Italian Central Guarantee Fund: An Analysis of the Guaranteed SMEs' Default Risk

M. C. Arcuri, L. Gai, F. Ielasi

Abstract—Italian Central Guarantee Fund (CGF) has the purpose to facilitate Small and Medium-sized Enterprises (SMEs)' access to credit. The aim of the paper is to study the evaluation method adopted by the CGF with regard to SMEs requiring its intervention. This is even more important in the light of the recent CGF reform. We analyse an initial sample of more than 500.000 guarantees from 2012 to 2018. We distinguish between a counter-guarantee delivered to a mutual guarantee institution and a guarantee directly delivered to a bank. We investigate the impact of variables related to the operations and the SMEs on Altman Z''-score and the score consistent with CGF methodology. We verify that the type of intervention affects the scores and the initial condition changes with the new assessment criterions.

Keywords— Banks, default risk, Italian Guarantee Fund, mutual guarantee institutions.

Jel codes—G11, G12, G21, G28.

I. INTRODUCTION

ITALIAN productive system is made up mostly of SMEs. It is known that small firms experience difficulties in accessing the credit market. Information asymmetry and adverse selection are reasons that commercial banks are generally reluctant to provide loans to SMEs. SMEs are often unable to provide information on their creditworthiness. This leads to uncertainty on the expected rates of return and the integrity of the borrower. Gathering information on SMEs can be challenging and costly.

In order to facilitate SMEs' access to credit, the role of the Italian CGF is crucial. It supports SMEs' access to credit through a public guarantee as opposed to private ones. CGF is the major Italian aid instrument for enterprises. It is managed by Mediocredito Centrale on behalf the Ministry of Economic Development and its mission consists in supporting access to credit by SMEs through direct guarantees to banks or counter-guarantees to credit guarantee institutions, the Italian Confidi.

The fund does not take part in the relationship between the bank and the SME but it provides a public guarantee on the financial operations. This guarantee can cover up to 80% of the loan, up to €2.5 million. The aim is to improve the financial conditions (e.g. loan amount, required collateral,

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interest rate levels) applied to the borrowers by banks and Confidi.

CGF applies to micro, small and medium enterprises (European Commission Recommendation 2003/361/CE) and it is operational since 2000 [28]. CGF has progressively increased its activity, with a strong boost in recent years. In 2017, CGF has approved around 120,000 guarantee applications submitted by 78,000 enterprises, which had access to EUR 17.5 billion of financing. As of the end of July 2018, since the start of operations, CGF has approved more than 828,000 guarantee applications in favor of around 400,000 enterprises, equaling an overall amount of EUR 78.8 billion in issued guarantees [28].

In 2018 a reform of CGF was adopted with the purpose to equip the fund of an internal credit rating model similar to those developed by banks, more accurate than the previous scoring system used for identifying the eligible companies.

The aim of the paper is to verify the financial sustainability of the CGF, given by the creditworthiness of the guaranteed companies, distinguishing the channel of the direct guarantee to banks and that of the counter-guarantee to Confidi. In particular, we investigate the impact of many variables related to the operations (i.e. type of intervention, type of loan, amount, maturity) and the single SME (i.e. geographical area, financial ratios, balance sheet and income statement data) on their Z''-score. We also analyse the impact of the mentioned variables on the scores calculated consistently with the CGF methodology.

Our main research questions are the following: (i) Does the type of CGF intervention affect the probability of default (i.e. scores that approximates it) of SMEs? (ii) Are some variables related to the operations and the single SME able to affect the SMEs' Altman Z''-score? And the scores calculated according to CGF assessment methodology? (iii) Is the new CGF economic evaluation method more accurate than the previous one for estimating the SMEs' default risk?

The remainder of the paper proceeds as follows. In Section II, we present a literature review. In Section III, we describe the data and methodology. In Section IV, we discuss the results and in Section V, we provide concluding comments.

II. LITERATURE REVIEW

Public Credit Guarantee Schemes (PCGSs) are government-allocated funds to reduce banks' financial losses in cases of borrower default through the provision of direct guarantees or specific forms of co-guarantees or counter-guarantees. They are prevalent schemes of public intervention in financial markets in both developing and developed countries [1], [2],

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[13], [49], [57]). These schemes mainly intend to facilitate access to credit for specific types of firms—often SMEs or start-ups—that are particularly disadvantaged in terms of interest rate spreads and requested collateral [20], [23], [31], [36], [51]-[53], [56], [59], [62], [69]. These constraints, exacerbated in recent years by economic and financial crises, have prompted many governments to ramp up existing structural guarantee instruments. Moreover, new guarantee programmes have been introduced to indirectly stimulate growth and job creation [21], [44]. Several authors report that banks consider PCGSs the most common and effective government support programme for SME lending, ahead of directed credit and interest rates or subsidised loans [12], [19], [21], [27], [40], [41], [55], [67].

