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## Evidence from the Colombian National Guarantee Fund

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# Partial Credit Guarantees and Firm Performance: Evidence from the Colombian National Guarantee Fund<sup>1</sup>

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## Abstract

This paper studies the effect of government-backed partial credit guarantees on firms' performance. These guarantees are automatically granted to firms without enough collateral in order to lift their credit constraints. We put together a panel, covering the period 1997-2007, that combines data from DANE's Annual Manufacturing Survey; DIAN's export and import information; and firm-level records from the National Guarantee Fund (NGF), the government agency in charge of implementing this policy. Using propensity score matching and difference-in-differences, we found that firms that gain access to credit backed by the NGF are able to grow in terms of both output and employment. However, we did not find any effect on productivity, wages, or investment. These results suggest that firms use the new funds as working capital to grow their businesses rather than for investment in new durable goods that increase their capital stock.

**JEL Classification:** H43, L25, O12, O54

**Keywords:** Partial credit guarantee, access to credit, firm growth, job creation, productivity

## 1. Introduction

Given that debt contracts entail the exchange of cash today for the promise of payment in the future, the functioning of credit markets depends crucially on whether that promise can be enforced even when payment does not occur voluntarily. One way credit markets have to enforce payment is through the use of collateral: by requiring the borrower to pledge a specific asset as guarantee for the loan, the creditor increases the cost of default for the borrower and affects the moral hazard problem faced by the borrower when

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dealing with a creditor. While in an unsecured loan the loss is limited by the borrower's equity, in a secured loan the loss also includes the asset pledged as collateral. By reallocating part of the loss from the creditor to the borrower, the creditor also reduces the borrower's incentive to take excessive risk.

For the creditor to have incentives to enter into debt contracts, the legal system needs to be efficient and any guarantee or collateral pledged for a loan should be settled quickly and at a low cost in the event of a default. Problems associated with procedures for the liquidation of assets used as collateral, limitations in the type of assets that can be used as collateral, inefficiencies of property registries and the judiciary system, and uncertainty about property rights of these assets hinder access to credit. According to Beck et al. (2008), small firms use less bank finance but they also benefit the most from better protection of property rights and financial intermediary development.

Small and Medium Enterprises (SMEs) are particularly vulnerable to the lack of access to credit because: (i) SMEs are less likely to survive since the probability of firm survival increases with firm size and firm age (Evans 1987), which makes SMEs inherently riskier investments; (ii) SMEs face proportionally greater scrutiny and proportionally larger appraisal and monitoring costs for each dollar borrowed; and (iii) SMEs are also proportionally more expensive to deal with in the event of a default since the expenses associated with a liquidation procedure—for instance, court and attorney fees—are independent of the amount borrowed. Moreover, SMEs often lack sufficient assets to pledge as collateral. According to data from the World Bank's Enterprise Survey standardized dataset, while only 2.9% of large firms did not apply for a line of credit or loan because of unattainable collateral requirements, 14.1% of medium firms and 83.1% of small firms did not apply because of the same reason.<sup>5</sup>

The rationale for targeted assistance to SMEs is that this group represents a very large percentage of firms, generates most of the jobs and a large percentage of the private sector payroll, and is disproportionately affected by market failures. Given that access to finance is identified as one of the greatest obstacles for the operation and growth of businesses, especially for SMEs, policies directed to efficiently lifting credit constraints for this group would consequently have a direct impact on its growth and on the growth of the economy as a whole.<sup>6,7</sup> Another indirect channel through which access to credit might lead to aggregate growth is by generating long-run gains in aggregate productivity. By lifting constraints on small firms, the pace of entry of new firms, growth of young ones, and exit of unprofitable firms increases leading to a continuous process of resource

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<sup>5</sup> The survey defines large firms as firms with 100 employees or more, medium firms as firms with 20 employees or more but less than 100 employees, and small firms as firms with 5 employees or more but less than 20 employees.

<sup>6</sup> See World Bank's Enterprise Surveys.

<sup>7</sup> King and Levine (1993); Rajan and Zingales (1998); Demirgüç-Kunt and Maksimovic (1998); Jayaratne and Strahan (1996) find that the level of financial intermediation development has a large causal impact on real per capita GDP growth. Beck, Levine, and Loayza (1999) find "an economically large and statistically significant relationship between financial intermediation development and both real per capita GDP growth and total factor productivity growth." Although the link between access to finance and growth seems to be a settled matter in the economic literature, the channel through which access to finance leads to growth is still the subject of debate.

allocation that generates gains in aggregate productivity via the Schumpeterian “creative destruction” process.<sup>8</sup>

Government-backed partial credit guarantees are one of the mechanisms devised to increase access to credit. By acting as guarantor of a fraction of the loan, the government is able to lift the credit constraint of SMEs that otherwise would have been unable to access the credit market. By outsourcing the origination and servicing of loans to for-profit intermediaries, the government increases the efficiency of the operation and by guaranteeing the loan only partially it assures that the lender retains some risk so it has an incentive to conduct an accurate credit appraisal (see Honohan 2010).<sup>9</sup> This intervention offers advantages over direct government lending and has been widely used by OECD countries after the 2008 credit crunch (see OECD 2009).

