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The impact of public guarantees on credit to SMEs

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Abstract This article provides an in-depth evaluation of the impact of public credit guarantees to SMEs in increasing credit availability and reducing borrowing costs, without compromising their financial sustainability. Extensive econometric tests have been carried out by comparing the performance of the SMEs that benefited from such guarantees in Italy with a sample of comparable firms. The findings confirm the presence of a causal relationship between the public guarantee and the higher debt leverage of guaranteed firms, as well as their lower debt cost. Italy's guarantee instrument has proved to be an effective instrument in these respects.

Keywords Causal effect · Credit rationing · Difference-in-difference · SME · State-fund guarantee

JEL Classifications G14 · G21 · G28 · L26

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1 Introduction

Fragmentation of the enterprise system is a long standing feature of the Italian economy, a feature that has not declined in recent decades, OECD (2004), Confindustria (2005).[1] Many factors account for the tendency of Italian firms to remain small. According to surveys of entrepreneurs, Federconfidi (2004), Confapi (2001), shortage of bank financing is one of the stumbling blocks to growth, given small firms' narrow equity base. Small firms actually show on average a ratio of financial debt to total financial debt plus equity (59% in 2003) that is higher than those of medium- and large-size enterprises. Within financial debt, the largest component is given by borrowing from banks (74%), a component that is still higher than that of other firm classes, Banca d'Italia (2005).

Small business formation and growth bear heavily the impact of imperfections in bank credit markets. *Ex ante* asymmetric information between bank lenders and borrowers, together with agency problems related to the appropriate use of borrowed funds, lead to well-known phenomena of credit rationing and higher interest charged to small business, as compared to larger firms.

[1] The average number of employees per business in industry and services was less than 4 in Italy, versus almost 8 in the EU15 in the year 2001 [Istat, 2004]. In 2003, the share of small firms was 99.4%, the same percentage as in 1996. These firms provided 69.5% of total employment, against 71% in 1996.

Specifically, interest rate setting cannot often work as a screening device for selecting creditworthy small businesses, since information asymmetries leave enough room for adverse selection, Stiglitz and Weiss (1981). This is compounded by moral hazard, due to difficulties and costs involved in monitoring the behaviour of small borrowers, Vogel and Adams (1997).

Apart from these market failures, access to credit may be denied just because the evaluation of small borrowers' creditworthiness does involve fixed costs that turn out to be generally high compared to the risk-adjusted return to the lender. Nor banks have a strong incentive to monitor a small firm, when the latter splits its credit demand into small portions to tap several banks at the same time, Guelfa (2005). In other words, there might actually be situations in which there is no market for smaller firms, where they can borrow.

Under certain conditions, the provision of collateral can lessen credit rationing and borrowing costs, allowing a better allocation of credit and investment in the economy, Coco (2000), Bester (1985), Besanko and Thakor (1987). This, however, depends on the working characteristics of the individual loan and deposit markets, Berger and Udell (1998), as well as on the effectiveness of legal procedures for loan recovery. But if a small firm is unable to post a collateral, or the legal system is inadequate to protect creditor rights, SME's access to bank credit would remain restricted.

The empirical evidence, *prima facie*, seems to confirm this conclusion. In Italy, 83% of bank loans to small enterprises are backed by guarantees, that mostly take the form of a real asset pledge (65% of bank loans). The relevance of guarantees is, instead, lower in lending to other enterprises (72% and 56%, respectively), Banca d'Italia (2005).

Mutually-based guarantees can also obviate some of the moral hazard problems that limit banks' credit to SMEs. Their emergence is, however, hindered by the same adverse selection problems that lead banks to ration their lending to risky firms. Less risky SMEs are actually reluctant to enter into mutual guarantee agreements with other firms, knowing that close monitoring of their peers' performance is difficult and that such guarantee schemes attract more risky firms.

To overcome financial market imperfections and institutional weaknesses, Governments resort to various industrial policy tools, with credit guarantees being one of them. But is State intervention in the credit guarantee system or a State-funded guarantee scheme an effective instrument to promote lending to small firms?

In the economic literature, there is no consensus on the answers to these questions. Theoretical and empirical studies lead to contrasting views.[2] On the one side, it is argued that credit guarantee schemes (CGS) are costly instruments that pose problems of financial sustainability, Vogel and Adams (1997), Llisterri (1997). These problems are mainly due in most countries to relatively high loan default rates, relatively high guarantee coverage ratios and fee levels that are inconsistent with financial viability principles. Their outcome is that CGS usually run out of funds in a few years.

At the same time, CGS' benefits have still to be proved, as there is no conclusive evidence about the contention that they allow additional lending to financially constrained SMEs. In any case, they should not be viewed as a substitute for correcting financial market or legal system failures that are at the source of credit rationing, Vogel and Adams (1997), Llisterri (1997).

On the other side, CGSs are seen as capable of opening up new access to credit (credit additionality), although they can be effective only under a well-specified set of conditions about their operations, Holden (1997), Levitsky (1997), Boocock and Shariff (2005), Riding et al. (2006). These studies, however, provide neither econometric evidence about a causality relationship between public guarantees and credit additionality, nor an econometric estimate of their impact on guaranteed SMEs' borrowing costs. Hence, little guidance is given to policy makers as regards CGSs' effectiveness in easing SMEs' financing constraints, as compared to other financial tools.

Against this background, this article aims at providing convincing econometric evidence that, in a country specific context such as the Italian one, a properly designed CGS can increase credit availability for SMEs, reduce their borrowing costs, at the same time without being financially unsustainable. Specifically, the authors apply a new econometric approach to test whether Italy's State-funded guarantee scheme for SMEs (SGS) is an effective means to allow small firms to have a larger access to bank

[2] For a survey of the issues, see in particular Bosworth et al. (1987), Gudger (1998)

credit market (credit additionality) and to obtain relatively lower borrowing costs (cost reduction).

Accordingly, in the following section an outline of the Italian guarantee system is presented, highlighting its operating features. Next comes an analysis of its performance, focussing on its pattern of guarantee allocation, on its role in promoting mutually-based guarantee schemes and on its costs. In the Sect 4, the analysis is focussed on an econometric test of the SGS' ability to ease SMEs' financial constraints.

