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EVALUATING THE IMPACT OF PUBLIC PROGRAMS OF FINANCIAL AID TO SMEs DURING TIMES OF CRISIS: THE SPANISH EXPERIENCE (*)

Anahí Briozzo
National Southern University, Bahía Blanca, Argentina
abriozzo@uns.edu.ar

Clara Cardone-Riportella
Pablo de Olavide University, Seville, Spain
ccardone@upo.es

DEPARTMENT OF
FINANCIAL ECONOMICS AND ACCOUNTING

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Anahí Briozzo
Clara Cardone-Riportella
Department of Financial Economics and Accounting
Universidad Pablo de Olavide
Carretera de Utrera, km. 1
41013 Seville (Spain)

Abstract

The aim of this study is to analyse the differential effects of the public programs that provide financial aid to small and medium enterprises during times of crisis in Spain. We use different methods to control for potential selection bias. The results show that the effects of these financial aid programs are more significant during times of crisis: during normal (non-crisis) periods, these programs impact the growth of assets, sales, efficiency, and productivity, whereas during recessions, their effects extend to employment growth.

Keywords: public programs, impact evaluation, financial aid, SMEs, crisis, selection bias, average treatment effects.

JEL: G3, C5

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Introduction

The relevance of small and medium enterprises (SMEs) in the European economy, and in the Spanish economy in particular, and their unique problems compared to those of large businesses calls attention to this sector from both the academic and the institutional perspective. One of the most studied aspects of SMEs is the problem of access to financing, mainly as a consequence of information asymmetries between these businesses and financial backers. As a response to these imperfections in the market, specific public aid instruments have been designed for SMEs, such as tax reduction and guarantee systems (Cardone and Briozzo, 2012).

Compared with the rest of Europe, according to Fonfría Mesa (2003), 82.56% of SME policy measures in Spain are directed towards financing, whereas in Europe as a whole, the average is 48.93%. This greater emphasis on financial aid policies in Spain can be understood in the context of the more pronounced problems in Spain associated with access to credit, which have worsened since the economic crisis began at the end of 2007.

The Official Credit Institute (Instituto de Crédito Oficial - ICO, 2008) notes that since 2008, the Spanish economy has entered into a process of deterioration in real sector activity, with a 2.5% drop in the gross domestic product (GDP) over 2007. Similarly, there was a 7.2% drop in the total credit growth over the previous year. According to the Bank of Spain (2009), the variation in the indicators of economic activity (such as the retail trade index, the industrial production index, and consumer and industrial confidence) became negative after 2008. The change in the gross value-added between 2008 and 2007 was -2.9% for all businesses, on average, and 3.4% for smaller businesses. This contraction affected virtually every sector of economic activity as a result of the contraction in demand and investment, especially during the second half of 2008. At the same time, an increase in the Bank of Spain's indicator showing the tightening of credit and a drop in credit demand among non-financial corporations has been reported since 2008.

In response to the heightened restrictions on access to credit as a result of the crisis, a question arises that frames the objective of this study: what is the impact of the public financial aid programs for SMEs? We propose to analyse whether differential effects exist for the SMEs that have participated in this type of program during times of crisis. Based on the database of the

Iberian System for Financial Statement Analysis (SABI, Sistema de Análisis de Balances Ibéricos), the Spanish SMEs that participated in financial aid programs were identified for two time periods: 2002-2003 (normal pre-crisis years) and 2007 (the beginning of the crisis). We used three tools to control for the possible effects of selection bias: i) the determination of a comparison group via matching, ii) a two-stage model to analyse the probability of receiving aid, and iii) the inclusion of control variables to estimate the average treatment effect.

This paper contributes to the current literature by offering an analysis of the relevance of public financial aid programs for SMEs during times of crisis. Among the key findings is that the effects of these financial aid programs are stronger during times of crisis: during normal (non-crisis) periods, these programs only impact the growth of assets, sales, efficiency, and productivity, whereas during recessions, their effects extend to employment growth.

This paper is organised into four sections. The first section describes the relevant theoretical framework and the preliminary empirical evidence. The second section is devoted to methodological aspects. The third section presents the main results obtained in the study, and the fourth section offers conclusions.

1. Theoretical Framework and Preliminary Evidence

SMEs account for 99% of all existing businesses in the European Union, one-third of sales volume, and nearly half of import and export volume (European Commission, 2009a). In Spain, there are 2.69 million SMEs (of which 92% are micro-enterprises). These SMEs provide 78% of all jobs (above the European average of 67%) and generate 68% of the value added (also above the European average of 58%), according to data from the European Commission (2009b).

Policies providing financial aid to SMEs seek to moderate the imperfections that arise in the credit market for the businesses in this sector. These imperfections include transaction costs and, especially, information asymmetries between the financial backers and the business.

Stiglitz and Weiss (1981) studied the particular problem of the bank credit market and found that it can be characterised by an equilibrium with credit rationing due to the effects of moral hazards and adverse selection. Adverse selection arises when low-risk businesses that are not ready to address high interest rates self-exclude from the demand for credit. Higher interest rates can lead businesses to take on higher-risk projects, causing the problem of a moral hazard. Banking institutions can respond to these problems by establishing restrictive conditions for rewarding credit, requiring a higher interest rate to compensate for the costs of control and high risk, or asking for additional guarantees (collateral) in exchange for credit. Given that the banking system is the primary source of external funds for SMEs after commercial credit

(Hughes, 1997), this situation can lead to restrictions in the access to financing that limit the growth of these businesses.

The government policies that seek to mitigate the imperfections of the financial markets include an array of tools, such as interest rate subsidies, guarantee systems (through mutual guarantee societies), incentives for venture capital, fiscal incentives for trading in alternative markets, and special public offering schemes, to facilitate access to capital markets.

With respect to evaluating the impact of public aid programs for SMEs, Storey (2000) describes six stages in the process of measuring their effectiveness:

1. The primary characteristics of the program are revealed via a descriptive analysis of the number of participating businesses, their distribution by activity sector, the total monies involved, and other attributes.
2. Opinions are gathered from the program participants regarding implementation problems and other difficulties that they may have faced.
3. Opinions are gathered from program participants on whether they believe the programs have had an impact on the performance of their businesses.
4. The performance (as growth in employment or in sales) of the participating businesses is compared to that of the businesses that did not participate, without taking into consideration how this comparison group is determined.
5. Business matching is carried out, such that both groups of companies coincide in characteristics such as age, sector, and geographical location. Performance comparisons are made between these groups.
6. One consideration is that, beyond these observable characteristics, the businesses that demand aid programs differ in their "level of motivation", which may, for example, imply that their owners are more growth-oriented (a self-selection bias). Another consideration is that the governmental entity that administers the program could display an administrative bias for participant selection. These sources of selection bias should be taken into account in the analysis. It is in this final stage that it becomes truly possible to quantify the effectiveness of public aid programs for SMEs.