In particular, a strand of literature focuses on the advantages of counter-guarantee schemes, for both the guarantors (Confidi and Government) and the companies. First, empirical studies show that the possibility to obtain a public counter-guarantee has helped increase the volume of Confidi's mutual guarantees and improved the credibility and reputation of private guarantee schemes, even during the most intense periods of crisis [35], [2]. Moreover, they can generate a significant leverage effect on private guarantee schemes, contributing to their sustainability and permanence [21]. The CGF leaves to the first-level guarantor only a minimum part of the risk taken, giving to Confidi the possibility to increase the operational activity without increasing the risk. From the public perspective, a counter-guarantee does not imply an immediate negative cash flow for the government because the payment is effective only when main guarantor enforces the counter-guarantee in the event of borrower default [12], [21], [45]. In terms of impact on SMEs, the use of a counter-guarantee offered to a Confidi, in comparison to a direct guarantee offered to a bank, is able to produce a higher multiplier of the access to credit opportunities. In fact, given a stated amount of public funds, the number of assisted firms is higher in cases of counter-guarantees than in cases of direct guarantee because a part of the risk continues to be allocated to the first-level guarantor [34]. Nevertheless, some studies highlight that firms with a mutual guarantee by a Confidi is characterized, ceteris paribus, by a higher level of default risk than similar SMEs without mutual guarantee [16]. Then, the counter-guarantee can produce a higher level of risk for the CGF than direct guarantees to banks.

Starting from this point, our research focuses on the thread of study that aims to assess the level of financial sustainability of public interventions, related to the potential risk of losses on public funds. The financial sustainability of governmental programmes is especially urgent and relevant today, given the strong growth in the scale and scope of PCGSs internationally. A counter-guarantee scheme can maintain the sustainability if it provides proper incentives to financial intermediaries for realizing an effective assessment of firms' creditworthiness. As the guarantor of last resort, the government assumes risk for loans granted and guaranteed by other financial institutions that can potentially assume moral hazard behaviours, particularly common when the assessment of default risk and

the associated risk taking are separated [1], [13], [25], [26], [42], [46].

In order to evaluate the financial sustainability of CGF, we refer to the international field of study focused on predicting bankruptcy using statistics and economic-financial indicators. The first studies date back to the 1930s [37], [60], [64] when many models were developed to facilitate the creditworthiness assessment by banks. In the years that followed, other analyses have been developed. Many researchers concentrated on the possibility for prediction using economic-financial indicators [3], [4], [8], [10], [11], [14], [15], [18], [24], [29], [30], [32], [33], [38], [39], [43], [48], [50], [54], [58], [61], [63], [65], [66], [68]. Some of these analyses were used by practitioners because of the simplicity of application. For an interesting overview of bankruptcy predictions from 1930 to 2002 see [22].

The original Altman Z-Score [3] is one of the most well-known distress prediction models, due to its ability to predict and easy application. This study identified four balance sheet and income statement variables and a stock market variable, concerning liquidity, profitability, leverage, solvency and activity, useful for predicting the bankrupt likelihood of companies. At the first application the model was extremely accurate since the percentage of correct predictions was about 95%. It received positive feedbacks and only a few criticisms [47]. The model has been revised by its author over time [4]-[6]. They have constantly updated the parameters and adapted the indices for different samples of companies not only quoted in the American stock exchange. The Z'-Score [4] is an adaptation for private companies. The Z''-Score [5], [7] was introduced for the non-manufacturing and manufacturing sectors or companies operating in developing countries. Reference [9] tried to identify the appropriate Z-Score to Italian manufacturing companies subject to Extraordinary Administration [EA-under Decreto Legislativo 270/1999 and Decreto Legge 347/2003] during the period from 2000 to 2010. Reference [9] found that the Z''-Score prediction tool is the more suitable index for the Italian context, in consideration of the relationship between Italian firms and banks, and the fact that many of the EA firms were not manufacturers.

III. DATA AND METHODOLOGY

A. Data

We analyse an initial sample of more than 500.000 financial operations taking place from the third quarter 2012 to the second quarter 2018. Table I shows that only 0.13% of operations are co-guaranteed while 46.92% are counter-guaranteed and 52.95% are direct guaranteed.

TABLE I
THE INITIAL SAMPLE - INTERVENTIONS

	N.	%
Co-guarantee	741	0.13%
Counter-guarantee	273,559	46.92%
Direct guarantee	308,722	52.95%
Total	**583,022**	**100%**

Source: Our elaboration on CGF data .

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Given the structure of the interventions, we focus on counter-guarantees and direct guarantees.

We analyse some relevant data useful for predicting the default risk of the SME, related to the loan (i.e. type of loan and amount of the loan); to the guarantee (i.e. granting date, type of CGF intervention); and to the SMEs (i.e. geographical area, financial ratios).

Tables II-IV show the structure of some relevant independent variables in our analysis. Table II reports the economic sectors to which guaranteed SMEs of the initial sample belong.

TABLE II
THE INITIAL SAMPLE – ECONOMIC SECTORS OF GUARANTEED SMES

Economic Sector COUNTER-GARANTEE			Economic Sector DIRECT GARANTEE		
Agriculture	573	0.209%	Agriculture	1,438	0.466%
Commerce	200	0.073%	Commerce	474	0.154%
Manufact.	222	0.081%	Manufact.	280	0.091%
Services	272,564	99.636%	Services	306,529	99.290%
n.a.	-	-	n.a.	1	0.%
Total	**273,559**	**100%**	**Total**	**308,722**	**100%**

Source: Our elaboration on CGF data.