In this paper, we use firm-level data to evaluate the impact of the partial credit guarantee government program in place in Colombia on the performance of firms that received the program. Applying propensity score matching and difference-in-differences, we find that credit facilitation through the National Guarantee Fund (NGF) has had a positive impact on firms’ growth—measured by output and employment. We do not find any impact on investment, productivity, or wages. Our results suggest that firms use the new funds as working capital to grow their businesses rather than as a source for investment in new durable goods that increases their capital stock.

The paper is organized as follows. Section 2 describes the National Guarantee Fund, the government agency in charge of implementing the partial credit guarantee program. Section 3 describes the dataset and presents the model used for the estimation. Section 4 presents the results and Section 5 concludes and discusses policy recommendations.

## **2. The National Guarantee Fund**

The main objective of the NGF is to facilitate access to credit for Micro, Small, and Medium Enterprises (MSMEs) through the use of guarantees. Although the NGF was created in 1981, it was not until the 2000s that the number of beneficiaries and the amount of the guarantees became significant. The number of beneficiaries went from 8,394 in 1999 to 23,131 in 2000; 50,849 in 2003; and 113,375 in 2008, and the amount of credit facilitated by the NGF grew from US\$591 million in 2003 to US\$2578 million in 2008, at an annual average rate of 34% over this five-year period.<sup>10</sup> Growth in the portfolio coincided with recognition of the guarantees by the Superintendence of Banks in 1999 and with strong financial support given to the fund in 2000, which more than tripled its capital. With the recognition of the Superintendence, banks were no longer required to make provisions for the whole loans guaranteed by the fund, freeing resources

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<sup>8</sup> See, for example, Bartelsman and Doms (2000) and Foster, Haltiwanger, and Krizan (2001) for a literature review.

<sup>9</sup> Whether the guarantor does any credit appraisal, the proportion of the credit that is guaranteed---if the scheme guarantees individual loans rather than portfolios---and the categories of eligible borrowers are design dimensions that, together with the pricing, affect the operation of the scheme and its effectiveness in affecting the availability of credit.

<sup>10</sup> Values in 2008 pesos converted to dollars at the average 2008 exchange rate of 1966.26 pesos per dollar.

for intermediation.<sup>11</sup> Banks consider that the additionality of the fund is in access to credit itself: the mechanism helps provide credit to entrepreneurs that without the fund guarantee would have been unable to obtain the loan for lack of collateral (Llisterri et al. 2006).

Guarantees offered by the fund correspond to credit aimed at Colombian MSMEs and are intended for working capital, investment, research and development, and business creation. All sectors of the economy are eligible except for the agricultural sector, which is served by another institution. In addition to these loans that are guaranteed individually and mostly automatically, the fund also guarantees the portfolio of microfinance institutions.<sup>12</sup> More than 95% of the guarantees are approved automatically and do not require any appraisal from the part of the fund;<sup>13</sup> however, the partial coverage of the guarantees—on average 48% in 2008—generates incentives for the banks to conduct accurate credit appraisals. In fact, once the NGF adopted the practice of outsourcing origination and servicing of loans to banks in 1995, the default rates decreased from nearly 20% in 1996 to 4.2% in 2008.

The fund does not set limits to the number of times an entrepreneur can use the guarantees; however, it does not allow a credit to have additional guarantees from other institutions. Moreover, one debtor may have several NGF guarantees simultaneously provided that the total debt does not exceed the limit set by the NGF to ensure the same debtor.

In the event of default, the bank has to bring an action for recovery before a court. After filing the complaint, the bank may file a claim for payment of the guarantee before the NGF, accelerating the recovery process. Once the fraction of the loan that is guaranteed is paid to the bank, the NGF subrogates against the borrower into the legal process of recovery. All costs and recoveries from this process are shared between the bank and the NGF. Whenever the estimated cost of the recovery process exceeds the expected value of the collateral collected, the NGF abandons the subrogation process in order to free financial institutions from having to proceed before a court, given that the procedure is not cost-effective. Although Colombia has one of the most efficient debt enforcement proceedings in Latin America, the World Bank estimates that a lender could recover only 52.8 cents on the dollar on a defaulted loan when taking into account the cost of enforcing contracts—court fees and fees on insolvency practitioners, independent assessors, lawyers and accountants—and the loss in value due to the time spent on the enforcement proceedings, which in Colombia totals about 3 years.<sup>14</sup>

Data from the Superintendence of Banks and the NGF indicate that commercial credit and microcredit guaranteed by the fund increased from 1.4% of the total commercial and

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<sup>11</sup> The provision required depends on the credit rating and the number of days in arrears.