According to Baker (2000), 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. Table 1 displays the results found in previous studies in different countries, and Table 2 displays the studies conducted in Spain.

Table 1: Empirical analyses of the impact of aid programs outside of Spain

Authors	Sample	Methodology	Results

Lerner (1999)	Studies the effect of the Small Business Innovation Research program (SBIR) in the US on a sample of 894 companies.	The comparison group is developed through two matching procedures: one defined by activity and size and the other by location and size. Subsequently, a model of ordinary least squares (OLS) is estimated.	Finds positive effects in the percentage change of sales and employment levels.
Roper and Hewitt-Dundas (1999)	Studies 703 Northern Ireland and Republic of Ireland businesses. Participation in different types of programs for SMEs is considered.	Uses the Heckman selection model (1979).	Finds a positive effect on job creation. The effect is not significant for growth in assets and sales.
Wallsten (2000)	Studies the effect of the commercial incentive programs for R & D in the US (for small, high-tech businesses) in a sample of 367 companies.	Has an instrumental variable focus. The instrumental variable is defined as a function of the budget of the funding agency.	Finds no effect on job creation. The program appears to reward the most commercially viable projects.
Almus (2001)	Studies 1,726 German companies (472 received aid during their start-up phase).	Uses a three-stage selection model.	Finds significant effects on job growth.
Bradshaw (2002)	Analyses 1,166 businesses that participated in the California State Loan Guarantee Program.	Business development before and after receipt of loan is evaluated through a comparison of means.	Finds a positive effect on jobs and revenue generation.
Hyytinen and Toivanen (2005)	Studies the effect of aid policies in Finland on a sample of 700 businesses.	A Tobit regression model is used at the industry level.	The industries that rely more on external financing invest more in R & D and are more growth-oriented when public financing programs are available.
Honjo and Harada (2006)	Based on panel data from 1995 to 1999 from the Japanese Institute of Economic Research, the impact of industrial promotion law is studied.	Uses the least squares method (LSM) at the company level.	Finds a positive effect of the aid measure for asset growth but not for sales and employment.
Riding, Madill, and Haines (2007)	Studies the effect of a system of guarantees in Canada on a sample of 350 companies.	Seeks to analyse possible incrementality: whether, as a result of this system, there is access for companies that could not obtain credit previously. A logit model is estimated, for which the dependent variable is whether or not credit was awarded.	Finds a positive effect of the system of guarantees on credit access.
Craig, Jackson, and Thomson (2008)	Studies 504 loans guaranteed by the Small Business Administration (US) from 1991 to 2001. Data were collected on a local level.	Uses LSM on a cross-section with fixed effects. The unit of analysis is the region and not an individual company.	Finds a positive effect on job creation.
Kobeissi (2009)	Studies 394 start-ups from the 1997-1999 period in the US. Studies the effect of the Community Reinvestment Act (CRA).	Uses panel data with fixed effects formulated on a regional level and not by individual company.	Finds that the level of CRA loans is significant in the growth of start-ups per year and for job creation per region.
Mole, Hart,	Studies the effects of aid services to SMEs in England on	Uses a Probit model for the probability of being assisted and	Finds that intensive assistance has a positive

Roper, and Saal (2009)	a sample of 3,348 companies.	an average treatment effects model to study program impact.	effect on job growth.
Oh, Lee, Heshmati, and Choi (2009)	Evaluates the effects of a guarantee program in Korea in the post-Asian-crisis period.	Uses propensity score matching comparing businesses that participated in the program with those that did not.	Finds that the least productive receive aid. The program has a positive effect on growth in employment, sales, and salaries.
Chandler (2010)	Studies the effect of a financing program for SMEs in Canada on a sample of 2,105 businesses.	Uses a robust LSM. Includes financing structure and growth intent as control variables.	Finds a positive effect on growth in salaries, employment, and revenue.

Table 2: Empirical analyses of the impact of aid programs in Spain

Authors	Sample	Methodology	Results
Calvo, García, and Madrid (2004)	Studies 53 businesses that received a subsidy and 53 that did not in the region of Murcia.	Uses business matching. Compares averages between comparison and treatment groups. Uses logistic regression to study the differential characteristics of the subsidised businesses.	Finds greater efficiency (use of fixed capital) in the non-subsidised businesses and lower risk in the subsidised businesses (both before and after receiving aid). Finds that the positive effect is short term (1 year) but later disappears and that the non-subsidised businesses are more efficient.
Rivera and Muñoz (2004)	Uses data from the Central Balance Sheet Data Office of the Bank of Spain for the period 1992-2002, with 415 observations (at the sector level).	The authors create two groups based on whether the industrial sector receives higher or lower subsidies than the average. Uses mean differences with t tests and Mann-Whitney U tests.	Obtains positive results for the personal income/expense and revenue/assets indicators. Productive efficiency increases more for larger businesses. Does not obtain positive results for other efficiency measures.
García and Crespo (2005)	Defines six different samples based on the type of financing (total: 23,328 companies from the SABI database). Evaluates the effects of guarantees from the MGS and of loans from the ICO.	Uses factorial analysis and LSM. Includes participant surveys.	Finds that businesses that participate in the programs have a greater proportion of current assets and higher productivity and profitability.
Madrid and García (2008)	Studies 532 companies from the Economic Barometer of SMEs (Murcia Regional Development Agency).	Studies motivation bias and administrative selection bias using logistic regressions.	The variables number of employees, belonging to the industrial sector, and innovative strategies have positive effects on the probability of seeking out public aid. The perceived technological position has a positive effect on the probability of receiving public aid.
Del-	Studies 755	Compares investments	Discovers a positive effect from the

Palacio, Zhang, and Sole (2010).	investments conducted by 83 venture capital (VC) funds over ten years for all of Spain.	conducted by VC funds before and after the implementation of development policies for these types of funds.	policies on the growth of the investments made by VC companies.

As shown in Table 1, the empirical evidence generally demonstrates a positive effect on job creation, whereas there is less support for profit and asset growth. With respect to the studies carried out in the Spanish market (Table 2), there is a relevant effect on the efficiency measures (such as turnover of assets) and on productivity. Beyond the observed results, a background survey leads to two methodological conclusions: first, several statistical techniques have been used to consider selection bias and second, the impact of programs tends to be evaluated in the short term. Long-term results are not significant because outside factors intervene, which are difficult to control for over time.

