THESIS

EVALUATION OF PUBLIC PROGRAMS ON SMALL AND MEDIUM ENTERPRISES IN SPAIN

Submitted by

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Introduction

Stimulating the growth of small businesses has been a matter of concern and interest in most developed countries. It is often argued that small and medium enterprises (SMEs) play a major role as an engine of economic growth and they contribute to social wealth through the creation of new businesses and jobs. In Spain, almost 99% of the firms are SMEs, thus they are a key driver for economic growth, innovation, employment and social integration. SMEs provide 67% of all jobs and generate 68% of the value added in Spain, according to data from the European Commission. One of the most studied aspects of SMEs is the problem of access to financing. The financial institutions limit the loans granted due to the lack of guaranties. Specific public aid instruments have been designed for entrepreneurs that respond to their inability to access bank financing, such as tax reduction and guarantee systems.

In this research, we evaluate the effect of the participation in the public programs in terms of growth in assets of the firm, sales, number of employees, efficiency and productivity in the period from 2007 to 2012, by comparing granted firms with non-granted firms. The main objective of this study is to provide an empirical evidence regarding the impact of two of the most important Spanish financial policies for SMEs, which are subsidised credit offered by the Official Credit Institute (ICO) and credit guaranteed by a Mutual Guarantee Society (MGS).

The impact of the financial support is analysed within cross-section and panel data frameworks. The matching methodology and inclusion of control variables helped to solve the problem of selection bias. We control for intra-class correlation and unobserved heterogeneity using special econometric techniques. The results show that there is a positive effect of financial aid on sales growth and negative effect on efficiency growth. Effect of program participation is not homogeneous among all participating firms, it depends on the firm's regional location and industrial activity.

The analysis is presented as follows. Section 2 is devoted to theoretical motivations and public policies in Spain. Section 3 reviews the previous researches and the hypotheses. Section 4 describes the data, and section 5 introduces estimation methodology. Section 5 presents the main results, and section 6 offers the main conclusions.

Theoretical motivation and public policies in Spain

The purpose of credit guarantee was to provide financial support to SMEs suffering from insufficient investment from private financial institutions due to market failures and lack of collateral, to increase the competitiveness of SMEs and to increase SMEs' accessibility to private financial sources. The credit guarantee institutions give warranty to private financial institutions such as banks and they remove the risk of lending to SMEs.

Many governments provide subsidised loans and loan guarantees to SMEs. The USA, UK, France, Belgium, the Netherlands, and others have adopted financial assistance programs. However, lots of debates are still going on regarding the efficiency of government support in the SME loan market. The economics literature suggests a set of rationales for governments to offer subsidies to firms. However, some of them argue that government involvement may be distorted by the desire of interest groups or politicians to maximize their own benefits. These suggest a more skeptical view of such programs.

Governments subsidies can increase efficiency of firms by supporting projects that would not be undertaken without the subsidy. Because government subsidies are generally cheaper than other capital, firms will request funds for projects that are privatly profitable as well as for projects that benefit society. To increase motivation, public programs should not fund the best proposals they receive. Instead, they should fund the best proposals among those that are not likely to receive adequate funds from other sources.

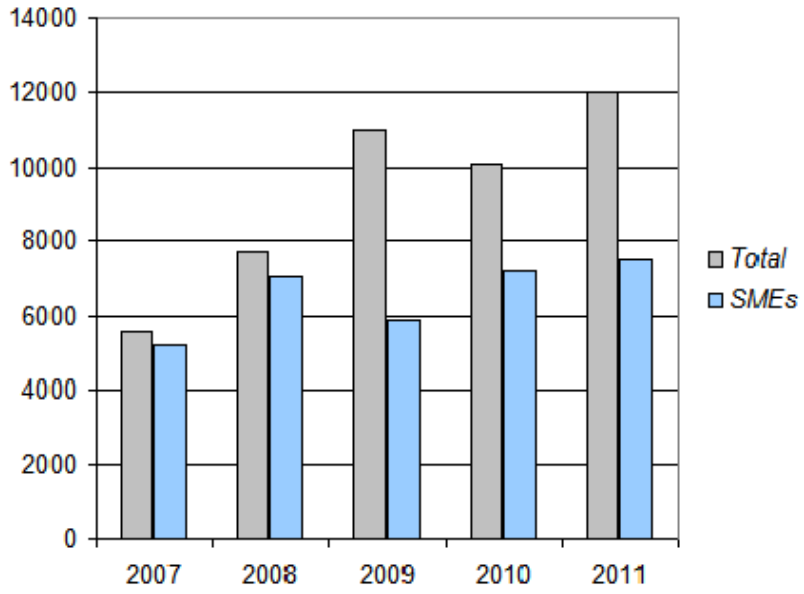
In a study Cressy (2002), bases on the argument of Lerner (1999), suggests a set of criteria in selecting firms to receive government subsidies. The criteria include subsidising industries which are not currently attractive to private sectors but may have growth potential, avoiding financing firms which have already received other government awards, and basing choice more on management flexibility and experience rather than on particular product or service offered by the firm.

Spain has a banking-oriented financial system. Thus, the roll of the banking industry is relevant as there are no alternative sources to finance SME projects, which leads to a significant dependency on bank credit. However, the size, the lack of business experience, the lack of viability of the business plan and the lack of necessary guarantees are major restrictions encountered by entrepreneurs trying to access financing and in the right conditions. This situation justifies the appearance of public aids for financing. Figure 1 presents the share of

government support of SMEs in the total amount of government financing in Spain in the period from 2007 to 2011.

Figure 1: Trends in SME and entrepreneurship finance in Spain (2007-2011)

Annual, in EUR million



Source: Direccion General del Tesoro y Politica Financiera

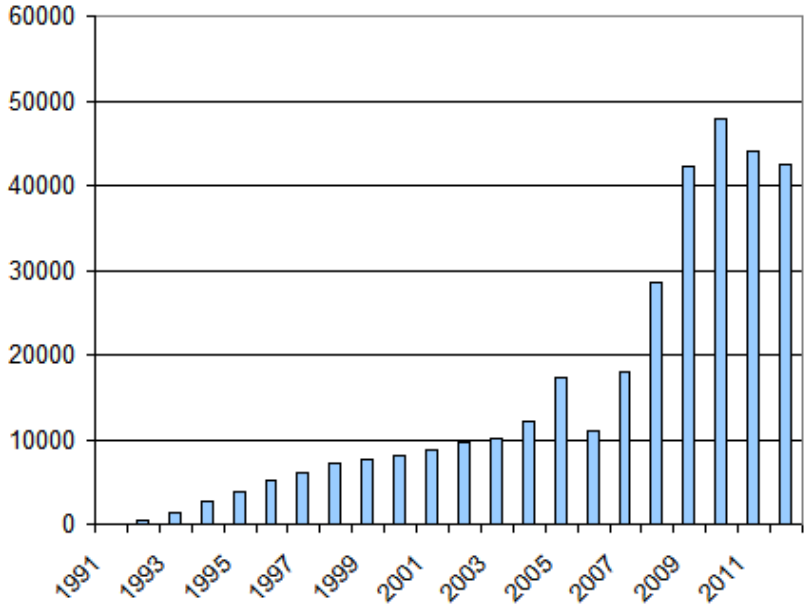
As we see, more than half of the amount each year is aimed at financing of small and medium enterprises. Hence, the relevance of public programs for SMEs calls attention from both the academic and the institutional perspectives.

Among the most important public policies in Spain are special lines of finance interest rates subsidies by the government through agreements with financial intermediaries (banks) and Mutual Guarantee Societies. The Official Credit Institute (ICO) is a public company that has a role of specified credit institute and a state financial agency. It provides Spanish companies with a framework of adequate financing to enable them to undertake their productive activity. The Official Credit Institute (ICO) was founded in 1971 as the institution responsible for coordinating and controlling Spain's state-owned banks. In the late 1980s, ICO took over ownership of these banks (which were later privatised) and began to raise funds on the financial markets. Figure 2 presents the trend of ICO financing to SMEs in Spain from 1992

to 2013. As wee see, the amount of loans increases significantly comparing with previous periods since 2007.

Figure 2: Loans granted to SMEs in Spain (1992-2013)

Annual, in EUR million



Source: Annual reports of Spanish Official Credit Institute

Mutual Guarantee Societies (MGS) are a special type of limited liability societies. Regional and sectoral specialisations are a feature of Spanish model of mutual schemes (Sociedades de Garantia Reciproca – SGR). Typically, the guarantees issued by MGSs cover 100% of the bank loan. The first MGS in Spain was created in 1979, following political changes that promoted economic reforms to foster competitiveness and innovation. Spanish system of public support to MGSs is based on certain limited tax exemptions and mainly on counterguarantees granted by CESGAR (Confederación Española de Sociedades de Garantía Recíproca). It is the umbrella organisation of all MGSs and is the central negotiator with the government, the central bank and with competition authorities. The organisation also supports MGSs by organising periodical training sessions, providing technical assistance and liaising with international organisations and networks.

Previous research and hypotheses

An evaluation of the impact of public aid programs involves determining whether the program produced the desired effects for its participants and whether those effects are attributable to the program intervention itself. Various authors have sought to analyse the effectiveness of public aid policies for SMEs in different markets.

