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Credit Guarantee Schemes – Are They Efficient? Experience from European Union Countries

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Abstract

The paper aims to assess selected elements of the business models of credit guarantee schemes (CGSs) implemented in 20 European Union countries within the financial framework between 2007 and 2013. This paper focuses on the CGSs' financial additionality that depends mainly on how these programs are managed, the institutions implementing them, the objectives set and their distribution constraints. We analyse the implementation costs and the use of the funds allocated to implement the schemes. To reach the goal, we used several methods: the Kruskal-Wallis by ranks, the median test, discriminant analysis, multidimensional scaling, and correlation. We also did the power analysis. We discovered that the efficiency of CGS implemented by non-governmental organisations, mutual guarantee funds and regional agencies is related to the level of regional development. The relationship is not visible only when banks are engaged, which may be due to the impossibility of assigning a bank's activities to a single region. However, we did not find differences in efficiency between types of organisations that implement CGSs. The answers to the research questions posed in the article can help policymakers

and researchers conclude whether it is cost-effective to continue supporting CGSs and whether the management of these schemes should change. The paper contributes to the economic policy theory in the area of state aid to SMEs and public finance.

Introduction

The main barriers for SMEs in accessing bank loans include the lack of sufficient collateral and the high-risk SMEs face from credit institutions. Loan guarantees increase SMEs' creditworthiness, decrease the risk of insolvency, and indirectly lower the cost of financing to reduce differences in the availability of external capital for companies of different sizes (Song, Zhang, and Zhao 2020). Credit Guarantee Schemes (CGSs) reduce financing obstacles and improve a firm's ability to access bank financing, especially for small and micro companies (Caselli et al. 2019). As Pergelova and Angulo-Ruiz (2014) stated, government guarantees directly affect new firms' competitive advantage and indirectly impact their performance. Mkhaiber and Werner (2021) and D'Ignazio and Menon (2020) contradict these findings, pointing to the greater importance of the length of the relationship between the borrower and the bank rather than collateral, including guarantees, especially for small (cooperative) banks. D'Ignazio and Menon (2020) added that firms rarely tend to swap banks or look for better opportunities.

Credit Guarantee Schemes (CGSs) are implemented and conducted by various government institutions, NGOs, financial institutions, and business associations to provide SMEs with better access to loans. They aim to increase SMEs' creditworthiness by guaranteeing the loans provided by financial institutions. Some authors state that CGSs reduce SMEs' borrowing costs and financing constraints (Zecchini and Ventura 2009). However, expectations about the effects of guarantee schemes can be contradictory. On the one hand, guarantees are expected to be given to companies that are most likely to experience growth and be profitable to pay back their loans (Ben-Yashar, Krausz, and Nitzan 2018). On the other hand, guarantee schemes are expected to target companies with the most difficulties in obtaining a bank loan on a commercial basis. When applying for a loan, such companies often do not guarantee rapid growth or are even characterised by high investment risk. Some authors (e.g., Agnese, Rizzo, and Vento 2019) even state that CGSs may increase the probability of SME bankruptcies.

As some studies indicate (Leonello 2018; Shan and Tang 2019), CGSs are an effective instrument to increase the availability of loans to SMEs with relatively little guaranteed capital. However, there are also opposing opinions that CGSs only theoretically reduce SMEs' barriers to accessing credit (Yang and Zhang 2013). According to Cowling

et al. (2018a; 2018b), banks use guarantees under CGSs to secure loans that would have been provided otherwise. It results in lower additionality compared to loans secured by guarantees provided to companies with the highest risk of defaults, such as microenterprises that have been operating in the market for less than five years. On the other hand, Saito and Tsuruta (2018) opt for a reduction in the coverage rate, which is positively correlated with the default rate. They believe that too high a guaranteed coverage (above 80% of the loan) makes guarantee schemes cover too many risky borrowers, resulting in inefficient resource allocation.

CGSs are financed by the government, the European Union (EU), and private sources. The business models of CGSs vary and may affect the amount of support offered to SMEs. Given the recommendations of the European Commission (EC) for self-financing guarantee schemes, it is reasonable to assume that not-for-profit institutions and banks will achieve different effects. According to the EC recommendation, "The premiums charged have to cover the normal risks associated with granting the guarantee, the administrative costs and a yearly remuneration on the necessary capital" (Commission Notice on the application of Articles 87 and 88 2008). If costs (guarantee fees) are too high (Song, Zhang, and Zhao 2020), it may negatively affect the additionality of CGSs and overstate the cost of obtaining funding. However, according to some, delegating the task of implementing CGS to banks increases the program's efficiency as there is more excellent rationalisation of loans (Jia 2013). State or EU subsidisation of CGS programs results in excessive lending and increased losses. The cost of lending and collateral, such as guarantees, would then also depend on external factors such as the economic outlook, and they would differ over time.