In the concluding section, it is shown that this analysis lends support to the contention that such a scheme had a positive impact on lending to SMEs. This conclusion does not appear to be country-specific, since the model specification is consistent with the existing literature on the topic, and the econometric analysis can be equally applied to other countries. What this study adds to the existing empirical evidence is, first, the strength of a causality test and, second, its application to Italy's guarantee scheme, an analysis never carried out before.

2 The Italian guarantee system

Italy's universe of credit guarantee institutions tend to form a multipillar and multilayer system based on a mix of private and public funding. It is not an outright system, because no specific network agreement or legal constraint exists in order to bring together all these entities within the framework of a system.

Three pillars can be identified: (a) the mutual guarantee institutions (MGI), that are associations of small entrepreneurs willing to mutually share their debt risk as a way to improve their access to credit market; (b) the banks and other financial companies, that provide guarantee services to the enterprise sector; and (c) the public funds, set up at State and Regional government levels, for the purpose of offering guarantees, i.e. insurance and/or reinsurance services, to institutions that lend to SMEs or to MGIs.

As private, mutual guarantee schemes are expensive and risky, public money is the true engine of the entire system. The Government gives financial support through two channels: by contributing to fund the MGIs and by financing the public guarantee schemes, at both central and regional levels, with the primary objective of allowing a counter-guarantee (namely, a re-insurance) for the MGIs' guarantees.

The system actually works as a multilayer structure. At the grassroots level, both MGIs and banks provide guarantees. But MGIs fulfil a special function. They act as a facilitator in the bank-SME relationship by providing potential borrowers with both, a guarantee and the benefit of an interest rate reduction. At the same grassroots level, there are also banks that sell credit insurance to firms on their own.

The particular value of a MGI guarantee derives from three features: the deep assessment that the guarantor can make on the firm's creditworthiness due to its access to inside information, the close monitoring of the firm's business conditions after the loan, and the mutual responsibility of all participating firms.

At present, more than 1,000 MGIs are officially registered, but around 600 are actually operational. They are spread throughout the country and constitute a network that covers almost all economic sectors, Zecchini (2002) .

At the second level of the guarantee system, there are second-tier MGIs, that are set up by groups of the same institutions. Their function is to reinsure (i.e. to counter-guarantee) MGI guarantees in order to reach a broader sharing of the financial risk involved, as each MGI covers a narrow range of enterprises.

At the same level, there are reinsurance entities that are funded by regional governments. Banks can, however, bypass second-tier MGIs and these regional entities, and apply for a direct guarantee from a State-supported guarantee fund.

Three such funds are in operation and constitute the system's third level: one is the central "Fund for Guarantee to SME" (SGS), that aims at the SMEs in general; another aims exclusively at the craft sector; still another at the agricultural sector. Each of them acts as a sort of guarantor of last resort for a specific enterprise category.

The focus of this analysis is just on the SGS, that is the largest one among the three and is funded only by the central government.[3]

[3] This was established in 1996 with the generic mandate of providing guarantees to banks and financial institutions, against their loans to SMEs, as well as against their minority equity participations in small and medium-size companies, and to MGIs, against their guarantees for SMEs's borrowing. Hence, the SGS offers direct guarantees to lending banks, co-guarantees together with other guarantor institutions, and guarantees of last resort to MGIs

A number of strict conditions apply to SGS' operations as to the beneficiaries and the nature of the guarantee (Table 1). The main eligibility criteria for applying for a guarantee are that the enterprise has to be in good health and does not belong to a number of manufacturing and services sectors that are excluded because they benefit from other public aid regimes. A specific quota of this fund is devoted to ICT small firms.

As a result of these criteria, no assessment is made about the degree of financial need of the applying firm, so as to ascertain that the guarantee is necessary in order to improve the firm's credit access. Banks, in particular, can choose what part of their SME loan portfolio to submit for a guarantee, provided that the loans meet the eligibility criteria and the parameters that SGS established for the SMEs, taking into account their economic sector and their size. These parameters form an enterprise scoring system that is used by the SGS to order applications according to their guarantee-merit. Hence, banks could, in principle, use the SGS guarantee just to improve the risk profile of a portion of their portfolio to free resources for lending to other sectors.

The cost of the guarantee is a matter of different degrees of public aid, since the SGS is seen as a tool to promote SMEs development, particularly in some areas and sectors. The subsidised nature of the public guarantee scheme is tempered by the fact that the scheme is geared to cover just a fraction of the principal. This can limit moral hazard problems,

Table 1 Characteristics of the fund

Degree of discretion in lending	The Fund decides on bank's and MGIs' proposals, according to a pre-specified scoring system, or set of indicators.
Eligibility conditions	Only small- and medium-size firms, as defined by EU regulations, and SME consortia.
	Sound economic and financial conditions.
	The following sectors are excluded: coal and steel, shipbuilding, synthetic fibres, automobile, transport. Guarantee ceilings are applied to the following sectors: car components, food industry and related trade.
Guarantee coverage rates	In less developed areas: up to 80% loan for direct guarantees; up to 90% for MGIs' guarantees, that cannot, however, go beyond 80% loan.
	In rest of the country: up to 60% of loan for direct guarantees; up to 90% for MGIs' guarantees, that cannot, however, go beyond 60% loan.
Fees	No fee in the less developed areas.
	In areas in economic decline, once only: 0.125% of loan for micro firms; 0.125% for equity and participatory debt, and 0.25% loans to small firms; 0.25% for equity and participatory debt, and 0.50% of loans to medium firms and consortia of firms.
	In the rest of the country, once only: 0.25% of loan for micro firms; 0.25% for equity and participatory debt, and 0.50% loans to small firms; 0.50% for equity and participatory debt, and 1.00% of loans to medium firms and consortia of firms.
Types of guarantee	Direct guarantee to banks.
	Counter-guarantee to mutual guarantee institutions.
	Co-guarantee with MGIs.
	On equity participation or participatory debt.
Priority sectors	MGIs.
	Southern regions.
	Women entrepreneurship.
	Micro firms.
	Start-up.
	Digital economy firms.
Nature of the guarantee	Subsidiary, after debt recovery procedure is completed.
	Since 2006, direct.
Funding	Annual allocations from State budget, and levied fees.

since other entities, including the lender itself, share a significant portion of the financing risk.

