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Garanzie di credito parziale e finanziamento delle PMI

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Partial Credit Guarantees and SMEs Financing

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Sommario

Il lavoro si prefigge di analizzare l'effetto delle garanzie dei credito parziale erogate dal Fondo di Garanzia italiano per le piccole e medie imprese. Tramite un'accurata analisi econometrica, si mostra che la pratica seguita in letteratura finora, secondo cui le imprese garantite sono state considerare come parimenti trattate, conduce ad un errore di stima dell'effetto (per difetto). Inoltre, il lavoro documenta l'esistenza di effetti non lineari della garanzia, suggerendo che percentuali di copertura inferiori ad una certa soglia individuata al 25% sono inefficaci nell'alleviare il razionamento del credito, fenomeno di cui soffrono le imprese italiane ed in particolari quelle di piccole e medie dimensioni.

Parole chiave*:* credit guarantees; credit rationing; SME.

Abstract

Using data for the Italian Central Guarantee Fund for Small and Medium Enterprises, the paper analyses the effect of partial credit guarantees on firms' financing. We show that neglecting heterogeneity in guarantee intensities, namely considering all firms as equally treated, leads to a mis-measurement of the additionality effect. Moreover, we document the existence of non-linear effects, suggesting that coverage ratios below a certain threshold are likely to be ineffective to lessen obstacles faced by firms when seeking external financing funds.

Keywords*:* credit guarantees; credit rationing; additionality; SME; Italy.

1. Introduction

Credit Guarantee Schemes (CGS) are multilateral agreements where lenders, guarantors and borrowers interact with each other. While lenders are generally private financial intermediaries, guarantors may be private or public in nature with borrowers typically seen as being underserved clients by the formal credit markets.

In this multi-parties environment, guarantors seek to facilitate borrowers' access to debt capital by distributing (costly) credit guarantees. It is well known, indeed, that the provision of collateral can lessen credit rationing faced by firms (and especially by Small and Medium sized Enterprises, SMEs; Beck et al., 2010; Berger and Udell, 1998) through several channels: first, it decreases lenders' risk in the event of default (Coco, 2000); second, it rectifies credit market imperfections related to adverse problems (Deelen and Molenaar, 2004); third, it reduces the costs of monitoring in the relationship between borrowers and lenders (Cowling and Mitchell, 2003).

Despite its relevance for all parties involved in a CGS (lenders, guarantors and borrowers), knowledge about the financial impact of partial coverage ratios is an issue largely neglected in the existent literature (Boocock and Sharif, 2005; Gale, 1991; Oh et al., 2009; Riding and Haines, 2001; Riding et al., 2007; Zecchini and Ventura, 2009). We contribute to filling this gap by assessing the effect of heterogeneous partial coverage ratios on credit additionality, which is commonly meant the extent to which guaranteed firms can attain a larger access to bank loans than in the absence of such guarantees.

To this aim, we develop a methodological framework which differs from previous works in several aspects. *First*, we resort to a generalisation of the Difference-in-Difference (DID) methodology so as to take into account heterogeneous treatment intensities (coverage ratios). *Second*, from a methodological point of view, we address the issue of the double dimension of self-selection (into treatment and the level of the treatment itself) by proposing a novel multi-step procedure. Specifically, the present paper proposes a new econometric strategy to overcome the problem of exact identification in an instrumental variable context. We artificially increase the number of instruments by generating them according to Lewbel (2012) and then we carry out a test on the validity of the subset of instruments we are interested in. *Third*, we test if there exist non-linearities in the causal relationship between the coverage ratio and credit additionality.

From a policy perspective, the proposed framework can offer useful metrics to assess possible alternative targets to be reached through the Fund. In particular, comparative statics exercises are performed in order to estimate: a) the additional Fund's endowment needed to ensure that all guaranteed firms would receive the minimum effective treatment, keeping constant the actual level of the Fund's risk; b) the reduction of the Fund's risk exposure arising from granting only guarantees above the minimum threshold. Our findings have also straightforward implications for borrowers: as a guaranteed firm could not obtain additional bank financing when its guarantee intensity is too low, it could be better off by simply declining the guarantee and avoiding the related costs.