Table III shows the granting date of the analysed counter-guarantees and direct guarantees.

TABLE III
THE INITIAL SAMPLE – DATE OF GRANTING OF COUNTER-GUARANTEES AND DIRECT GUARANTEES

Guarantee grant date COUNTER-GARANTEE			Guarantee grant date DIRECT GARANTEE		
2012 (2 quarter)	22,754	8.318%	2012 (2 quarter)	11,140	3.608%
2013	45,186	16.518%	2013	29,723	9.628%
2014	45,545	16.649%	2014	39,722	12.867%
2015	48,555	17.749%	2015	53,765	17.415%
2016	48,214	17.625%	2016	66,158	21.430%
2017	44,546	16.284%	2017	73,954	23.955%
2018 (2 quarter)	18,759	6.857%	2018 (2 quarter)	34,260	11.097%
Total	**273,559**	**100%**	**Total**	**308,722**	**100%**

Source: Our elaboration on CGF data.

Table IV shows the distribution of counter-guarantees and direct guarantees by Italian region.

Table V and VI show, respectively, some descriptive statistics of the dependent and independent variables we consider in our analysis (in this first analysis just for the manufacturing sector)[2].

For calculating the default score, we obtained the variables from the Aida–Bureau van Dijk database. To be included in our sample, financial ratios and balance sheet and financial income data had to be available in this database. Moreover, we conduct our investigation by considering the balance sheet and income statement of SMEs from the previous year and the two years following the CGF single operation. Consequently, we excluded operations for 2017 and 2018.

[2] Formulas of scores are described in Section III *B*.

TABLE IV
THE INITIAL SAMPLE – DISTRIBUTION OF COUNTER-GUARANTEES AND DIRECT GUARANTEES BY ITALIAN REGION

Italian region COUNTER-GARANTEE			Italian region DIRECT GUARANTEE		
Abruzzo	8,050	2.943%	Abruzzo	4,954	1.605%
Altro	1	0.000%	Altro	-	-
Basilicata	504	0.184%	Basilicata	2,227	0.721%
Calabria	984	0.360%	Calabria	7,872	2.550%
Campania	10,184	3.723%	Campania	42,152	13.654%
Emilia R.	21,298	7.786%	Emilia R.	24,090	7.803%
Friuli	2,552	0.933%	Friuli	5,884	1.906%
Lazio	13,903	5.082%	Lazio	21,118	6.840%
Liguria	2,954	1.080%	Liguria	4,659	1.509%
Lombardia	42,013	15.358%	Lombardia	59,269	19.198%
Marche	15,705	5.741%	Marche	8,964	2.904%
Molise	837	0.306%	Molise	1,824	0.591%
Piemonte	21,390	7.819%	Piemonte	25,281	8.189%
Puglia	6,729	2.460%	Puglia	18,379	5.953%
Sardegna	6,349	2.321%	Sardegna	5,647	1.829%
Sicilia	27,949	10.217%	Sicilia	25,552	8.277%
Toscana	61,159	22.357%	Toscana	-	-
Trentino	958	0.350%	Trentino	4,067	1.317%
Umbria	4,974	1.818%	Umbria	4,663	1.510%
Valle D'Aosta	825	0.302%	Valle D'Aosta	326	0.106%
Veneto	23,992	8.770%	Veneto	41,384	13.405%
N.A.	249	0.091%	N.A.	410	0.133%
Total	**273,559**	**100%**	**Total**	**308,722**	**100%**

Source: Our elaboration on CGF data.

TABLE V
DESCRIPTIVE STATISTICS FOR THE DEPENDENT VARIABLES (MANUFACTURING SECTOR)

Variable	Obs.	Mean	Std. Dev.	Min	Max
Z-score T-1	400	1.26	1.50	-2.19	12.95
Z-score T	400	1.26	1.70	-7.14	13.99
Z-score T+1	400	1.04	2.68	-13.07	10.90
Z-score T+2	400	0.33	5.51	-34.45	11.90
Pre-reform Score T-1	400	9.82	3.31	3	12
Pre-reform Score T	400	9.54	2.67	4	12
Pre-reform Score T+1	400	9.16	2.71	0	12
Pre-reform Score T+2	400	9.07	3.26	0	12
Post-reform Score T	400	-3	3.07	-51	-1

Source: Our elaboration. T is the guarantee granting date.

B. Methodology

This study focuses on applying the most appropriate Z-Score model, according to the company sector. In this paper we show the analysis for the Italian manufacturing SMEs. Moreover, the analysis is carried out on the scores calculated according to the CGF assessment methodology.

The original Z-Score [3] involved a group of American manufacturing companies quoted on the Stock Market. The Z'-Score [4] is an adaptation for private companies. The five indicators in the two Altman manufacturing firm versions of the studies are listed in Table VII, with the first four variables of Z'-score used in Z"-Score model, introduced in 1995 for non-US, emerging market companies and for non-manufacturers. Table VII also shows the linear relationship among variables.