Lerner in his paper of 1999 studied the effect of the Small Business Innovation Research program (SBIR) in the US on a sample of 894 companies. The comparison group is developed though two matching procedures: one defined by activity and size and the other by location and size. The model was estimated by ordinary least squares (OLS). Subsequently, he found a positive effect in the percentage change of sales and employment levels. However, he did not address endogeneity. Roper and Hewitt-Dundas in 1999 studied 703 Northern Ireland and Republic of Ireland businesses. They considered participation in different types of programs for SMEs. They used the Heckman selection model and found a positive effect on job creation, while the effect is not significant for growth in assets and sales.

Bergström (2000) showed that, in the case of Sweden, subsidisation is positively correlated with growth of value added and that productivity of the subsidised firms seems to increase the first year after the subsidies were granted. While, in long term financial aid has a negative effect on productivity. Almus (2001) found from analysis of German data using parametric selection approach that firms receiving assistance perform better in terms of sales and employment growth over a six year period. Girma et al. (2003) examines the impact of enterprise support on firm survival and growth in case of Irish manufacturing enterprises. In particular their study was special that in Ireland the public grants to enterprises have been used in addition to the improvement of domestic firms' performance also for attracting the foreign firms' production units to the country. They used traditional matching techniques in combination with difference-in-difference analysis and showed that especially capital (but also other types of) grants had important impact on firm survival and job creation. The main finding of Ege (2009) is that the Small Business Innovative Research grants in USA stimulate both sales and employment growth. These results are robust across several alternative regression models and different groups of control variables. The most important control variables were the firm's sales in the year of application and the firm's employment in the year of application. Sissoko (2011) investigates the role of R&D subsidies on productivity of

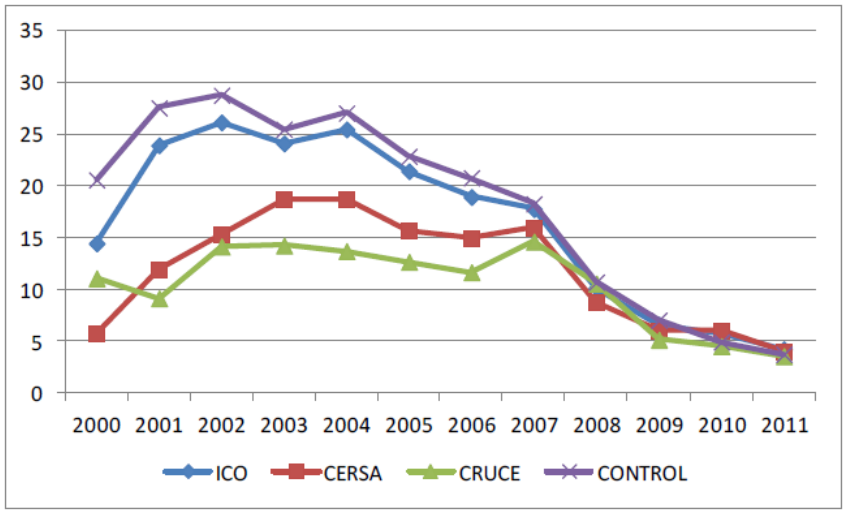
the French firms. He explores their role on the firm performance measures like employment, capital and R&D expenditures using difference-in-difference techniques. The results suggest that, on average, total factor productivity of the subsidised firms is around 15% higher towards the end of the 3-years grant period relative to the matched control group. There is also little evidence about a role of R&D subsidies on employment, capital, R&D expenditures and credit constraints. The research of impact of subsidy was done by Criscuolo et al. (2012) in Great Britain. They analysed the impact of expenditure on the Regional Selective Assistance program over a 20-year period. They had over 2.3 million observations before and after receiving government support. They found positive program treatment effect on employment, investment and net entry but not on productivity. Their research suggests that government grants to smaller firms in economically disadvantaged areas of Great Britain can increase employment, but that grants to larger firms have no effect. Chandler (2012) on the sample of companies that participated in Canada Small Business Financing Program found a positive effect on growth in salaries, employment and sales.

Moving on to the existing studies in Spain, Calvo, Garcia and Madrid (2004) studied 53 firms thast received a subsidy and 53 that did not in the region of Murcia. They used business matching, comparing averages between comparison and treatment groups. Using logistic regression, they found greater efficiency in the non-subsidised firms and lower risk in the subsidised businesses. Revera and Muñoz (2004) used data from the Balance Sheet Office Center in Spain for the period 1992-2002. Using mean differences with t-tests and Mann-Whitney U tests, they obtained positive results for the personal income/expense and revenue/assets indicators. Productive efficiency increases more for larger firms. Did not obtain positive results for other efficiency measures. Garcia and Crespo (2005) evaluated the Spanish Mutual Guarantee Scheme and ICO SME Lines financing of firms. Subsequently, companies that received public support are the most efficient ones in economic terms, generating a higher added value per employee and higher financial resources. Crecente, Garcia, Cano and Torres (2013) studied the effect of public financial aids for the creation of the companies in the crisis context. They used a sample of companies formed between 2000 and 2002 and have accessed to Mutual Guarantee Societies or Official Credit Institute within the first three years of its activity. They found that the evolution of the profitability of the companies in the sample is effective for the period during which they receive financial support. However, the profitability of the companies does not experience a positive effect in long term. Figure 3 presents the

evaluation of the profitability of the companies financed by Official Credit Institute (ICO), Mutual Guarantee Societies (MGS), both public programs (CRUCE) comparing with the control group of firms (CONTROL).

Figure 3: Profitability of companies (2000-2011)

Annual, in EUR million



Source: Prepared by Crecente, Garcia, Cano and Torres (2013)

They conclude that the financial profitability of the companies that have received financial aid (ICO, MGS or both) is below the control group profitability, converging, in a progressive way, into the average values of the period of the study.

Briozzo and Cardone (2014) studied effect of MGS and ICO financing on SMEs in Spain. The result show that during stable (non-crisis) periods, these public programs affect the growth of assets, sales and sales to assets ratio. However, during recession, the effects extend to include the growth of employment and sales to number of employees ratio.

The empirical evidence generally demonstrates a positive effect on employment creation, whereas there is less support for profit and assets growth in short term. While, there are evidences of negative effect of receiving financial aid on efficiency and productivity in long term.

Hypotheses

The objectives of financial aid programs for SMEs are centered on promoting economic development in this sector. As such, the participation in financial aid programs should improve the observed results in the performance variables. Following the methodology used in previous studies, we attempt to quantify this impact using different variables.

The hypotheses are as follows:

1. Assets Growth

Firms that participate in financial aid programmes should experience greater growth (or fewer declines) in their investments, measured as total assets, than firms in comparison group.

2. Sales Growth

Firms that participate in financial aid programmes should experience greater growth (or fewer declines) in their sales than firms in comparison group.

3. Employment Growth

Firms that participate in financial aid programmes should experience greater growth (or fewer declines) in the number of employees than firms in comparison group.

4. Growth in Efficiency

Firms that participate in financial aid programmes should experience greater growth (or fewer declines) in efficiency than firms in comparison group in short term and less growth in long term.

5. Growth in Productivity

Firms that participate in financial aid programmes should experience greater growth (or fewer declines) in productivity than firms in comparison group in short term and less growth in long term.

The construction of the data set

This research conducts an empirical analysis on a sample of companies that have accessed to Mutual Guarantee Companies (MGC's) and others that have accessed to the Spanish Official Credit Institute – Small and Medium Enterprises ICO Line. Official Credit Institute (ICO) provides specific funding to entrepreneurs in order to facilitate the infrastructure achievement and the principal repayment with more favorable conditions than in the market.

Mutual Guarantee Societies (MGS) help to limit the financial cost to business financing. Meanwhile, a representing group of companies who have obtained financial aids was extracted from the Iberian System for Financial Statement Analysis (SABI) database. The database provides quantitative information (financial statements) and qualitative information for Spanish businesses. The Spanish SMEs that participated in financial aid programs were identified for one time period: 2007 (as the starting point of the economic crisis). Only firms with fewer than 250 employees at the time they received financial aid were included, as they match the European Commission's definition of SME.

The businesses that participated in these programs were referred to a treatment group. The effect of a program can be defined as "what would have happened to those who, in fact, did receive treatment, if they had not received treatment?". Hence, just comparison between supported firm groups and non-supported firm groups cannot identify the exact additional effect of the support program, since their characteristics before participation in the supporting program were different already, which is also referred as the selection bias. The matching methodology was used to identify an appropriate control group, that helps to control the problem of selection bias. Only firms with fewer than 250 employees in 2007 were included. We used two approaches to determine a comparison group:

1. Ten businesses similar to each company in the treatment group were selected according to the following parameters, as in the study Briozzo and Cardone (2014) of the impact of public programs on SMEs in Spain:

– activity (NACE classification, 2nd revision, 4 digits);

– size (total assets measured during the previous year).

2. The most appropriate measure of the effectiveness of government support might be a comparison of the performances of two firms with the same characteristics, assuming that one received support and the other did not. However, it's hard to find an appropriate comparison group, which can represent the non-supported firms in evaluating the program. We applied the propensity score matching methodology, which allows us to construct a comparison group by matching twin firms based on the propensity score in the population of unsupported firm groups.

The propensity score is the conditional probability of participating in a program given observable characteristics.

$$Propensity\ score = p(X_i) = P(D_i = 1|X_i) \qquad (1)$$

where, X_i−the vector combining firm's characteristics;

D_i−the dummy variable for program participation.