2. Theoretical background

In order to derive an empirically testable relationship between banks' credit supply, its cost and proxies for credit demand, we follow Bowden (1978) and Pittaluga (1987) and assume that the lending rate faced by firm i at time t, p_{it}, is supposed to obey a partial adjustment mechanism

$$p_{it} = \lambda_i \mathrm{L} p_{it} + (1 - \lambda_i) p_{it}^{*} \qquad (1)$$

so that $p_{it} = \left(\frac{1-\lambda_i}{1-\lambda_i \mathrm{L}}\right) p_{it}^{*}$, where L is the lag operator and $\lambda_i \in (0,1)$ is a parameter measuring the speed of convergence of the current price towards the equilibrium level of the lending rate, p_{it}^{*}, occurring in the absence of credit rationing, that is when credit supply (Q_{it}) offered to a firm equals its demand for external financing (X_{it})

$$p_1 it = p_1 it^{\dagger} * \; | Q_1 it = X_1 it \qquad (2)$$

Given conditions (1) and (2), the evolution over time of the firm-specific lending rate mirrors credit demand-supply mismatch

$$p_{it} = \phi_i(\Delta D_{it}) \qquad (3)$$

with $\Delta D_{it} = X_{it} - Q_{it}$. As the price is an increasing function of the excess demand, we have $\phi_i'(.) > 0$, so that

$$Q_{it} = X_{it} - \Delta D_{it} = X_{it} - \varphi_i(p_{it}) \qquad (4)$$

where $\varphi_i(.)$ represents the inverse function of ϕ_i, $\varphi_i(.) \equiv \phi_i^{-1}(.)$, and with $\varphi_i'(.) < 0$, as the excess demand decreases as the price increases [$-\varphi_i'(.) > 0$].

We start by constructing an estimable version of condition (4) where the outcome variable in the left-hand-side is the (log of) bank loans, $bnkl$. To account for the set of explanatory variables of credit demand, we follow Pozzolo (2004) and Zecchini and Ventura (2009), so that the vector X_{it} contains: *i*) a proxy of firm size, given by (the log of) total sales, $tots$; *ii*) (the log of) fixed assets, $fixa$, as a variable aimed at assessing to what extent the presence of assets raise the firm's ability to borrow. Ideally, we would like to have firm-specific information on interest rates for bank loans as an indicator of the lending rate so as to account for $\varphi_i(.)$ in condition (4). Due to data limitations we measure the lending rate ($lrate$) faced by a given firm by balance sheets data on financial costs ($finc$) scaled by the amount of bank loans ($\mathbf{bnkl}$), i.e. $lrate = finc - bnkl$.

Accordingly, the empirical counterpart of condition (4) can be written as

$$bnkl_{it} = \tilde{\beta}_1 tots_{it} + \tilde{\beta}_2 fixa_{it} + \tilde{\beta}_3 (finc_{it} - bnkl_{it}) + \tilde{\varepsilon}_{it}$$

or equivalently

$$bnkl_{it} = \beta_1 tots_{it} + \beta_2 fixa_{it} + \beta_3 finc_{it} + \varepsilon_{it} \qquad (5)$$

where $\beta_j = \frac{\tilde{\beta}_j}{1+\tilde{\beta}_3}$, with $j = 1, \ldots, 3$ and $\tilde{\beta}_3 \neq -1$, the index it identifies the i -th firm observed at time t, and a stochastic residual, $\varepsilon_{it} = \frac{\tilde{\varepsilon}_{it}}{1+\tilde{\beta}_3}$, is added so as to obtain the relevant condition to put into empirical testing.
According to the econometric literature referred to as program (or treatment) evaluation (Rubin, 1974), the estimation of treatment effects aims at gauging how the outcome (the amount of bank debt) of an average untreated unit (a SME) would change if such a unit received the treatment (the Fund's guarantee with a given intensity).

Among the different estimators of the treatment effect, we opted for the Difference-In-Difference (DID) methodology. An advantage of the DID estimator is that the double difference can be easily computed by running a fixed effect regression (augmented by time varying covariates). Accordingly, condition (5) is estimated by specifying the following model

$$bnkl_{it} = \alpha_i + \eta_t + \beta_1 tots_{it} + \beta_2 fixa_{it} + \beta_3 finc_{it} + \delta d_{it} + \varepsilon_{it}$$

or

$$bnkl_{it} = \alpha_i + \eta_t + X'_{it}\beta + \delta d_{it} + \varepsilon_{it} \qquad (6)$$

where α_i and η_t represent cross-section and period fixed effects, respectively; d_{it} is a dummy variable taking value 1 if the firm i receives the treatment at time t, and 0 otherwise.