The efficiency of CGSs can be assessed in three dimensions: financial sustainability, economic additionality, and financial additionality (Panetta 2012). The first two areas concern two issues. One is the impact of guarantees on lending conditions, such as the cost of a loan or the amount of financing provided (Boschi, Girardi, and Ventura 2014). The other is connected with the indirect effects of guarantees, such as the SMEs' survival, financial performance (Caselli et al. 2019), employment (Caselli et al. 2019), and the impact on the economy (Lee 2018; Yang et al. 2021).

This paper focuses on the third aspect, which is the program implementation costs and the use of the funds allocated for their implementation. The financial additionality of CGSs depends mainly on how these programs are managed, the institutions that implement them, the objectives set, and their distribution constraints. Our goal is to evaluate if the efficiency of CGSs implemented in 20 European Countries between 2007 and 2013 (data as of the end of 2017) depends on selected elements of their business models. The answers to the research question posed in the article can help policymakers and researchers conclude whether it is cost-effective to continue supporting CGSs and whether the management of these schemes should change.

Public choice theory to explain the existence of guarantee schemes

Public choice theory assumes that although people in politics show some concern for others, their main motive is self-interest, whether they are voters, politicians, lobbyists or bureaucrats. Therefore, the efficiency of guarantee programs can depend on policymakers' decisions, i.e., how the programs are implemented.

According to Buchanan, James, and Tullock (1962), this theory 'replaces romantic and illusory ideas about how governments work with ideas that embody more scepticism'. Economists have used market failure theory to argue that the best way to reduce them is by government intervention. However, proponents of public choice theory point out that there are reasons why government intervention does not succeed in achieving the desired effect. One of the main reasons is that there is no incentive for citizens to effectively monitor initiatives introduced by the government. Although politicians and public sector employees may originally intend to spend taxpayers' money wisely, effective decisions will not allow them to increase their wealth. There is no direct reward for efforts and actions to provide benefits to a public that is not even aware of those benefits or who granted them. Therefore, the incentives for good governance in the public interest are weak. And this is why the EU seeks to involve the private sector as much as possible in implementing initiatives within operational programmes.

Although proponents of public choice theory have focused mainly on analysing government failures, they have also suggested ways to correct problems. For example, they argue that if government action is required, it should occur at the local level whenever possible (Boyne 1997). At the local level, people feel more connected to the effects of their work because it affects their immediate environment. For this reason, in some countries, guarantee schemes are implemented by regional agencies or cooperative banks rather than by a national institution.

Arping, Gyöngyi, and Morrison (2010) showed that, according to public choice theory, loan guarantees are a more effective support instrument and are less costly than direct loans. This is because, unlike non-bank loans and grants, the decision to provide loan guarantees lies with the (private) lender. The efficiency of guarantee schemes can only be reduced by the government's additional criteria, such as sectoral or geographical restrictions (Beck, Klapper, and Mendoza 2010). The decision-making power of the private investor is then limited.

Hence, we believe that the efficiency of guarantee programs may be connected with the region where it is offered (set criteria and rules by policymakers) and the type of institution providing guarantees under the program.

Distribution of guarantees for SMEs and hypothesis development

It has been claimed that private sector participation in guarantee schemes contributes to better outcomes. Simultaneously, the involvement of government entities should be limited to these schemes' early implementation phase and provide adequate funding for the schemes (Panetta 2012). However, Beck, Klapper, and Mendoza (2010) point out that the most significant default rate level is recorded when the government is involved in risk assessment and recovery. Cowling et al. (2018a; 2018b) indicate that banks are reluctant to finance working capital secured by guarantees, seeing current liquidity problems as a threat to a going concern. Thus, commercial loans that the bank decides to guarantee may have a lower loss ratio. However, Caselli et al. (2021) stress that mutual guarantee institutions, through peer monitoring and peer screening, are better able to mitigate the risk of default. As others point out, the ineffectiveness of guarantee schemes may be due to inadequate and unrealistic additionality effects and, therefore, difficulties in attracting the appropriate group of beneficiaries. Also, supporting mainly short-term lending may not allow the desired results to be achieved (Benavides and Huidobro 2008).

Guarantee schemes are organised in two ways: mutual guarantee schemes or public guarantee programs. The former is based on the capital paid in by members of the guarantee fund who can benefit from the fund's guarantees (Columba, Gambacorta, and Mistrulli 2009). Mutual guarantee funds have developed in countries with a long tradition of sectorial organisations facing economic problems (Camino, Cardone 1999), i.e. France and Italy. Other countries have created guarantee schemes funded with public money, mainly EU funds. In many countries, guarantees for SMEs are distributed by banking institutions or government agencies, such as Austria Wirtschaftsservice GmbH (AWS) and Osterreichische Hotel und Tourismusbank GmbH (OHT) in Austria.