The concept of the propensity score matching requires fulfillment of the conditional independence assumption. It means that conditioned on the observable characteristics (X) of possible participants, the decision for participation in the program should be independent of the outcome measures. Another required assumption is that the probability to participate in the program for treated group and comparison group should lie in the same domain, which is called the common support assumption. If these assumptions are satisfied we should obtain an unbiased estimation of the effect of a program.

Due to this, we construct two cross-section data frameworks using two matching procedures. As it might be a case that among the extracted sample some companies received financial support after 2007, we construct a panel data framework also using two matching procedures. The availability of panel data allows us to consistently estimate treatment effects without assuming ignorability of treatment and without an instrumental variable, provided the treatment varies over time and is uncorrelated with time-varying unobservable that affect the response. In particular, it's reasonable to think in existing of unobservable effects on the performance of companies which may be correlated with other explanatory variables, such as management of the company, its effort, intended or non-intended use of the financial aid, etc. This possibility is often called the self-selection problem. Alternatively, public programs might assign firms based on characteristics that we cannot observe.

The literature on panel econometrics clarified how the increasing availability of panel data sets could improve the estimation of econometric models. The key feature of panel data is that we observe the same company in more than one condition. We use microeconomic data set that have a cross-section dimension (i) and a time dimension (t). We'll be able to measure time and firm variation in way that is unobservable in cross-section data.

In particular, a panel data set gives us:

– more accurate inference of model parameters;

– a control on the impact of omitted variables;

– dynamics in economic behavior;

– a reduction of the collinearity among explanatory variables;

– a control on the observable and unobservable heterogeneity.

Table 1 presents the samples' distribution. The cross-section data framework is constructed using two matching procedures: matching on industry and total assets in 2006 and matching on the propensity score. In the first case, we have a sample of 2393 firms (224 firms that did participate in financial aid program and 2169 firms that did not). In the second case, we have a sample of 430 companies (215 firms that did participate in public program and 215 that did not). Both samples of firms include the information for 2007 and 2012 on treated and non-treated companies. The panel data framework is also constructed using two matching procedures. Both samples of companies include the information on treated and non-treated firms from 2005 to 2012. As such, we have 8 observations forf each company. In the case of matching on industry and assets, we have a sample of 19144 observations (1792 observations for 224 companies that did participate in public program, and 17352 observations for 2169 companies that did not participate in public program). In the case of matching on the propensity score, we have a sample of 3440 observations (1720 observations for 215 companies that did participate in financial aid program and 1720 observations for 215 companies that did not).

Table 1: Sample distribution

Year	Matched on	Non-awarded SMEs (Firms in the comparison group)	Awarded SMEs (Firms in the treatment group)	Total (Firms)
2007, 2012	Industry; Total assets (t-1)	2169	224	2393
	Propensity score	215	215	430
Panel data (2005-2012)	Industry; Total assets (t-1)	2169 *(17352 obs.)*	224 *(1792 obs.)*	2393 *(19144 obs.)*
	Propensity score	215 *(1720 obs.)*	215 *(1720 obs.)*	430 *(3440 obs.)*

Note: The control group matched on the propensity score was identified in the sample of companies previously matched on industry and total assets in 2006 according to the following parameters: Age, Industry, Region, Export, Income, Total Assets, Number of Employees, Equity, EBIT in 2007, as assumed year of receiving a financial aid.

Estimation methodology

Differences between the performance of the assisted and non-assisted firms will reflect the characteristics of the companies as well as the effect of assistance. If y_i is an indicator of business performance a basic model which contains these effects can be defined as follows:

$$E(y_i) = \alpha + \beta D_i + X_i'\psi + \varepsilon_i \qquad (2)$$

where, y_i−the performance variable of interest measured after program participation;

D−the dummy variable that takes value 1 if the company participated in the financial aid program, and 0 if it didn't;

X−the vector combining firm's characteristics (control variables) measured during the year of program participation (t);

α, β, ψ−the coefficients, where $\alpha = E(Y_{0i})$, $\beta = E(Y_{1i} - Y_{0i})$;

$\varepsilon_i = \varepsilon_{0i} + (\varepsilon_{1i} - \varepsilon_{0i})D_i$−an error term.

In this model the size, sign and significance of the coefficients on the treatment terms (*i.e.* β) give an indication of the impact on business performance of receiving grant support. Other studies have shown, however, that such coefficients give an unbiased indication of the effect of grant support only if support is randomly distributed across the population of small and medium enterprises. Where there is any element of selection in the award of grants the coefficients will reflect the combination of assistance and selection effects. For example, a financial aid agency may wish to target its assistance at firms which had performed well in the past. In this case, if the selection effect was positive (i.e. the agency succeeded targeting faster growing firms), direct estimation of the coefficients the dummy variables would over-estimate the true assistance effect (Greene, 1997).

Rather than direct estimation of equation (2) a preferable approach is therefore to allow explicitly for this type of selection bias. The effect of program participation on the performance variable was analyzed by means of average treatment effects (ATEs). The model for the performance variables was estimated by interacting the treatment effect with each element after subtracting its mean. As such, we estimated the following equation:

$$E(y_i|D_i, X_i) = \alpha + \beta D_i + X_i'\psi + \delta(X - \bar{x})D_i + u_i \qquad (3)$$

where, y_i−the performance variable of interest measured after program participation;

D_i−the dummy variable that takes value 1 if the company participated in the financial aid program, and 0 if it didn't;

X_i−the vector combining firm's characteristics (control variables) measured during the year of program participation (t);

$\bar{x}_i$−the vector of the sample means for each characteristic;

$\alpha, \beta, \psi, \delta$−the estimated coefficients;

$u_i = y_i - E(y_i|X_i, D_i)$−an error term.

Conditional treatment effect is the difference in the means conditional on the observable characteristics of the outcome under treatment and non-treatment. As such:

$$TE(X_i) = E(y|X_i, D_i = 1) - E(y|X_i, D_i = 0) = \beta + \delta(X - \bar{x}) \qquad (4)$$

The ATE under conditional independence is equal to the estimated value of β. As such:

$$\hat{ATE} = E(E(y|X_i, D_i = 1) - E(y|X_i, D_i = 0)) = \hat{\beta} \qquad (5)$$

We used bootstrapped standard errors clustered on regions to correct for the intra-class correlation. An intra-class correlation reflects the correlation of the observations (firms) within a cluster (regions). A bootstrap procedure estimates a model for a specified number of repetitions using samples of the data base. For each repetition, the main analysis is repeated on the sample data, and the estimate is then stored (the model's coefficients in a linear regression). Once all repetitions have been computed, the standard errors can be calculated by taking the standard deviation of the stored model estimates. In bootstrapped standard errors clustered on regions, instead of drawing the observation units (the firms) with replacement, it draws with replacement within the cluster units (regions).

A list of the variables used is presented in the Table 2 along with the operational definitions that have been used. The explanatory variables are financial aid and the corresponding terms of interaction. The remaining variables act as control variables and help to control for the existing heterogeneity among different companies.

Table 2: Description of the variables

Variable	Definition
Control variables (vector X)	
NL TA	Natural logarithm of Total assets
TA Growth	NLTA year t – NLTA year $t-1$
NL Sales	Natural logarithm of Sales
Sales Growth	NL Sales year t – NL Sales year $t-1$
NLS / Emp.	NL Sales / Number of employees
NLS / Emp. Growth	Percentage change of NLS / Emp. ratio
Emp.	Number of employees
TA Turnover	Sales / Total assets
ROA	Income for the year before interests and taxes / Total assets
ROE	Net income / Equity
CRTA	Equity / Total assets
Exporting	Dummy variable that has a value of 1 if the firm carries out export activities.
Age	Years from the date the business was founded to the moment when aid was received.
Industry dummies	
Manufacturing	Dummy variable that has a value of 1 if the firm belongs to the manufacturing sector (NACE Classification 2nd Revision)
Retail	Dummy variable that has a value of 1 if the firm belongs to the retail sector (NACE Classification 2nd Revision)
Construction	Dummy variable that has a value of 1 if the firm belongs to the construction sector (NACE Classification 2nd Revision)
Location dummies	
Catalonia	Dummy variable that has a value of 1 if the firm is located in the autonomous region of Catalonia.
Madrid	Dummy variable that has a value of 1 if the firm is located in the autonomous region of Madrid.
Basque Country	Dummy variable that has a value of 1 if the firm is located in theautonomous region of Basque Country.
Explicative variable	
Aid(D_i)	Dummy variable that has a value of 1 if the firm participated in a financial aid program in year t .
Performance variables (dependent variables y)	
TA Growth	NLTA year $t+1$ – NLTA year t
Sales Growth	NL Sales year$t+1$ – NL Sales year t
Emp. Growth	Percentage change in number of employees
Efficiency (TA Turnover Growth)	Percentage change in Sales / Assets ratio
Poductivity (NLS / Emp. Growth)	Percentage change in NL Sales / Emp. ratio

Note: In the model, there are terms for the interaction of the control variables with aid. This table includes all the tested variables, including those that are not incorporated into the final model.

The independent variables are measured:

−in cross-section data framework: in the year of program participation (2007), while the performance (dependent) variables are measured in 2012. Dummy variable for participation in the program takes value 1 if company did participate in financial aid program and value 0 if did not.