The effectiveness of the guarantee for the lender is also mitigated by its subsidiary nature. In case of debt insolvency, the lender has to pursue the debt recovery procedure by itself. Only at the end of this process, the Fund steps in to reimburse the portion of the debt that was not recouped by the lender.[4]

Overall, from the regulatory standpoint, it appears that the scheme tends to be rather stringent in selecting its beneficiary firms, but without going as far as to target the most disadvantaged among the SMEs. The priority status that the regulations grant to some categories of firms (those of industry, trade and services, those guaranteed by MGIs, those owned by women, micro firms, start-ups) are in fact so broad as to be tantamount to covering the vast majority of potential demand. There is no attempt to reach those small firms that are mostly constrained in financing their investment projects, because of the risk element involved. Only in 2005, a special section of SGS was dedicated to an innovative and risky sector, such as the ICTs.

Furthermore, the stringency of scoring parameters that are applied to the guarantee applications, leads to skimming the best credit risks among the eligible SMEs, making it particularly difficult to assess whether the most disadvantaged groups of firms, such as start ups and those operating in R&D fields, can actually rely on this scheme for gaining better access to credit.

Of particular significance is that the SGS regulation does not give any strong preference to Mutual guarantee institutions vis-à-vis banks and other financial institutions. Both groups are on the same level playing field. This is justified by the importance of banks in SME financing. However, it deprives the Fund of a possible incentive effect, that could be achieved by giving priority to MGIs. Such a priority could induce more SMEs to resort, first, to MGIs for acquiring a guarantee. This would strengthen the sense of mutual responsibility among borrowing firms, since it would lead them to take part in institutions that aim at mutually sharing part of the financing risk, rather than shifting it directly to public funds.

[4] This approach was changed in 2006 to ensure full reimbursement within a short time since insolvency, as requested by the new Basel 2 criteria for bank capitalisation

3 The economic performance of the fund for guarantees to SMEs

The Fund's guarantee capacity is currently € 233.5 millions. By applying a gearing ratio over its capital base, the Fund has guaranteed loans amounting to 4.6 billions in its 6 years of operation. This corresponds to just around 3% of total lending that small enterprises belonging to the sectors covered by the Fund were granted in 2005

Given the relative modesty of these figures, it is apparent that this mechanism is in no position to have a significant impact either on the economy, or on promoting entrepreneurship to a significant scale. The Fund has, nevertheless, a strong potential to direct credit to certain disadvantaged sectors and enterprises that deserve credit, since it is run according to tight criteria aimed at reducing the risk of resource misuse. In particular, eligibility criteria (Table 1) are such as to greatly limit the percentage of guarantee applications that are rejected on merit grounds. On average, 83% of all applications were accepted, and the acceptance rate was even higher in 2004 (93%). The guarantee coverage rate was also limited to such an extent as to reduce the risk of sizeable losses.

The guarantee allocation pattern across firms of different sizes can be interpreted as evidence that the Fund showed a significant degree of risk aversion. Guarantee allocation actually approaches an increasing function of firm size (Table 2).

Looking at the allocation pattern across economic sectors, the Fund appears to have been used to support what already existed in industry and services, more than to open up new opportunities in technology, investment and production, that involve higher risks and more innovative enterprises. The tiny fraction of resources that was directed to the new technology sectors is highly indicative of the Fund's failure in promoting a new growth pattern for the economy.[5]

The Fund's cautious attitude towards risk taking is also confirmed by the maturity structure of guaranteed loans. While one should expect an upward sloping maturity structure of guarantees, the actual outcome is a bell shaped structure (see Table 2).

[5] This shortcoming was corrected only in part in 2005, by setting up a specialized section devoted to the ICT sector

Table 2 Allocation of guarantees and default distribution 2000–2004 (%)

Distribution Size	Guaranteed loans	Guaranteed loans in default	Fund's loan repayment
Size	100.00	100.00	100.00
Medium-size firm	40.59	50.39	49.00
Small-size firm	36.84	29.39	27.00
Micro firm	22.45	20.22	24.00
Consortia of firms	0.12	–	–
Categories of firm	–	–	–
Equity participation	0.19	4.51	35.56
SMEs (with lower credit score)	25.43	36.86	24.44
Women entrepreneurship	3.79	3.89	0
Start-ups	11.76	12.75	24.44
SMEs (with higher credit score)	28.82	19.13	4.44
MGIs (top of the group)	29.49	22.86	11.11
Micro credit	0.52	0	0
Maturity	100.00	100.00	100.00
Short-term loan	23.26	22.86	9.09
Medium-term loan	48.18	49.92	40.91
Long-term loan	28.37	22.55	13.64
Equity participation	0.19	4.67	36.36
Type of guarantee	100.00	100.00	100.0
Direct guarantee	37.71	41.37	43.00
Counter-guarantee	60.78	58.16	57.00
Co-guarantee	1.52	0.47	0
Economic sector	100.00	100.00	100.00
Industry and Construction	70	74.00	85.00
Tourism	11.14	11.00	10.00
Trade and other services	17.98	15.00	5.00
By areas	100.00	100.00	100.00
North-West	45.74	55.21	64.00
North-East	14.31	13.53	2.00
Centre	13.65	9.95	17.00
South (Mezzogiorno)	26.3	21.31	17.00

Source: Elaborations based on Fund's data

An important role was played by the Fund in promoting the emergence of a national guarantee system. In fact, it focussed more on counter-guaranteeing MGIs' operations (61% on average) than on providing direct guarantees to the banks. This is the result of a significant shift of orientation that took place over 5 years.

In a number of loans, the Fund's intervention had a complementary role, to the extent that it backed borrowing that was in part collateralized by real assets. In 2005 a quarter of the outstanding guarantees concerned such loans. This is a signal that the public guarantee helped to overcome not only small firms' lack of collateral, but the shortcomings stemming from Italy's particularly costly and lengthy procedures for contract enforcement, Generale and Gobbi (1996).

On the whole, what emerges is the picture of a public guarantee instrument that has served the purpose of giving assistance to an industrial sector under stress and to the backward regions. It has not, however, promoted entrepreneurship and risk taking

in innovative sectors to a significant scale. In any event, its effectiveness must also be measured in terms of its financial sustainability and its ability to add to the amount of loanable funds made available to small firms, as well as to lower their cost compared to other firms.

To be financially sustainable a guarantee scheme has to break even, by balancing costs with revenues. Specifically, the degree of Fund's financial sustainability over the 5 year period can basically be assessed by drawing on the following equation:

$$L + A + I = F + O + S$$

where L = loan losses; A = administration expenses; I = public debt service cost (cost of use of borrowed capital); F = guarantee fees; O = other income, such as the return from the investment of reserves; and S = the amount of public subsidy to cover any losses.