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TABLE VI
DESCRIPTIVE STATISTICS FOR THE INDEPENDENT VARIABLES
(MANUFACTURING SECTOR, YEAR T)

Direct guarantee	Obs.	Mean	Std. Dev.	Min	Max
Liquidity index	400	0.80	0.62	0.90	6.99
Short-term debt index	400	0.86	0.15	0.29	1
Fixed asset coverage ratio	400	1.56	2.37	-4.29	13.81
Debt ratio	400	9.49	9.85	-6.46	51.03
Debt to banks/Sales	400	33.87	21.18	0	96.67
Financial charges/Sales	400	2.56	4.94	0	91,47
Equity ratio	400	19.70	15.32	-15.48	100
Net debt position	400	1,900.96	2,406.34	2,379.91	12,838.00
Debt/equity	400	3.29	4.42	0	24.78
Debt/EBITDA	400	5.31	4.12	-6.89	32.34
Capital turnover	400	1.10	0.58	0	4.24
Operating working capital incidence	400	34.85	53.51	-754.15	158.37
Days in account receivable	400	123.78	72.08	0	416.01
Days in account payable	400	125.36	60.35	21.90	419.25
EBITDA/Sales	400	8.23	9.68	-18.44	89.67
Return on Assets (ROA)	400	4.80	5.80	-22.51	35.55
Return on Sales (ROS)	400	4.44	4.34	-33.66	17.19
Return on Equity (ROE)	400	8.11	21.49	-128.66	118.42
Extraord. charges/ Extraord. Income	400	28.46	48.84	-104.43	495.51
Net working capital	400	751.23	1,916.40	-5,395.10	12,716.75
Cash flow	400	316.12	571.20	2,974.27	3,381.03
Unemployment rate	400	9.40	3.43	4.90	22.17
Employment rate	400	62.40	5.81	39.01	67.80
Gross Domestic Product (GDP)	400	146,641.29	79,670.01	10,816.90	361,401.40

Source: Our elaboration. Descriptive statistics of independent variables for years T-1, T+1 and T+2 are available on request.

TABLE VII
ALTMAN Z- SCORE AND Z'SCORE MODELS

Z-score (1968) [3]	Z'-score (1983) [4]
X_1=Working Capital/Total Assets	X_1=Working Capital/Total Assets
X_2=Retained Earnings/Total Assets	X_2=Retained Earnings/Total Assets
X_3= EBIT/ Total Assets	X_3= EBIT/ Total Assets
X_4= Market Value Equity/Book Value of Total Debt	X_4= Book Value Equity/Total liabilities
X_5= Sales/ Total Assets	X_5= Sales/ Total Assets
Linear regression	**Linear regression**
$Z=1.2X_1+1.4X_2+3.3X_3+0.6X_4+0.999 X_5$	$Z=0.717X_1+0.847X_2+3.107X_3+0.420 X_4+0.998X_5$

During the following years, parameters and coefficients were adapted for different situations. The Z" Score [5], [7] was introduced for the non-manufacturing as well as manufacturing sectors or companies operating in developing countries. The variables of the Z"-Score were the same as the Z'-Score model with the exclusion of the sales/total assets, activity ratio (X_5) in order to filter the function from the possible distortion related to the sector and country [5]. The weighted coefficients thus have different values:

$$Z'' = 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4 \qquad (1)$$

Reference [9] focused on applying the most appropriate Z-Score model to Italian manufacturing companies subject to Extraordinary Administration (EA-under *Decreto Legislativo* 270/1999 and *Decreto Legge* 347/2003) between 2000 and 2010. They state that the Z''-Score prediction tool is more suitable for the Italian context than the Z'-Score, in consideration of the long-standing relationship between Italian firms and banks, and the fact that many of the EA firms were not manufacturers. Indeed, Italian firms, even if they look distressed from a statistical point of view, were likely to be supported by the banks, and the owners have often preferred to leverage their companies in order to profit from fiscal advantages. This no longer is as pervasive in 2012 as many banks in Italy are struggling due to capital shortages. Finally, it has been shown that the Z"-Score model applied to non-US companies is far more robust than his other models [7].

In order to verify the trend of the default risk for guaranteed SMEs, we analyse the variation in Z"-Score after one year and after two years starting from the guarantees granting date. Moreover, we verify the initial credit score calculated by the CGF for each guaranteed company, and we measure the variation of the score after one year and two years.

Later, we observe the new CGF scoring model after the 2018 reform, for verifying if it is able to better discriminate, compared to the initial scoring model, SMEs with the higher default risk.

Before the recent reform, in order to evaluate the creditworthiness of manufacturing SMEs, CGF considered the following ratios related to the last two balance sheet and income statements (Table VIII).