−in panel data framework: at time period t (2005 – 2012), while the performance (dependent) variables are measured at time period $t+1$ (2006 – 2012). Here, we make a strong assumption, regarding the time period of program participation. Dummy variable for participation in the program takes value 0 for 2005 and 2006, and value 1 from 2007 to 2012, as assumed period for participation in financial program if company did participate in financial aid program. If company did not participate in financial aid program, dummy variable for program participation takes value 0 for all studied periods.

We have a list of variables that are fixed for a business (at least over a long period of time), as exporting, industry dummies and region dummies. This may cause the problem of omitted dummy variable estimating the panel data. To solve this problem and to control for the unobserved heterogeneity, we use the Fixed Effects model for estimation the effect of public programs on SMEs. This approach works well when the treatment and control groups are designated based on time-constant variables and when treatment status is not constant across time. The Fixed Effect model assumes that individual heterogeneity is captured by the intercept term. This means every individual gets his own intercept $\alpha_i + \eta_i$ while the slope coefficients are the same.

A more complicated model allows the treatment effect to interact with observable variables and unobserved heterogeneity. As such, we estimate the following equation:

$$E(y_{t+1,i}|D_{ti}, X_{ti}) = \alpha_i + \eta_i + \beta D_{ti} + X'_{ti}\psi + \delta(X - \bar{x})D_{ti} + u_{ti} \qquad (6)$$

where, y_{ti}−the performance variable of interest measured after program participation;

D_{ti}−the dummy variable that takes value 1 if the company participated in the financial aid program, and 0 if it didn't;

X_{ti}−the vector combining firm's characteristics (control variables) measured during the year of program participation (t);

$\bar{x}_{ti}$−the vector of the sample means for each characteristic;

$\alpha_i, \beta, \psi, \delta, \eta_i$—the coefficients;

u_{ti}—an error term. The idiosyncratic error term u_{ti} is assumed uncorrelated with the explanatory variables of all past, current and future time periods of the same firm.

The first Fixed Effects (FE) assumption is strict exogeneity of the explanatory variables conditional on α_i:

$$E(u_{ti}|X_{ti}, \alpha_i) = 0 \qquad (7)$$

The second Fixed Effects (FE) assumption proves why time-constant variables are not allowed in analysis (unless they are interacted with time-varying variables).

The conditional treatment effect is:

$$TE(X_i) = E(y|X_i, D_i = 1) - E(y|X_i, D_i = 0) = \beta + \delta(X - \bar{x}) \qquad (8)$$

The ATE under conditional independence is equal to the estimated value of β. As such:

$$\hat{ATE} = E(E(y|X_i, D_i = 1) - E(y|X_i, D_i = 0)) = \hat{\beta} \qquad (9)$$

In the following methodology, the possible selection bias is controlled in two ways: the determination of the comparison group via matching and the inclusion of the control variables in the equation to study the ATE.

Results

Descriptive statistics

The characteristics of each group of firms (comparison and treatment) are studied as a function of the analysis period. Tables 3 and 4 show the sample means for the variables of interest at the next moments of time: two periods prior participating in the program - 2005 and 2006, the year of program participation - 2007 and the years after participating in the program - from 2008 to 2012 (assumed period of receiving financial aid's payments).

Table 3: Sample means (matching on the Industry and Total Assets in 2006)

Variable	2005		2006		2007		2008	
	Treated	Control	Treated	Control	Treated	Control	Treated	Control
Age	12.842	12.367	13.842	13.367	14.841	14.366	15.84	15.365
Industry	1.4464	1.4495	1.4464	1.4495	1.4464	1.4495	1.4464	1.4495
Region	0.6071	0.6906	0.6071	0.6906	0.6071	0.6906	0.6071	0.6906
Export	0.1205	0.0899	0.1205	0.0899	0.1205	0.0899	0.1205	0.0899
Assets	7.4831	7.4278	7.6128	7.5037	7.768	7.614	7.764	7.6459
Employees	30.28	29.021	30.536	28.643	33.166	28.995	34.297	28.699*
Sales	7.6661	7.3435	7.6531	7.3147	**7.8501**	**7.4861*** **	**7.8047**	**7.417*** **
ROA	0.0449	0.0377	0.0255	0.0476	0.0585	0.0460	0.0273	0.0271
ROE	0.1481	0.2128	0.2448	0.1187	0.0999	0.1613	0.0438	-0.1334
Equity / Assets	0.3289	0.2935	0.2885	0.2773	0.3031	0.2916	0.3148	0.3360
Sales / Assets	**0.8937**	**1.0853***	1.54	1.5192	**1.5796**	**1.4321*** **	**1.5755**	**1.3215*** **
Sales / Emp.	0.8937	1.0853	**0.8844**	**1.114****	0.7961	1.0551	**0.7659**	**1.0773*** **
Assets Growth			0.2272	0.1850	**0.1552**	**0.0725*** **	0.0290	0.0048
Sales / Emp. Growth			0.0279	0.0471	**-0.0361**	**0.0226***	0.0469	0.1315
Sales Growth			0.1570	0.1015	**0.2184**	**0.1044****	-0.0103	-0.0731
Emp. Growth			0.2941	0.2283	0.2546	0.1675	0.1024	0.1167
Sales / Assets Growth			0.1384	0.6046	0.4976	2.254	0.0504	2.3835

Variable	2009		2010		2011		2012	
	Treated	Control	Treated	Control	Treated	Control	Treated	Control
Age	16.842	16.367	17.842	17.367	18.841	18.366	19.84	19.365
Industry	1.4464	1.4495	1.4464	1.4495	1.4464	1.4495	1.4464	1.4495
Region	0.6071	0.6906	0.6071	0.6906	0.6071	0.6906	0.6071	0.6906
Export	0.1205	0.0899	0.1205	0.0899	0.1205	0.0899	0.1205	0.0899
Assets	7.7726	7.5872	7.7734	7.6112	7.8008	7.6163	7.7234	7.5761
Employees	31.566	27.158	30.647	26.584	32.12	26.084*	29.261	25.838
Sales	**7.6162**	**7.1697*** **	**7.5837**	**7.1783*** **	**7.5814**	**7.1184*** **	**7.5388**	**7.0575*** **
ROA	-0.0327	-0.0071	0.0056	-0.0461	-0.009	-0.0037	-0.0515	-0.069
ROE	**0.9740**	**0.0376****	-0.5958	-0.1801	0.0596	0.0504	-0.2876	-1.2454
Equity / Assets	0.2905	0.3286	0.2969	0.2008	0.3255	0.1515	0.2482	0.2395
Sales / Assets	**1.343**	**1.1471****	**1.3069**	**1.1113****	**1.2989**	**1.1078****	**1.256**	**1.0896***
Sales / Emp.	**0.8565**	**1.1321*** **	**0.9655**	**1.1561***	0.8605	1.1303	**0.9027**	**1.1291****
Assets Growth	-0.0344	-0.0518	0.0266	-0.0125	-0.0339	-0.033	-0.0505	-0.0679
Sales / Emp. Gr.	0.1130	0.1527	0.1220	0.1134	**0.0386**	**0.1216****	0.0845	0.0949
Sales Growth	-0.21331	-0.0237	-0.0558	-0.0730	-0.1057	-0.1025	-0.0682	-0.1303
Emp. Growth	-0.0518	-0.0265	-0.0164	0.0203	**0.5358**	**0.0127*** **	0.0132	0.0369
Sales / Assets Gr.	-0.0283	1.6319	0.0337	1.1363	0.1015	1.5169	0.3935	0.6287

Note: Signifficant differences between the comparison and treatment groups for each year are shown according to the following notation: *** - 1% significance, ** - 5% significance and * - 10% significance

Table 4: Sample means (matching on the propensity score)

Variable	2005		2006		2007		2008	
	Treated	Control	Treated	Control	Treated	Control	Treated	Control
Age	13.092	12.03	14.091	13.029	15.091	14.028	16.09	15.028
Industry	1.4465	1.3907	1.4465	1.3907	1.4465	1.3907	1.4465	1.3907
Region	0.6045	0.6465	0.6047	0.6465	0.6047	0.6465	0.6057	0.6465
Export	0.1256	0.0977	0.1256	0.0977	0.1256	0.0977	0.1256	0.0977
Assets	7.4748	7.6303	7.5959	7.7011	7.7531	7.799	7.7432	7.8646
Employees	30.732	31.917	31.108	30.492	33.921	30.874	35.074	33.282
Sales	7.6642	7.5235	7.6556	7.4513	7.8448	7.5775	7.8236	7.5578
ROA	0.0469	0.0616	0.0248	0.0512	0.0598	0.0534	0.0314	0.0412
ROE	0.1515	0.0652	0.2863	0.0708	0.1108	0.0925	0.0186	0.2484
Equity / Assets	0.3332	0.3151	0.2941	0.3005	0.3093	0.3116	0.3245	0.3391
Sales / Assets	**1.5953**	**1.2596*** **	**1.5175**	**1.1973*** **	**1.557**	**1.177*** **	**1.5528**	**1.1386*** **
Sales / Emp.	0.8867	1.0411	**0.8812**	**1.1241***	**0.7964**	**1.1191** **	**0.7621**	**1.0692** **
Assets Growth			0.2311	0.2162	0.1572	0.0979	0.0250	-0.0162
Sales / Emp. Growth			0.0302	0.0446	-0.0357	0.0219	0.0480	0.0513
Sales Growth			0.1659	0.1119	0.2229	0.1806	**-0.0086**	**-0.0968***
Emp. Growth			0.2986	0.2300	**0.2621**	**0.1441***	0.1008	0.0823
Sales / Assets Growth			0.1439	0.1015	0.5079	2.5928	0.0517	0.0269