The subsidy component is the balancing item that allows the Fund to avoid exhausting its capital base as a result of both, annual losses due to the firm's failure to repay the guaranteed loan, and the Fund's operating expenses that are not covered by the fees.

As to the losses deriving from non-repayment of loans, the Fund's performance is appreciable and much better than that of similar schemes of other European countries. Default losses as a ratio to Fund's guarantees[6] are 0.25% for the period 2000–2004 (Table 3), against percentages ranging from 2% in Germany to 10% in Spain, Oehring (1997). Although the loss ratio shows a sharp upward trend after the first 2 years of Fund's operations (Table 3), it remained at a relatively low level in 2005, hinting that at cruising speed it should not exceed 0.50% by far. After all, the guarantee system passed unscathed a period of serious economic stagnation, such as the first half of the current decade.

The default ratio (i.e. defaulted loans as a ratio to guaranteed loans) is also much lower than that of Italy's banking system, being 1.83% against 5.89% for banks' loans to the private non-financial sector[7] (Table 3).

[6] The default loss ratio can be decomposed as the product of the default loan rate, the repayment rate and the reciprocal of the guarantee coverage rate. These ratios are presented in Table 3.

[7] The default rate for banks' loans to micro enterprises is 9.82%, Banca d'Italia (2005).

Beside losses, another cost component is given by the operating expenses. They come very close to the loss rate, being 0.39% of guarantees in the period 2000–2004. They also show a clear rising trend, increasing from 0.29% in 2000 to 0.67% in 2004.

Funding costs are not included in the Fund's accounting, but are relevant, since they impinge on the willingness of the public sector to incur additional debt to fund this mechanism. They can be approximated by the weighted average of the yields on Government securities over the period 2000–2004, i.e. 3.65% , Ministero dell'Economia e delle Finanze (2005). By applying this rate to the funds provided by the Government, the funding cost amounts to 0.47% of guarantees given by the Fund. Instead if we use the ratio of interest payments to public debt for the same period, as a proxy, the funding cost would be 0.66%.

On the revenue side, the main source is derived from guarantee fees. These do not reflect any assessment of the risk involved in the specific guarantee, but are charged at a subsidised rate to about two-thirds of the borrowers. The other firms are exempted in order to maximise public support (see Table 1). On the whole, fees represent just 0.35% of guarantees for the period 2000–2004.

An additional income was drawn from the investment of any liquid funds that were maintained as part of ongoing operations. This source amounts to 0.012% of guarantees.

By normalising the equation above, the amount of guarantees (G) and applying the estimated ratios, we have the subsidy rate in percentage terms as given below:

$$S/G = ((L + A + I - F - O)/G)^{*}100$$

namely,

$$0.25 + 0.39 + 0.47(\sim 0.66) - 0.35 - 0.012 = 0.75(\sim 0.94)$$

On this basis, the average subsidy that the Government gave per unit of guarantee in the period 2000–2004, is estimated at less than 1%.

In principle, for such a guarantee mechanism to be financially sustainable, the fee revenues should cover both, losses and operating expenses. In the case of the Fund, fees did not cover either. There was, in fact a current-account deficit averaging 0.28% per guarantee, that prevented the scheme from breaking even.

Table 3 Fund for guarantees to SMES

	2000	2001	2002	2003	2004	Total
	(%)					
Guarantee coverage ratio (1)	55.78	53.94	54.77	48.9	44.91	50.16
Loan default rate (2)	0	0.47	1.36	1.51	3.63	1.83
Repayment/guarantees (3)	0	0	0.11	0.38	0.47	0.25
Loss/loans (4)	0	0	0.06	0.19	0.21	0.12
Repayment rate (5)	0	0	4.3	12.29	5.8	6.81

Source: Elaborations based on Fund's data

(1) Guarantees/guaranteed loans

(2) Guaranteed loans in default/guaranteed loans

(3) Fund's loan repayments/guarantees

(4) Fund's loan repayments/guaranteed loans

(5) Fund's loan repayments/guaranteed loans in default

Such a deficit (0.14% per euro of guarantee[8]) looks, however, very low compared to the other State-funded subsidy schemes for enterprises, that carry a much higher grant element and absorb 94.5% of total State resources devoted to aiding enterprises. Moreover, its magnitude should be assessed against the sizeable amount of loanable funds that the scheme succeeded in mobilising to the advantage of credit constrained SMEs. On this ground, the scheme appears to be an outright success.

4 Credit additionality and interest cost reduction: panel data estimates

Assuming that SMEs are considered by lending institutions as being sub-prime borrowers, due to their relatively smaller size and information asymmetries in the lending relationship, Stiglitz and Weiss (1981), they are subject to a degree of credit rationing, that depends on their risk element and the overall monetary policy stance, Pittaluga (1987). In such a condition, a public credit guarantee should serve the purpose of lowering SMEs' degree of discrimination vis-a-vis prime borrowers, in terms of borrowing costs and unmet demand for credit. In the economic literature, various approaches have been followed to test the presence and extent of short- and long-term credit rationing on a macroeconomic scale, by using proxies, such as the share of prime lending over total lending, Jaffee and Modigliani (1969), or the speed of adjustment of lending rates to market rates, Bowden (1978a).

Here, credit rationing is approached from a microeconomic vantage point (namely, a sample of SMEs) and under the perspective of the effectiveness of a public credit guarantee scheme, namely the Fund. To test the Fund's role in widening credit access for SMEs and lessening borrowing cost, a new econometric approach is applied, using financial data concerning a sample of SMEs, that includes both, those that received a guarantee and those that did not.

Never before, such an approach has been presented in the literature on the subject. Attempts to estimate the effects of Government credit programmes, however, are not new in the economic literature. They were carried out, among others, by Gale (1991), NERA (1990), Pieda (1992), KPMG (1999), Boocock and Shariff, (2005), Riding and Haines (2001), Riding et al. (2006).

Differently from these authors, this analysis is based neither on surveys, nor on an ad hoc model, but on the consolidated econometric literature of causal effects estimation. What is tested is whether and to what extent the borrowing cost and credit supply to SMEs is affected by the Fund's guarantee. For a technical discussion of this approach, see the Technical Appendix and Wooldridge (2002).