<sup>12</sup> The rest of the guarantees go to credit for social housing and student loans.

<sup>13</sup> The NGF automatically grants partial 50% coverage for loans of up to US\$264,462. It grants partial 70% coverage for special Bancóldex credit lines of up to US\$300,000.

<sup>14</sup> These estimations, reported annually by the World Bank's publication *Doing Business*, are based on fictitious standardized cases solved by local practitioners and verified through a study of laws and regulations as well as public information on bankruptcy systems.

microcredit portfolio in December 2001 to 6.1% in December 2008.<sup>15</sup> Table 1 summarizes the activity of the NGF between 2003 and 2008, the period for which firm level data are available.

**Table 1: The NGF activity in the period 2003-2007**

	Beneficiaries	Credit (in USD million)	Average loan size (in USD)	Average coverage (%)	Average repayment period (months)
2003	50,849	591	11,623	53.0	29.7
2004	82,383	1,014	12,308	54.5	30.1
2005	103,935	1,373	13,210	52.4	35.3
2006	117,968	1,841	15,606	49.9	39.6
2007	122,284	2,104	17,206	49.8	36.1

Source: National Guarantee Fund and authors' calculations.

### 3. Empirical Strategy

#### Data

We merge three firm-level datasets. Our primary dataset is the Annual Manufacturing Survey of Colombia (*Encuesta Anual Manufacturera*, henceforth EAM) collected by DANE. EAM is a census of all manufacturing plants with 10 or more employees and output exceeding 500 minimum wages, and is available from 1977 to 2007. It contains information on plant characteristics like location, sector of activity, legal organization form, size; and information on plant performance like output, employment, capital stock and expenditures. The second dataset comes from the customs authority, DIAN, and contains firm-level detailed information on foreign trade. DIAN's data can be merged with EAM's data using firm identifiers to follow firms' exports and imports over time. These data are available for the same 1997-2007 period. The third dataset comes directly from the NGF and contains firm-level records from 2003 onward with information about the moment in which the NGF granted the guarantee, the amount of credit facilitated by the guarantee, and the guarantees' coverage. This database can also be merged with EAM using firm identifiers.

We drop all observations of plants that exited before 2003—i.e., before the date on which we can identify treatment for the first time in our NGF dataset—or that entered after 2002—our baseline year. We also drop observations of plants appearing only one year in the dataset or belonging to firms that own multiple plants—in EAM only 3% of plants belong to multi-plant firms, and treated multi-plant firms account for only 0.6% of the manufacturing firms treated, so the data loss is negligible. By doing this we obtain a firm-level dataset.

<sup>15</sup> Since the NGF only guarantees credit aimed to MSME, these percentages grossly underestimate the importance of the credit guaranteed by the fund.

This panel of firms allows us to identify beneficiaries several years before and after they receive the guarantee and to compare them to non-beneficiaries during the same time period. Moreover, EAM provide us with rich firm-level information useful to identify non-beneficiary firms with similar characteristics to firms that benefited from the guarantees.

The main limitation of using this dataset is that it restricts the analysis to firms with 10 or more employees in the manufacturing sector, even though the NGF offers guarantees for MSME in almost all sectors of the economy. Table 2 provides information for the number of firms in EAM and the number of manufacturing firms that received partial credit guarantee from the NGF.

**Table 2: Manufacturing firms with NGF guarantees**

	Number of firms in EAM	Beneficiaries in the manufacturing sector	%
2003	7039	693	9.85
2004	7008	256	3.65
2005	7231	178	2.46
2006	7001	176	2.51
2007	6818	181	2.65

### Identification Strategy

We are interested in measuring the impact of credit facilitation by the fund on firm performance measured by employment, output, productivity, and capital stock. The causal effect of the program is the difference between the value of the outcome variable in two different scenarios: one in which the firm participates in the program and one in which it does not. The main challenge for the estimation of this causal effect is that firms cannot simultaneously participate and not participate in the program and therefore it is necessary to construct a counterfactual.