Another advantage of DID is that it facilitates empirical works with treatment other than binary. When the treatment variable takes on different treatment intensities, equation (6) can be rewritten as

$$bnkl_{it} = \alpha_i + \eta_t + X'_{it}\beta + \gamma pc_{it} + \varepsilon_{it} \qquad (7)$$

where the variable pc_i is the coverage ratio, a measure of the treatment intensity given by the ratio between guaranteed amount ($gamo$) over granted loan ($gral$). The granted loan, *gral*, is, in turn, a fraction of the total bank loans, *bnkl*.

The analysis of pc is the core of our investigation 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. Equation (7) allows taking into account heterogeneity in the coverage ratio, modelled as a variable aimed at capturing varying treatment intensities across firms. The variable pc_{it} indeed can take constant values over time in the interval (0,1), if and when the firm is guaranteed, or 0 otherwise.

When considering heterogeneous treatment intensities, one may suspect that the benefits accruing to the treated firms with very high coverage ratios (for instance 70 or 80%) would be different with respect to those receiving guarantees covering a small fraction of their guaranteed loan (say 10 or 20%). Accordingly, we also formulate a more flexible specification of condition (7) by relaxing the linearity assumption in the functional form so as to capture possible non-linear effects in the treatment-response relationship

$$bnkl_{it} = \alpha_i + \eta_t + X'_{it}\beta + \gamma_1 pc_{it} + \gamma_2 pc_{it}^2 + \varepsilon_{it} \quad (8)$$

3. Empirical results

Table 1 collects the estimation results for our baseline specification, labelled Model [1], which represents the empirically testable version of equation (7)

Table 1. DID estimates: benchmark model and its variations

	Model [1] Benchmark model	Model [2] Granger-type test model	Model [3] Parallel trend model	Model [4] Partial vs total guarantees
$inpt$	1.962*** (0.563)	2.522*** (0.895)	1.964*** (0.562)	1.937*** (0.026)
$finc$	0.363*** (0.098)	0.215** (0.103)	0.362*** (0.097)	0.365*** (0.027)
$tots$	0.094* (0.057)	0.192** (0.080)	0.096* (0.056)	0.093*** (0.031)
$fixa$	0.452*** (0.063)	0.429*** (0.065)	0.450*** (0.063)	0.454*** (0.019)
pc	0.136** (0.055)	0.199*** (0.063)	0.267** (0.106)	
pc_{t-1}		0.060 (0.079)		
pc_{t-2}		0.097 (0.072)		
$d \times trend$			-0.027 (0.019)	
d				0.051** (0.026)
Period effects	yes	yes	yes	yes
Cross-section effects	yes	yes	yes	yes
F-test	0.00	0.00	0.00	0.00
Obs.	3,530	1,694	3,530	3,530

Note. The dependent variable is the (log of) bank debt in real terms (base year 2000). Robust standard errors in parenthesis. "***", "**" and "*" indicate 1%, 5% and 10% significance levels, respectively. "F-test" reports the p-value associated with the test for the joint non-significance of all the regressors entering the model. The time effects included pertains 2003 and 2004, as the others are not statistically significant.

The coefficient for fixed asset is positive and statistically significant, corroborating the positive role of (potential) collateral in favouring SMEs' access to bank credit. As expected, the credit offered by banks is positively and significantly related to the cost charged to firms. The positive (and statistically significant) coefficient for total sales is consistent with the evidence in Berger and Udell (1998) and Beck et al. (2010), among others, according to which larger firms are better served by the banking system. Finally, the associated coefficient of the regressor of main interest (the treatment variable) suggests an Average Treatment Effect, ATT, of 13.6%. The finding of a statistically significant additionality effect is not trivial in our case: since Generale and Gobbi (1996), indeed, it is well known that the Italian institutional context is characterized by costly and lengthy procedures for contract enforcement which may hinder the effectiveness of legal procedures for loan recovery and thus the effectiveness of a CGS in lessening credit constraints faced by SMEs seeking external funds. In economic terms, the effect of the Fund guarantee is therefore relatively small if compared to the much larger incrementality effect - up to 75% ($\pm$ 9% confidence interval) - estimated by Riding et al. (2007) under the terms of the Canada Small Business Financing (CSBF) program. D'Ignazio and Mellon (2013), by contrast, find no impact on the size of firms' bank debt of a regional credit guarantee scheme implemented in Italy, though the guarantee improved the firms' financial conditions by increasing the proportion of long-term debt and decreasing the interest rate.