The data for guaranteed SMEs, that are used in these econometric tests, concern those that received

[8] This is the ratio of the deficit to the amount of guaranteed loans, and is equal to the product of the deficit ratio by the guarantee coverage ratio (Table 3).

the Fund's guarantee for the entire period of the Fund's existence.[9] Descriptive statistics of the main variables employed in this analysis are presented in Table 4.

As a simple OLS estimation does not allow to detect the presence of a causal relationship, a different approach must be applied, i.e. the one by Angrist (1990) and Angrist-Imbens-Rubin (1996). They prove that by resorting to a suitable instrumental variable (IV), under certain conditions, it is possible to "locally" insulate causal effects.

The IV approach on Cross-Sectional data can single out the Average Treatment Effect (ATE) for some treated units, but not for the whole economy. In particular, it gives the average treatment effect for those treated units that are sensitive to the instrument, i.e. those firms that have changed their status from a non-guaranteed SME to a guaranteed one, because they were eligible. This local effect, called Local Average Treatment Effect (LATE), is actually relevant for our purpose. Nevertheless, since this estimation is affected by temporal variation,[10] it is preferable to use another technique, the Difference-in-difference (DID) approach.

The latter is based on the notion that treated units and non-treated ones are not directly comparable when there are reasons to believe that they differ in unobservable characteristics that are associated with the potential outcome. This is so even after controlling for differences in observed characteristics.

To deal with such a shortcoming, an impact analysis of outcomes could be made for the same treated units by comparing their performance in the two periods, before and after treatment. In other words, the treated units' outcome before treatment is used as a control variable for the treated units' outcome after treatment.

Such a comparison could, however, be affected by time trends in the outcome variables, or by the effect of events, other than the treatment, that occurred over the two periods. When only a fraction of the population is exposed to the treatment, an untreated comparison group can be used to identify temporal variations in the outcome, that are not due to the treatment. In other words, the DID estimator relies on the assumption that the average outcomes for the treated units and the control ones would have followed parallel paths over time in the absence of the treatment.

This assumption can be considered quite realistic in the case of SMEs' borrowing cost, since the temporal variation in the outcome variable, that is associated with the guaranteed firms, is basically affected by the same changes in macroeconomic conditions that affect other SMEs.

Table 4 Descriptive statistics of used variables

	Guaranteed firms[a]	Non-guaranteed firms[a]
Number of firms	1,243	10,018
Financial cost/bank debt	0.103	0.129
Bank debt/total assets	0.422	0.513
Employees per firm	61	42
Sales (thousand euros)	11,532	8,092
Fixed assets (thousand euros)	3,290	2,229
Intangible assets (thousand euros)	391	214
Non-banking debt (thousand euros)	582	448
Net worth (thousand euros)	2,343	2,241
Earnings (thousand euros)	42	2

[a] Mean value for each variable, except for the number of sampled firms

[9] These data originate from the Fund's books. Information on SMEs' financial statements was drawn from AIDA balance-sheet data bank. From the latter, a random sample of 11261 SMEs was drawn, including firms that were eligible for the Fund's guarantee (3952) but did not apply for it, and firms that were not eligible (6066), because of the EU exclusion of some economic sectors from the guarantee. A totoal of 1,243 of sampled firms received the Fund's guarantee. The sample period is 1999–2004. Financial data comprise financial costs, earnings, net worth, fixed and intangible assets, long/short term bank-related debt, long/short term bonds, long/short term non-bank-related financial debt, sales, number of employees, depreciation allowance, total assets.

[10] Cross section estimates were made but are not reported in the text. They are made available upon request to the interested reader. In these estimates, the δ coefficient linearly increases over time, signalling the possibility that the estimates are affected by temporal variation. This distortion might be due to changing macroeconomic conditions, such as a decrease in official interest rates, or factors that allow firms to systematically save on financial costs over time. For instance, this result might come from improvements in financial management attributable to technological advances. To account for this possibility the authors resort to the DID estimation procedure.

Table 5 Estimates of the δ parameter using data prior to 1999 for firms receiving the fund's guarantee in the following years

Guarantee years	2000 OLS	2001 OLS	2002 IV	2003 OLS	2004 OLS
δ	0.185*** (0.070)	0.167*** (0.039)	0.180*** (0.042)	0.149*** (0.004)	0.159***(0.036)
R^2	0.654	0.654	0.654	0.654	0.065
Prob (F-stat.)	0.00	0.00	0.00	0.00	0.00
1/F of exclusion of instruments in the First Stage[11]			0.0003		

Robust standard errors in parenthesis. "***", "**" and "*" indicate 1%, 5% and 10% significance levels, respectively. Standard errors are computed through the White correction to account for heteroskedasticity. All the regressions include a constant. The dependent variable is the (log of) financial costs in 1999. The regressors are the (log of) number of employees, sales, total debt. All the variables are at time t = 1999. The full estimates are not reported for brevity. Different regressions are reported in each column by changing the dummy in order to account for the firms guaranteed in different years. For instance, in column 3 we report the estimated δ coefficient related to the 1999 financing cost for firms that received a guarantee only in the year 2001

But such an assumption could be violated if firms eligible for the Fund's guarantee would react to it in anticipation of the guarantee (see, Blundell et al. (2003)).

To rule out this possibility, in the spirit of De Galdeano and Vuri (2004), the following equation is estimated for the year 1999, i.e. prior to the first guarantee operation.

$$\mathbf{r}_t = \alpha + \beta_1 \mathbf{x}_{1t} + \beta_2 \mathbf{x}_{2t} + \beta_3 \mathbf{x}_{3t} + \delta \mathbf{d}_{\mathbf{t+n}} + \mathbf{u}_\mathbf{t}$$

where $\mathbf{r_t}$ $N \times 1$ vector of (log of) financial costs, that were borne by the sampled SMEs in 1999;

$\mathbf{x_{1t}}$ $N \times 1$ vector of (log of) number of employees in 1999;

$\mathbf{x_{2t}}$ $N \times 1$ vector of (log of) sales in 1999;

$\mathbf{x_{3t}}$ $N \times 1$ vector of (log of) total debt in 1999;

$\mathbf{d_{t+n}}$ dummy variables, that takes on value of 1 if the firm is guaranteed at time $t + n$ (where t = 1999) and to 0 otherwise;

$\mathbf{u_t}$ error term.