The present study makes a significant contribution by studying one aspect that has not previously been analysed: the relevance of public financial aid programs for SMEs during times of crisis, especially during the recent 2008 crisis. In particular, the effect of aid programs is studied in combination with performance variables. These variables are summarised in Table 3 together with their expected result and the prior empirical evidence.

Table 3: A review of the existing evidence for performance variables

The Effect of Participating in Financial Aid Programs on. . .	**Expected Result**	**Previous Empirical Evidence**
Asset growth	+	+ → Honjo and Harada (2006). ns → Roper and Hewitt-Dundas (1999).
Sales growth	+	+ → Lerner (1999), Oh et al. (2009), Chandler (2010). ns → Roper and Hewitt-Dundas (1999), Honjo and Harada 2006.
Job growth	+	+ → Lerner (1999), Roper and Hewitt-Dundas (1999), Almus (2001), Bradshaw (2002), Craig et al. (2008), Kobeissi (2009), Mole et al. (2009), Oh et al. (2009), Chandler (2010). ns → Wallsten (2000), Honjo and Harada (2006).
Efficiency growth	+	+ → Rivera and Muñoz (2004), Calvo et al. (2004), (only short-term).
Productivity growth	+	+ → García and Crespo (2005).

Note: "ns" denotes that the observed effect is not significant.

2. Methodology

2. 1. Data and sample determination

The SABI database is used, which provides quantitative information (financial statements[1]) and qualitative information for Spanish businesses. Included among the qualitative variables is the number of financial entities that the businesses operate with, among which official credit organisations, such as the Official Credit Institute (ICO) and the Mutual Guarantee Societies (MGS), are listed.

Two time periods are considered for the sample selection: i) a normal economic cycle (2002-2003) and ii) the year 2007 as the starting point of the economic crisis. For 2002 and 2003, there are data for 96 businesses that participated in financial aid programs, whereas there are 58 businesses for 2007. Only businesses with fewer than 250 employees at the time that they received financial aid[2] are included. According to García and Crespo (2005), who compare the ICO and the CERSA databases with SABI, approximately 10% of the SMEs that appear in SABI participate, in any given year, in some type of financial aid program. Nevertheless, only a small proportion of businesses report their participation in this type of program in SABI. This possible bias in data collection, when added to possible self-selection bias and administrative bias, is analysed in Sections 2.2, 3.2, and 3.3.

The financial aid instruments used by the SMEs in the sample are subsidised credits offered by the Official Credit Institute as well as bank credits guaranteed by an MGS. It is well known that the guarantee offered by an MGS facilitates access to credit while cheapening its cost, which is why the two instruments are considered to be comparable.

Once the businesses that participated in these programs, referred to as the treatment group, are identified, the next step involves identifying an appropriate comparison group. As in earlier studies (Lerner, 1999; Calvo, García, and Madrid, 2004), the matching methodology is used in this study. At least one business similar to each company in the treatment group[3] is selected according to the following parameters: location (autonomous region), activity (NACE classification, 2nd revision, 4 digits), and size (total assets measured during the previous year, with a variation of +/-10%). In this manner, the final sample of 368 businesses is determined as shown in Table 4.

[1] In Spain, Royal Decree 1/2010 establishes that the financial statements of businesses must be audited, excepting those businesses that present abbreviated balance sheets. To be included in the latter category, during two consecutive business years, a business must meet at least two of the following conditions: i) assets below 2.8 million €, ii) annual profit from sales below 5.7 million €, and iii) average number of employees below 50. In our sample, 38% of the businesses met the requirement for providing audited financial statements.

[2] A firm with fewer than 250 employees matches the definition of an SME by the European Commission.

[3] In cases in which more than one comparable business meets these conditions, two businesses are chosen at random.

Table 4: Sample distribution

Year	SMEs that Do not Participate in Financial Aid Programs (Comparison Group)	SMEs that Do Participate in Financial Aid Programs (Treatment Group)	Total
2002-2003	137	96	233
2007	77	58	135
Total	214	154	368

In the appendix (Tables 11 and 12), the sample distribution is shown according to the autonomous region and sector. Half of the sample is concentrated in three regions (Catalonia, Basque Country, and Madrid). Three sectors make up 73% of the sample: manufacturing (31.2%), retail (24.2%), and construction (17.6%)[4].

2.2. Estimation methodology

The econometric methodology for applied analysis is carried out in two stages: i) an analysis of selection bias and ii) a study of the effect of program participation on the performance variables.

With $y = \beta x + u$ as a starting point, we modelled selection bias assuming that w* represents the latent variable behind the selection model and that w is the observable treatment (participation in the aid program in year t), such that

$$w^* = z\delta + v \qquad w = \begin{cases} 1 \Rightarrow \delta z + v > 0 \\ 0 \Rightarrow \delta z + v < 0 \end{cases} \qquad \textbf{Eq. 1}$$

where $v \sim N(0,1)$.

The expected value of the residual is given as

$$E(u \mid x, v > -z\delta) = \lambda(z\hat{\delta}) = \frac{\phi(z\hat{\delta})}{\Phi(z\hat{\delta})},$$

where ϕ is the normal probability density function and Φ is the normal cumulative distribution function (Brown and Mergoupis, 2010). The explanatory variable z_i is measured in the year preceding the receipt of aid, described in Section 2.4 (Table 4).

Lambda (or the Inverse Mills Ratio, λ) is the correction factor for residuals, such that the estimation model is

[4] The real estate sector represents 5% of the sample, and significant participation by high technology sectors is not observed.

$$y = \beta x + \alpha w + \gamma\lambda + v\,,$$

where λ corrects for selection bias and γ measures the correlation between u and v. In this way, the non-observable factors that make participation more likely are determined.

For the businesses that requested financial aid, received it, and reported it, the proposed model estimates self-selection, administrative, and data collection biases together. Because the three biases can be expected to act in the same direction (the best businesses request aid, receive it, and have the motivation to report it), if the estimated model is not significant, it can then be concluded that the three biases are not relevant for the sample. However, if significant results are shown, the source of the bias will not be identifiable.