TABLE VIII
CGF PRE-REFORM FINANCIAL RATIOS INCLUDED IN THE SCORING SYSTEM [28]

Financial ratio	Reference value
A) (Equity + Long-term Debt)/Total fixed assets	$\geq 100\%$
B) Equity/Total liabilities	$\geq 10\%$
C) EBITDA/Financial expenses	≥ 2
D) EBITDA/Sales	$\geq 8\%$

TABLE IX
CGF PRE-REFORM SCORING SYSTEM [28]

VALUE	SCORE
"A" $\geq 100\%$	3
$50\% <$ "A" $< 100\%$	2
$0 <$ "A" $\leq 50\%$	1
"A" ≤ 0	0
"B" $\geq 10\%$	3
$6\% <$ "B" $< 10\%$	2
$0 <$ "B" $\leq 6\%$	1
"B" ≤ 0	0
"C" ≥ 2	3
$2 >$ "C" ≥ 1.5	2
$1.5 >$ "C" ≥ 1	1
"C" < 1	0
"D" $\geq 8\%$	3
$8\% >$ "D" $\geq 5\%$	2
$5\% >$ "D" $\geq 3\%$	1
"D" $< 3\%$	0

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On the basis of the reference values of the ratio, the following scores are assigned to the SMEs (Table IX).

The total score for each company can vary between a maximum of 12 points and a minimum of 0 points. Companies are divided into three levels to which different evaluation ranges correspond.

After the recent reform, in order to evaluate the creditworthiness of manufacturing SMEs, CGF determines the basic score as:

$$Xb_{SDC;SDPDI} = COST + \sum_{i=1}^{n} x_i * b_i \qquad (2)$$

where *cost* = constant; x_i = variable; b_i = coefficient.

CGF assesses the economic and financial situation of manufacturing SMEs by considering the variables (included dummy variables - D) shown in Table X.

TABLE X
CGF POST 2018 REFORM FINANCIAL RATIO INCLUDED IN THE SCORING SYSTEM

Variables	Description
V1	Short-term debt/Sales
V2	Financial expenses/EBITDA
D1	Financial expenses/EBITDA (downside)
D2	EBITDA (downside)
V3	Cost of debt
V4	Cash/Sales
V5	Inventory turnover
V6	Percentage change in Sales
D3	Percentage change in Sales (downside)
D4	Sales volume
D5	Short-term debt/Sales (for sales volume)
D6	Cost of debt (for sales volume)
D]	Cash/Sales (for sales volume)

Table XI shows the coefficient of the variables for manufacturing SMEs.

TABLE XI
COEFFICIENT OF THE VARIABLES FOR MANUFACTURING SMEs [17]

Variable (x_i)	Coefficient
V_1*	1.709764
V_2*	1.006155
D_1	-1.380646
D_2	0.52537
V_3*	21.7339
V_4*	-3.257383
V_5*	-0.035931
V_7*	-1.842869
V_6*	0.874921
D_3	-1.318575
D_4	0.925375
D_5	-0.672704
D_6	-11.51058
D_7	1.934049
Constant	-4.584023

Depending on the score, each class is assigned an evaluation class from 1 to 12. The 12 evaluation classes are grouped into 5 evaluation ranges. The fifth evaluation range, which includes the highest valuation classes, corresponds to the highest probability of default.

It is important to specify that the mentioned score calculation is only a part of the probability of default assessment. The full process is composed, in fact, by an economic-financial module and a module based on data provided by Centrale Rischi and Credit Bureau. It follows that our calculations may not be completely correct.

Once we calculated the scores approximating the probability of default of the considered manufacturing firms, we apply a multiple linear regression estimated using ordinary least squares (OLS) to identify the variables (concerning the single operation and the single firm) more relevant for explaining the risk.

As it is known, the multiple linear regression model assumes a linear (in parameters) relationship between a dependent variable y_i and a set of explanatory variables $x'_i = (x_{i0}, x_{i1}, ..., x_{iK})$. The first regressor $x_{i0} = 1$ is a constant unless otherwise specified. The multiple linear regression model is the following:

$$Y_i = \beta_0 + \beta_1 x_{1i} + \ldots + \beta_k x_{ki} + \varepsilon_i \qquad (3)$$

where y_i is the dependent variale, with $i = 1, 2, \ldots n$; $x_{1i}, \ldots, x_{ki}$ are the independent variables, with $i = 1, 2, \ldots, n$; $\beta_0, \beta_1, \ldots, \beta_k$ are the regression parameters.

IV. RESULTS AND IMPLICATIONS

Tables XII-XV and Tables XVI-XIX show, respectively, the significant results for Z''-score and CGF pre-reform score. Full results are available on request. Furthermore, we compare the CGF pre-reform and post-reform scores in the year T (i.e. when CGF granted the guarantee). Results are reported in Table XX.