In such a specification, the borrowing cost is a function of the number of employees, the volume of total sales, total debt and the presence of a credit guarantee. The employee variable is seen as a proxy of the degree of information available to allow an adequate assessment of the SME credit-worthiness (Pozzolo 2004). Total sales are seen as a proxy to account for the financial risk stemming from the firm's size. The total debt variable is included among the regressors in order to factor in the relationship between the degree of financial leverage and the financing cost.

Of course, the choice of variables is somewhat restricted by data availability. Specifically, the dependent variable is measured in terms of the (log of) financial costs, since these are the most clearly identifiable cost figures in the AIDA data bank. The actual interest rate paid by the firms would be a better choice, but this requires a level of detail that is not available in our data set.

To test the specific hypothesis of anticipation effect, the regression is run on 1999 data and the dummy δ takes on the value of 1 for all firms that received a Fund's guarantee in the following years, and zero otherwise. Results are reported in Table 5.

Diagnostic tests have been carried out in advance in order to rule out problems of endogeneity and/or simultaneity. The Durbin-Wu-Hausman signals the inconsistency of the OLS estimator only for the year 2002. In this case an instrumental variables estimate has been run, where the set of instruments are d_{t+1}, d_{t+2}, d_{t+4}, d_{t+5}, i.e. various lags and leads of the dummy variable. This set of instruments is validated by the Sargan and Basmann tests.[12]

It is worth stressing that the estimates in Table 5 are not aimed at detecting a causal relationship between the treatment and the outcome variable, since in 1999 the treatment had not occurred yet. In this respect, it is not necessary to check the conditions

[11] According to Bound et al (1995), instrumental variables estimates may be biased in small samples. A correct practice is to report a statistic that measures this possible bias. Staiger and Stock (1997) prove that when the instrumented variables are no more than 1, the reciprocal of the F-test of the exclusion of the instruments in the first stage approximates the fraction of the OLS bias that is still present in the IV approach to LATE in a finite sample. For an example of the inclusion of the F of the first stage in a LATE estimate, see Ichino and Winter-Ebner (2004).

[12] Proofs are available from the authors upon request.

by Angrist-Imbens-Roubins (1996). What is needed to validate these estimates is to carry out the usual diagnostic tests, as in any IV estimate.

For our analysis, the estimate of the δ coefficient is the most relevant element, since it signals the impact of the guarantee on the borrowing cost of guaranteed firms, as compared to other firms. Its estimate is positive and significant in all the columns of Table 5. This evidence can be interpreted as signalling that in the year 1999, those firms that received a Fund's guarantee years later paid higher financial costs, other things being equal. The cost difference is estimated to be between 16.07% and 20.32% at the median point.[13] This result goes in the direction of ruling out the possibility of an anticipation effect.

On the basis of this result, a fixed-effect panel version[14] of Eq. 1 for the years from 1999 to 2004 is estimated (Table 6). Following Abadie (2005), Blundell et al. (2003), De Galdeano and Vuri (2004), the coefficients in the pre-guarantee year (1999) are estimated separately from those for the other years, by applying a time dummy variable to all regressors.

In the first two columns, total debt is included among the regressors, while bank debt is in the second two columns, and non-bank debt in the last two columns.

The interesting finding of these estimates is the lack of significance of the guarantee dummy. When bank-debt and total debt are used as regressors, the guarantee dummy turns out to be non-significant. This means that, other things being equal, guaranteed firms do not significantly differ from non-guaranteed ones in terms of financial costs. Combining this result with that obtained in Table 5, showing that guaranteed firms were charged higher financial costs in 1999, it can be argued that the guarantee has proved to be an effective instrument in reducing borrowing cost for credit-rationed firms. In other words, the public guarantee allows a guaranteed firm to face the same financial cost as a non-guaranteed one, while it used to pay more in the non-guarantee period.

Using non-bank debt as a measure of the debt, the effectiveness of the Fund seems to disappear, because the coefficient of the guarantee dummy is significant and positive. Actually, this evidence does not change the preceding conclusion, since the bulk of SMEs financing (74%) is provided by banks and the guarantee is aimed at lessening the cost of bank debt, not the cost of any debt.

According to the estimated coefficients, the presence of the guarantee seems to have reduced the SME financing cost at the median point by 16.07–20.32%.[15] Although this result is not easily comparable with other evidence, since it refers to a median value, it is not far from actual data gathered by some MGIs for the year 2004. In its annual survey of its guaranteed firms, Federconfidi (2004) reported an average reduction in bank interest charges of about 1.5% points (−21% of reported average bank rates) for short-term loans and 1.1 points (−20%) for medium-term loans. Another MGI, Fedart Fidi (2005), recorded average charges for their members, that were lower than reported average market interest rates by 1.2 points for medium-term loans.

Turning to credit additionality, to test the impact of the guarantee on the credit supply to SMEs, the same DID approach is adopted, using the (log of) different measures of debt as the dependent variable.

The theoretical scheme of reference for these estimates is the disequilibrium approach proposed by Bowden (1978a, 1978b). This allows a quantification of the credit rationing phenomenon. In the simplest version of this approach, the amount of borrowed funds is a function of both, its cost and a set of explanatory variables concerning the demand for funds. This model specification has had several empirical applications, Pittaluga (1987, 1989) and the bibliography herein cited. Among them, the disequilibrium approach by Pittaluga (1988) is noteworthy, since it was applied to estimate the credit rationing phenomenon across different regions in Italy.

The approach followed in this article draws on the above-mentioned theoretical and empirical works. In Bowden and Pittaluga, credit rationing has been approached from a macroeconomic point of view, by using lending rates for various loan sizes and total

[13] This figure is obtained by taking the antilog (to base *e*) of the estimated dummy coefficient, subtracting 1 and multiplying the difference by 100. Since the dependent variable is in log, once taken the antilog one must refer to the median value of the dependent variable, not to the mean value. For more details see p. 321 of Gujarati (2004) and cited references.

[14] On the basis of a Hausman test, we can reject the null hypothesis of consistency of both fixed and random effects.

[15] See previous footnote.