Second, the effect of program participation on the performance variables is studied ($y = \beta x + u$). According to Wooldridge (2002), this relationship can be estimated by means of the average treatment effects (ATE) on the treated group. As such, we estimate the following equation:

$$E(y_{t+1}|w, x_t) = \beta_0 + \alpha w + \tau g + \theta g w + \beta \mathrm{x} + \beta \mathrm{x} g + \psi(\mathrm{x}\text{-}\bar{\mathrm{x}})w + \omega(\mathrm{x}\text{-}\bar{\mathrm{x}})wg + u$$

Eq. 2

These variables have the following definitions:

y: performance variable of interest measured the year after program participation.

w: dummy variable that takes the value 1 if the company participated in a financial aid program and 0 if it did not.

g: dummy variable that takes the value 1 if the company belongs to the 2007 sample and 0 if it does not.

X: vector combining business characteristics (control variables) measured in the year of program participation (t).

$\bar{\mathrm{x}}$: vector of the sample means for each characteristic.

$\beta_0, \alpha, \tau, \psi, \beta, \theta, \omega$: the estimated coefficients.

u: error term.

The ATE, which measures the effect of participating in the financial aid program in a business selected at random from the sample, can be estimated as follows:

$$\hat{ATE}(\mathrm{x}) = E(y|w=1) - E(y|w=0) = \begin{cases} \theta + \psi(\mathrm{x}\text{-}\bar{\mathrm{x}}) & \text{si } g\text{=0 (year 2002-2003)} \\ \theta + \tau + \psi(\mathrm{x}\text{-}\bar{\mathrm{x}}) + \omega(\mathrm{x}\text{-}\bar{\mathrm{x}}) & \text{si } g\text{=1 (year 2007)} \end{cases}$$

The control variables (x) included in the estimate are described in Section 2.4. (Table 5). This model of treatment effects is estimated using consistent estimators in two stages. However, if the Lambda coefficient is not significant, a direct estimate via the least squares method (LSM), including control variables, is preferable (Honjo and Harada, 2006).

In following this methodology, the possible selection bias is controlled in three ways: the determination of the comparison group via matching, the analysis of the selection equation (Eq. 1) and the statistical relevance of Lambda, and the inclusion of the control variables in the equation to study the ATE (Eq. 2).

2.3. Hypothesis

The objectives of financial aid programs for SMEs are centred 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 (such as Roper and Hewitt-Dundas, 1999; Honjo and Harada, 2006; and Chandler, 2010, among others), we attempt to quantify this impact using different variables:

- Asset Growth:

H1: Businesses that participate in aid programs should experience greater growth (or less decline during crisis times) in their investments, measured as total assets, than the companies in the comparison group.

- Sales Growth

H2: Businesses that participate in financial aid programs should experience a greater growth (or less decline during crisis times) in their profits from sales than those companies in the comparison group.

- Job Growth

H3: Businesses that participate in financial aid programs should experience a greater growth in the number of employees (or less decline during crisis times) than those companies in the comparison group.

- Growth in Efficiency

H4: Businesses that participate in financial aid programs should experience a greater increase in efficiency (or less decline during crisis times) than those companies in the comparison group.

- Growth in Productivity

H5: Businesses that participate in financial aid programs should experience a greater increase in productivity (or less decline during crisis times) than those companies in the comparison group.

The data on business export volume are not available and, thus, are not used to formulate a hypothesis.

2.4. Operational definitions of variables

To estimate the ATE for the performance variables described in the hypotheses in Section 2.3, we use the following operational definitions for the dependent variable:

- Asset Growth: Natural logarithm of assets in year t+1 – natural logarithm of assets in year t (aid year).
- Sales Growth: Natural logarithm of profits from sales in year t+1 – natural logarithm of profits from sales in year t (aid year).
- Job Growth: Percentage variation in the number of employees from year t+1 with respect to year t (aid year).
- Growth in Efficiency: Percentage variation in the turnover of total assets from year t+1 with respect to year t (aid year).
- Growth in Productivity: Percentage variation of the natural log ratio of profits/number of employees from year t+1 with respect to year t (aid year).

A list of the independent variables is presented in Table 5 along with the operational definitions that have been used. The explanatory variables in the ATE model (Eq. 2) are financial aid and the corresponding terms of interaction; the remaining variables act as control variables.[5] These control variables are grouped into ratios of size (assets, sales, age, and employee number); growth (variation in assets, sales, and employees); profitability (ROA, ROE); efficiency (turnover of total assets, growth in this variable); financing structure (equity/total assets); location (dummy variables for autonomous regions[6]); productivity (natural logarithm of profits per employee and growth in this variable); and qualitative variables such as export nature, sector (only the most relevant in the sample), and whether the company belongs to an economic group.[7] To estimate Eq. 2, there are terms for the interaction between the group and the control variables to control for possible heterogeneity among the companies of different ages.

Table 5:

[5] The control variables control for existing heterogeneity among different companies.

[6] Spain is divided into 17 autonomous regions and two autonomous cities. Dummy variables have been selected to represent the communities of Madrid, Catalonia, and Basque Country due to their substantial participation in the Spanish GDP (National Statistics Institute, or Instituto Nacional de Estadística – INE) and the large number of SMEs from these geographical locations that participate in the sample: 16.2%, 19.2%, and 16.4%, respectively (Table 11).

[7] It is not possible to control for the factors that are included in other papers, such as the level of intangible assets or R & D expenses, because the data are missing for these variables.

Description of the independent variables

Variable	Definition
NLTA	Natural logarithm of total assets
TA Growth	NLTA year t – NLTA year t-1
NLSales	Natural logarithm of profits from sales
NLSales Growth	NLSales year t – NLSales year t-1
NLS/Emp.	NL Sales/Number of employees
NLS/Emp. Growth	Percentage variation of NLS/Emp ratio
Emp.	Number of employees
Emp. Growth	Percentage variation in number of employees
TA Turnover	Net sales/total assets
TA Turnover Growth	Percentage variation in TA turnover ratio
ROA	Income for the year before interests and taxes/total assets
ROE	Income for the year (net income)/net equity
CRTA	Capital and reserves/total assets
Manufacturing	Dummy variable that has a value of 1 if the business belongs to the manufacturing sector (letter C in the NACE Classification 2nd Revision)
Retail	Dummy variable that has a value of 1 if the business belongs to the retail sector (letter G in the NACE Classification 2nd Revision)
Construction	Dummy variable that has a value of 1 if the activity belongs to the construction sector (letter F in the NACE Classification 2nd Revision)
Exporting	Dummy variable that has a value of 1 if the business carries out export activities
Holdings	Dummy variable that has a value of 1 if the business has holdings in other companies
Catalonia	Dummy variable that has a value of 1 if the company is located in the autonomous region of Catalonia
Madrid	Dummy variable that has a value of 1 if the company is located in the autonomous region of Madrid
Basque Country	Dummy variable that has a value of 1 if the company is located in the Basque Country autonomous region
Age	Years from the date that the business was founded to the moment when aid was received
Group	Dummy variable that has a value of 1 for businesses in the comparison and treatment groups for the year 2007 and a value of 0 for the comparison and treatment groups for the years 2002-2003
Aid (Only for ATE)	Dummy variable that has a value of 1 if the company participated in a financial aid program

Note: For the estimate of the probability of participating in the aid programs (logit), variables are measured in the year preceding the aid (i.e., t=year preceding the aid), and for the specification of the ATE model, t=aid year. The interaction terms of the variable group with the rest of the variables are included in the logit model (Eq. 1). In the ATE model, there are also terms for the interaction of variables with aid and with the group, and there are terms differing from the mean, as described in Eq. 2. This table includes all of the tested variables, including those that are not incorporated into the final model.

