

EMPIRICAL RESEARCH ON BANKRUPTCY IN SMALL AND MEDIUM-SIZED ENTERPRISES ACROSS THE EUROPEAN UNION

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Abstract: *The present study examines determinants of bankruptcy using data from small and medium-sized enterprises (SMEs) operating in 21 countries within the European Union (EU). By means of panel modelling with cross-section fixed and random effects, we showed that the number of bankruptcies and bankruptcy growth rates during the period 2007–2020 were mainly driven by factors such as outstanding business loans, total non-performing loans, loan applications and rejection rate. Given the importance of small and medium-sized companies for EU economies, labor market and GDP, the manner in which SMEs deal with bankruptcy pressure should be monitored by all players within the financial system.*

Keywords: *bankruptcy; small and medium-sized enterprises; loans; European Union*

JEL Codes: D81; G32

1. Introduction

The “too big to fail” (TBTF) (Moosa, 2010) wording has become extremely popular especially after the 2008 global financial crisis, when private institutions (commercial banks, insurance companies) received subsidies from state authorities not to go bankrupt and, hence, disturb the entire financial system. At that time, such state interventions were considered adequate because the world had been facing an unprecedented global financial downturn. Nevertheless, bankruptcy appears frequently on markets around the world (Foy, 2020; Passmore & Faherty, 2024), it is not an outlier phenomenon, therefore it is monitored by official statistics. For that matter, it is said that almost 50% of new businesses disappear during the first five years of their activity.

Companies, irrespective of their size and sector of activity, are always concerned about bankruptcy and make considerable efforts to stay relevant for their customers. This is true especially in the case of small and medium-sized enterprises (SMEs), which do not have sufficient financial power or leverage to avoid financial distress, as compared to large companies. Still, SMEs are important players of national economies around the world, since they represent more than 90% of businesses and employ more than half of the global potential labor force.

Therefore, investigations on the determinants of bankruptcy for small and medium-sized companies are relevant and insightful for businesspeople, professionals, bankers, state authorities and the general public, alike. The article aims to investigate bankruptcy determinants on SMEs data during the period 2007–2020 by means of panel data modelling.

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Our sample comprised 21 nations belonging to the European Union and the Organisation for Economic Co-operation and Development (OECD), for which we retrieved data on the economic activity of small and medium-sized enterprises.

The article has the following structure. Section 2 details studies in the literature that document the topic of bankruptcy within the business environment. Section 3 describes the research methodology and the set of variables considered. Section 4 presents the empirical results, while Section 5 discusses main results and draws concluding remarks and addresses policy implications.

2. Literature Review

The following paragraphs synthesize results reported in the literature with respect to the topic of bankruptcy, focusing especially on small and medium-sized companies.

Small and medium-sized companies are considered the backbone of national economies (Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, 2023; Madgavkar et al., 2024) based on the number of people they employ, their widespread presence across economies and contribution to the global GDP (between 50% in emerging countries and 70% in most OECD countries) (International Labour Organization, 2019).

Given their importance for the overall global economy, empirical studies have been examining the “why” behind the bankruptcy of small and medium-sized companies. In this sense, Wymenga et al. (2011) reported that in 2009, following the financial crisis, bankruptcy rate in Europe increased by 46%. Using data from the 28 European Union countries, Ghulam, Hakro and Naumani (2025) examined the degree to which SMEs access to bank loans was influenced by the economy, banking system and firm-specific factors during the sovereign debt crisis and subsequent period. Authors found that the highest rejection rates had been registered during the period 2009–2013, as a natural consequence of the crisis.

Rashid et al. (2024) conducted a bibliometric analysis of studies grasping the topic of SMEs bankruptcy and identified the most influential journals, articles and authors focused on this topic. For a sample of Spanish SMEs, Rico, Pandit and Puig (2021) reported that survival rates of companies increased when SMEs retrenched intangible and tangible assets, inventory and receivables. In a comprehensive report, Kraemer-Eis et al. (2023) noted that SMEs across Europe had been struggling with access to financing mainly because of sharp increases in corporate borrowing costs, which had reached levels comparable to the ones from 2008.

When talking about corporate insolvency as a cause of bankruptcy, Lee, Choi and Yoo (2023) advanced an insolvency prediction model based on decision trees. Jun and Ran (2024) noted that SMEs could better avoid bankruptcy in the future through microcredit financing, which could enhance their financial stability.

Bergthaler et al. (2015: 5) also reported that increasing SMEs access to financing (e.g., securitization, government support schemes), making insolvency regimes less complex, costly and rigid, and improving SMEs financial reporting could contribute to fewer bankruptcies for this dynamic category of businesses.