Table 6 DID estimate of the causal effect of the guarantee on the (log of) financial costs

		OLS	Fixed effects (DID)	OLS	Fixed effects (DID)	OLS	Fixed effects (DID)
	α	−1.837*** (0.080)	−0.345 (0.247)	−1.397*** (0.091)	−0.026 (0.245)	−0.764*** (0.216)	1.429*** (0.465)
Year 1999	No. of employees	0.069***(0.013)	0.081*** (0.015)	0.089*** (0.014)	0.089*** (0.015)	0.171*** (0.030)	0.106*** (0.027)
	Sales	0.192*** (0.011)	0.329*** (0.022)	0.188*** (0.015)	0.331*** (0.022)	0.616*** (0.021)	0.561*** (0.036)
	Bank debt			0.698*** (0.015)	0.399*** (0.014)		
	Non-bank debt					0.178*** (0.021)	0.045*** (0.015)
	Total debt	0.717*** (0.011)	0.423*** (0.016)				
post 1999	No. of employees	0.042*** (0.006)	0.045*** (0.012)	0.061*** (0.007)	0.054*** (0.012)	0.166*** (0.016)	0.064*** (0.023)
	Sales	0.171*** (0.006)	0.330*** (0.017)	0.166*** (0.008)	0.330*** (0.017)	0.607*** (0.016)	0.588*** (0.032)
	Bank debt			0.724*** (0.006)	0.446*** (0.009)		
	Non-bank debt					0.185*** (0.007)	0.068*** (0.007)
	Total debt	0.744*** (0.004)	0.464*** (0.010)				
	Guarantee dummy	0.063*** (0.019)	0.014 (0.017)	0.049*** (0.015)	0.014 (0.017)	0.434*** (0.029)	0.096*** (0.027)
	R^2	0.800	0.945	0.816	0.946	0.544	0.939
	# Obs	17430	17430	17430	17430	8588	8588
	Prob(*F*-stat)	0.00	0.00	0.00	0.00	0.00	0.00

Robust standard errors in parenthesis. "***", "**" and "*" indicate 1%, 5% and 10% significance levels, respectively. S.E. are computed through the SUR (PCSE) coefficient covariance matrix to account for both cross-section heteroskedasticity and correlation

bank loans as dependent variables in credit rationing tests. In contrast, this analysis is developed in a microeconomic context, by applying different debt measures, in order to show that well-focussed public guarantee schemes can indeed contribute to ease credit rationing for disadvantaged SMEs.

In line with Pittaluga (1987, Eq. 10), the quantity of granted funds is seen as a function of two components: (i) its cost; and (ii) a set of explanatory variables of credit demand. The database for econometric tests is made out of repeated cross sections, containing mainly balance sheet entries. The use of repeated cross sections does not allow to explicitly insert an interest rate variable (such as the prime rate), as it is done in the cited literature, because this variable does not vary across firms, thereby collapsing into a constant term. However, to take account of temporal variation in interest rates, period-fixed effects and cross section-fixed effects have been included in the regression equation.

As explanatory variables for the demand of funds, the following variables are used: the number of employees is taken as an indicator of creditor's ability to gain an insight into the firm's creditworthiness—this is a proxy of the demand quality, Pozzolo (2004); Total sales is included as a proxy of the firm size—this has a bearing on the demand for credit; total assets is included to assess to what extent the presence of a credit guarantee raises the firms' ability to borrow. For a given level of total assets, this equation specification allows to highlight the guarantee impact on guaranteed firms, as compared to non-guaranteed ones.[16] Of course the inclusion of the dummy variable is the core of our analyses and is consistent with a lending additionality test, since a credit-rationed firm with no guarantee is expected to have a relatively lower debt level than a comparable guaranteed firm.

In the resulting estimates, as reported in Table 7, the guarantee coefficient is found to have the expected (positive) sign and to be significant. Specifically, the median value of bank debt is higher by 12.41% for guaranteed firms as compared to that of their non-guaranteed counterparts. In terms of total debt, the median value is higher by 9.64%. As a counterproof, when the credit additionality effect is measured in terms of non-bank debt, the guarantee is found to have no impact (last column in the table), as it is to be expected since the guarantee is only for bank lending.

Overall, the relevance of the Fund guarantee in widening SME access to bank credit is confirmed. Of course, these findings refer specifically to Italy's SGS in the context of a banking system that usually links lending decisions concerning SMEs to the presence of an adequate collateral, Coco (2000). But this empirical evidence is also relevant for any other country, where the absence of a collateral leads to a stringent credit rationing towards SMEs.

These quantitative findings also go in the same direction as those of other authors, although the latter findings lack the strength of a causality test, comparable to our case. A much higher additionality effect (+37% on average) is estimated by Boocock and Sharif (2005) for Malaysia on the basis of a variety of methods drawing on questionnaire answers, interviews and case studies. A higher impact also results from the simulations by Gale (1991): he calculates a 25–33% rise in credit allocation to small business as a result of loan guarantees provided under US federal credit programmes. Riding et al. (2006), instead, estimate (through a credit scoring and logistic regression model) a $74.8 \pm 9\%$ increase in the number of loans made possible by Canada Small Business Financing programme. These loans would have otherwise been turned down by credit institutions. In spite of differences in their accuracy, all the mentioned estimates attest to the significance of guarantee's additionality effect.

5 Conclusions

Most advanced economies have established publicly-funded guarantee schemes to help SMEs overcome their financing difficulties, that are due to imperfect or incomplete financial markets. Under such conditions, credit rationing for sub-prime borrowers, such as SMEs, is the usual outcome in Italy, as in other countries.

Conflicting assessments of the effectiveness of a public guarantee, however, come out of the empirical evidence gathered so far through various analytical tools. The evidence presented here is based on

[16] Estimates have also been carried out by replacing total assets with the share of physical over total assets. The results show no appreciable difference from the above estimates

Table 7 DID estimate of causal effect of the guarantee on the (log of) different measures of debt