3. Results

3.1. Univariate analysis

In this section, we study the characteristics of each group of businesses (comparison and treatment) as a function of the analysis period. Tables 6 and 7 show the sample means for the variables of interest at three moments in time: the year prior to participating in the program (t-1), the year of program participation (t), and the year after participating in the program (t+1). For the years 2002-2003 (Table 6), there are no significant differences in the year prior to or in the year after the program participation, except for productivity and growth in productivity. It is interesting to note that the businesses that participated in aid programs are less productive than their peers for all of the years studied. At the same time, the growth in productivity was greater for the businesses that did not participate in the program during the prior year (t-1). These results appear to indicate, *a priori*, that the most productive businesses do not seek out this type of financial aid, possibly because they face fewer restrictions in the financial system. This finding of adverse selection coincides with that observed by Oh et al. (2009).

However, those businesses that received aid experienced more growth in sales and in total assets for the same year as the program.

Table 6: Sample means for the 2002-2003 group

Variable	Aid Year -1		Aid Year		Aid Year +1	
	Comp.	Treatment	Comp.	Treatment	Comp.	Treatment
NLTA	14.65	14.81 (0.43)	14.69	14.92 (0.26)	14.75	14.99 (0.25)
TA Growth	6.58%	3.11% (0.28)	3.83%	10.26%** (0.05)	5.52%	4.35% (0.72)
NLSales	14.83	14.99 (0.43)	14.83	15.06 (0.25)	14.85	15.15 (0.13)
NLSales Growth	3.39%	0.21% (0.39)	-0.38%	7.06%* (0.07)	1.90%	6.19% (0.42)
NLS/Emp.	1.32	0.82** (0.02)	1.37	0.82** (0.01)	1.40	0.87** (0.02)
NLS/Emp. Growth	2.49%	-2.92%* (0.08)	4.59%	2.99% (0.72)	3.05%	8.20% (0.36)
Emp.	39.18	46.59 (0.33)	39.65	44.53 (0.52)	39.45	46 (0.41)
Emp. Growth	2.32%	7.04% (0.20)	0.72%	1.12% (0.88)	2.53%	4.35% (0.76)
TA Turnover	1.46	1.47 (0.79)	1.42	1.40 (0.84)	1.36	1.46 (0.38)
TA Turnover Growth	3.32%	0.78% (0.70)	-1.44%	3.38% (0.31)	8.62%	7.06% (0.88)

ROA	5.21%	6.26% (0.41)	4.92%	5.17% (0.85)	3.68%	4.73% (0.53)
ROE	11.34%	13.08% (0.71)	31.45%	7.78% (0.45)	-2.31%	4.84% (0.62)
CRTA	38.39%	38.05% (0.92)	40.52%	36.28% (0.26)	40.38%	36.80% (0.35)

Note: Significant differences (ANOVA for quantitative variables, Pearson's chi-squared, and Fisher´s exact test for qualitative variables) between the comparison and the treatment groups for each year are shown according to the following notations: **, 5% significance and *, 10% significance. In the Treatment columns, the p-value is shown in parentheses.

For 2007 (Table 7), no significant differences between the aid year and the prior year are seen except for productivity, which shows an increase in productivity. The same occurs for the period 2002-2003; the businesses that participated in the program are less productive than their peers for all years. It is also observed that the increase in productivity was greater for the businesses in the comparison group for the year prior to participation, but this relationship is inverted in the year following the program. Similarly, in the year following the program, the size (measured as NLTA) is greater for the businesses that participated in the program, whereas growth in the number of employees is lower.

The non-significant results for the majority of the variables for the year prior to the program indicate that, from the perspective of univariate analysis, there are no differences for the characteristics of interest between the treatment and the comparison groups, which would demonstrate that the matching procedure was performed correctly. The only significant *a priori* difference between the two groups is found in productivity and productivity growth, but this difference does not indicate a selection bias that outweighs the interpretation of the impact of aid programs because the comparison group companies are “better”.

Table 7: Sample means for the 2007 group

Variable	Aid Year -1		Aid Year		Aid Year +1	
	Comp.	Treatment	Comp.	Treatment	Comp.	Treatment
NLTA	14.14	14.52 (0.14)	14.22	14.61 (0.14)	14.26	14.7* (0.09)
TA Growth	17.49%	22.91% (0.47)	11.18%	8.79% (0.60)	1.80%	5.07% (0.51)
NLSales	14.25	14.65 (0.20)	14.28	14.79 (0.19)	14.30	14.71 (0.11)
NLSales Growth	12.47%	21.80% (0.20)	5.72%	13.34% (0.19)	-4.59%	-2.26% (0.69)
NLS/Emp.	2.48	1.23*** (0.004)	2.62	1.34*** (0.005)	2.41	1.47** (0.04)
NLS/Emp. Growth	10.11%	-5.38%* (0.1)	17.09%	3.57% (0.79)	-3.04%	9.29%** (0.04)

Emp.	27.93	33.38 (0.40)	28.7	34 (0.43)	33.9	34.21 (0.97)
Emp. Growth	8.24%	25.25% (0.23)	9.21%	6.22% (0.64)	14.77%	1.89%* (0.09)
TA Turnover	1.29	1.38 (0.50)	1.33	1.47 (0.34)	1.27	1.26 (0.90)
TA Turnover Growth	31.18%	15.57% (0.71)	4.35%	17.55% (0.27)	5.45%	-1.91% (0.60)
ROA	6.39%	4.75% (0.41)	5.99%	6.56% (0.74)	-0.8%	3.39% (0.63)
ROE	42.55%	28.93% (0.85)	9.79%	13.28% (0.61)	10.11%	12.21% (0.95)
CRTA	31.53%	27.65% (0.50)	31.25%	27.79% (0.57)	16.01%	29.37% (0.62)

Note: Significant differences (ANOVA for quantitative variables, Pearson's chi-squared, and Fisher´s exact test for qualitative variables) between the comparison and the treatment groups for each year are shown according to the following notation: **, 5% significance and *, 10% significance. In the Treatment columns, the p-value is shown in parentheses.