One may suspect that our application of the DID methodology may be flawed in two main respects: *i*) being the treatment heterogeneous, the firms can self-select into the level of the treatment, other than into the treatment itself: this double line of self-selection would invalidate the result; *ii*) as *pc* is the ratio between the guaranteed amount and the borrowed loan, with $bnkl$ being the total amount borrowed from the bank system (part of which consists of the guaranteed loan), simultaneity/endogeneity problems between pc and the dependent variable may emerge.

In order to shed light on these two issues, we have performed a three-step procedure based on the method recently proposed by Lewbel (2012) so as to assess the exogeneity of partial coverage ratios when estimating condition (7). Specifically, this procedure makes it possible to overcome the exact identification problem, i.e. when the validity of the instruments cannot be tested as the number of instruments is equal to the number of (potential) endogenous variables. In its essence, our multi-stage procedure involves the following steps:

a) finding an appropriate instrument;[1]

b) checking its validity following the procedure proposed by Lewbel (2012) which generates valid instruments based on the presence of heteroskedastic errors;

c) testing for non-endogeneity of the treatment variable.

We conclude that pc can be safely considered as non-endogenous, ruling out possible simultaneity/endogeneity problems of our treatment variable with respect to the response one ($bnkl$).[2] From an economic point of view, this finding reflects how the Fund actually operates, in that the maximum coverage ratio is set by the guarantor on the grounds of strictly predefined criteria which are invariant over the time span of the loan and not subject to any sort of conditioning on the firms' choices.

[1] The instrument chosen consists in the sum of the time dummy variables not included in the main regression as not significant. This instruments has the clear advantage of being not correlated with the dependent variable. This choice is not new in the literature and dates back to eighties; see, for instance, MaCurdy (1981) and Altonji (1986).

[2] Evidence is not reported in the text for sake of room, it can be made available upon request.

As a further corroboration of our estimation result, we have performed standard specification tests: the Hausman test rejects the random effect hypothesis at the 1% level of significance; moreover, the null of redundancy of firm-specific and period-specific fixed effects is rejected at the 1% level. Besides these testing procedures drawn from the panel data literature, we have also run a group of diagnostic tests (specifically related to the DID approach), whose results are reported in the second and third column of Table 5. More in details, we have augmented Model [1] by (two) leads of pc so as to gauge whether the outcome is affected by future treatments (see Model [2]), as suggested by Angrist and Pishke (2009).[3] Testing for causality (in the spirit of Granger, 1969) leads not to reject the null of both individual and joint non-significance of the leads with a p-value of 0.23. In the second test, Model [1] has been augmented by a trend multiplied by d_{it} in order to capture a difference in trends between the two groups (see Model [3]). As the Table shows, such additional term turns out to be not statistical significant, adding confidence to our results as the parallel path assumption, that is the basic hypotheses the DID methodology hinges on, cannot be rejected.

On the grounds of these diagnostic tests, the baseline specification appears to be a reasonable starting point in order to quantify the role of firm-specific coverage ratios in lessening credit constraints to external financing for SMEs. In order to delve deeper into the effects of heterogeneous treatment intensities when assessing credit additionality, we compare the estimation results from our benchmark Model [1] to those from condition (6), where pc_{it} (the partial coverage ratio) is replaced by d_{it} (the full coverage ratio, Model [4]). Testing whether the partial guarantee has no role with respect to the total one, through a standard Hausman-like test, suggests rejecting the null of equality between δ and γ at the 1% level. As a consequence, neglecting heterogeneity in guarantee intensities, namely considering all firms as equally treated, leads to a mis-measurement of the additionality effect provided by guarantees. Such a finding makes it possible to go beyond the conclusions of some earlier evidence (for instance Oh et al., 2009; Zecchini and Ventura, 2009, among others), for which this criticism is relevant.