The guarantee distribution model influences not only the effects of guarantee schemes but also the possibility of measuring them. Organisations that secure the granted guarantees with the possessed guarantee capital can give a lot of information about the effectiveness of using these funds, as opposed to the managers of guarantee programs, who only are intermediaries between the guarantee institution and entrepreneurs. A lack of responsibility resulting from the involvement of own capital may also increase the level of risk secured by guarantees (Molina Sánchez et al. 2018).

Some state that private capital and a private share in the risk decrease the loan losses and then paid guarantees, while others claim that when a decision is left to government employees, less attention may be paid to a fair risk assessment (Beck, Klapper, and Mendoza 2010). Additionally, private institutions may help achieve better financial performance (revenues and the use of resources) due to the support provided by the private

shareholder, like an advisor to SMEs, promotion of the scheme, and additional inflows of capital.

On the other hand, Woźniak and Matejun (2018) found that schemes that offer additional support were less cost-effective. Zwane (2019) posits that the main reason for the low effectiveness of guarantee schemes in some countries is poor promotion. He indicates that most entrepreneurs learn about the possibility of receiving a guarantee from a bank. Thus, separating and delegating the task of providing guarantees to governmental organisations or NGOs may result in lower outcomes (the number and value of guarantees provided). Another problem may be the duplication of tasks (in a bank and an organisation providing guarantees), resulting in a longer process and discouraging entrepreneurs from applying for a guarantee and a loan (Zwane 2019). Therefore, we form our first hypothesis:

H1. There is a difference in the efficiency between various types of distribution and countries

The proxy for the *efficiency* of CGS is the leverage ratio (the granted volume/capital of guarantees for guarantees) in the guarantee schemes in the financial perspective of the EU between 2007 and 2013. We use three main *types of guarantee distribution* channels based on their structure and ownership criteria, distinguished by Beck, Klapper, and Mendoza (2010).

However, as other researchers note, the banks' goals may differ from those of the founders of guarantee schemes. Private institutions may use guarantee programs to cover administrative costs or, as with banks in Japan, to secure loans already granted but with little collateral (Reutemann, Twiname, and Samujh 2012). Banks can increase their customer base due to intermediation in the distribution of guarantees since, as shown by other studies, many customers remain with their CGS bank as commercial customers. On the other hand, banks risk governments not providing adequate support when CGSs loans are defaulted (Reutemann, Twiname, and Samujh 2012).

Further research indicates that a significant number of western banks are reluctant to participate in CGSs because they believe that guarantees increase loan default probability. It results from the fact that guarantees provided within governmental schemes allow projects to be financed with a risk level that would not have been targeted before (Chatzouz et al. 2017). Ben-Yashar, Krausz, and Nitzan (2018) pointed out that the efficiency of guarantee distribution may depend on the structure of decision-making in the bank or organisation providing the guarantee (centralised or a decentralised decision rule). Meanwhile, Green (2003) found that in over-centralised schemes, the programs are less effective.

Waniak-Michalak, Michalak, and Turała (2021) suggested that the support schemes for SMEs should be designed based on organisational capacity, the needs of entrepreneurs, and available sources of finance and that they should take into account and in-

volve the private sector. The banking sector should be involved in distributing funds to small and micro-entrepreneurs. It is due to better access to beneficiaries (contact base, number of outlets) and experience in the financial instruments market. Non-profit organisations may have a supportive role, but banks or other financial institutions should deal with entrepreneurs' financial services. The same is true in other countries, such as France, where entrepreneurs using Socama's (mutual guarantee funds in France) services are directed to cooperative banks, with which the organisation has an agreement and where they undergo a credit assessment procedure, receive a loan and pay their liabilities. According to the OECD (2013), guarantees are most efficient "in those countries where a network of local or sectoral guarantee institutions is well-established."

The efficiency of CGSs may depend on different factors, not only the type of distribution. The effectiveness of the CGSs differs in rural and urban areas (Wardhono, Modjo, and Utami 2019), as do the characteristics of borrowers (size, age, industry, and financial data), loan purposes, loan size, and maturity (Caselli et al. 2021). Ughetto, Scellato, and Cowling (2017) stated that better credit conditions are offered for loans of larger amounts and longer durations, for service firms, larger firms, and those located in well-developed regions. Other effects can be expected in times of crisis. As Gonzalez-Uribe and Wang's (2020) study pointed out, during an economic crisis, guarantees may be granted to support operating activities and maintain employment, but mainly in companies where workers are costly to train and hire. Corredera-Catalán, di Pietro, and Trujillo-Ponce (2021) indicated that guarantee schemes vary in different countries and regions due to the different economic and historical backgrounds and legal contexts. Waniak-Michalak, Michalak, and Turała (2021) demonstrated the impact of regional development and economic situation on organisations' financial stability by providing guarantees.