3.2. The determining factors for the probability of participating in a program

In this section, we study the determining factors for receiving aid in a given year based on the selection model (Eq. 1), where the dependent variable is defined as Y=1 if the business participated in an aid program. The results of the final estimated model[8] are shown in Table 8.

Table 8:
The effects of variables on the probability of participating in an aid program

Variable	Coefficient
Employees	-0.003 (0.21)
NLTA Growth	-0.535* (0.08)
Holdings	0.192 (0.28)
Exporter	0.127 (0.5)
Group	0.321** (0.04)
Age	0.004 (0.52)
NLS/Emp	-0.152** (0.02)

[8] Different specifications of the model were carried out using the variables described in Table 5.

NLS/Emp Growth	-0.918** (0.02)
Constant	-0.377* (0.07)
Prob>Chi-Squared	0.0012
Adjusted Count R2	0.024

Note: The independent variables are measured in the year prior to aid. Prob>chi-squared is the p-value of the joint significance test. The Adjusted Count R2 is the percentage of correct predictions adjusted by the marginal majority. Significance is indicated with * at 10%, ** at 5%, and *** at 1%. The p-value is shown in parentheses.

The results show that only four variables are significant for predicting aid: Productivity, Increase in Productivity, Holdings, and Asset Growth. Whereas belonging to the 2007 group has a positive effect on the probability of participating in a program, asset growth, productivity, and productivity growth have a negative effect (the latter relationship was already observed in the univariate analysis). These results appear to indicate the existence of a possible adverse selection bias: the less-productive businesses are the ones that participate in aid programs, an effect that coincides with the observations of Oh et al. (2009).

3.3. The effect on performance variables of participating in an aid program

In this section, we show the estimates for the ATE according to the methodology proposed by Wooldridge (2002) and described in Section 2.2. In the two-stage selection methodology used for all performance variables except for turnover and productivity, the Lambda coefficient is not significant (appendix, Table 13). This result indicates that there is no correlation between the proposed selection equation (Eq. 1) and the ATE model (Eq. 2); therefore, the latter can be estimated using the LSM. The two-stage model is used only for turnover and productivity variations because it is the only case in which selection bias is significant. The results are shown in Table 9.[9]

For control variables, the following is observed:

- Asset Growth:

For the 2007 sample businesses, capital structure (CRTA) has a positive differential effect when compared to other companies.

- Sales Growth:

Turnover has a negative effect on sales growth. For businesses in the 2007 group, ROE has a negative differential effect compared to other companies.

- Job Growth:

[9] Ditto 7.

Belonging to the retail sector and ROE have a negative relationship. For businesses from the 2007 group, age has a negative effect, and capital structure has a positive effect.

- Increase in Efficiency:

Asset turnover has a general negative effect, whereas asset volume for the 2007 group has a positive effect.

- Increase in Productivity:

For businesses from the 2007 group, the effect of CRTA is negative, whereas that of age is positive.

Table 9:
The effect of variables on performance measures (ATE model without selection except for TA Turnover and NLS/Emp)

	TA Growth	Sales Growth	Emp. Growth	Growth TA Turnover	NLS/Emp. Growth
Independent variables of interest					
Aid	-0.011 (0.75)	0.009 (0.85)	-0.004 (0.96)	**-1.588**** **(0.02)**	**-0.800***** **(0.01)**
MAge*Aid	0.003 (0.12)	0.001 (0.81)	-0.006 (0.32)	-0.002 (0.83)	**0.021***** **(0.00)**
MROE*Aid	**0.177*** **(0.08)**	-0.266 (0.19)	0.029 (0.92)	-0.589 (0.18)	**-1.131***** **(0.00)**
MCRTA*ay	0.022 (0.88)	-0.309 (0.22)	0.179 (0.44)	-0.527 (0.27)	-0.266 (0.18)
MEmp.*Aid	0.000 (0.68)	0.000 (0.55)			
MTATurnover*Aid	0.078 (0.13)	**0.157**** **(0.04)**	-0.039 (0.46)	0.168 (0.29)	0.088 (0.18)
MNATL*Aid				0.120 (0.15)	-0.019 (0.59)
MNLSales * Aid			0.097 (0.12)		
Aid*Group	0.049 (0.40)	0.044 (0.54)	-0.089 (0.32)	0.019 (0.91)	**0.246***** **(0.00)**
MAge*Aid*Group	-0.002 (0.74)	-0.003 (0.66)	**0.023***** **(0.01)**	0.001 (0.95)	**-0.039***** **(0.00)**
MROE*Aid*Group	-0.198 (0.24)	**0.500**** **(0.02)**	0.307 (0.37)	0.866 (0.14)	**0.902***** **(0.00)**
MCRTA*Aid*Grou	-0.401*	0.004	**-0.672****	0.776	**0.591****

p	(0.09)	(0.99)	**(0.03)**	(0.27)	**(0.04)**
MEmp.* Aid*Group	0.002 (0.14)	**0.003**** **(0.02)**			
MTATurnover*Aid*Group	-0.099 (0.25)	-0.150 (0.19)	**0.215*** **(0.09)**	0.122 (0.64)	-0.168 (0.12)
MNATL*Aid*Group				-0.112 (0.38)	-0.010 (0.84)
MNLSales*Aid*group			-0.102 (0.19)		
Control Variables					
Manufacturing	0.032 (0.25)	-0.006 (0.87)	-0.046 (0.48)	-0.055 (0.56)	0.013 (0.78)
Construction			-0.082 (0.20)		0.003 (0.96)
Retail			**-0.127**** **(0.04)**		0.054 (0.29)
Catalonia				0.084 (0.46)	-0.016 (0.73)
Basque Country				-0.076 (0.54)	0.026 (0.62)
Madrid				-0.106 (0.43)	-0.007 (0.89)
CRTA	0.077 (0.22)	0.131 (0.48)	-0.189 (0.32)	0.215 (0.44)	0.043 (0.71)
ROE	-0.002 (0.22)	0.001 (0.90)	**-0.006*** **(0.10)**	-0.001 (0.96)	0.003 (0.76)
Emp.	0.000 (0.59)	0.000 (0.62)			
Age.	-0.001 (0.48)	0.000 (0.90)	-0.001 (0.31)	0.001 (0.92)	0.000 (0.93)
TATurnover	0.055 (0.14)	**-0.099*** **(0.08)**	0.022 (0.38)	**-0.302***** **(0.00)**	-0.032 (0.42)
NATL				-0.060 (0.31)	0.021 (0.40)
NLSales			-0.014 (0.43)		