As the effect of the partial coverage ratio is an ATT, one may wonder to what extent this result applies to heterogeneous treatment intensities. Accordingly, we estimate condition (8) and test for possible redundancy of the non-linear terms for orders higher than two (and up to the fifth power) (Model [5] of Table 2). Several remarks ensue. *First*, we find that in Model [5] the term pc^2 is negative and statistically different from zero. By equating to zero the second order polynomial in pc , we obtain an U-shaped parabola with a minimum at 0.22, thus suggesting the existence of a lower bound for the effectiveness of the coverage ratios. *Second*, for all the remaining regressors entering the model (namely, total sales, fixed assets, and financial costs), the estimation results of Model [5] confirm the previous findings. *Third*, adding powers greater than two does not alter our conclusion since these additional terms turn out to be statistically redundant according to standard LR tests when compared to Model [5].

Given the evidence of a unique threshold, we split the treatment intensity into two mutually exclusive variables: the first one, $pc25$, accounts for low intensities (that is lower

[3] Finally, note that it would have been of interest augmenting also by including lags of the treatment variable. Unfortunately, we have only one period before treatment and the inclusion of lags generates near singular matrix.

than 25%), whilst its complement to pc , $pc - pc25$, refers to high treatment intensities (i.e. above the threshold).[4] Thus, the relevant empirical model changes into

$$bnkl_{it} = \alpha_i + \eta_t + X'_{it}\beta + \gamma_1(pc25_{it}) + \gamma_2(pc_i - pc25_i) + \varepsilon_{it} \qquad (9)$$

where the coefficients γ_1 and γ_2 capture the effect of the guarantee for low and high treatment intensities, respectively (Model [6] of Table 2).

Our results show that firms with low guarantees are unable to exploit the potential benefits in terms of credit additionality provided by the guarantee scheme. By contrast, firms receiving a treatment above that threshold exhibit an estimated coefficient which is positive and significant. This finding sheds further light onto the role of guarantee schemes on SMEs' access to bank loans. While a standard dichotomous approach (based on the raw distinction between treated and non-treated, as in Zecchini and Ventura 2009, for instance) could be useful in assessing the ultimate scope for the existence of a certain policy program (that is the Fund in our context), allowing for heterogeneity in treatment intensities allows us to better gauge the economic effect of a policy tool. This conclusion is especially important in the presence of non-linearities, since there emerges the need for the detection of relevant thresholds to identify sensible values of treatment intensities when considering alternative scenarios with respect to the baseline case, as discussed in the following Section. The overall additionality effect may indeed be increased by re-designing the guarantee schemes so that the changing effect across the range of coverage ratios is taken into account. This is further discussed in the following section.

Table 2. DID estimate: non-linear effects

	Model [5]	Model [6]
$inpt$	1.961*** (0.366)	1.945*** (0.590)
$finc$	0.362*** (0.019)	0.364*** (0.113)
$tots$	0.097*** (0.027)	0.095 (0.062)
$fixa$	0.451*** (0.026)	0.453*** (0.068)
pc	-0.298 (0.200)	
pc^2	0.691** (0.310)	
$pc25$		-1.067 (0.654)
$pc - pc25$		0.145** (0.057)
Period effects	yes	yes
Cross-section ef-	yes	yes

[4] We have proxied the threshold at 0.25 since the distribution of *pc* is such that there are no firms with a coverage ratio in the range between 0.23 and 0.25.

fects		
F-test	0.00	0.00
Obs.	3,530	3,530

Note. The dependent variable is the (log of) bank debt in real terms (base year 2000). Robust standard errors in parenthesis. "***", "**" and "*" indicate 1%, 5% and 10% significance levels, respectively. "F-test" reports the p-value associated with the test for the joint non-significance of all the regressors entering the model.

4. Policy implications

The next logical step refers to the computation of some comparative statics exercises so as to assess possible alternative Fund's policies in setting "optimal" degrees of coverage. In our setup, "optimal" policies do not have a Paretian content. Rather, they refer to the desirable strategies consistent with a chosen policy goal. In particular, we consider two scenarios where: a) all low treatment levels are kept at the minimum threshold value (that is 25%); b) all coverage ratios below the critical threshold are set to zero.