This study will examine if the place of guarantees' distribution (country) and level of economic development measured by SHDI (Subregional Human Development Index) influence guarantee schemes' efficiency. Therefore, the second hypothesis is formulated below:

H2. There is a relationship between efficiency and the level of regional development

In order to verify our research hypotheses, we used the EC's report on EU-funded guarantee schemes between 2007 and 2013. The European Commission report (European Commission 2017) allowed us to collect data for 20 EU countries where CGSs were implemented on: funds provided by the EU, other public funds, funds involved in supporting SMEs, the number of guarantees granted under the schemes, the names of institutions that implement the schemes, and the costs of managing the schemes. Using these institutions' websites, other information necessary for the survey, such as the type of institution implementing the programme, was obtained, e.g., the region

in which the institution operated, and using the globaldatalab.com website, the economic level of development of the region.

A preliminary analysis of the structure revealed different levels of the use of EU support. In some countries (France, Italy, Poland, and Greece), where guarantees are the primary tool for supporting SMEs and eliminating the equity gap, the guarantees provided exceeded several times the guarantee capital received. In other countries, the effects of implementing guarantee schemes were much lower; often, less than 100% of the support provided was used. In France, where the value of granted guarantees was the highest, most programmes were implemented by the Socama, Oseo, and Siagi mutual guarantee funds. Only two organisations achieved an effectiveness rate of less than 100% in France, an NGO and a bank. The average effectiveness of guarantee schemes for all countries exceeded 100%; however, there were some schemes where the utilisation of EU funds did not exceed 2%.

Methodology and data analysis

In the first stage, we used a method of grouping statistical data. As a result, three groups were created. The first consists of data for non-governmental organisations and regional agencies. The second includes only information about CGSs offered by banks. The third consists of data for mutual guarantee funds. Then, the following control variables were chosen: the period of functioning, the level of regional development, and the origin country. After that, the additional variables were selected: money of operating program paid to the fund or set aside in case of guarantees, managerial costs and fees, number of guarantees, operating program contributions invested in final recipients, and efficiency.

In the next phase, we tested if there was a normal distribution of the data. Therefore, three tests were conducted: Lilliefors, Kolmogorov-Smirnov, and Shapiro-Wilk. The last test is particularly important for small samples, such as in this research. Moreover, one needs to compare a histogram of the sample data to produce a normal probability curve.

In order to verify hypothesis H1, we chose the Kruskal-Wallis by ranks and the median test, as the type of CGSs is a qualitative variable. Both tests are appropriate to make comparisons in more than two groups. Moreover, they are non-parametric alternatives to between-groups one-way analysis of variance. The interpretation of the Kruskal-Wallis test (1) is identical to the parametric one-way ANOVA (Wheelan 2014). However, it is based on ranks and not means. It is calculated as follows:

$$H = \left[\frac{12}{n*(n+1)} * \sum_{j=1}^{c} \frac{T_j^2}{n_j} \right] - 3*(n+1), \tag{1}$$

where:
n – the sum of sample sizes for all samples;
c – the number of samples;
T_j – the sum of ranks in the jth sample;
n_j – the size of the jth sample.

The median test is a basic version of the Kruskal-Wallis test as it frames the computation in terms of a contingency table. The number of cases in each sample that falls above or below the standard median is calculated. Then, one computes the Chi-square value for the resulting 2 x k samples contingency table. The null hypothesis assumes that all samples come from populations with identical medians. It is expected that about 50% of all cases in each sample will fall above or below the common median. The median test is especially useful when the scale contains artificial limits. Therefore, many cases fall at either extreme of the scale. It is the only appropriate tool for comparing samples in this case. The formula (2) is as follows:

$$x^2 = \frac{n*\left(|ad-bc|-\dfrac{n}{2}\right)^2}{(a+b)*(c+d)*(a+c)*(b+d)}, \tag{2}$$

where:
a, b, c, d – substituting values from a different group;
n – the number of cases.

Post hoc tests are required if the results of these methods are positive. They should enable multiple comparisons of mean ranks for all groups (Siegel and Castellan Jr. 1988). The first selected test contains the z-test statistic values for each pair of compared groups u and v. The second one was the two-tailed p-levels with Bonferroni's correction for each pair compared.

In the next step, discriminant analysis was conducted, which is a type of multivariate analysis. It is used to decide which variables best divide a given set of cases into naturally occurring groups. It is very similar to the analysis of variance (ANOVA). However, the main idea underlying discriminant function analysis is verifying whether groups vary due to the average of a particular variable and then using that variable to predict group membership, for instance, in new cases (TIBCO Software Inc. 2017). The first stage includes the selection of the grouping variable and independent variables. The variable grouping must contain codes (text labels) which clearly define the group's cases.

The method of building a model most often consists of a stepwise (forward or backward step analysis) approach to build a classification function, whose value makes it possible to assign an observation to a given class. In this research, the stepwise forward method was chosen. The forward-stepping procedure is controlled by the appropriate values of the F statistic. Sequence variables with the highest value of F are included in the model. That suggests their statistical significance in the discrimination of groups, which is the contribution of an individual variable to the prediction of group membership. The variables are selected for the model as long as the corresponding F statistic values for those variables are higher than those specified by the researcher (TIBCO Software Inc. 2017).