When the treatment is assigned randomly, the counterfactual is easily estimated by averaging the value of the outcome variable for the non-treated. But when the treatment is not randomly assigned, as in our case, participants and non-participants may differ in their characteristics—both observable and unobservable. Therefore, the simple comparison of averages between participants and non-participants does not provide an unbiased estimate for the causal effect. Moreover, it may be precisely the difference in those characteristics the reason why some firms decide to participate in the program and others do not. Therefore, to identify the causal effect of the program, it is necessary to consider the effect of observable and unobservable characteristics on both the participation decision and the outcome variables.

Given that we have panel data and we do observe participants and non-participants before and after they participate in the program, we can apply difference-in-difference (DID). An important advantage of this method is that it allows avoiding biases caused by both observed and unobserved firm characteristics that do not vary over time. It also allows

controlling for observables and non-observables that vary in time and affect all firms in the same way (for example, inflation, business cycle, exchange rate, or any shock that affects the economy as a whole). The general idea of the DID method is to estimate the effect of the program by considering first the difference in the value of the outcome variables before and after the program is applied for each group of firms and then the difference between beneficiaries and non-beneficiaries.

As Heckman et al (1999) point out, even the estimation by DID might result in biased estimates if the firms in the control group differ significantly from the participants. To avoid this bias, Heckman et al (1999) recommend using the DID estimators on a group of firms with similar characteristics. To define the group of firms with similar characteristics they propose to use matching on the ex-ante participation probability—i.e. Propensity Score Matching, PSM.

There are several alternatives to match beneficiaries and non-beneficiaries and, in general, results depend on the matching algorithm and the variables included to estimate the propensity score. We match observations using nearest neighbor with one neighbor because this choice is the most conservative algorithm in terms of bias reduction—see Caliendo and Kopeinig 2008. In order to estimate the propensity score, we use a logit model and data from 1997 to 2002, the period before the beneficiaries received support.<sup>16</sup>

After identifying the firms for the control group—i.e. non-beneficiaries with the same probability of participation than beneficiaries—it is necessary to check that the characteristics of the control group are equal to the characteristics of those firms that participated in the program—see Rosenbaum and Rubin 1983. We test this by: (i) a difference in mean test before and after the matching; (ii) a joint test that all the characteristics in the control group are equal in mean to those in the treatment group; and (iii) a test of the equality of the distribution of the propensity score between participants and firms in the control group.

We estimate the impact of the program by estimating the parameters  $\delta$  in the following equation:<sup>17</sup>

$$Y_{it} = \delta_0 P_{i,t} + \delta_1 P_{i,t-1} + \delta_2 P_{i,t-2} + \mu_t + c_i + v_{it}, \quad i \text{ in } C, \quad t=1,2,\dots, T \quad (1)$$

where  $Y_{it}$  is the value of the outcome variable  $Y$  for firm  $i$  in period  $t$ ,  $P_{i,t}$  is a variable that takes value 1 if firm  $i$  participates in the program in period  $t$ . Therefore,  $\delta_0$ ,  $\delta_1$ , and  $\delta_2$  reflect the impact of the program the year the firm receives the loan, one year after the firm receives the loan, and two years after the firm receives the loan, respectively.  $\mu_t$  is a set of year dummies,  $c_i$  are firm-level fixed effects controlling for unobserved characteristics of firm  $i$  that do not vary over time, and  $v_{it}$  can be interpreted as random shocks to the outcome variable that are not correlated with the participation in the program. Finally,  $C$  is the set of firms in the common support defined using PSM.

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<sup>16</sup> We use 2002 as our baseline because firm-level records from the NGF are available from 2003 onwards.

<sup>17</sup> The same approach was used in Arraiz et al (2012) who estimated the impact of a supplier development program on firms' performance in Chile.

#### 4. Results

As we mentioned above, we estimate the effect of the program using DID and an important assumption of this method is that, in the absence of the program, the trend in outcome variables is equal for beneficiary and non-beneficiary firms. Although this counterfactual cannot be tested, it is more likely to hold if we compare firms that have similar trends before the program is applied.

In order to do this, we first estimate a participation model using a logistic regression with data from 1997 to 2002 and construct a control group of non-beneficiaries with similar characteristics to beneficiaries. The explanatory variables we include in this model are firm size dummies (defined by the number of employees), dummies denoting organization types, ISIC 2-digit sector, and location dummies.<sup>18,19</sup> We also include other firm characteristics like the value of output, labor productivity, capital per worker, and the value of fixed assets which presumably affect the firm's ability to access collateralized debt. Unfortunately, the Annual Manufacturing Survey of Colombia does not include information on the firms' level of indebtedness. But given that we have information on interests paid, we use these data to infer which firms hold debt. We are, however, unable to identify the source of that debt—financial sector, ONGs, cooperatives, informal sources, family and friends, credit card finance, or others sources.<sup>20</sup>