TABLE XII
IMPACT ON Z''-SCORE (YEAR T-1)

Variables	Estimate	Std. Error	T value	P-value
Intercept	9.0594	5.1487	1.7595	0.0794 .
Liguria	1.7650	1.0017	1.7620	0.0790 .
Umbria	1.9813	0.9018	2.1969	0.0287 *
Liquidity index	1.2650	0.2833	44646	0.000 ***
Short-term debt index	-1.9703	0.5414	-3.6397	0.003 ***
Fixed asset coverage ratio	-0.3213	0.0594	-5.409	0.000 ***
Debt to banks/Sales	-0.0172	0.0072	-2.3922	0.0173 *
Debt/equity	0.1051	0.0488	2.1549	0.0319 *
Operating working capital incidence	0.0149	0.0042	3.5813	0.0004 ***
Days in account receivable	-0.0027	0.0012	-2.2872	0.0228 *
EBITDA/Sales	0.0288	0.0105	2.7533	0.0062 **
Return on Assets (ROA)	0.0507	0.0257	1.9749	0.0491 *
Extraord. charges/ Extraord.Income	-0.0028	0.0016	-1.7394	0.0829 .
Net working capital	0.0001	0.0001	2.2541	0.0249 *
Cash flow	-0.0006	0.0002	-2.1769	0.0302 *
R^2: 0.5512; Adj. R^2: 0.4956; F-statistic: 9.918				

The significance is expressed with asterisks displayed according to the p-value computed. Signif. codes: 0 '***'; 0.001 '**'; 0.01 '*'; 0.05 '.'; 0.1 ' ' 1. Dependent variable: Z-score (T-1).

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TABLE XIII
IMPACT ON Z''-SCORE (YEAR T)

Variables	Estimate	Std. Error	T value	P-value
Direct guarantee	0.4646	0.1119	4.1537	0.0000 ***
Puglia	-2.2019	0.9250	-2.3804	0.0178 *
Liquidity index	1.1961	0.1075	11.1307	0.000 ***
Short-term debt index	-1.1630	0.3561	-3.2660	0.0012 **
Fixed asset coverage ratio	-0.2074	0.0363	-5.7152	0.000 ***
Debt ratio	0.03353	0.0124	2.6939	0.0074 **
Debt to banks/Sales	-0.0095	0.0042	-2.2461	0.0253 *
Equity ratio	0.0718	0.0076	9.4853	0.000 ***
Debt/equity	0.0766	0.0289	2.6470	0.0085 **
Debt/EBITDA	0.0353	0.0110	3.1972	0.0015 **
Capital turnover	0.2604	0.1252	2.0798	0.0383 *
Operating working capital incidence	0.0063	0.0015	4.2246	0.000 ***
Days in account payable	0.0018	0.0009	1.9958	0.0468 *
Return on Assets (ROA)	0.0749	0.0155	4.849	0.000 ***
Return on Sales (ROS)	-0.0322	0.0193	-1.6715	0.0955 .
Extraord. charges/ Extraord.Income	0.0015	0.0009	1.7488	0.0842 .
Net working capital	0.0001	0.001	4.6341	0.000 ***
Cash flow	-0.0003	0.0001	-2.764	0.0060 **
Employment rate	-0.1023	0.0461	-2.2214	0.0269 *

R^2: 0.8586; Adj. R^2: 0.8421; F-statistic: 51.92

The significance is expressed with asterisks displayed according to the p-value computed. Signif. codes: 0 '***'; 0.001 '**'; 0.01 '*'; 0.05 '.'; 0.1 ' ' 1. Dependent variable: Z-score (T).

TABLE XIV
IMPACT ON Z''-SCORE (YEAR T+1)

Variables	Estimate	Std. Error	T value	P-value
Intercept	-7.9656	2.2696	-3.5097	0.0001 ***
Basilicata	5.2168	1.6903	3.0864	0.0022 **
Liguria	2.1887	1.1244	1.9466	0.0524 .
Marche	2.5991	1.2227	2.1258	0.0342 *
Umbria	1.4819	0.8407	1.7627	0.0788 .
Liquidity index	0.0226	0.0041	5.5366	0.0000 ***
Debt to banks/Sales	-0.0050	0.0022	-2.2701	0.0238 *
Financial charges/Sales	-0.0045	0.0026	-1.7484	0.0813 .
Debt/equity	0.0273	0.0033	8.2784	0.0000 ***
Operating working capital incidence	0.0035	0.0018	1.9551	0.0514 .
Days in account payable	-0.0039	0.0015	-2.5814	0.0102 *
EBITDA/Sales	0.00327	0.0015	2.0977	0.0366 *
Return on Assets (ROA)	0.00496	0.0019	2.5900	0.0100 **
Return on Sales (ROS)	-0.0046	0.0021	-2.2130	0.0275 *
Net working capital	0.0064	0.0014	4.6953	0.0000 ***

R^2: 0.7386; Adj. R^2: 0.7086; F-statistic: 24.65

The significance is expressed with asterisks displayed according to the p-value computed. Signif. codes: 0 '***'; 0.001 '**'; 0.01 '*'; 0.05 '.'; 0.1 ' ' 1. Dependent variable: Z-score (T+1).

Table XX shows that the new methodology appears more stringent than the previous one. Considering our sample of manufacturing guaranteed SMEs, the post-reform scores determine an increase of the percentage of SMEs characterized by a high and medium level of probability of default. SMEs characterized by a low level probability of default significantly reduce.