The Wilks lambda value can range from 0 (perfect discrimination) to 1 (no discrimination). The partial Lambda Wilks test statistics are related to the appropriate variable's contribution to the obtained model's discriminant power. The p level is the test probability level corresponding to the F value of the input. A given variable's tolerance value is calculated as one minus the R-squared statistic value that describes this variable's correlation with other variables included in the model. Thus, tolerance is a measure of the redundancy of a given variable. For example, a tolerance of 0.10 means that a given variable is 90% redundant in relation to other variables included in the model. 1-Tolerance (R^2) is a value of R-squared statistics that describes a variable's interdependence with other variables included in the model (TIBCO Software Inc. 2017).

The Wilks lambda statistic (3) is calculated as follows (Dobosz 2004):

$$\lambda = \frac{\det g}{\det(g + h)},$$

(3)

where:
g – intragroup variance-covariance matrix;
h – intergroup variance-covariance matrix.

The above statistic takes values in the range <0, 1>. If the λ statistic's value is closer to zero, their intergroup variability explains the greater part of the variables' general variability. Moreover, it proves the high discriminant ability of a model. When verifying the discriminant function, it is necessary to evaluate the discriminant ability of those included individual variables. When assessing the discriminant ability of the X_k variable, we use the partial Wilks (4) coefficient (Hadasik 1998):

$$\lambda_k^{cz} = \frac{\lambda^1}{\lambda^0},$$

(4)

where:

λ^1 – the value of the Wilks lambda coefficient for the model after introducing the variable to it;

λ^0 – the value of the Wilks lambda coefficient for the model before introducing the given variable.

The coefficient value λ_k^{cz} takes values in the range <0, 1> and describes the contribution of a given variable to group discrimination. The closer this value is to zero, the greater the contribution of this variable to discrimination. The appropriate test statistic (5) is calculated as follows (Hadasik 1998):

$$F_k = \frac{N-K-I}{K-1}\frac{1-\lambda_k^{cz}}{\lambda_k^{cz}},$$ (5)

where:

N – the total number of objects in the sample;

K – the number of variables;

I – the number of considered populations.

This statistic has an F-Fisher distribution with $K – 1$ and $N – K – I$ degrees of freedom. The probability level of the above test statistic indicates the significance of a variable's contribution to the discriminant function (Kasjaniuk 2006).

We then conducted multidimensional scaling to verify **hypothesis H2**. This analysis aims to discover meaningful hidden dimensions that allow the researcher to explain observed similarities or dissimilarities – distances – between the tested objects. Multidimensional scaling aims to arrange variables in a space with a given number of dimensions, most often two-dimensional, to recreate the observed distances. The most commonly used measures of goodness of fit are *stress* (Kruskal 1978) and the alienation coefficient (Guttman 1968).

Stress is the most common measure used to estimate how well a given configuration reproduces the observed distance matrix. The raw value of the Phi stress (6) for a given configuration is defined as:

$$Phi = \sum[d_{ij} - f(\delta_{ij})]^2.$$ (6)

In this formula, d_{ij} is the reproduced distances given the number of dimensions, and δ_{ij} is the input data – observed distances. The expression $f(\delta_{ij})$ indicates a non-metric monotonic transformation of the observed input data (distances) (TIBCO 2017).

The alienation coefficient is a slightly modified version of the stress measure. One can plot the reproduced distances for a given number of dimensions relative to the observed inputs (distances). Such a scatter plot is known as a Shepard diagram. This plot shows

the reconstructed distances plotted on the vertical (Y) axis against the original similarities plotted on the horizontal (X) axis. Hence, there is a generally negative slope. The graph also shows a step function. This line represents the result of the monotonic transformation $f\left(\delta_{ij}\right)$ of the input data. If all reconstructed distances were on the step line, the appropriate solution-dimensional model would accurately reproduce the rank order of distances (or similarities). Deviations from the step line indicate a lack of fit (TIBCO Software Inc. 2017).

The correlations were then calculated. In case of a lack of normal distribution for data, a non-parametric method must be used. There are three commonly used correlation coefficients: Spearman's R, Kendall Tau, and Gamma. We chose the first method. It assumes that the variables under consideration are measured on at least an ordinal scale, that is, that the individual observations can be ranked into two-ordered series (Siegel and Castellan 1988). The advantage of this method is the similarity to Pearson's correlation in terms of interpretation.

There are two methods to calculate Spearman's correlation (7), connected with tied ranks of data. When there are no tied ranks, the formula is as follows:

$$p = 1 - \frac{6 * \sum d_i^2}{n * \left(n^2 - 1\right)}, \tag{7}$$

where:
d_i – difference in paired ranks;
n – number of cases.
When there are tied ranks, the formula (8) is as follows:

$$p = \frac{\sum_i \left(x_i - \bar{x}\right) * \left(y_i - \bar{y}\right)}{\sqrt{\sum_i \left(x_i - \bar{x}\right)^2 * \sum_i \left(y_i - \bar{y}\right)^2}}, \tag{8}$$

where:
i – paired score.