3. Study methodology and research hypotheses

We retrieved panel data on small and medium-sized companies for the period 2007–2020 from the OECD public database. The sample included 21 members of the European Union, which also belong to OECD: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, the Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden. Our empirical models were estimated with EViews version 10.0 and included either random or fixed effects.

The choice for the period of analysis is motivated by the fact that we were interested in considering an extended time frame, which included major economic unrests (i.e., 2008 global financial crisis, 2010 sovereign debt crisis, the onset of the 2019 global pandemic crisis). It is likely that such financially challenged periods might have impacted on the bankruptcy rates of EU companies. When analyzing data from small and medium-sized enterprises, which have less financial leverage to survive economic downturns than bigger companies, the impact of the time span is very likely.

The methodological approach included the following methods: panel two-stage EGLS (cross-section random effects); panel least squares (cross-section fixed effects); panel fully modified least squares (FMOLS) (cross-section fixed effects); panel dynamic least squares (DOLS) (cross-section fixed effects).

Table 1 displays the variables that we used as outcomes and predictors.

Table 1. Set of variables considered in the analyses

Variables	Symbol	Definition	Measurement unit
SMEs bankruptcies	NB	It shows the number of bankruptcies among small and medium-sized companies.	number
SMEs bankruptcies (year-on-year growth rate)	BGR	It shows the annual percentage ratio of SMEs bankruptcies.	%
Outstanding business loans	OBL	It indicates the volume of outstanding business loans.	billions (EUR)
Total non-performing loans (% of all business loans)	TNPL	It indicates the ratio of non-performing loans to total loans granted to SMEs.	%
SMEs loan applications	LA	It indicates the ratio of SMEs loan applications to the total number of SMEs.	%
Rejection rate	RR	It shows the difference between one unit and the ratio of authorized loan applications to requested loan applications.	%
Growth rate of venture capital	GRVC	It shows the ratio of current year venture capital and prior year venture capital.	%

Source: <https://data-explorer.oecd.org/> (accessed November 10, 2024).

4. Econometric results

In the first place, we analyzed the evolution of the two outcome variables across the entire period. We noted the following:

- EU countries with the highest number of bankruptcies among SMEs were France, Belgium, the Netherlands, Spain and Sweden. Fewer cases of bankruptcy were registered by Greece and Slovakia;
- the highest increases in annual bankruptcy growth rates were found in Spain (2011), Denmark (2015) and Ireland (2011). At the other end, countries such as Lithuania (2013), Greece (2019), Estonia (2011) and Portugal (2013) reported the lowest annual bankruptcy growth rates in those respective years.

Descriptive statistics

Table 2 shows the descriptives for outcome and predictor variables during the period of analysis.

Table 2. Descriptive statistics

Indicator	NB	BGR	OBL	TNPL	LA	RR	GRVC
Mean	7.4807	3.4959	10.2599	2773.439	19.4404	18.6679	29.6346
Median	7.5694	-0.0300	10.9612	6.2500	20.3500	9.7700	12.5850
Maximum	11.0533	185.2300	23.7596	56199	80.1200	84.4000	869.7200
Minimum	4.4067	-66.9100	1.9199	0.0800	0.5200	0.4100	-100
SD	1.4440	30.7584	4.4566	10252.19	14.2792	23.5343	104.7176
Skewness	0.4914	2.3058	0.8927	3.9921	0.9701	1.7727	4.7471
Kurtosis	3.1091	11.9754	4.8079	17.9426	5.4817	4.9445	34.1574
Jarque-Bera test	8.8423	848.5441	72.3675	2942.046	57.4720	108.3245	10078.78
Probability	0.0120	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Obs.	217	200	269	246	139	159	228

Source: Authors' computations.

Descriptive statistics showed that the highest values for standard deviation were registered by *TNPL*, *GRVC* and *BGR*, which indicated a high volatility. In turn, variables *NB* and *OBL* reported the lowest volatility. In terms of skewness, all variables were skewed to the right (positive values). Kurtosis values indicated that all distributions were leptokurtic. Moreover, by applying the Jarque-Bera test, we found that all variables were non-normally distributed.

Correlation analysis

We also conducted correlation analyses to rule out multicollinearity issues, which might bias econometric results (Table 3). As can be noticed from the table, no correlation values exceeded the standard benchmark of 0.9. In this context, we concluded that correlations did not bias our econometric estimations.

In addition, we determined variance inflation factors (VIFs) that ultimately supported correlation analyses.

Table 3. Correlation values

Indicators	BGR	NB	OBL	TNPL	LA	RR	GRVC
BGR	1						
NB	0.097	1					
OBL	-0.058	0.138	1				
TNPL	0.392**	-0.169	0.388**	1			
LA	-0.061	0.309**	-0.307**	-0.397**	1		
RR	0.022	0.290*	0.124	-0.221*	-0.281*	1	
GRVC	-0.082	-0.186	0.074	0.171	-0.134	-0.102	1

Source: Authors' computations.