These variables are known to affect access to finance and therefore are good candidates to explain the participation of firms into the program. Compared to large firms, small and medium firms use less bank finance and finance a lower proportion of their investment externally. Firms in the manufacturing sector use more bank finance than firms in the service sector, presumably because they are more capital intensive and consequently are more likely to satisfy banks' collateral requirements. The same holds for firms with a higher proportion of fixed assets. Firms' growth opportunities—in our case approximated by firms' output, employment and productivity growth in the period 1997-2002—are also used by financial intermediaries as a proxy for firms' ability to pay and the literature finds that they are good candidates to explain access to finance—see Beck et al. (2008) for an analysis of financing patterns of small firms around the world.

We also include a variable aimed at measuring the degree of a firm's credit constraint. Following Hsieh and Parker (2007), we calculate the correlation between firm cash flow and investment for each firm between 1997 and 2002. This correlation provides us with a credit constraint variable because credit constrained firms heavily rely on internal funds to finance operations and are unable to invest if cash flow drops substantially. Therefore, firms with a high correlation between cash flow and investment are more likely to be credit constrained than firms with a low correlation. Investment decisions by firms with access to financial markets are independent of their cash flow. The exact measure is

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<sup>18</sup> We defined three size categories as follows: from 10 to 50 employees, from 50 to 200 employees, and 200 employees and more.

<sup>19</sup> Location is defined as the metropolitan area in which the firm is located.

<sup>20</sup> According to the Enterprise Survey dataset, private commercial banks finance 13.6% of investment in Colombia, family and friends finance 6.7%, and informal sources finance 2.4%. The percentages for working capital are 31.5%, 18.9%, and 0.05% respectively.

constructed as the correlation coefficient between the ratio of operational profits to capital and the ratio of net investment to capital—assuming a 5% depreciation rate. Hsieh and Parker’s methodology is based on a broad literature surveyed by Bernanke, Gertler, and Gilchrist (1996). The seminal paper by Fazzari, Hubbard, and Petersen (1988) finds that investment is quite sensitive to cash flow for the firms thought most likely *a priori* to be credit-constrained and not very sensitive to cash flow for firms that are not expected to be constrained. Gilchrist and Himmelberg (1992) find that, even after accounting for the predictive power of cash flow for future profitability, the cash flow’s role in alleviating credit constraints remains in firms with limited access to capital markets and in these cases investment is still “excessively” sensitive to fluctuations in cash flow.

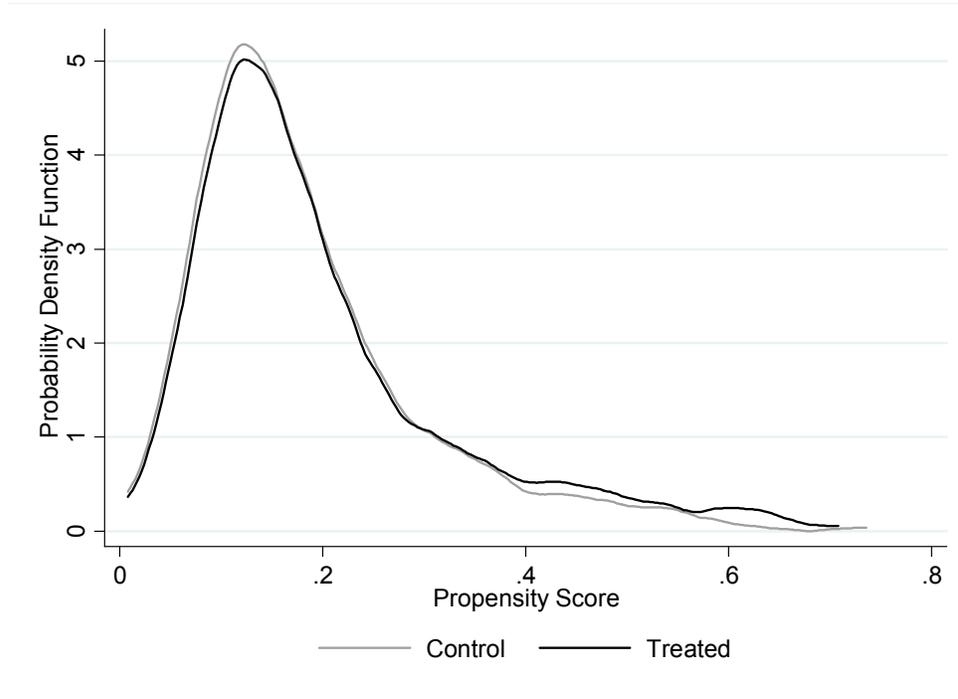
We use the estimated probability from the participation model—the propensity score—to identify for each firm that participated in the program a firm that did not participate but that has the closest value of the propensity score; i.e., we apply propensity score matching with the nearest neighbor algorithm, considering only one neighbor.