Furthermore, in every case, a scatter graph was scrutinised. All the above statistical calculations were done with the Statistica program.

In order to make a post hoc power analysis, the procedure for differences between two independent means for two groups was used. The following assumption was made: alpha level = .05. The effect size (d Cohen) was calculated according to the following procedure for the t-test for independent samples:

$$Es = (\mu1 - \mu2) / \sigma, \tag{9}$$

where:

Es – effect size;

$\mu1$ – the mean in subgroup 1;

$\mu2$ – mean in subgroup 2;

σ – standard deviation in the whole group.

The effect size is related to the power of the test. In the chosen test, the higher the differences between the subgroups, the higher the effect size. According to Cohen (1992), one should assume the following interpretations of the size effect: d = .2 – little effect; d = .5 – average effect; d = .8 – big effect.

Results

Based on the Lilliefors, Kolmogorov-Smirnov, and Shapiro-Wilk tests, we determined that there is no normal distribution for the analysed variables. Because the samples for groups are relatively small (<100), we used non-parametric methods.

Based on the Kruskal-Wallis test, there are no differences in *efficiency* between the following groups of CGSs: NGO or regional agencies, banks, and mutual guarentee funds (H = .2661242; p = .8754). The median test ($\chi2$ = 2.143169; df = 2; p = .3425) produces a similar conclusion.

The differences in *efficiency* in various countries give statistically significant results for both the Kruskal-Wallis (H = 40.55; p = .00) and the Median (χ^2 = 29.92; df = 18; p = .04) tests. However, the post hoc test shows a significant difference only in one case – between Portugal and France. In all other cases, the results are statistically insignificant.

The next step of our research was the discriminant analysis. The results suggest that the model is correct. The lambda test's value is .55, which means an average match. Six of the eight explanatory variables were included in the model. However, only three justify the division into groups represented by the *type* of CGSs, i.e., *development of region, costs and fees, and efficiency.* It is confirmed by the lambda Wilks, partial lambda Wilks, and the *F* statistic tests, which do not change significantly after introducing the following variables into the model. Furthermore, the tolerance and R^2 values for efficiency mean that 84.6% of the information brought to the model by this variable is connected with two other variables already included in the model.

The three other variables do not contribute much to the model. However, the *F* statistics for *amounts of support* for one guarantee and *amounts of OP (operating program)* are insignificant.

In this study, eight quantitative variables were scaled to test their mutual similarity – spatial distribution. A standard *Guttman-Lingoes* configuration was chosen as the initial configuration. This procedure is equivalent to principal component analysis and, in most cases, provides the correct initial configuration for the iterative matching procedure (TIBCO Software Inc. 2017) (Raw stress = 0.8246739; Alienation = 0.1133315; D2: Crude stress = 0.3584455; Stress = 0.0748379). The conclusion is that the model is correct, as evidenced by the alienation and stress coefficient's relatively low values. They were calculated, respectively, for the transformed input data values calculated according to Guttman's rank procedure (D*) and according to the monotone regression procedure (D^).

The results of multidimensional scaling, shown in Figure 1, suggest that the analysed variables are diversified. They are not close together, except for *amounts of OP* and *OP contributions*. Therefore, they are suitable for other statistical analyses. However, the most comparable variable to *efficiency* is *regional development* (Figure 2).
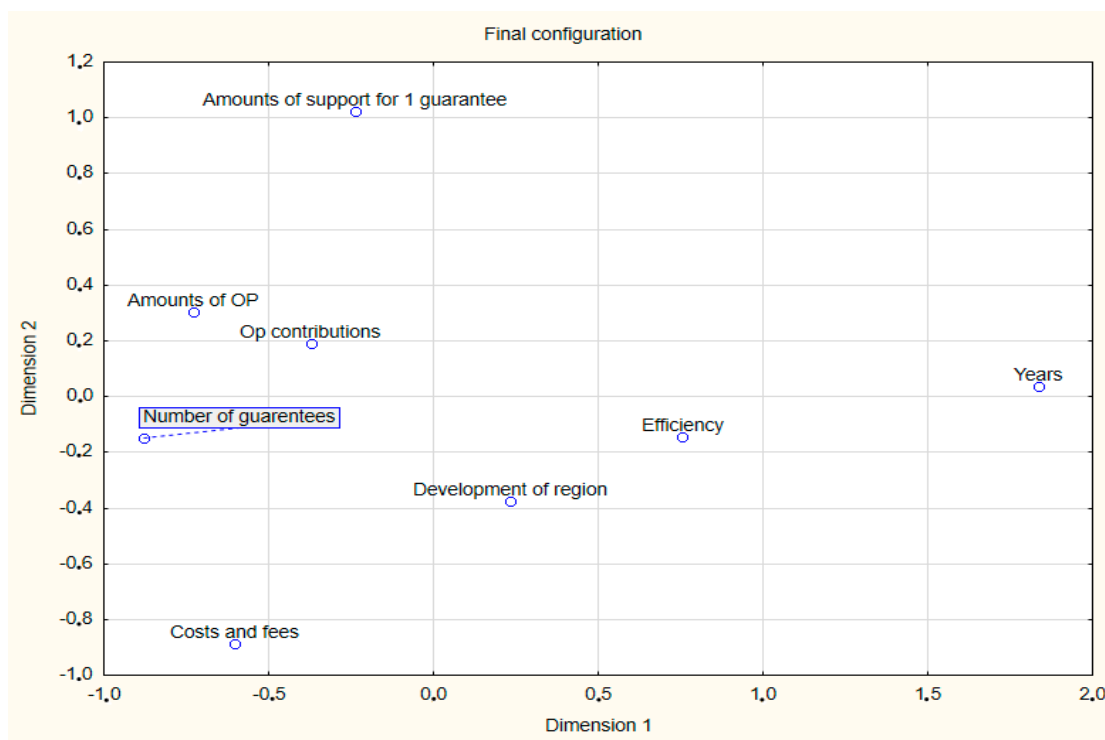