		OLS dep vbl: bank debt	Fixed effects (DID) Dep vbl: bank debt	OLS dep vbl: total debt	Fixed effects (DID) Dep vbl: total debt	OLS dep vbl: non-bank debt	Fixed effects (DID) Dep vbl: non-bank debt
	α	−2.035*** (0.190)	−1.401*** (0.374)	−1.808*** (0.156)	−2.094*** (0.307)	0.377 (0.260)	−1.690*** (0.490)
Year 1999	No. of employees	−0.118*** (0.031)	0.026 (0.032)	−0.128*** (0.024)	0.014 (0.028)	−0.091** (0.042)	0.053 (0.045)
	Sales	0.107*** (0.036)	0.125*** (0.047)	0.051 (0.032)	−0.046 (0.042)	−0.132*** (0.049)	−0.014 (0.060)
	Total assets	0.974*** (0.037)	0.962*** (0.034)	1.038*** (0.033)	1.112*** (0.032)	0.973*** (0.050)	0.933*** (0.056)
Post 1999	No. of employees	−0.093*** (0.015)	0.076*** (0.027)	−0.106*** (0.012)	0.018 (0.022)	−0.089*** (0.021)	0.035 (0.034)
	Sales	0.143*** (0.018)	−0.035 (0.031)	0.081*** (0.015)	−0.073*** (0.024)	−0.042* (0.024)	−0.028 (0.036)
	Total assets	0.926*** (0.015)	1.022*** (0.030)	0.997*** (0.012)	1.159*** (0.025)	0.874*** (0.019)	0.976*** (0.041)
	Guarantee dummy	0.479***(0.030)	0.117*** (0.033)	0.377*** (0.024)	0.092*** (0.029)	−0.182*** (0.058)	0.068 (0.068)
	R^2	0.476	0.868	0.583	0.891	0.350	0.843
	# Obs	18352	18352	19790	19790	10545	10545
	Prob(F-stat)	0.00	0.00	0.00	0.00	0.00	0.00

Robust standard errors in parenthesis. "***", "**" and "*" indicate 1%, 5% and 10% significance levels, respectively. S.E. are computed through the SUR (PCSE) coefficient covariance matrix to account for both cross-section heteroskedasticity and correlation. Financial statement data are the result of elaborations on AIDA-MCC data

standard econometric techniques about causality effects, and is mainly aimed at checking whether and to what extent a causal relationship can be established between Italy's State-funded guarantee scheme and the level of credit supply and its cost to SMEs.

To this end, a fixed-effect panel data estimation is carried out, using financial statements data concerning SMEs that benefited from the Italian SGS's guarantee, and comparing them with their non-guaranteed counterparts. To account for temporal variation in the relationship, a Difference-in-difference approach is applied and tested for time trends.

The empirical evidence presented in this analysis shows that Italy's scheme has reached a measure of effectiveness in reducing SMEs' borrowing cost and easing their financing constraints. The cost reduction is evaluated as being in the range of 16–20%, while the additional supply of credit by banks is estimated at 12.4% at the median. Albeit tilted towards the low end of the estimate range that is available in the economic literature, these estimates are consistent with those resulting from alternative and less rigorous methodologies.

What this study adds to the existing empirical evidence is, first, the strength of a causality test and, second, its application to Italy's SGS, an analysis never carried out before. This econometric test, however, is not relevant just for the country under review, but can be replicated for other countries as well, since no explanatory variable in this analysis is highly specific to a single country.

What differs from other countries is the way in which the SGS was run in Italy. The evidence described here indicates that a high degree of selectivity was used in choosing the targeted SME groups, the individual beneficiaries and the guarantee coverage ratios. All these factors pertain to SGS management and could be replicated in other countries. They also help explain the reason why, contrary to other SGS, the Italian one has managed to limit default rates and to contain the public subsidy element, that is required in order to maintain the Fund's financial sustainability.

By another token, these findings indirectly shed some light on the credit rationing phenomenon in Italy by resorting to micro-economic data. In the economic literature, credit rationing has generally been approached from a macro-economic standpoint.

Such is also the evidence provided for Italy, Pittaluga (1987, 1991), where lending rates for various loan sizes and total bank loans were used as dependent variables in credit rationing tests. In this analysis, instead, different debt measures are used in a micro-economic context, with the result of showing that well-focussed public guarantee schemes can indeed contribute to ease credit rationing for disadvantaged SMEs.

No attempt has, however, been made in this article to assess the overall net welfare gain or loss for the economy deriving from SGS. This would require testing the presence of direct and indirect crowding-out effects for other SME groups, Gale (1991), as well as the overall economic growth and employment impact. But this goes far beyond the aim of this work, and could be the subject for further research.

Technical appendix

DID estimates

Estimates reported in Tables 6 and 7 are based on the following equation:

$$\mathbf{y_i} = c_i\mathbf{i_T} + \mathbf{I_T}\gamma + \mathbf{S}\mathbf{X_i}\boldsymbol{\beta} + (\mathbf{I_T} - \mathbf{S})\mathbf{X_i}\boldsymbol{\beta} + \delta(\mathbf{I_T} - \mathbf{S})\mathbf{d_i} + \mathbf{u_i} \quad \textbf{for i} = \mathbf{1}\ldots\mathbf{N}$$

Broadly speaking, this equation is a standard DID regression equation, where all regressors are treated with a dummy variable to distinguish the two periods. For its algebraic derivation, we refer the reader to Abadie (2005), Blundell et al. (2003), De Galdeano and Vuri (2004).

Given that our data set is made out of a number of cross-section data related to different years, we may rewrite the panel equation regression as a pool of cross-sectional equations. Each equation's observations are actually stacked on top of the others. In the above equation, $\mathbf{i_T}$ is a T-element unit vector, $\mathbf{I_T}$ is the T-element identity matrix, c_i is a cross section fixed effect, γ is a vector containing all of the period effects, $\gamma' = (\gamma_t, \gamma_{t+1}\ldots\gamma_T)$, $\boldsymbol{\beta}$ is a $k \times 1$ coefficient vector, $\mathbf{X_i}$ is a $N \times k$ matrix of explanatory variables, $\mathbf{S}$ is the corresponding matrix ($T \times T$) form of the usual temporal dummy variable, that takes on value 1 for all t belonging to the first period, and 0 otherwise. In matrix form $\mathbf{S}$takes on value 1 in the tth element of the principal diagonal for all t belonging to the first period. In our case, we are interested in distinguishing between data prior and next to the treatment, i.e. 1999 is the first period and 2000–2004 belong to the second. Hence, $\mathbf{S}$ takes on value 1 only in the first element of the principal diagonal.

δ is our parameter of interest, since it captures the effect of the guarantee on the dependent variable. The dummy $\mathbf{d_i}$ captures the guaranteed firms, taking on value 1 in the year(s) of guarantee for the guaranteed firm, and 0 otherwise. From another standpoint, it can be regarded as the staked interleaved form of the $\mathbf{d_t}$ vectors of Eq. 1. Obviously, it takes on value 0 for all firms in 1999.

The same estimation procedure was applied both to estimate the effect of the guarantee on the borrowing cost and the credit additionality effect.

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