Figure 1 presents the distribution of the propensity score for beneficiaries and non-beneficiaries in the common support. The Kolmogorov-Smirnov tests of the equality of distributions of the propensity scores—after matching and using the common support—cannot reject the null hypothesis that the distributions are equal for treated and control firms—the p-value is 0.64. Table 3 shows the balance in the observable characteristics before and after the matching. After the matching, for each variable the equality of means in the treated and non-treated groups cannot be rejected. Moreover, the pseudo  $R^2$  from a probit of treatment status on all the variables decreases from 0.114 to 0.012 and the corresponding p-value of the likelihood-ratio test of the joint insignificance of all the regressors increases from 0 to 0.983, indicating that after the match our regressors are not able to determine which firms get credit guaranteed by the NGF and which do not.<sup>21</sup> Therefore, treated and untreated firms in the sample are indistinguishable from each other based on the variables included in the participation model.

**Figure 1: Distribution of the propensity score for beneficiary and non-beneficiary firms in 2002**

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<sup>21</sup> The `pstest` command in Stata used to carry out these tests estimates probit models instead of the logit we are using as our participation model.



Notes: Firms in the common support.

**Table 3: Balance in observables before and after matching**

	Full sample			Firms in the common support		
	NGF	Non NGF	p-value of t test for difference in means	NGF	Non NGF	p-value of t test for difference in means
Output in 02 (logs)	14.001	14.552	0.000	14.001	13.954	0.541
Labor productivity in 02 (logs)	10.846	11.060	0.000	10.846	10.813	0.469
Capital per worker in 02 (logs)	8.928	9.333	0.000	8.928	8.854	0.281
Proportion of firms with debt in 02	0.890	0.845	0.007	0.890	0.888	0.920
Fixed assets in 02 (logs)	12.083	12.826	0.000	12.083	11.995	0.357
Financial constraint correlation (97-02)	-0.068	-0.035	0.068	-0.068	-0.051	0.480
Annual growth in output (97-02)	0.003	0.001	1.000	0.003	0.003	0.682
Annual growth in employment (97-02)	0.006	-0.002	1.000	0.006	0.002	0.906
Annual growth in capital per worker (97-02)	0.011	0.014	0.001	0.011	0.012	0.331
Annual growth in labor productivity (97-02)	0.002	0.002	0.748	0.002	0.003	0.252
Annual growth in TFP (97-02)	-0.005	-0.011	0.998	-0.005	-0.005	0.530

We cannot test the assumption that in the absence of the program both beneficiaries and non-beneficiaries have the same trend in outcome variables. However, we can observe the trends before the beneficiaries participated in the program (1997-2002) and test that these trends are the same for beneficiaries and non-beneficiaries. Table 3 presents these tests for the full sample and for firms in the common support. The results show that for

the full sample, the trends in outcome variables from 1997-2002 were different for beneficiaries and non-beneficiaries. When only firms in the common support are considered, it is not possible to reject the hypothesis that trends in the outcome variable—output, employment, wages, labor productivity, total factor productivity (TFP), capital stock per worker, and exports—are equal for beneficiaries and non-beneficiaries.<sup>22</sup> Figure 2 shows the mean of the different output variables for beneficiaries and non-beneficiaries before and after 2002, our baseline.

We estimate the effect of the program using equation (1). The treatment variable is an indicator variable equal to one for the firm that obtained a credit guaranteed by the NGF at the moment it received the credit, and equal to zero otherwise. This variable captures firms that were marginally able to gain access to credit and that otherwise would not have been able to get credit because of lack of enough collateral. In addition to this variable, we include two of its lags to assess the impact of the program not only the year the firm is able to secure a new loan, but also in the years following the granting of the loan—the average repayment period of the loans is 34 months.

If access to finance was indeed a binding constraint for growth, and its facilitation through the NGF’s partial credit guarantees succeeded in removing the constraint, treated firms should outperform comparable firms that do not benefit from the government program. To test this hypothesis, we use a set of firm performance measures as outcome variables that include output in levels; employment; productivity measured alternatively as labor productivity and as total factor productivity, TFP; average wages paid by the firms; and capital stock.