TABLE XV
IMPACT ON Z''-SCORE (YEAR T+2)

Variables	Estimate	Std. Error	T value	P-value
Direct guarantee	1.3980	0.4422	3.1614	0.0017 **
Emilia Romagna	4.2003	2.5437	1.6512	0.0993 .
Lazio	6.2959	2.4088	2.6137	0.0094 **
Lombardia	3.8975	2.3151	1.6835	0.0932 .
Umbria	5.2997	1.9988	2.6514	0.0084 **
Liquidity index	1.5554	0.7211	2.1565	0.0317 *
Debt ratio	0.1126	0.0372	3.0215	0.0027 **
Debt to banks/Sales	-0.0218	0.0141	-1.9289	0.0546 .
Equity ratio	0.0655	0.0275	2.3835	0.0177 *
Net debt position	0.0001	0.0001	1.6629	0.0973 .
Debt/EBITDA	0.0575	0.0247	2.3254	0.0206 *
Operating working capital incidence	0.0651	0.0077	8.4734	0.0000 ***
Days in account receivable	-0.01798	0.0028	-6.3180	0.0000 ***
EBITDA/Sales	-0.3650	0.0844	-4.3230	0.0000 ***
Return on Assets (ROA)	0.2166	0.0563	3.8457	0.0001 ***
Return on Sales (ROS)	0.2601	0.1166	2.2301	0.0264 *

R^2: 0.8084; Adj. R^2: 0.7854; F-statistic: 35.22

The significance is expressed with asterisks displayed according to the p-value computed. Signif. codes: 0 '***'; 0.001 '**'; 0.01 '*'; 0.05 '.'; 0.1 ' ' 1. Dependent variable: Z-score (T+2).

TABLE XVI
CGF PRE-REFORM SCORE (YEAR T-1)

Variables	Estimate	Std. Error	T value	P-value
Intercept	18.5962	9.7075	1.9156	0.0563 .
Liquidity index	0.9268	0.5446	1.7018	0.0898 .
Debt ratio	-0.0674	0.0284	-2.3746	0.0181 *

R^2: 0.1331; Adj. R^2: 0.0258; F-statistic: 1.24

The significance is expressed with asterisks displayed according to the p-value computed. Signif. codes: 0 '***'; 0.001 '**'; 0.01 '*'; 0.05 '.'; 0.1 ' ' 1. Dependent variable: Pre-reform score (T-1).

TABLE XVII
CGF PRE-REFORM SCORE (YEAR T)

Variables	Estimate	Std. Error	T value	P-value
Intercept	15.8539	9.0892	1.7442	0.0820 .
Fixed asset coverage ratio	0.3011	0.1024	2.9404	0.0035 **
Debt ratio	-0.1432	0.0338	-4.2393	0.0000 ***
Equity ratio	-0.0505	0.0211	-2.3924	0.0173 *
Days in account receivable	-0.0059	0.0023	-2.5854	0.0101 *
Return on Sales (ROS)	0.1609	0.0677	2.3753	0.0181 *

R^2: 0.27; Adj. R^2: 0.1834; F-statistic: 3.116

The significance is expressed with asterisks displayed according to the p-value computed. Signif. codes: 0 '***'; 0.001 '**'; 0.01 '*'; 0.05 '.'; 0.1 ' ' 1. Dependent variable: Pre-reform score (T).

TABLE XVIII
CGF PRE-REFORM SCORE (YEAR T+1)

Variables	Estimate	Std. Error	T value	P-value
Fixed asset coverage ratio	0.0077	0.0038	2.0482	0.0413 *
Capital turnover	-0.0156	0.0056	-2.7691	0.0059 **
EBITDA/Sales	0.0040	0.0024	1.6775	0.0944 .
Return on Assets (ROA)	0.0060	0.0029	2.0931	0.0371 *

R^2: 0.2196; Adj. R^2: 0.1278; F-statistic: 2.392

The significance is expressed with asterisks displayed according to the p-value computed. Signif. codes: 0 '***'; 0.001 '**'; 0.01 '*'; 0.05 '.'; 0.1 ' ' 1. Dependent variable: Pre-reform score (T+1).

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TABLE XIX
CGF PRE-REFORM SCORE (YEAR T+2)

Variables	Estimate	Std. Error	T value	P-value
Direct guarantee	-1.4563	0.6014	-2.4214	0.0159 *
Marche	-5.9641	3.4032	-1.7525	0.0806 .
Debt ratio	-0.1071	0.0492	-2.1766	0.0302 *
Financial charges/Sales	-0.4083	0.1703	-2.3967	0.017 *
Operating working capital incidence	0.0382	0.0096	3.9574	0.000 ***
Days in account receivable	-0.0102	0.0039	-2.6124	0.0094 **
Return on Equity (ROE)	0.0348	0.0155	2.2421	0.0256 *
Cash flow	-0.0011	0.0005	-2.3367	0.0201 *
Gross Domestic Product (GDP)	0.0001	0.0001	2.2194	0.0271 *

R^2: 0.2118
Adj. R^2: 0.1185
F-statistic: 2.27

The significance is expressed with asterisks displayed according to the p-value computed. Signif. codes: 0 '***'; 0.001 '**'; 0.01 '*'; 0.05 '.'; 0.1 ' ' 1. Dependent variable: Pre-reform score (T+2).