Under a), the ultimate scope of functioning of the Fund should be the attainment of a sort of "effectiveness", in the sense that the Fund should seek to make all guarantees provided to SMEs effective. According to b), instead, the ultimate scope of the Fund is geared to the achievement of "efficiency", so that guarantees below the threshold should be denied in an effort to minimize its risk exposure.

To this aim, let us define the potential risk (that is the hypothetical maximum risk exposure) faced by the Fund as the ratio between the nominal values of guarantees provided to SMEs and its endowment

$$\sigma = \frac{\sum_i pc_i \times gral_i}{endw} = \frac{\sum_i gamo_i}{endw} = 0.4801 \qquad (10)$$

where $endw$ is equal to 750 million euro. Condition (10) informs us that almost a half of Fund's endowment is allocated to provide guarantees to SMEs. In order to assess the economic content of the scenarios a) and b) we carry out two placebo regressions building on the same specification as the one of Model [1], where pc is replaced by synthetic or placebo treatment variables, namely, $synt_a$ and $synt_b$, defined as

$$synt_a = \begin{cases} 0.25 & if\ pc < 0.25 \\ pc & otherwise \end{cases}, \quad synt_b = \begin{cases} 0 & if\ pc < 0.25 \\ pc & otherwise \end{cases}$$

The results in Table 3 clearly show that in the first placebo regression, the additionality effect would be 13.2%, while in the second case it would be around 14.6%.

Table 3. DID estimate: placebo tests

	Effective guarantee (*a*)	Efficient coverage (*b*)
$inpt$	1.960*** (0.563)	1.964*** (0.564)
$finc$	0.364*** (0.098)	0.363*** (0.098)
$tots$	0.094* (0.057)	0.094* (0.057)
$fixa$	0.452*** (0.063)	0.452*** (0.063)

$synt_a$	0.132** (0.055)	
$synt_b$		0.146*** (0.056)
Period effects	yes	yes
Cross-section effects	yes	yes
F-test	0.00	0.00
Obs.	3,530	3,530

Note. The dependent variable is the (log of) bank debt in real terms (base year 2000). Robust standard errors in parenthesis. "***", "**" and "*" indicate 1%, 5% and 10% significance levels, respectively. "F-test" reports the p-value associated with the test for the joint non-significance of all the regressors entering the model.

By exploiting the definition of potential risk given in (10) and the estimated values for the additionality effect under the two alternative scenarios, we are able to answer the following questions: I) if the Fund had pursued "effectiveness", what would have been the increase in the potential risk incurred? Or, alternatively, what would have been the extra endowment required to keep potential risk unchanged? II) If the Fund had pursued "efficiency", instead, what would have been the extra amount of credit offered by the bank system to SMEs?

Answering question I) has a relevant policy content in that if the increase in σ is somehow acceptable (in terms of soaring costs for public finances), all coverage ratios can be set to the threshold. Under scenario a), the potential risk, σ_a, would be

$$\sigma_a = \frac{\sum_i synt_{a,i} \times gral_i}{endw} = 0.4824$$

In order to keep fixed the potential risk at the actual level, $\sigma = \sigma_a$, the new endowment should be

$$endw_a = \frac{\sum_i synt_{a,i} \times gral_i}{\sigma}$$

and the Fund would require an extra endowment, Δ_{endw}, equal to

$$\Delta_{endw} = endw - endw_a \cong 3.5\ mln \qquad (11)$$

As for question II), the policy aimed at "efficiency" is less risky in the sense that it generates a lower level of potential risk. This obvious result comes from the fact that all the guarantees actually below 25% are denied. Therefore, keeping the potential risk at $\sigma = 0.48$ the Fund has a "tank" of guarantees to assign. Under scenario b), the guarantees not assigned and to be re-allocated, Δ_{guar}, can be calculated as the difference between the actual value of total guarantees and the amount of guarantees under the placebo test,

$$\Delta_{guar} = \sum_i gamo_i - \sum_i gamo_{i,b} = 6.1\ \text{mln} \qquad (12)$$