Variable	2009		2010		2011		2012	
	Treated	Control	Treated	Control	Treated	Control	Treated	Control
Age	17.092	16.03	18.091	17.029	19.091	18.028	20.09	19.028
Industry	1.4465	1.3907	1.4465	1.3907	1.4465	1.3907	1.4465	1.3907
Region	0.6047	0.6465	0.6047	0.6465	0.6047	0.6465	0.6047	0.6465
Export	0.1256	0.0977	0.1256	0.0977	0.1256	0.0977	0.1256	0.0977
Assets	7.7404	7.8007	7.7287	7.8106	7.7647	7.966	7.6927	7.7599
Employees	32.152	31.04	31.209	29.374	32.823	27.994	29.709	28.799
Sales	**7.6299**	**7.2623** **	**7.6137**	**7.2797***	**7.6079**	**7.216***	**7.5625**	**7.0809** **
ROA	-0.0325	0.0200	0.0069	0.0156	-0.0077	-0.0024	-0.0486	-0.0154
ROE	0.9902	-0.0174	-0.6262	-0.0075	0.0380	-0.0028	-0.0304	0.2356
Equity / Assets	0.2967	0.3495	0.3058	0.3671	0.3349	0.3542	0.2584	0.3642
Sales / Assets	**1.3374**	**0.9091*** **	**1.284**	**0.9227*** **	**1.2688**	**0.8966*** **	**1.2381**	**0.8566** **
Sales / Emp.	**0.8287**	**1.0895** **	0.9572	1.1421	**0.8319**	**1.0889***	0.8824	1.1248
Assets Growth	-0.0437	-0.0221	0.0162	-0.0151	-0.0244	-0.0205	-0.0546	-0.0671
Sales / Emp. Gr.	0.1089	0.1433	0.1326	0.1601	0.0322	0.0822	0.0867	0.0727
Sales Growth	-0.2159	-0.2632	-0.0407	-0.0823	-0.1154	-0.0971	**-0.0596**	**-0.1715** **
Emp. Growth	-0.052	0.0100	-0.02805	-0.0039	0.5630	0.0226	0.0158	-0.03245
Sales / Assets Gr.	-0.0255	0.2094	0.0399	0.0393	0.0151	0.0107	0.4146	-0.0374

Note: Significant differences between the comparison and treatment groups for each year are shown according to the following notation: *** - 1% significance, ** - 5% significance and * - 10% significance.

For the sample of companies, matched on Industry and Total Assets the year before receiving the financial aid, those firms that received financial aid experienced more growth in sales and in total assets for the same year as the program (2007). These findings concur with the self-selection bias in that the more growth-oriented firms tend to demand public aid. There are no significant differences in the years prior to program participation, except for Sales to Assets and Sales to Employees ratio, which show that non-granted firms performed better. It's interesting to note that the firms that participated in financial aid programs have a smaller Sales to Employees ratio than their peers for all years studied, while the level of Sales is smaller for those that did not participate.

For the sample of companies, matched on the propensity score, those firms that received financial aid experienced more growth in number of employees for the same year as the program (2007). The period prior to program participation, the non-granted group of firms performed better only in Sales to Employees ratio. This tendency was stable during all studied period.

In the case of matching on industry and assets, there are more significant differences in favor of the granted group of firms since 2007. In the case of matching on the propensity score, the number of significant differences is almost stable across the studied period. Thus, the use of matching on the propensity score leads to reduction of differences between control and treated groups.

The effect of participating in a financial aid program on performance variables

The estimates for the ATE are made according to the methodology proposed by Wooldridge (2002) and as previously described. Tables 5 and 7 present the estimated effect of variables on performance measures in the cross-section data frameworks.

Table 5: The effect of variables on performance measures
(cross-section data: matcing on Industry and Total Assets in 2006)

VARIABLES	Assets Growth	Sales Growth	Emp. Growth	Sales/Assets Growth	Sales/Emp Growth
Aid	0.0451	0.1336	0.3011	**-0.7180***	-0.0695
	(0.059)	(0.084)	(0.519)	**(0.4906)**	(0.122)
μAge * Aid	0.0029	-0.0072	0.0087	**-0.4906***	-0.0095
	(0.010)	(0.017)	(0.020)	**(0.278)**	(0.006)
μROE * Aid	0.0541	-0.0430	0.0868	**-2.5303***	0.0463
	(0.054)	(0.121)	(0.713)	**(1.427)**	(0.038)
μEquity/Assets * Aid	0.3540	0.3060	2.4759	**9.9983***	0.0482
	(0.346)	(0.557)	(4.767)	**(6.017)**	(0.321)
μEmployees * Aid	**-0.0034*****	**-0.0035*****		0.0154	
	(0.001)	**(0.001)**		(0.011)	
μSales/Assets * Aid		0.0225			-0.0476
		(0.078)			(0.116)
μSales Growth * Aid	-0.0319	-0.0461	-0.7510	**16.3592***	0.1590
	(0.127)	(0.162)	(1.986)	**(8.718)**	(0.448)
μAssets Growth * Aid			2.0512	**-6.7273***	-0.1270
			(5.463)	**(3.868)**	(0.206)
Equity/Assets	0.1059	0.0390	0.0491	**-9.9534***	**-0.2356*****
	(0.105)	(0.044)	(0.055)	**(5.876)**	**(0.018)**
ROE	-0.0135	0.0237	0.0196	**3.1516***	**-0.0208***
	(0.019)	(0.024)	(0.019)	**(1.816)**	**(0.012)**
Employees	-0.0004	0.0003		**-0.0108***	
	(0.000)	(0.001)		**(0.006)**	
Age	**-0.0042****	-0.0012	**-0.007*****	**0.5193***	**0.0092*****
	(0.002)	(0.002)	**(0.002)**	**(0.310)**	**(0.002)**
Sales/Assets		**-0.1131*****			-0.0093
		(0.035)			(0.019)
Sales Growth			-0.0234	**-16.3001***	**-0.2820****
			(0.119)	**(8.628)**	**(0.127)**
Assets Growth			0.2358	6.5885	**-0.1784****
			(0.150)	(4.068)	**(0.076)**
Catalonia	**-0.0437****	-0.0404	0.0542	**-1.9746****	-0.1025
	(0.020)	(0.066)	(0.136)	**(0.966)**	(0.092)
Madrid	-0.0195	-0.1178	**0.3517****	**-3.5131***	-0.0688
	(0.016)	(0.083)	**(0.174)**	**(1.841)**	(0.090)
Basque Country	0.0041	**0.1535****	0.2122	**-0.6244****	**-0.2581****
	(0.009)	**(0.078)**	(0.132)	**(0.298)**	**(0.129)**
Manufacturing	**-0.0760***	**-0.1275****	-0.2374	-2.1589	**0.0712***
	0.040	**(0.058)**	(0.218)	(1.370)	**(0.037)**
Retail	-0.0930	0.0168	**-0.2279****	-2.6980	0.0335
	(0.085)	(0.088)	**(0.106)**	(1.825)	(0.036)

Table 5: The effect of variables on performance measures

Construction	**-0.2965*** **	**-0.6050*** **	**-0.5312** **	**9.3285***	**0.6221*** **
	(0.106)	**(0.210)**	**(0.225)**	**(5.129)**	**(0.056)**
Export	**0.1505*** **	**0.2800*** **	0.0449	-2.0002	**-0.2194*** **
	(0.031)	**(0.106)**	(0.111)	(1.805)	**(0.065)**
Constant	0.0088	-0.2401*	0.1805	-1.1625	0.3664***
	(0.033)	(0.137)	(0.165)	(1.144)	(0.122)
Observations	1329	1283	1235	1283	1226
R-squared	0.0373	0.0647	0.0561	0.0572	0.0483

Standard errors in parenthases
****p<0.01, **<0.05, *p<0.1*

Note: Empty cells indicate the variable was not included in the model. $\mu Variable$ indicates that the sample mean is subtracted from the variable when calculating the estimate. Estimations were made with bootstrap standard errors clustered on regions with 1000 replications.

As shown in Table 5, firms from Catalonia show different impacts of program participation on assets and sales to assets ratio growth. The effect is less comparing with other regions in Spain. Firms from Madrid experience a higher effect on employees growth and a less effect on efficiency comparing with others. Firms from Basque Country experience a higher effect on sales growth and a less effect on efficiency and productivity comparing with other regions. Firms that work in manufacturing and construction experience a less effect of program participation on assets and sales growth and a higher effect on productivity comparing with firms from other industries. Firms that work in retail and construction experience a less effect on employees growth comparing with other industries. Firms that work in construction have a higher effect on efficiency comparison with firms from other industries in Spain.

With respect to the control variables, the following observations are made:

- *Effect on Assets Growth:* Age has a negative effect and export has a positive effect.

- *Effect on Sales Growth:* Sales to Assets ratio has a negative effect and export positive.

- *Effect on Employment Growth:* Age has a negative effect.

- *Effect on growth of Efficiency:* Equity to Assets ratio, number of employees and sales growth have a negative effect and ROE and age positive.

- *Effect on growth of Productivity:* Equity to Assets ratio, ROE, sales growth, assets growth and export have a negative effect and age positive.

