The Impact of the Recent Financial Crisis on the Financing of European SMEs[1]

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Abstract

Lack of financing is an important obstacle for growth and development of small and medium-sized enterprises all over the Europe. This paper reveals the effect of the sovereign stress on the financing of small businesses from Euro area economies that have suffered most, denoted as stressed economies. The main finding is that 37% of the firms in the researched sample were either rejected on their loan application or their loan application was accepted but refused due to high costs. Also, the heterogeneity across firms plays a significant role when it comes to loan granting, older firms with higher turnover are less likely to be rejected on their loan application. The firms in the stressed countries are most likely to be refused in their bank loan application after the crisis unfolded and have a higher probability of not applying to a bank loan compared to the firms from the non-stressed economies.

Keywords: *sovereign debt, credit access, SMEs*

JEL Classification: D22, G21, H63

Introduction

Euro area countries slipped into recession in 2010, proving to be a severe sovereign debt crisis. It was caused by the incapacity of some Euro area countries to repay or refinance their government debt or to bailout over indebted banks under their national supervision and it significantly disrupted financial markets and slowed down the economic activity. The consequences of the crisis

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unfolded through increased borrowing costs for a number of peripheral countries and tightened credit conditions imposed by banks.

During the sovereign debt crisis, five of the Euro area countries (Greece, Ireland, Italy, Portugal and Spain, denoted as "stressed economies") have suffered a substantial deterioration in their sovereign creditworthiness compared to the rest Euro area countries. The focus of the paper lies in the analysis of credit access of small and medium-sized enterprises, since these represent the backbone of European economy[2] and are more vulnerable to the market fluctuations. Previous studies point out the fact that small businesses are high reliable on bank lending (Bhaird, 2013); therefore they are more likely to become credit constrained especially in times of crisis (Jimenez et al., 2012). A significant reduction in lending to private sector can lead to negative consequences for real economic activity.

Few previous studies address the impact of sovereign debt crisis on access to financing of small and medium-sized enterprises for stressed Euro area countries, most of the research papers focus on identifying credit supply factors that contracted the decrease in new loan issuance in particular countries and in different timeframes (e.g. Holton, Lawless and McCann, 2014; Ferrando, Udell and Popov, 2015). Employing a difference in differences methodology, this paper attempts to identify the consequences of the sovereign debt crisis on the financing of small businesses across 11 Euro area countries with a particular focus on most stressed Euro area economies (Greece, Ireland, Italy, Portugal and Spain). First we study the effects of deteriorated economic outlook on deteriorated access to external financing for firms in stressed countries (Greece, Ireland, Italy, Portugal and Spain) and non-stressed countries (Austria, Belgium, Germany, Finland, France and Netherlands). Also, at this stage it is important to understand which factors contributed most to the deteriorated access to financing for the same groups of countries (EIB, 2014). The limited monetary transmission could result not only from the contraction in loan supply or demand, but it could also be a result from increase in loan maturity and/or rate of refinancing. This means that if firms extended the maturity of existent loans during the financial crisis, then it is obvious the decrease in credit supply. Moreover, if firms refinanced their loans during the financial crisis because of the decrease in interest rates and weak covenants, then it can be explained the decrease in new loan issuance during the following period of time (Ivashina and Scharfstein, 2010). These hypotheses need further inquiry on the bank's perception of the general economic outlook during the crisis and their increased awareness SMEs.

[2] According to European Central Bank (ECB), small and medium-sized enterprises (SMEs) account for 99.8% of the number of firms in the Euro area, 60% of turnover and 70% of employment.

In order to understand the impact of the recent European sovereign debt crisis on the financing of European SMEs it is important to consider the all-known facts that unfolded with the crisis, such as increased interest rates, increased awareness toward businesses considering the financial situation of banks and their selective behavior towards small businesses. The increase in borrowing costs is observed in 2011 – 2012, with the acceleration of the so-called "credit crunch". This is particularly worrying, as small firms are important economic driver of innovation, prosperity and sustainability; moreover, these firms account for large shares of gross value added in European countries and are an important source of employment.

In order to identify the supply factors that slowed the loan transmission it is used data provided by the SAFE Survey (Small and Medium Enterprise Access to Finance) that offers information on banks' and firms' perception of availability of financing, application success as well as the need of firms to get new loans or other sources of external financing.