The resulting extra amount of credit, Δ_{cred}, for a coverage ratio set at its minimum "efficient" level, is, thus:

$$\Delta_{cred} = \frac{\Delta_{guar}}{0.25} = 24.3\ \text{mln} \qquad (13)$$

Conditions (11) and (13) provide useful metrics for an ex-ante evaluation of changes in Fund's endowment and for assessing alternative targets attainable by such a policy tool. For instance, in the 2008-2013 period, the actual Fund's endowment increased to 3.05 billion euro. According to (11), the expected additional endowment to keep unchanged the Fund's potential risk at the 2000-2004 level should have been of about 14 million euro, whilst expression (13) informs us that the additional resources arising from a more restrictive rule in granting guarantees should have been of around 94 million euro, *ceteris paribus*.[5]

All in all, the "efficiency" goal could be pursued even in periods of economic slump because excluding from the Fund's program borrowers with an extremely low coverage ratio (that is below the critical threshold) should do not produce harmful effects on SMEs' access to bank credit since guarantees below 25% are expected to be ineffective. Moreover, low guaranteed firms can safely save financial resources by avoiding the fee payments related to the guarantees provided by the Fund. In contrast, pursuing "effectiveness" entails increasing costs for public finances, so that this policy option should be pursued during good times.

This is only a part of the whole story, however. The result $\Delta_{guar} > \Delta_{endw}$ from (11) and (12) suggests indeed that financial resources accumulated when pursuing "efficiency" turn out to be greater than what needed to ensure a minimal coverage ratio for all treated firms. In this respect, the purpose of "effectiveness" could be self-financed (or at least partially financed) by a proper and timely management of Fund's resources aimed at favouring "efficiency" in good times so as to make the Fund effective in ensuring higher coverage ratios when phases of economic downturn occur.

5. Concluding remarks

During the last two decades, policy tools aimed at providing credit guarantees to SMEs have become extremely popular forms of public intervention to promote private sector growth in both advanced and emerging economies. Despite a proper assessment of the ability of those schemes in providing credit additionality to firms is of crucial relevance for all parties involved, knowledge about the effect of heterogeneous partial guarantees on credit availability is lacking.

To fill this gap, we present a methodological framework based on a generalisation of the DID approach which takes into account heterogeneous treatment intensities (coverage ratios) and allowing for possible non-linearities in the causal relationship between coverage ratios and credit additionality.

We provide evidence that neglecting heterogeneity tends to provide biased estimates of the average credit additionality effect exerted by guarantees. Furthermore, non-linear effects between bank debt and (heterogeneous) coverage ratios do exist. In turn, the presence of non-linearities calls for the identification of relevant thresholds so as to find out sensible values of treatment intensities when performing comparative statics exercises. Our calculations indicate that a lower threshold for the effectiveness of coverage ratios is about 25%. On the grounds of these findings we present two alternative scenarios which illustrate possible policy targets attainable by the Fund: in the first scenario we examine what would have happened if the Fund had provided guarantees at least equal to the minimum threshold, whilst in the second one we try to quantify what would have happened if the Fund had pursued a more restrictive policy by giving zero guarantees to guaranteed firms below the threshold.

Our results have relevant implications for both borrowers and policy makers. As for the former, a poorly guaranteed firm may not obtain additional bank financing if its guar-

[5] An assessment of the effects of the ongoing financial turmoil on the causal relationship between Fund's guarantees and SMEs' access to bank credit constitutes an important and interesting venue for further research.

antee intensity is too low. Therefore, a firm offered a guarantee below the minimum can be better off by simply declining the guarantee and avoiding the costs related to the guarantee. Regarding the Fund, it can minimize its risk exposure by granting (partial) guarantees above a threshold, and thus generating an extra endowment. We also quantify the additional Fund’s endowment needed to ensure that all guaranteed firms would receive the minimum effective treatment keeping constant the actual level of the Fund’s risk.

Revising the Fund's functioning procedures along the lines discussed above becomes even more cogent in light of the relatively small economic size of the additionality effect of the scheme - a focus on larger guarantee intensities would possibly increase the Fund's overall additionality effect.

Admittedly, no attempt has been made in this paper to investigate whether and to what extent the ongoing financial turmoil has affected the causal relationship between Fund’s guarantees and SMEs’ access to bank credit. In this respect, further research would be desirable should a more recent dataset become available.

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