Quantification of ATEs effects

- Effect on Assets Growth:
$ATE = -0.0034(Emp - \bar{Emp})$
- Effect on Sales Growth:
$ATE = -0.0035(Emp - \bar{Emp})$
- Effect on Employment Growth:
$ATE - no\ significant\ effect$
- Effect on growth of Efficiency:
$ATE = -0.7180 - 0.4906(Age - \bar{Age}) - 2.5303(ROE - \bar{ROE}) + 9.9983(Equity/Assets - \bar{Equity/Assets}) + 16.3592(Sales\ Growth - \bar{Sales\ Growth}) - 6.7273(Assets\ Growth - \bar{Assets\ Growth})$
- Effect on growth of Productivity:
$ATE - no\ significant\ effect$

Table 6: Summary of the observed additional average treatment effect (ATEs)

Firms with above average	An effect after program participation on Assets Growth	Sales Growth	Emp. Growth	Sales / Assets Growth	Sales / Emp. Growth
Age				-	
ROE				-	
Equity/Assets				+	
Employees	-	-			
Sales Growth				+	
Assets Growth				-	

As shown in Table 6, each cell shows the additional effect of program participation on the target variable. In the case of Total Assets growth, the firms with higher than average number of Employees experience a negative additional effect in Assets growth after receiving aid, as in the case of Sales growth. In the case of Sales to Assets ratio growth, the firms with higher than average Age, ROE and Assets growth experience a negative additional effect in Sales to Assets ratio growth after receiving aid. The firms with higher than average Sales growth and Equity to Assets ratio experience a positive additional effect in sales to Assets ratio growth after receiving aid. In the case of Employees growth and Sales to Employees ratio growth, we didn't get significant additional effect of financial aid.

Table 7: The effect of variables on performance measures
(cross-section data: matcing on the propensity score)

VARIABLES	Assets Growth	Sales Growth	Emp. Growth	Sales/Assets Growth	Sales/Emp Growth
Aid	0.0542	**0.2815*** **	0.4681	-0.0092	-0.0525
	(0.058)	**(0.097)**	(0.798)	(0.237)	(0.117)
μAge * Aid	-0.001	**-0.0296***	0.0009	-0.0504	0.0008
	(0.011)	**(0.016)**	(0.025)	(0.039)	(0.008)
μROE * Aid	0.0728	-0.0339	0.0993	-0.1559	0.055
	(0.100)	(0.106)	(0.762)	(0.114)	(0.082)
μEquity/Assets * Aid	0.1455	0.4385	2.4899	0.3755	-0.2915
	(0.352)	(0.905)	(6.187)	(0.615)	(0.342)
μEmployees * Aid	**-0.0047*** **	**-0.0047***		**0.0057** **	
	(0.002)	**(0.002)**		**(0.003)**	
μSales/Assets * Aid		0.0204			-0.1979
		(0.177)			(0.126)
μSales Growth * Aid	-0.0281	-0.0666	-0.8476	0.1351	-0.1045
	(0.139)	(0.160)	(2.301)	(0.308)	(0.408)
μAssets Growth * Aid			2.7291	-0.2482	-0.5676
			(6.953)	(0.389)	(0.349)
Equity/Assets	**0.4171** **	-0.0468	-0.1582	-0.0757	0.1081
	(0.168)	(0.692)	(0.639)	(0.666)	(0.520)
ROE	-0.0371	0.0137	0.0197	0.0832	-0.0310
	(0.122)	(0.127)	(0.315)	(0.069)	(0.045)
Employees	0.0006	0.0011		-0.0028	
	(0.001)	(0.002)		(0.002)	
Age	-0.0011	0.0201	0.0045	0.0365	-0.0012
	(0.004)	(0.015)	(0.014)	(0.039)	(0.005)
Sales/Assets		-0.1141			0.1374
		(0.111)			(0.097)
Sales Growth			0.0097	-0.0191	-0.0126
			(0.0097)	(0.285)	(0.233)
Assets Growth			-0.4370	0.0218	0.2545
			(1.003)	(0.354)	(0.418)
Catalonia	-0.0413	0.0251	-0.1306	0.0772	-0.0103
	(0.063)	(0.067)	(0.791)	(0.158)	(0.059)
Madrid	0.1468	**0.1863***	**1.9000***	**0.5206** **	**-0.1867** **
	(0.089)	**(0.099)**	**(1.001)**	**(0.261)**	**(0.091)**
Basque Country	**-0.0799***	0.1387	0.6431	**0.2393***	**-0.1839***
	(0.044)	(0.091)	(0.838)	**(0.142)**	**(0.104)**
Manufacturing	0.0947	0.0678	-0.4706	-0.0604	0.0564
	(0.099)	(0.181)	(1.540)	(0.260)	(0.135)
Retail	0.0774	0.0891	-0.6178	0.0312	0.0705
	(0.069)	(0.098)	(0.538)	(0.272)	(0.133)

Table 5: The effect of variables on performance measures

Construction	-0.1218	-0.3522	-0.9418	-0.3442	**0.6316****
	(0.314)	(0.361)	(0.729)	(0.274)	**(0.267)**
Export	**0.1961*****	0.2272	-0.4533	-0.2605	-0.1583)
	(0.065)	(0.199)	(0.554)	(0.307)	(0.145)
Constant	**-0.3035*****	**-0.8302*****	0.1694	-0.5489	0.0870
	(0.064)	**(0.240)**	(0.841)	(0.524)	(0.180)
Observations	310	298	289	298	288
R-squared	0.1065	0.0978	0.0888	0.0819	0.0858

Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Note: Empty cells indicate the variable was not included in the model. $\mu Variable$ indicates that the sample mean is subtracted from the variable when calculating the estimate. Estimations were made with bootstrap standard errors clustered on regions with 1000 replications.

As shown in Table 7, firms from Madrid experience a less effect on productivity growth and a higher effect on sales, employees and efficiency growth of program participation comparison with other regions in Spain. Firms from Basque Country experience a less effect of program participation on assets and productivity growth and a higher effect on efficiency comparing with others. Firms that work in construction experience a higher effect of program participation on productivity growth comparing with other industries.

With respect to the control variables, the following observations are made: equity to assets ratio and export have a positive effect on assets growth.

Quantification of ATEs effects

- Effect on Assets Growth:
$ATE = -0.0047(Emp - \bar{Emp})$
- Effect on Sales Growth:
$ATE = 0.2815 - 0.0296(Age - \bar{Age}) - 0.0047(Emp - \bar{Emp})$
- Effect on Employment Growth:
$ATE - no\ significant\ effect$
- Effect on growth of Efficiency:
$ATE = 0.0057(Emp - \bar{Emp})$

- Effect on growth of Productivity:
$ATE - no\ significant\ effect$

Table 8: Summary of the observed additional average treatment effect (ATEs)

Firms with above average	An effect after program participation on Assets Growth	Sales Growth	Emp. Growth	Sales / Assets Growth	Sales / Emp. Growth
Age		-			
ROE					
Equity/Assets					
Employees	-	-		+	
Sales Growth					
Assets Growth					

As shown in Table 8, each cell shows the additional effect of program participation on the target variable. In the case of Total Assets growth, the firms with higher than average number of Employees experience a negative additional effect in Assets growth after receiving aid, as in the case of Sales growth. Also, in the case of Sales growth, the firms with higher than average Age experience a negative additional effect in Sales growth after receiving aid. In the case of Sales to Assets ratio growth, the firms with higher than average number of Employees experience a positive additional effect in Sales to Assets ratio growth after receiving aid. In the case of Employees growth and Sales to Employees ratio growth, we didn't get significant additional effect of receiving financial aid.

With respect to the sample of firms matched on industry and total assets, participation in the aid programs is relevant to their efficiency (Sales to Assets ratio) growth. However, for the sample of firms matched on the propensity score, participation effects growth in sales. Hence, there is an evidence to support first and fifth hypotheses.

As in the case of panel data framework we use Fixed Effect model, we should control for the problem of omited variables. Exporting, region and industry dummies are time-invariant. As such, we create terms of interaction of those dummy variables with dummy variable for program participation and control variables after subtracting its mean.

Tables 9 and 11 present the estimated effect of variables on performance measures in the panel data frameworks.