Econometric models

To examine the determinants of bankruptcy, we tested the following research hypotheses:

Hypothesis 1: There is a significant relationship between NB and the variables OBL, TNPL, LA, RR and GRVC.

Hypothesis 2: There is a significant relationship between BGR and the variables OBL, TNPL, LA, RR and GRVC.

Hence, econometric models had the following format:

$$\text{Ln}(Y_{it}) = a_0 + a_1 \ln(X_{1it}) + a_2 X_{2it} + a_3 X_{3it} + a_4 X_{4it} + a_5 X_{5it} + \delta_i + \theta_t + \varepsilon_{it}$$

(Hypothesis 1)

$$Y_{it} = a_0 + a_1 \ln(X_{1it}) + a_2 X_{2it} + a_3 X_{3it} + a_4 X_{4it} + a_5 X_{5it} + \delta_i + \theta_t + \varepsilon_{it}$$

(Hypothesis 2)

with:

- a_0 – constant;
- a_i – coefficients of predictors;
- X – predictor variable;
- i – EU country;
- t – time span from 2007 to 2020;
- δ – fixed effects that encompass country factors, not varying over time;
- θ – fixed effects that encompass common economic shocks;
- ε – error term.

Table 4 displays our econometric models estimated with panel data for the outcome *NB*.

Table 4. Econometric models for the outcome *SMEs bankruptcies (NB)*

Variables	VIF	$\text{Ln}(NB_{it}) = a_0 + a_1 \ln(OBL_{it}) + a_2 TNPL_{it} + a_3 LA_{it} + a_4 RR_{it} + a_5 GRVC_{it} + \delta_i + \theta_t + \varepsilon_{it}$		
Estimation method		Panel Two-Stage EGLS	Panel Fully Modified Least Squares (FMOLS)	Panel Dynamic Least Squares (DOLS)
<i>C</i>		14.1266*** (3.9209)	–	–
<i>OBL</i>	1.5061	–0.8919** (–1.9311)	–0.7617*** (–2.9082)	–0.6269*** (–2.8795)

TNPL	1.0578	-1.9505*** (-3.8491)	-1.5005 (-1.3837)	-1.8605* (-1.8094)
LA	1.3131	0.0471* (1.6869)	0.0350*** (3.0098)	0.0267*** (2.7885)
RR	1.2638	0.0963*** (2.8831)	0.0652*** (4.8340)	0.0529*** (5.3852)
GRVC	1.0547	9.0505 (0.0675)	-0.0004 (-1.4062)	-0.0001 (-0.4633)
Cross-section effects		Random	Fixed	Fixed
R^2		0.3539	0.9857	0.9856
Adjusted R^2		0.3027	0.9821	0.9828
F -statistic		14.950	–	–
Prob(F -statistic)		0.0000	–	–
Observations		69	63	81

Source: Authors' computations.

Note: We indicate robustness t -statistics in brackets. The symbols *, **, *** show statistical significance at the 10%, 5% and 1% levels. VIF values below 3 indicate no multicollinearity.

As can be seen from Table 4, the **first econometric model** estimated with panel two-stage EGLS indicated that predictors explained 30.27% of the variance in number of SMEs bankruptcies. Except for the growth rate of venture capital, all predictors had a significant impact on bankruptcy. Hence, when outstanding business loans and total non-performing loans increased by one unit, the number of bankruptcies would decrease by 0.89 and 1.95 units. The impact of loan applications and rejection rate was positive: should these two predictors increase by one percentage point, the number of bankruptcies among SMEs would also increase by 0.05 and 0.1 units, respectively. Overall, tests supported the validity of this first model ($F = 14.95, p < 0.001$).

The **second econometric model** (FMOLS) showed that independent variables explained 98.21% of the variance in the outcome. Hence, if *OBL* augmented by one unit, the number of bankruptcies would considerably decrease by 0.76 units. *LA* and *RR* played a direct role: when they increased by one unit, the outcome would also increase by 0.04 and 0.07 units, respectively.

The **third econometric model** (DOLS) indicated that all predictors (except for *GRVC*) had a relevant part. Therefore, if *OBL* and *TNPL* augmented by one unit, the outcome would mitigate by 0.63 and 1.86 units. When *LA* and *RR* increased by one unit, the number of SMEs bankruptcies would also augment by 0.03 and 0.05 units, respectively. Predictors explained 98.28% of the variance in the outcome.

Based on these three models, we concluded that the first research hypothesis was supported by our empirical results.

