
<td>0.998</td>
<td>0.999</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sargan Test for the Validity of Instruments</td>
<td>0.998</td>
<td>0.999</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>3933</td>
<td>3933</td>
<td>3933</td>
<td>3370</td>
<td>1617</td>
<td></td>
</tr>
<tr>
<td>R-squared</td>
<td>0.39</td>
<td>0.09</td>
<td>0.63</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. Other controls include logarithm of employment, logarithm of total sales, age, skill intensity, capital per worker, labor productivity, wage premium over the region’s average, share of imported raw materials, market share (firm’s sales as a percentage of total industry’s sales), as well as ownership structure, location, industry and year fixed effects. Column 5 reports the findings from the GMM analysis conducted on a sub-sample of the plants used in the logistic analysis. The coefficients are to be interpreted as percentage point changes in export intensity resulting from a subsidy of particular size as compared to receiving no subsidies.
Table 4: The Effect of Export Subsidies on the Incidence of Exports

<table>
<thead>
<tr>
<th></th>
<th>Exporting (0 - no, 1 - yes)_{ijt+1}</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Logit</td>
</tr>
<tr>
<td>Lagged Dependent Variable</td>
<td></td>
</tr>
<tr>
<td>Lagged(2) Dependent Variable</td>
<td></td>
</tr>
<tr>
<td>SMALL: 1.2 – 7.2%</td>
<td>30.688***</td>
</tr>
<tr>
<td></td>
<td>6.193</td>
</tr>
<tr>
<td>MEDIUM: 7.2 – 11.2%</td>
<td>22.845***</td>
</tr>
<tr>
<td></td>
<td>4.051</td>
</tr>
<tr>
<td>LARGE: 11.2 – 25%</td>
<td>17.335***</td>
</tr>
<tr>
<td></td>
<td>2.675</td>
</tr>
<tr>
<td>VERY LARGE: above 25%</td>
<td>10.936***</td>
</tr>
<tr>
<td></td>
<td>3.181</td>
</tr>
<tr>
<td>Observations</td>
<td>3933</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.40</td>
</tr>
</tbody>
</table>

Note: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. Other controls include logarithm of employment, logarithm of total sales, age, skill intensity, capital per worker, labor productivity, wage premium over the region’s average, share of imported raw materials, and market share (firm’s sales as a percentage of total industry’s sales). Coefficients in Logit regressions are restated as odds ratios. For example, the odds of exporting in the next period of a recipient of a small subsidy are twice the odds of exporting of a non-subsidized firm; the odds of exporting of a recipient of a disproportionately large subsidies are less than the half of the odds of exporting of a non-subsidized firm. Coefficients in Probit regressions are restated as marginal effects. Receiving a small subsidy increases the chances of exporting by 70 percent, while receiving a disproportionately large subsidy is no different from not being subsidized.