Figure 1. Final configuration

Source: own elaboration.

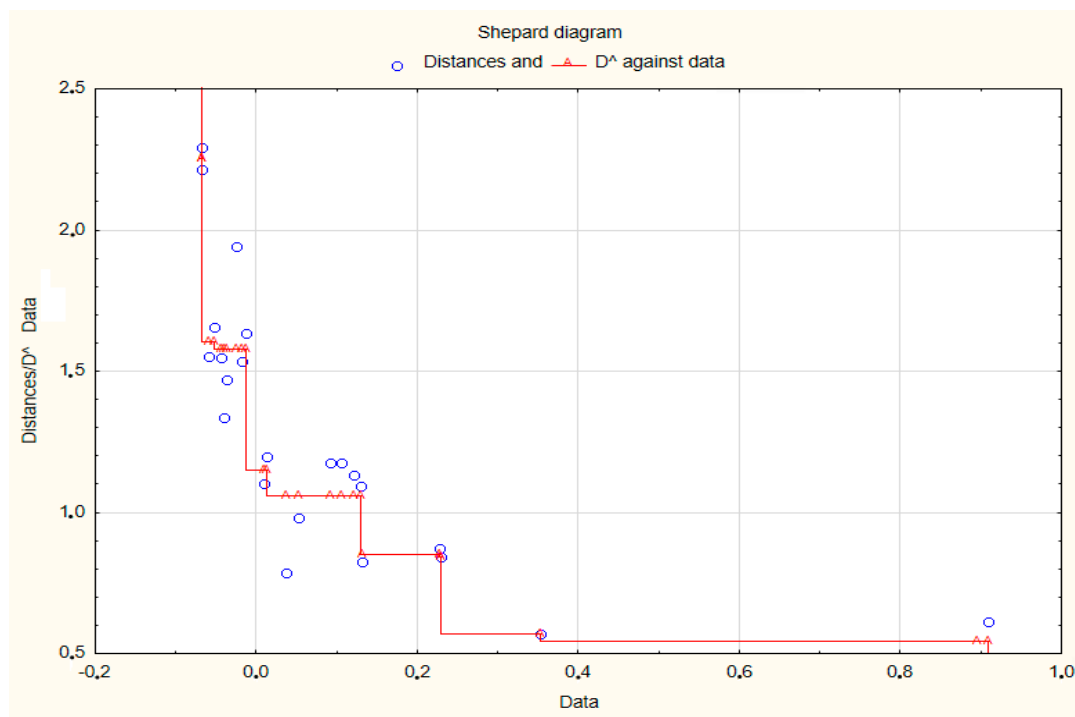The Shepard diagram indicates a good reproduction of the real distances.

Figure 2. Shepard diagram

Source: own elaboration.

In the next phase, we used the Spearman correlation. The results show only a weak positive correlation between *efficiency* and *regional development* for all types of guarantees (r = .25, p < .05).

There is also a weak positive relationship between efficiency and regional development for schemes run by non-governmental organisations and regional agencies (r = .30, p < .05). However, there is no correlation for CGSs distributed by banks. It may be due to the impossibility of assigning a bank's activities to a single region. Banks often operate nationwide (with branches in different regions), as well as internationally. The last analysed type of CGSs were mutual guarantee funds. Interestingly, there is a strong positive correlation between *efficiency* and *regional development* (r = .61, p < .05). The correlation coefficient is much higher than in the previous examples.