Table 9: The effect of variables on performance measures
(panel data: matching on Industry and Total Assets in 2006)

VARIABLES	Assets Growth	Sales Growth	Emp. Growth	Sales/Assets Growth	Sales/Emp Growth
Aid	-0.0070	**0.0267***	0.1534	**-1.2721***	-0.0645
	(0.025)	**(0.015)**	(0.178)	**(0.651)**	(0.066)
μROE * Aid	0.0079	0.0007	-0.0462	-0.0956	0.0093
	(0.027)	(0.002)	(0.105)	(0.224)	(0.020)
μEquity/Assets * Aid	0.1962	**-0.0508****	0.3280	1.4842	-0.2282
	(0.329)	**(0.023)**	(1.539)	(1.310)	(0.236)
μEmployees * Aid	-0.0038	**-0.0030*****		**0.0585***	
	(0.003)	**(0.001)**		**(0.034)**	
μSales/Assets * Aid		**-0.1051*****			0.0450
		(0.033)			(0.102)
μSales Growth * Aid	**0.1301****	**1.0000*****	0.6505	**16.8911****	0.0257
	(0.061)	**(0.002)**	(0.625)	**(8.286)**	(0.110)
μAssets Growth * Aid			1.0865	**-6.4002***	0.2944
			(1.054)	**(3.314)**	(0.207)
Equity/Assets	**0.0632*****	**0.0474****	-0.0051	0.0222	-0.0300
	(0.020)	**(0.022)**	(0.029)	(0.279)	(0.070)
ROE	0.0013	-0.0007	0.0002	0.0603	0.0001
	(0.001)	(0.001)	(0.001)	(0.058)	(0.001)
Employees	**0.0006***	**0.0029*****		**-0.0562****	
	(0.000)	**(0.001)**		**(0.025)**	
Age	**-0.0354*****	**-0.0345*****	**-0.0321*****	**0.5191****	0.0045
	(0.002)	**(0.003)**	**(0.011)**	**(0.232)**	(0.006)
Sales/Assets		**0.1035*****			**-0.0683*****
		(0.033)			**(0.023)**
Sales Growth			**0.1976*****	**-20.9561****	0.0301
			(0.068)	**(8.242)**	(0.047)
Assets Growth			**0.1523****	**9.6661*****	**-0.2703*****
			(0.069)	**(3.374)**	**(0.062)**
μEmployees * Aid * Madrid	**0.0060****	0.0000		-0.0135	
	(0.003)	(0.000)		(0.018)	
μSales * Aid * Madrid	-0.0049	-0.0007	4.0481	**-1.8259***	-0.0225
	(0.099)	(0.004)	(2.779)	**(1.063)**	(0.134)
μSales * Aid * Catalonia	**0.1343***	0.0013	-0.0854	**-2.1384****	-0.1905
	(0.080)	(0.004)	(0.422)	**(0.872)**	(0.267)
μSales * Aid * Basque Country	0.0735	0.0006	**1.6129***	-2.2953	0.0710
	(0.142)	(0.007)	**(0.969)**	(2.647)	(0.269)
μSales * Aid * Manufacturing	0.0193	0.0024	-0.2686	3.0062	**-0.2201***
	(0.087)	(0.004)	(0.911)	(3.525)	**(0.127)**
μSales * Aid * Construction	-0.0003	0.0015	-1.2514	**-2.3415****	-0.0580
	(0.086)	(0.003)	(0.841)	**(1.038)**	(0.130)

Table 9: The effect of variables on performance measures

μSales * Aid * Retail	0.2554	-0.0004	-0.6335	**-2.4034****	**-0.4505****
	(0.166)	(0.003)	(0.814)	**(1.065)**	**(0.207)**
Export * Aid	-0.0267	0.0008	-0.2110	-0.1694	-0.0002
	(0.067)	(0.002)	(0.405)	(0.348)	(0.085)
Year dummies	Yes	Yes	Yes	Yes	Yes
Constant	**0.6346*****	**0.3813*****	**0.6494*****	**-6.7504***	0.1085
	(0.037)	**(0.092)**	**(0.206)**	**(3.503)**	(0.134)
Observations	11491	11492	11152	11491	11147
R-squared	0.110	0.177	0.079	0.123	0.021
Number of companies	2175	2175	2143	2175	2143

Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Note: Empty cells indicate the variable was not included in the model. $\mu Variable$ indicates that the sample mean is subtracted from the variable when calculating the estimate. Estimations were made with bootstrap standard errors with 1000 replications.

As shown in Table 9, with respect to the control variables, the following observations are made:

- *Effect on Assets Growth:* Equity to assets ratio and number of employees have a positive effect, and age has a negative effect.

- *Effect on Sales Growth:* Equity to assets ratio, sales to assets ratio and number of employees have a positive effect, and age has a negative effect.

- *Effect on Employment Growth:* Age has a negative effect and sales and assets growth have a positive effect of program participation.

- *Effect on growth of Efficiency:* Number of employees and sales growth have a negative effect and age and assets growth positive.

- *Effect on growth of Productivity:* Sales to Assets ratio and assets growth have a negative effect.

Quantification of ATEs effects

- Effect on Assets Growth:

$ATE = 0.1301(Sales\,Growth - Sales\,\bar{G}rowth) + 0.0060Madrid(Emp - E\bar{m}p) +$
$+0.1343Catalonia(Sales\,Growth - Sales\,\bar{G}rowth)$

- Effect on Sales Growth:
$ATE = 0.0267 + 1.000(SalesGrowth - \bar{Sales\,Growth}) - 0.1051(Sales/Assets - \bar{Sales/Assest})$
$-0.0508(Equity/Assets - \bar{Equity/Assets}) - 0.003(Emp - \bar{Emp})$
- Effect on Employment Growth:
$ATE = 1.6129 Basque\,Country(Sales\,Growth - \bar{Sales\,Growth})$
- Effect on growth of Efficiency:
$ATE = -1.2721 - 1.8259 Madrid(Sales\,Growth - \bar{Sales\,Growth}) - 2.1384 Catalonia$
$(Sales\,Growth - \bar{Sales\,Growth}) - 2.315 Construction(Sales\,Growth - \bar{Sales\,Growth})$
$-2.4034 Retail(Sales\,Growth - \bar{Sales\,Growth}) + 0.0585(Emp - \bar{Emp}) + 16.8911$
$(Sales\,Growth - \bar{Sales\,Growth}) - 6.4002 - (Assets\,Growth - \bar{Assets\,Growth})$
- Effect on growth of Productivity:
$ATE = -0.2201 Manufacturing(Sales\,Growth - \bar{Sales\,Growth}) - 0.4505 Retail$
$(Sales\,Growth - \bar{Sales\,Growth})$

Table 10: Summary of the observed additional average treatment effect (ATEs)

Firms with above average	An effect after program participation on Assets Growth	Sales Growth	Emp. Growth	Sales / Assets Growth	Sales / Emp. Growth
Age					
ROE					
Equity/Assets		-			
Sales/Assets		-			
Employees	*+ Madrid*	-		-	
Sales Growth	*+, + Catalonia*	+	*+ Basque Coutry*	*+, - Madrid, Catalunia - Construction, Retail*	*- Manufacturing, Retail*
Assets Growth				-	

As shown in Table 10, each cell shows the additional effect of program participation on the target variable. In the case of Total Assets growth, the firms with higher than average number of Employees from Madrid experience a positive additional effect in Assets growth after receiving aid. The firms with higher than average Sales growth experience a positive additional effect in Assets growth after receiving aid, while the Catalonian firms experience also positive but a little bit higher effect. In the case of Sales growth, the firms with higher than average Equity to Assets ratio, Sales to Assets ratio and number of Employees experience a negative additional effect in Sales growth after receiving aid, while the firms with higher

than average Sales growth experience a positive additional effect. In the case of Employees growth the firms from Basque Country with higher than average Sales growth experience a positive additional effect in Employees growth after receiving aid. In the case of Sales to Assets ratio growth, the firms with higher than average Sales growth experience a positive additional effect in Sales to Assets ratio growth, while firms from Madrid and Catalonia and those that work in Construction and Retail have a negative additional effect. The firms with higher than average number of Employees experience a negative effect in Sales to Assets ratio growth. While, the firms with higher than average Assets growth experience a negative additional effect in Sales to Assets ratio growth. In the case of Sales to Employees ratio growth, the firms that work in Manufacturing and Retail with higher than average Sales growth experience a negative additional effect in Sales to Employees ratio growth after receiving aid.

Table 11: The effect of variables on performance measures
(panel data: matching on the propensity score)

VARIABLES	Assets Growth	Sales Growth	Emp. Growth	Sales/Assets Growth	Sales/Emp Growth
Aid	0.0133	0.0620	0.0865	-0.2223	-0.0254
	(0.048)	(0.039)	(0.180)	(0.379)	(0.083)
μROE * Aid	0.0069	-0.0084	-0.0461	0.0082	0.0011
	(0.022)	(0.012)	(0.118)	(0.226)	(0.026)
μEquity/Assets * Aid	0.4092	-0.0549	0.1647	-4.4643	-0.2356
	(0.314)	(0.187)	(1.613)	(5.491)	(0.268)
μEmployees * Aid	**-0.0054***	-0.0018		0.0369	
	(0.003)	(0.001)		(0.031)	
μSales/Assets * Aid		**-0.1987*** **			0.0583
		(0.065)			(0.111)
μSales Growth * Aid	**0.1319** **	**1.0009*** **	0.6548	5.7393	-0.0068
	(0.063)	**(0.004)**	(0.590)	(4.360)	(0.111)
μAssets Growth * Aid			1.0229	-1.9513	0.3179
			(1.297)	(1.679)	(0.268)
Equity/Assets	-0.0030	0.0635	-0.0789	5.2968	-0.0826
	(0.111)	(0.207)	(0.141)	(5.936)	(0.100)
ROE	0.0078	0.0080	-0.0162	-0.0411	0.0098
	(0.009)	(0.012)	(0.035)	(0.136)	(0.018)
Employees	**0.0022*** **	**0.0021***		-0.0324	
	(0.001)	**(0.001)**		(0.023)	