Group	-0.122	-0.137	-0.712	-1.872	0.375
	(0.24)	(0.47)	(0.29)	(0.14)	(0.49)
ROE*Group	-0.065	**-0.096**	0.032	-0.102	-0.069
	(0.40)	(0.09)	(0.60)	(0.64)	(0.44)
CRTA*Group	**0.240*** **	0.072	**0.376** **	-0.411	**-0.398*** **
	(0.01)	(0.74)	**(0.06)**	(0.21)	**(0.00)**
Emp.*Group	0.000	-0.001			
	(0.32)	(0.34)			
TATurnover*Group	0.017	0.058	-0.010	0.055	0.041
	(0.77)	(0.49)	(0.86)	(0.72)	(0.52)
Age*Group	-0.004	-0.003	**-0.012***	0.004	**0.015*** **
	(0.21)	(0.47)	**(0.06)**	(0.70)	**(0.00)**
NATL*Group				**0.138**	-0.019
				(0.09)*	(0.58)
NLSales*Group			0.045		
			(0.29)		
Constant	-0.057	0.112	0.370	**1.852** **	-0.052
	(0.49)	(0.42)	(0.35)	**(0.03)**	**(0.89)**
Lambda	na	na	na	**0.957** **	**0.417** **
				(0.02)	**(0.02)**
Prob>F	0.000	0.023	0.002	na	Na
Prob>chi-squared	na	na	na	0.048	0.000

Note: Empty cells indicate that this variable was not included in the model, and "na" denotes *not applicable*. Robust standard errors are estimated for the LSM. For turnover (TurnTA) and productivity (NLS/Emp), the estimate was carried out in two steps. Prob>F and Prob>chi2 indicate the p-value for the joint significance test for the LSM and the regression in two steps, respectively. MVariable (e.g., MROE) indicates that the sample mean is subtracted from the variable when calculating the estimate (according to Eq. 2). Significance is denoted as * at 10%, ** at 5%, and *** at 1%, and p-values are shown in parentheses.

To estimate whether there are differential effects for participation in financial aid programs during times of crisis, we summarised the results for the variables of interest (the aid variable and the terms of interaction) in Table 10. For the businesses in the 2002-2003 group, participation in the aid programs is relevant to their growth in assets, sales, efficiency, and productivity. However, for the businesses that participated in aid programs in 2007, participation also affects employment.

Table 10: Summary of the observed average treatment effects (ATE)

Group	**TA Growth**	**Sales Growth**	**Job Growth**	**TA Turnover Growth**	**NLS/Emp. Growth**
ATE (2002-2003)	ROE (+)	Turnover (+)	Not Significant	Aid (-)	Aid (-) Age (+) ROE (-)
ATE (2007)	ROE (+)	ROE (+)	CRTA (-)	Aid (-)	Aid (-, <)

	PN/AT (-)	Employee (+) Turnover (+)	Age (+) Turnover (+)		Age (-) ROE (-, <) CRTA (+)

Note: Each cell shows the control variable through which program participation has an effect on the target variable. In the case of sales growth, for example, in the years 2002-2003, the businesses with higher than average turnover experience a positive effect in sales growth after receiving aid. However, for the 2007 group, aid is also relevant for the companies with above-average employee numbers and ROE. In the case of NLS/Emp. growth, (-,<) shows that for the 2007 group, the effect of aid is also negative, as in 2002-2003, but less so.

The interpretation of these results can be extended by quantifying the observed ATEs.

- In Asset Growth (H1):

$$ATE(2002/3) = 0.177(ROE_i - \bar{ROE})$$

$$ATE(2007) = 0.177(ROE_i - \bar{ROE}) - 0.401(CRAT_i - \bar{CRAT})$$

For the businesses with above-average return on equity (ROE) and sales and below-average turnover, the effect of participating in the 2002-2003 and 2007 programs is positive. For the businesses with below-average debt in 2007, the effect of participation is positive. Hence, there is evidence in favour of H1.

- For Sales Growth (H2):

$$ATE(2002/3) = 0.157(TA\ \text{Turnover}_i - \bar{TA\ \text{Turnover}})$$

$$ATE(2007) = 0.157(TA\ \text{Turnover}_i - \bar{TA\ \text{Turnover}}) + 0.5(ROE_i - \bar{ROE}) + 0.003(Emp_i - \bar{Emp})$$

For the businesses with above-average turnover, the effect of participating in the program in both years is positive. For the businesses with above-average ROE and employee numbers, the effect of participating in the program in 2007 is positive. Hence, there is evidence in favour of H2.

- For Job Growth (H3):

$$TE(2007) = 0.023(Age_i - \bar{Age}) + 0.215(TA\ \text{Turnover}_i - \bar{TA\ \text{Turnover}}) - 0.672(CRAT_i - \bar{CRAT})$$

For the businesses with above-average age and turnover and below-average debt, the effect of participating in the program in 2007 is positive. Participation in the program during 2002-2003 does not show significant effects. Hence, there is evidence in favour of H3.

-For Increase in Efficiency (H4):

$$ATE(2002/3) = ATE(2007) = -1.588$$

For all businesses and for both years, participating in the program has a negative effect. Hence, there is no evidence in favour of H4.

- For Increased Productivity (H5):

$$ATE(2002/3) = -0.8 + 0,021(Age_i - \bar{Age}) - 1.131(ROE_i - \bar{ROE})$$

$$ATE(2007) = -0.555 + 0.591(CRAT_i - \bar{CRAT}) - 0.019(Age_i - \bar{Age})) - 0.229(ROE_i - \bar{ROE})$$

In the 2002-2003 group, for the businesses with above-average age and below-average ROE, the effect of aid is positive. For all 2007 businesses, there is less negative effect for participating in the program than for the 2002-2003 group. In the 2007 group, for the businesses with above-average CRTA and below-average age and ROE, the effect of aid is positive. Therefore, there is evidence in favour of H5.