Contribution of the current paper to the existent literature on the financing of European SMEs is significant since to the best of our knowledge, there is no research paper focused solely on the effect of the sovereign debt crisis on the financing of small businesses from stressed Euro area economies (Greece, Ireland, Italy, Portugal and Spain) versus non-stressed Euro area countries (Austria, Belgium, Finland, France, Germany and Netherlands) using data from 2009 to 2014 of SAFE Survey conducted by the European Central Bank jointly with the European Commission.[3]

The rest of the paper is organized as follows: Section 1 provides the review of the most relevant papers conducted to the issue of bank lending during the sovereign debt crisis; Section 2 presents data and methodological approach; the empirical results and the robustness check are presented in Section 3 and conclusions in last Section.

1. Literature Review

Lack of access to financing is an important obstacle for the growth and development of small and medium enterprises. Multiple research papers were conducted on the financing of small businesses and they concentrate on testing the determinants and effects of bank lending constraints on firms since the onset of the crisis (e.g. Becks et al., 2014; Ivashina and Scharfstein, 2010; Jimenez et al.,

[3] Summary statistics present the preliminary results on the use of bank loans, rejected applications and refused applications due to high costs and other indicators that justify the need of grouping the countries into stressed and non-stressed.

2012; Ozturk and Mrkaic, 2014; and Popov and Udell, 2012). Reliance on bank finance by SMEs is particularly increased during financial crises (Popov and van Horen, 2013), therefore these suffer most from disruptions in financial markets and the slowdown in economic activity.

A separate strand of the literature addresses the credit supply factors that have deteriorated the issuance of new loans. (Ivashina and Scharfstein, 2010). However, the credit crisis may have been influenced by the reduction in demand for finance as a response to the financial crisis (delay in investment decisions, reduction of expansion plans and switch to alternative sources of financing) and it becomes unclear to what extent the reduction in private sector credit is a result of supply or demand side responses to the sovereign debt crisis.

In order to better identify and measure the supply factors that could contribute to slowdown in new lending, we use firm level survey data that is specifically designed for this purpose. Since many research papers use loan applications from a single country (e.g., Akbar, Rehman and Ormrod, 2013; Jimenez et al., 2012) few papers like ours analyze the consequences of the sovereign debt crisis in a cross-country analysis (e.g., Beck et al., 2014; Ferrando, Udell and Popov, 2015; Arteta and Hale, 2008).[4] Another thing is that most studies focus on the impact of a sovereign debt crisis on sovereign borrowing and not on bank lending to private sector (e.g. Gelos, Sahay and Sandleris, 2011).

Other cross-country studies research the credit availability for SMEs since the recent Euro area economic crisis in order to identify the heterogeneity in SME credit conditions (e.g. Holton, Lawless and McCann, 2013), even so, unlike our paper the mentioned one limits to a different strand and particularly whether the small and medium-sized enterprises' financing conditions in Europe are due to the sovereign debt crisis or fundamental increased awareness towards small firms.

Kirschenmann (2016) revealed that in the case of relatively small firms are more credit rationed, but that this occurrence decreases in time, as the relationship with the bank increases and the bank is being able to gather more soft information about the borrower. Drakos and Giannakopoulos (2011) outline that there is a negative relationship between the sales growth of a firm and number of employees and the probability of being credit rationed. Levenson and Willard (2000) reveal that, in the case of SMEs, these are more credit rationed, depicting at the same time the occurrence of self-credit rationing, the firms not applying for a loan, being discouraged by past interactions with the banks or by the present requirements. Hashi and Toci (2010) evaluate the determinants of both credit rationing and self-credit rationing. The factors their study revealed consist of

[4] For papers using ECB's "Survey on the Access to Finance of Enterprises" (SAFE) survey data in determining the small and medium-sized enterprises' access to finance without analyzing the role of the sovereign debt crisis, see Casey and O'Toole (2014).

firm characteristics, including firm age, size ownership and performance. Their research outlined that SMEs are more discouraged than larger firms to apply for a loan (self-credit rationing) and have a higher probability of being denied credit (pure credit rationing). In their investment decisions, small firms begin by looking at internal funds rather than relying on bank loans. By comparing large firms with SMEs in Italy, Agostino, Lawless and McCann (2008) found that larger firms are less credit rationed than small firms because of their associated lower level of risk.