TABLE XX
CGF PRE-REFORM AND POST-REFORM SCORES (YEAR T)

Probability of default	Pre-reform score		Post-reform score	
level	n. operations	%	n. operations	%
High	34	8.50%	156	39.00%
Medium	44	11.00%	138	34.50%
Low	300	75.00%	98	24.50%
n.a.	22	5.50%	8	2.00%
Total	400	100%	400	100%

Source: Our elaboration.

The aim of the paper was to understand if the type of CGF intervention affects the probability of default of SMEs. Previous literature [16] found that counter-guaranteed SMEs are characterized by an increased incidence of non-performing loans compared to SMEs without a mutual guarantee. We expect that this hypothesis is in general confirmed also for SMEs that accessed to CGF, but with differences according to specific characteristics regarding the banking loan, the CGF guarantee, and the SME. In general, our first exploratory analysis confirms that the type of CGF intervention affects the probability of default of SMEs. With reference to the Z''-score, we find that the type of intervention is a significant variable in time T and T+2, showing a positive sign of the estimated coefficient. It means that direct guarantees have a greater positive effect on the average score compared to counter-guarantees.

In light of the analysis on the pre-reform score, two years after the granting of the guarantee, the direct guarantee does not seem to be the way able in general to allow CGF to reduce the default risk of its portfolio. Consequently, counter-guarantees granted to Confidi seem to be less risky than direct guarantees in manufacturing sector. Moreover, geographical area is relevant for explaining the variation in the SME credit scoring in the short and medium term. Probably, the risk is less where mutual guarantee institutions work better.

We find other relevant variables affecting the risk. Some variables are related to the financial and economic situation of guaranteed SMEs, as showed by balance sheet and financial ratios. Others are macroeconomic variables, such as the GDP,

the unemployment and employment rate. In this sense, an appropriate design of the CGF is crucial for controlling moral hazard in financial institutions and ensuring the financial sustainability of public intervention. For rationalizing its intervention, the CGF has three main levers:
- the modulation of the guarantees' pricing;
- the modulation of the maximum amount of the guarantee granted;
- the modulation of the maximum percentage of coverage of each loan (coverage ratio).

Using these levers according to the results of our study, the CGF has the opportunity to fine tune public resource allocation in order to both reduce opportunistic behaviours of financial institutions and reward the most virtuous intermediaries for managing their portfolios to limit default rates. Secondly, in our research we consider the initial SMEs' credit score and its trend in the short and medium term measured with the pre-CGF reform.

We expect that the higher complexity of the new model (i.e. post-2018 CGF reform) is able to increase the level of initial selection of the SMEs. In effect, the new CGF scores at time T (i.e. guarantee year), compared to the pre-reform scores, show values that would have led to more stringent decisions in terms of granting the guarantee. In other words, the recent enrichment and improvement of the scoring models used by the CGF would seem to be an effective mean for increasing the economic allocation of public funds, without discriminating between Confidi and banks.

V. CONCLUSION

The paper aims to study the CGF activities mainly consisting in granting guarantee to SMEs. Because there are different types of CGF interventions, the analysis distinguishes the channel of the direct guarantee to banks and that of the counter-guarantee to Confidi. In particular, we study the impact of many variables related to the operations (i.e. type of intervention) and the single SME (i.e. geographical area, financial ratios, balance sheet and income statement data) on Z''-score and scores calculated consistently with the CGF methodology. We also try to understand if the new CGF economic evaluation method is more accurate than the previous one for estimating the SMEs' default risk.

We find that type of intervention and some variables relating to the single operation (e.g. geographical area), the single guaranteed SME (e.g. balance sheet, financial ratios), and the macroeconomic context (e.g. GDP, unemployment and employment rate) affect the scores.

The analysis we carried out is an exploratory attempt to investigate the CGF activities and the effects of its recent reform, in order to pursue a greater efficiency and improve the conditions. Many aspects of the CGF Guaranteed SMEs' default risk deserve however to be further investigated. First of all, the economic sector of guaranteed SMEs has to be considered. We will carry out further analysis on the full sample of more than 500.000 financial operations taking place from the third quarter 2012 to the second quarter 2018 and we will distinguish among firms belonging to the following

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sectors: manufacturing, agriculture, commercial and services. Moreover, as we found in our first analysis, we expect that the higher complexity of the new model (i.e. post-2018 CGF reform) is able to increase the level of initial selection of the SMEs. In particular, we expect a reduction both of first type error and second type error: The accepted companies are those characterized by a lower level of score reduction and the rejected SMEs are the companies with the higher decrease of their credit score after one year and two years. In our future analysis, we will examine the trend over time of the post-reform score comparing it with the trend of the pre-reform one and considering the variation over time of both scores.

We also expect that the use of the new scoring model within the CGF is able to reduce the differences between the two channels of intervention (counter-guarantee to Confidi or direct guarantee to banks). We think that the post-reform model can allow to limit the interventions in firms characterized by higher levels of risk, thereby indirectly controlling the behaviour of first-level guarantors. Consequently, in our future analysis, we will continue to distinguish between counter-guarantee and direct guarantee.

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