Table 11: The effect of variables on performance measures

Age	**-0.0399*** **	**-0.0378*** **	-0.0193	**0.2342** **	0.0012
	(0.007)	**(0.008)**	(0.016)	**(0.112)**	(0.013)
Sales/Assets		**0.2008*** **			**-0.0853** **
		(0.065)			**(0.042)**
Sales Growth			**0.1633** **	**-9.7134** **	0.0560
			(0.082)	**(4.128)**	(0.051)
Assets Growth			**0.4980** **	**4.3516*** **	**-0.2587*** **
			(0.241)	**(1.561)**	**(0.073)**
μEmployees * Aid * Madrid	**0.0060***	0.0000		-0.0143	
	(0.003)	(0.000)		(0.016)	
μSales * Aid * Madrid	-0.0004	0.0002	4.1565	**-1.8851***	-0.0031
	(0.099)	(0.008)	(2.882)	**(1.028)**	(0.133)
μSales * Aid * Catalonia	**0.1393***	0.0026	-0.0142	**-2.2192** **	-0.1787
	(0.083)	(0.007)	(0.408)	**(0.873)**	(0.256)
μSales * Aid * Basque Country	0.0757	-0.0084	**1.6588***	-2.4954	0.0648
	(0.148)	(0.015)	**(0.997)**	(2.481)	(0.266)
μEquity/Assets * Aid * Manuf.	**-0.6764** **	0.0079	-2.2333	0.3804	0.2506
	(0.278)	(0.045)	(2.859)	(1.767)	(0.323)
μSales * Aid * Manufacturing	0.0013	-0.0040	-0.2988	3.3305	**-0.2104***
	(0.085)	(0.009)	(0.955)	(3.438)	**(0.116)**
μSales * Aid * Construction	0.0076	-0.0033	-1.2716	**-2.2465** **	-0.0870
	(0.091)	(0.006)	(0.887)	**(1.040)**	(0.145)
μSales * Aid * Retail	0.2560	-0.0027	-0.6068	**-2.2557** **	**-0.4474** **
	(0.166)	(0.006)	(0.764)	**(1.059)**	**(0.201)**
Export * Aid	-0.0280	-0.0020	-0.2145	-0.0302	0.0083
	(0.063)	(0.003)	(0.392)	(0.314)	(0.084)
Year dummies	Yes	Yes	Yes	Yes	Yes
Constant	**0.6645*** **	**0.3045***	0.2865	-4.1250	0.2064
	(0.116)	**(0.180)**	(0.211)	(2.799)	(0.262)
Observations	2476	2476	2422	2476	2422
R-squared	0.196	0.574	0.234	0.327	0.056
Number of companies	428	428	426	428	426

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1*

Note: Empty cells indicate the variable was not included in the model. $\mu Variable$ indicates that the sample mean is subtracted from the variable when calculating the estimate. Estimations were made with bootstrap standard errors with 1000 replications.

As shown in Table 11, with respect to the control variables, the following observations are made:

- *Effect on Assets Growth:* Number of employees has a positive effect, and age has a negative.

- *Effect on Sales Growth:* Sales to assets ratio and number of employees have a positive effect, and age has a negative effect.

- *Effect on Employment Growth:* Sales and assets growth have a positive effect.

- *Effect on growth of Efficiency:* Assets growth, age have a positive effect, sales growth negative.

- *Effect on growth of Productivity:* Sales to assets ratio and assets growth have a negative effect.

Quantification of ATEs effects

- Effect on Assets Growth:

$ATE = 0.1319(Sales\,Growth - Sales\,\bar{G}rowth) - 0.0054(Emp - E\bar{m}p) + 0.0060Madrid\,(Emp - E\bar{m}p) + 0.1393Catalonia(SalesGrowth - Sales\,\bar{G}rowth) - 0.6764Manufacturing\,(Equity/Assets - Equity\bar{/}Assets)$

- Effect on Sales Growth:

$ATE = 1.0009(Sales\,Growth - Sales\,\bar{G}rowth) - 0.1987(Sales/Assets - Sales\bar{/}Assest)$

- Effect on Employment Growth:

$ATE = 1.6588Basque\,Country(Sales\,Growth - Sales\,\bar{G}rowth)$

- Effect on growth of Efficiency:

$ATE = -1.8851Madrid(SalesGrowth - Sales\,\bar{G}rowth) - 2.2192Catalonia(SalesGrowth - Sales\,\bar{G}rowth) - 2.2465Construction(Sales\,Growth - Sales\,\bar{G}rowth) - 2.2557Retail\,(Sales\,Growth - Sales\,\bar{G}rowth)$

- Effect on growth of Productivity:

$ATE = -0.2104Manufacturing(Sales\,Growth - Sales\,\bar{G}rowth) - 0.4474Retail\,(Sales\,Growth - Sales\,\bar{G}rowth)$

Table 12: Summary of the observed additional average treatment effect (ATEs)

Firms with above average	An effect after program participation on Assets Growth	Sales Growth	Emp. Growth	Sales / Assets Growth	Sales / Emp. Growth
Equity/Assets	- *Manufacturing*				
Sales/Assets		-			
Employees	-, + *Madrid*				
Sales Growth	+, + *Catalonia*	+	+ *Basque Coutry*	- *Madrid, Catalunia* - *Construction, Retail*	- *Manufacturing, Retail*
Assets Growth					

As shown in Table 12, each cell shows the additional effect of program participation on the target variable. In the case of Total Assets growth, the firms that work in Manufacturing with higher than average Equity to Assets ratio experience a negative additional effect in Assets growth after receiving aid. The firms with higher than average number of Employees experience a negative additional effect in Assets growth after receiving aid, while firms from Madrid positive. The firms with higher than average Sales growth experience a positive additional effect in Assets growth after receiving aid, while the Catalonian firms experience also positive but a little bit higher additional effect. In the case of Sales growth, the firms with higher than average Sales to Assets ratio experience a negative additional effect in Sales growth after receiving aid, while the firms with higher than average Sales growth experience a positive additional effect. In the case of Employees growth, the firms from Basque Country with higher than average Sales growth experience a positive additional effect in Employees growth after receiving aid. In the case of Sales to Assets ratio growth, the firms that work in Construction and Retail with higher than average Sales growth experience a negative additional effect in Sales to Assets ratio growth after receiving aid. Also, the firms from Madrid and Catalonia with higher than average Sales growth experience a negative additional effect in Sales to Assets ratio growth after receiving aid. In the case of Sales to Employees ratio growth, the firms that work in Manufacturing and Retail with higher than average Sales growth experience a negative additional effect in Sales to Employees ratio growth after receiving aid.

With respect to the sample of firms matched on industry and total assets, participation in the aid programs is relevant to their efficiency (Sales to Assets ratio) and sales growth. However, for the sample of firms matched on the propensity score, we did not find a significant effect of program participation. Hence, there is an evidence to support first and fifth hypotheses.

Conclusion

Because investment subsidies are seen by many politicians in Spain as well as in the EU as an efficient instrument to increase growth in firms, and because it is unclear how government subsidies influence the growth of firms' performance, the objective of this study is to analyse whether the effects exist when Spanish SMEs participate in financial aid programs (credit subsidised by the ICO or credit guaranteed by the MGS). To do so, we consider five performance variables: assets, sales and employees growth, efficiency and productivity growth. This analysis contributes to previous studies accounting for heterogeneity across regions, unobserved heterogeneity across companies and exogenous components of growth. To control for possible effects of selection bias, the control variables are included to estimate the average treatment effect and comparison group is identified using matching methodology.

The main finding of this study is that the effect of financial policy programs is positive on the sales growth and negative on the efficiency. Nevertheless, these effects are not homogeneous among all participating firms, but rather, they depend on the firm's characteristics, its regional location and industrial activity. The observed effects coincide, in general terms, with those reported in previous studies. For the sales growth, see Lerner (1999); Ege (2009); Chandler (2012). For the efficiency, see Bergstrom (2000); Calvo, Garcia and Madrid (2004); Sissoko (2011); Criscuolo et al. (2012); Crecente, Garcia, Cano and Torres (2013).

Due to the common results that we got, using different data frameworks and different estimation methods, we see strong additional effect of program participation. Such as:

- *Assets Growth:* there is a positive effect of sales growth.

- *Sales Growth:* there is a positive effect of sales growth, and a negative effect of age and sales to assets ratio.

- *Efficiency Growth:* there is a negative effect of assets growth, and a positive effect of sales growth.

This study presents at least two contributions. First, there is an impact of financial policy program during observed period (2007 - 2012), given the significant effect on sales and efficiency growth. Second, the existence of particular impacts for the location and activity leads us to consider differences in implementation of SME financial policy programs among regions and industries.

The mutual guarantee systems or the ICO aids should not be used as the only way to

solve financial problems. If a company is a bad borrower, it will remain a bad borrower. It is the responsibility of public and financial institutions in charge of distribution of funds to integrate to the public aids some reasonable and quantifiable indicators, in order to measure the degree of exploitation of the investments. An implication of this study, as well as of the results from Bergstrom (2000) study of financial policy in Sweden, is that even if there might be market failure justifications for subsidies, it is not certain that resources will be efficiently allocated. The influence of important pressure groups can lead to subsidisation of less efficient firms, which implies that financial aid's policy prevents or delays the structural transformation of the awarded firms.

The results obtained are important premises for decision makers when they have to determine whether a firm should be supported or not. However, the analysis is based on particular results and should not be used as a single decision criterion as to whether a firm should be supported or not. Some results deserve further analysis. First, the significant effects of sales and assets growth show the relevance of selection bias in policy evaluation. Second, the studied period is a crisis period in Spain that may lead to overestimating or underestimating of effect of program participation. Third, in the case of existence an endogeneity of awards reveal that firms with better performance receive subsidies, but subsidies do not lead to increase the performance, in the presence of good instrumental variable, this problem may be solved. Fourth, due to the variety of methods used in the literature on firm growth, it is difficult to determine which econometric method should be used. Should be reasonable to focus on testing the present result using different econometric methods.

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