We also performed the t-test power analysis with the G * Power 3.1 program, analysing *regional development of region, cost and fees* and *efficiency*. They contributed the most to the differentiation based on type. Three subgroups with the following frequencies were then defined: Type 1 (Non-governmental organisations and regional agencies) – 61 observations; Type 2 (Banks) – 35 observations; Type 3 (Mutual guarantee funds) – 12 observations. The results suggest that the test power is average. It exceeds 90% only in two cases, both of which concern subgroups

of the *regional development* variable, which means that the test was the most reliable. Therefore, the variable best differentiates the data set based on type. The lower power of the test in the remaining cases may be connected with a small number of cases in subgroups 1 and 2 and outliers. In our research, only in two cases was the size effect negligible.

Furthermore, we did the post hoc power analysis for correlation. The results of the test reveal quite high values for the relationship between regional development and efficiency for all types of guarantee funds (0.7484), non-governmental organisations and regional agencies (0.6798), and mutual guarantee funds (0.617500). Only for banks is the power low (0.0809).

Conclusions

This paper focused on the financial additionality of guarantee programs, which may depend on the management of these programs, the institutions implementing them, the objectives set, and the constraints on their distribution. We aimed to assess the relationship between selected elements of the business models of CGS programs implemented between 2007 and 2013 (data as of the end of 2017) and the effectiveness of CGSs measured by the ratio of guarantees granted to resources engaged in the implementation of CGSs.

Based on a literature review, we set the following hypotheses:

H1. There is a difference in efficiency between various types of distribution and countries and

H2. There is a relationship between efficiency and the level of regional development.

The results of the statistical analysis are inconclusive. There are differences in efficiency based on the type of distribution. However, the tests revealed that these differences are not statistically significant. Moreover, there was only one example of disparities in efficiency between countries: France and Portugal. All other results are statistically insignificant.

Nevertheless, the discriminant analysis suggests that efficiency is one of three variables that justify the division into groups represented by type of distribution. Therefore, this issue requires more research, and we cannot confirm that public choice theory applies in every case. This may be due to a failure to recognise many variables that relate to political circumstances in a particular country or differences in program management from one country to another.

The discriminant analysis results confirm hypothesis 2. Multidimensional scaling analysis revealed that regional development is related to efficiency. Moreover, there is a correlation between these two variables, although it is weak. However, the detailed results suggest different intensities of this relationship. There is a strong correlation between efficiency and regional development for mutual guarantee funds, a weak correlation for NGO and regional agencies, but no correlation regarding banks.

The paper has some constraints. The available data are for a relatively short period. Moreover, there are only a few indicators about the activities of CGSs and none about the performance of the beneficiaries. Therefore, there is a need to acquire more detailed information, which will enable the use of more advanced research methods such as counterfactual analysis. This approach should be used in future studies to obtain more reliable results. The answers to the research questions posed in the paper can help policymakers and researchers to infer whether it is cost-effective to continue supporting CGSs and whether the management of these schemes should change. In our opinion the paper contributes to the economic policy theory in the area of state aid to SMEs and public finance.

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Czy programy gwarancji kredytowych są efektywne? Doświadczenia krajów Unii Europejskiej

Celem artykułu jest ocena wybranych elementów modeli biznesowych programów poręczeń kredytowych (CGS) wdrażanych w 20 krajach Unii Europejskiej w ramach perspektywy finansowej 2007–2013. W artykule skupiono się na dodatkowości finansowej programów poręczeń kredytowych, która zależy głównie od sposobu zarządzania tymi programami, instytucji je wdrażających, wyznaczonych celów oraz ograniczeń dystrybucyjnych. Analizie poddano poziom kosztów wdrażania i wykorzystania funduszy przeznaczonych na realizację programów. W celu weryfikacji hipotezy zastosowaliśmy kilka metod: Kruskala-Wallisa, test mediany, analizę dyskryminacyjną, skalowanie wielowymiarowe, korelację. Przeprowadziliśmy również analizę mocy. Stwierdziliśmy, że efektywność systemów gwarancji kredytowych wdrażanych przez organizacje pozarządowe, fundusze poręczeń wzajemnych i agencje regionalne jest związana z poziomem rozwoju regionalnego. Zależność ta nie jest widoczna tylko w przypadku zaangażowania banków w realizację programów gwarancyjnych. Może to wynikać z braku możliwości przypisania działalności banku do jednego regionu. Nie stwierdziliśmy natomiast różnic w efektywności pomiędzy typami organizacji wdrażających programy gwarancji kredytowych. Odpowiedzi na postawione w artykule pytania badawcze mogą pomóc decydentom i badaczom w ustaleniu, czy dalsze wspieranie systemów gwarancji kredytowych jest opłacalne i czy należy zmienić sposób zarządzania tymi programami.

Słowa kluczowe: programy gwarancji kredytowych, model biznesowy, Unia Europejska, efektywność, organizacje pozarządowe, małe i średnie przedsiębiorstwa