Table 4 shows the estimates of equation (1) for the full sample—Panel A—and the firms in the common support—Panel B. Our estimations confirmed a positive impact of treatment on firm size measured both by output and employment. Firms that benefited from the government program become 6.0% larger in terms of output and 3.7% larger in terms of employment than their counterparts in the control group. We found no evidence that the use of NGF partial credit guarantees results in higher capital stock, higher productivity, or higher wages. We interpreted these results as suggestive of firms using credit to increase their working capital rather than to invest in durable goods and increase their capital stock. We also found a positive impact on exports as a share of output which is consistent with this interpretation: using credit to increase firms’ working capital that allows them to grow.

**Table 4: The impact of the program on firm’s performance**

Employment (in logs)	Output (in logs)	Wages (in logs)	Exports as proportion of output	Capital stock per worker (in logs)	Labor productivity (in logs)	TFP (in logs)
(1)	(2)	(3)	(4)	(5)	(6)	(7)

(A) Full sample

<sup>22</sup> We measure TFP using the firm-level residual from a standard production function. We use the estimates of factor elasticities from Eslava et al (2006) who estimated the production function controlling for the endogeneity of inputs using instrumental variables and EAM data for the 1982-1998 period.

NGF (t)	0.0758*** [0.0128]	0.0938*** [0.0190]	0.0309*** [0.0077]	0.0029 [0.0031]	-0.0284 [0.0178]	0.0180 [0.0171]	0.0223 [0.0146]
NGF (t-1)	0.0621*** [0.0140]	0.0892*** [0.0183]	0.0187** [0.0081]	0.0066* [0.0034]	0.0206 [0.0189]	0.0271* [0.0150]	0.0199 [0.0125]
NGF (t-2)	0.0703*** [0.0163]	0.0736*** [0.0217]	0.0273*** [0.0096]	0.0107** [0.0044]	0.0189 [0.0225]	0.00330 [0.0172]	0.00628 [0.0142]
R <sup>2</sup>	0.04	0.04	0.679	0.040	0.280	0.037	0.05
Number of obs.	60,918	60,918	60,918	60,918	60,918	60,918	60,918
Number of firms	5,469	5,469	5,469	5,469	5,469	5,469	5,469