4. Conclusions

The goal of this study is to analyse whether differential effects exist when participating in financial aid programs for Spanish SMEs during times of crisis. To control for the possible effects from selection bias, three tools are used: i) the determination of a comparison group via matching, ii) a two-stage model for the analysis of the probability of receiving aid, and iii) the inclusion of control variables to estimate the average treatment effect (ATE)

One of the main findings is that the effects of financial aid programs are stronger during times of crisis: in normal times, participation in programs only affects the growth in assets, sales, efficiency, and productivity, whereas in difficult times, the effect is also translated into job growth. Nevertheless, these effects are not homogeneous among all participating businesses; rather, they depend on turnover, equity, debt level, number of employees, and age in relation to the average business.

The observed effects coincide, in general terms, with those reported in previous studies. For example, with respect to job growth, see Lerner (1999), Roper and Hewitt-Dundas (1999), Almus (2001), Craig et al. (2008), Mole et al. (2009), Oh et al. (2009), and Chandler (2010); for sales growth, see Lerner (1999), Oh et al. (2009), and Chandler (2010); for asset growth, see Roper and Hewitt-Dundas (1999); and for efficiency, see Rivera and Muñoz (2004). In addition, an adverse selection effect is observed because a lower proportion of the most productive SMEs seek out this type of aid. This result coincides with the findings of Oh et al. (2009). This study differs from that of García and Crespo (2005) in the temporal approach used, in the comparison between a crisis and a normal economy, and in the statistical methodology for data analysis that takes into account selection bias and average treatment effects.

Our results provide evidence of the differential impact of financial aid programs during times of crisis and have implications not only for the planning of SME aid programs but also for the development of countercyclical policies.

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Appendix

Table 11: Sample distribution by autonomous region

Region	Percentage
Catalonia	19.2%
Basque Country	16.4%
Madrid	16.2%
Castile and León	11.10%
Valencia	7.80%
Galicia	5.30%
Castile-La Mancha	4.80%
Andalusia	4.00%
Aragon	4.00%
Murcia	3.50%
Balearic Islands	2.00%
La Rioja	1.50%
Navarra	1.50%
Cantabria	1.30%
Extremadura	0.80%
Asturias	0.50%

Table 12: Sample distribution by sector

Sector	Percentage
Manufacturing	31.2%
Wholesale and retail commerce; automotive repair	24.2%
Construction	17.6%
Real estate activities	5.0%
Transport and storage	4.5%
Extractive industries	4.0%
Information and communications	3.0%
Hospitality	2.5%
Agriculture, livestock, forestry, and fishing	2.5%
Other	5.3%

Table 13: The effect of variables on performance measures (ATE model with selection except for TA Turnover and NLS/Emp.)

Variable	TA Growth	Sales Growth	Emp. Growth	TA Turnover Growth	NLS/Emp. Growth
Independent Variables of Interest					
Aid	-0.01	-0.054	-0.252	-0.069	-0.113
MAge*Aid	0.003	0.000	-0.008	-0.001	0.018
MROE*Aid	0.156	-0.292	0.173	**-0.611***	-1.183
MCRTA*ay	0.072	-0.33	0.107	-0.502	-0.246
MEmp.*Aid	0.000	0.001			
MTATurnover*Aid	**0.101****	**0.155****	-0.071	0.223	0.096
MNATL*Aid				0.104	-0.013
MNLSales * Aid			**0.109****		
Aid*Group	0.036	0.034	-0.111	0.011	**0.197***
MAid*Aid*Group	-0.001	-0.002	**0.024****	0.001	**-0.035****
MROE*Aid*Group	-0.285	0.447	0.075	**0.782****	0.923
MCRTA*Aid*Grou p	**-0.389***	0.044	-0.454	0.687	**0.638****
MEmp.* Aid*Group	0.001	0.003			
MTATurnover*Aid* Group	**-0.204*****	-0.171	0.112	-0.023	**-0.245****
MNATL*Aid*Group				-0.11	-0.030
MNLSales*Aid*Gr oup			-0.107		
Control Variables					
Manufacturing	0.029	0.000	-0.054	-0.115	-0.028
Construction			-0.108		-0.026
Retail			**-0.151****		0.038
Catalonia				0.079	-0.037
Basque Country				-0.091	0.009
Madrid				-0.107	-0.040
CRTA	0.077	0.128	-0.207	0.249	0.056
ROE	-0.002	0.001	-0.007	0.002	**0.004****
Emp.	0.000	0.000			
Age	-0.001	0.000	-0.001	0.000	0.000
TA Turnover	**0.055****	**-0.098*****	0.029	**-0.339****	**-0.045****
NATL				-0.115	-0.002
NLSales			-0.005		
Group	**-0.176****	-0.169	-0.913	-2.014	0.179

ROE*Group	-0.023	-0.061	0.011	0.017	-0.039
CRTA*Group	**0.263*** **	0.108	**0.401** **	-0.421	**-0.399*** **
Emp.*Group	-0.001	-0.001			
TATurnover*Group	0.044	0.072	0.001	0.081	0.046
Age*Group	-0.002	-0.002	**-0.011***	0.001	**0.012*** **
NATL*Group				0.137	-0.010
NLSales * Group			0.057		
Constant	-0.055	0.129	0.333	2.214	0.128
Lambda	0.002	0.04	0.164	nc	Nc
Prob>F	nc	Nc	nc	0.352	0.000
Prob>Chi-Squared	0.000	0.096	0.041	nc	Nc

Note: Empty cells indicate that this variable was not included in the model, and "na" denotes *not applicable*. Regressions for all columns except TATurnover were carried out in two steps: the robust standard errors for the estimates through LSM for TATurnover and NLS/Emp. Prob>F and Prob>chi-squared show the p-value for the joint significance test. MVariable (e.g., MROE) indicates that the sample mean is subtracted from the variable when calculating the estimate (according to Eq. 2). Significance is denoted as * at 10%, ** at 5%, and *** at 1%.

Estimates from the two-step model (Table 13) show that the selection equation (Eq. 1) is not significant for studying growth in sales, assets, and jobs. However, the Lambda coefficient presents a relevant result for analysing the changes in turnover and productivity (Table 9). If Lambda is positive (negative), the non-observable factors that make participation more probable tend to be related with a greater (lesser) effect for the explicatory variables in the value of the dependent variable when the estimate is calculated through LSM. In this case, when comparing the estimates for turnover, for example, in the results using LSM (Table 13), the effect of participation shows a significant effect for profitability (negative in 2002/2003 and positive in 2007), whereas for the two-step estimate (Table 9), aid is not relevant. In other words, in the LSM estimate, the effect of profitability is overestimated for the companies that participate in the program.