Table 5. Econometric models for the outcome *SMEs bankruptcies (year-on-year growth rate)* (*BGR*)

Variables	VIF	$BGR_{it} = a_0 + a_1 \ln(OBL_{it}) + a_2 TNPL_{it} + a_3 LA_{it} + a_4 RR_{it} + a_5 GRVC_{it} + \delta_i + \theta_t + \varepsilon_{it}$		
Estimation method		Panel Least Squares	Panel Fully Modified Least Squares (FMOLS)	Panel Dynamic Least Squares (DOLS)
<i>C</i>		174.5125 (1.0079)	–	–
<i>OBL</i>	1.4846	–23.2409* (–1.3197)	–30.0683* (–1.7808)	–23.2409* (–1.8468)
<i>TNPL</i>	1.0815	0.0034*** (4.5602)	0.0039*** (5.6018)	0.0034*** (5.7402)
<i>LA</i>	1.2339	0.2620 (0.4809)	0.3639 (0.4848)	0.2620 (0.4731)
<i>RR</i>	1.4400	3.2500*** (3.4276)	3.4602*** (3.9802)	3.2500*** (5.7276)
<i>GRVC</i>	1.0380	–0.0064 (–0.7431)	–0.0181 (–0.9965)	–0.0064 (–0.4180)
Cross-section effects		Fixed	Fixed	Fixed
R^2		0.4865	0.4559	0.4865
Adjusted R^2		0.3868	0.3115	0.3868
<i>F</i> -statistic		4.8819	–	–
Prob(<i>F</i> -statistic)		0.0000	–	–
Observations		81	63	81

Source: Authors’ computations.

Note: We indicate robustness *t*-statistics in brackets. The symbols *, **, *** show statistical significance at the 10%, 5% and 1% levels. VIF values below 3 indicate no multicollinearity.

Table 5 presents the econometric estimations for the outcome *BGR*. According to the **fourth econometric model** (panel least squares), independent variables explained 38.68% of the variance in *BGR*. This time, three predictors had a relevant role. Should outstanding business loans increase by one unit, the outcome decreased by 23 units. When total non-performing loans and rejection rate increased by one unit, the growth rate of bankruptcies would also increase by 0.003 and 3.25 units, respectively. Overall, the model was valid ($F = 4.88, p < 0.001$).

The **fifth econometric model** (FMOLS) showed that 31.15% of the variance in *BGR* was explained by predictors. Therefore, *TNPL* and *RR* had a direct impact and triggered changes of at least 0.004 and 3.46 units. Moreover, the impact of *OBL* was negative, meaning that a one-unit increase in outstanding loans would be followed by a massive 30.07-unit decrease in *BGR*.

The **sixth econometric model** (DOLS) explained 38.68% of the variance in *BGR*, like in the fourth model case. Again, *OBL* had a negative impact: should the predictor augment by one unit, *BGR* mitigated by 23.24 units. The influence of *TNPL* and *RR* was positive: a one-unit increase in these predictors would generate an increase of 0.003 and 3.25 units in *BGR*.

Based on this set of three models, we concluded that the second research hypothesis was supported by our empirical results.

5. Conclusions

The present study examined determinants of bankruptcy for a sample of 21 countries from the European Union during the period 2007–2020, using data on small and medium-sized companies retrieved from the OECD database.

We estimated results with panel data modelling methods such as: panel least squares, panel two-stage EGLS, panel fully modified least squares and panel dynamic least squares.

Empirical results showed that the number of bankruptcies was slightly influenced by the number of loan applications and rejection rates, which is according to expectations. In this context, when SMEs that experience financial struggle are denied certain loans they will eventually go bankrupt. The strongest impact was registered for total non-performing loans and outstanding loans, which yielded a mitigation in the number of bankrupt SMEs. A possible explanation for this result is that postponing the repayment of loan installments would generate a temporary financial surplus for SMEs, based on which they could continue economic activities and avoid going bankrupt.

In the case of the annual bankruptcy growth rate, the strongest impact was driven by the outstanding business loans: as previously stated, delays in repaying loans create a financial cushion for SMEs, giving them room to continue activities without declaring bankruptcy. The influence of the rejection rate was also quite significant, as expected. The more SMEs are granted no access to additional funding from banks, the more likely they are to declare bankruptcy.

All in all, our study draws attention to the factors that raise financial pressure for small and medium-sized companies, which are the backbone of the EU economy. The main players within the national financial system should pay attention to these factors and monitor the ones with the strongest impact on bankruptcies. At the end of the day, bankruptcies do not only affect the SMEs *per se* but overall societies through their negative externalities (e.g., massive lay-offs, fewer taxes collected for state budgets, decrease in customer traffic, lower demand for goods and services) (Benmelech et al., 2019; Bernstein et al., 2019).

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