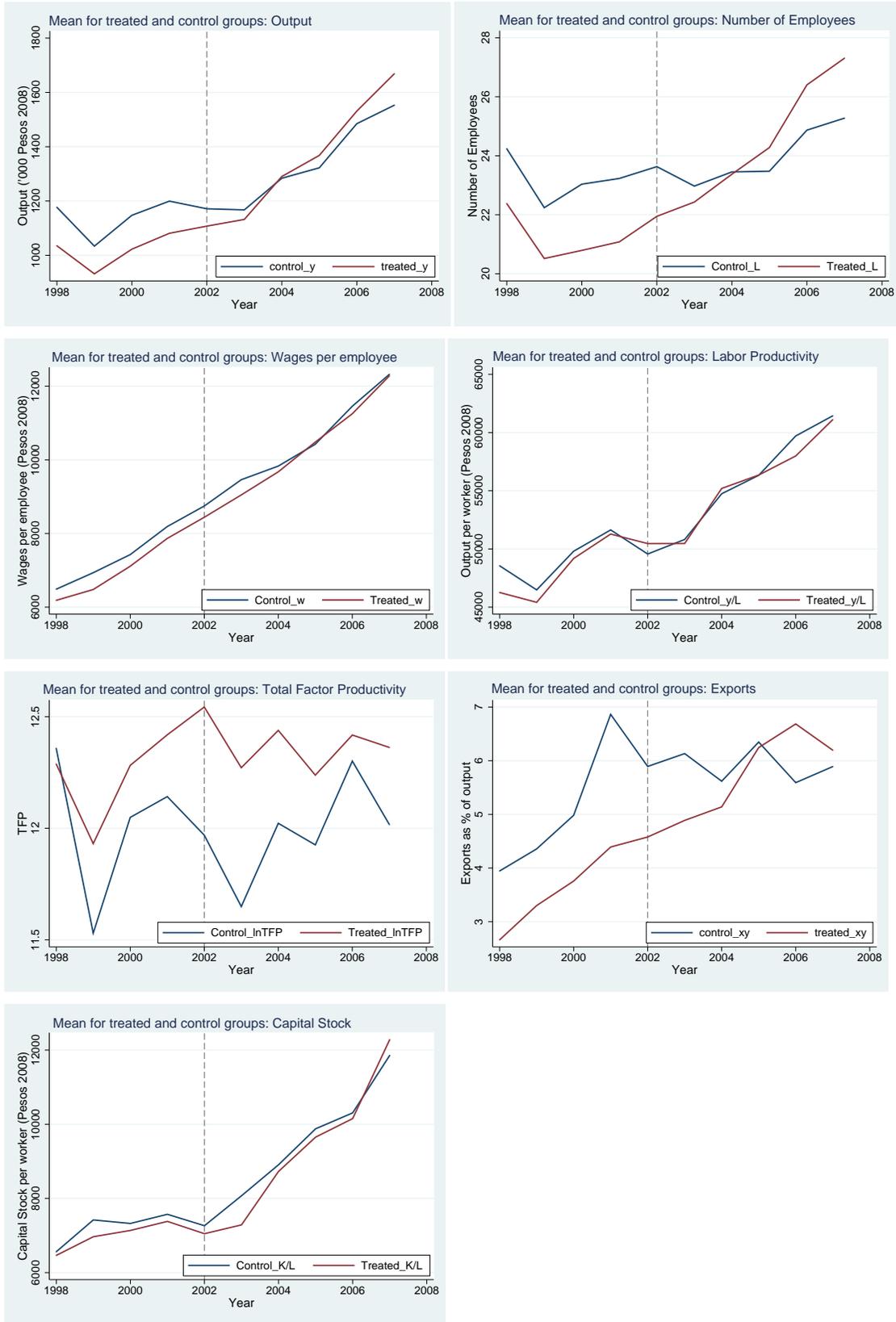
**(B) Firms in the common support**

NGF (t)	0.0361** [0.0162]	0.0582** [0.0226]	0.0124 [0.0097]	0.0061 [0.0042]	-0.0126 [0.0191]	0.0221 [0.0201]	0.0166 [0.0165]
NGF (t-1)	0.0534*** [0.0182]	0.0661*** [0.0228]	0.0160 [0.0103]	0.0114** [0.0047]	-0.0079 [0.0214]	0.0127 [0.0189]	0.0102 [0.0147]
NGF (t-2)	0.0643*** [0.0210]	0.0548** [0.0276]	0.0183 [0.0131]	0.0175** [0.0072]	-0.0156 [0.0250]	-0.00954 [0.0217]	0.00842 [0.0171]
R <sup>2</sup>	0.027	0.061	0.707	0.036	0.325	0.046	0.027
Number of obs.	10,780	10,780	10,780	10,780	10,780	10,780	10,758
Number of firms	932	932	932	932	932	932	932

**Notes:** All regressions include year dummies and firm-level fixed effects. Robust standard errors in brackets. \*\*\*, \*\*, and \* denotes significance at 1%, 5%, and 10%, respectively.

The results on output, employment and exports are maintained over time. The impact on output, for instance, is 6.0% the year the firm receives the credit, 6.8% one year after, and 5.6% two years after the firm receives the credit. The impact on employment is 3.7% the year the firm receives the credit, 5.5% one year after, and 6.6% two years after the firm receives the credit. The impact on exports as a share of output is 1.2% the year after the firm receives the credit and 1.8% two years after that. Once again, these results suggest that firms might be using the new funds as working capital.

**Figure 2: Mean of output variables for beneficiary and non-beneficiary firms before and after 2002**



## **5. Conclusions and policy recommendations**

This paper evaluates the impact of partial credit guarantees on manufacturing firms' performance in Colombia. By using partial credit guarantees, the NGF lifts credit restrictions faced by firms without enough assets to pledge as collateral. An interesting characteristic of this program is that, by outsourcing the origination and servicing of loans to for-profit intermediaries, the NGF does not affect the banks' incentives to conduct an accurate credit appraisal because they partially assume the default risk.

We used propensity score matching and difference-in-differences in the common support to find the causal relationship between program participation and firm performance. We found that the program was effective in easing credit constraints and that beneficiary firms were able to grow both in terms of employment and output. We also found that through participation in the program, beneficiaries were able to increase their sales in foreign markets. We did not capture an impact on productivity or wages paid to the employees. Finally, our results indicate that the program has no impact on investment, suggesting that firms are using the new funds for working capital rather than for investment in durable goods which would increase their capital stock.

These results, however, are restricted to firms that participate in the program; firms that marginally gained access to credit. And although the program has grown since its creation, it represents a small percentage of commercial credit granted by the Colombian financial system. Partial credit guarantees seem to be a second best solution for easing credit constraints for SMEs because they do not directly affect the lending infrastructure with the largest impact on access to credit: commercial and bankruptcy laws that affect creditor rights and restrict the type of assets that can be used as collateral, slow and expensive judicial enforcement of contracts, ineffective sharing of credit information, etc. Partial credit guarantees should be used as a temporary second best solution while implementing other policies aimed at solving these structural problems.

Due to data restrictions, the analysis in this paper rests on manufacturing firms with more than ten employees. The partial guarantee program also targets micro firms and other sectors and therefore a question that remains unanswered is whether the program is also effective for micro firms and firms in other sectors of the economy other than manufacturing.

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