As it comes to the firm age, the relationship with the credit rationing is depicted in the literature as being a negative one. As the banks are able to gather more information and to overcome the information asymmetry problem, the firm is being less credit rationed. Beck et al. (2006) revealed that, among country characteristics, the size, the age and the ownership of the company are the variables that have the major impact on the firm being credit rationing, concluding that the business entities that encountered the lowest levels of credit rationing were the ones that were the oldest, the largest and that were owned by foreigners.

We extend the existent European studies that have focused only on the initial phase of the financial crisis in Europe by exploring the sovereign debt crisis that occurred in 2010 – 2012 and its impact on the access to financing of European SMEs in a cross-country analysis. We employ the Survey on the Access to Finance of Enterprises (SAFE) survey conducted by ECB jointly with the European Commission on 11 Euro area countries. Therefore, our paper's concerns relate to assessing the impact of the sovereign debt crisis on the access to finance of small and medium-sized enterprises from most affected Euro area countries (i.e. Greece, Ireland, Italy, Portugal and Spain) versus the rest of the analyzed Euro area countries (i.e. Austria, Belgium, Finland, France, Germany and the Netherlands).

Besides the identifying of supply factors that could contract the credit transmission to private sector our study also focuses on firm characteristics as an important feature for credit access unlike papers also using SAFE data but determine the consequences of the crisis on firms' switch to alternative sources of financing (Casey and O'Toole, 2014). In addition, other papers stress the attention upon the fact that monetary transmission mechanism in the Euro area has been damaged due to the limited transmission of changes in the monetary policy stance (Ozturk and Mrkaic, 2014).

Not only the SMEs were affected by the crisis. Ivashina and Scharfstein (2010) showed that the large enterprises from U.S have also suffered a decline in new lending during the financial crisis from 2007 – 2009 even though these are less screened by banks and have a better perception of repayment than small firms have. The sovereign debt crisis from Europe has tightened even more the

relationship between banks and private sector, since they became less supportive and increased the risk profile to businesses. In this context, by adding firm heterogeneity we could identify whether the banks have changed their behavior and the increased costs and terms of financing were responses to the crisis and their own weak balance sheets (Gertler and Kiyotaki, 2010).

Considering the existing literature on SMEs credit availability during financial crisis there are a number of ways in which this paper brings additional insights to research on bank lending constraints during the recent financial crisis. First of all, the main idea behind this paper is on the analysis of the post-crisis bank lending constraints on stressed economies versus the non-stressed economies, in order to avoid erroneous results and to provide explanations behind the behavior of banks toward small businesses. Second, we use the latest available round of SAFE Survey for the research, which underlines the novelty of the paper compared to other studies that use SAFE Survey data as well.

2. Data and Methodological Approach

2.1. Data

The data used in our investigation come from SAFE Survey collected on behalf of the European Central Bank in collaboration with European Commission. The SAFE Survey is conducted since 2009 on a bi-annual basis. Some of the firms were re-surveyed, while in other countries the sample size was increased in order to get more representative results per country. Therefore, we have access to panel data of European firms during the 11 rounds of the survey. The period of analysis covers the survey rounds from January 2009-September 2014. The sample size covers approximately 72,000 observations that include small and medium sized enterprises from Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Spain and Portugal. The number of firms across each of the Euro area countries is presented in Table 1.

The dataset is unbalanced, due to the fact that for some countries the sample size was increased over time. Since the SAFE Survey also contains information on large enterprises, these were excluded from the further investigation in order to obtain representative results strictly on small and medium sized enterprises. Therefore, the share of micro firms in our study is only 18%, with the rest 37% and 43% for small and medium firms respectively.[5] In terms of sectorial breakdown,

[5] According to the ECB enterprises have been classified by the number of employees, microfirms have 1 to 9 employees, small firms encounter from 10 to 49 employees, while medium-sized enterprises have between 50 and 249 employees.

over 36% are the firms in the wholesale or retail trade; about 27% are manufacturing firms, including electricity, gas and water supply; 25% mining companies; and 12% in construction. Even if the domain of activity is not the biggest concern for the current research, it is an important benchmark for determining which companies are more credit constrained than others.

T a b l e 1

Number of Firms Participating at the Survey Broken Down by Country and Year

	2009	2010	2011	2012	2013	2014(H1)
AT	387	641	935	946	941	460
BE	381	674	973	970	976	456
DE	1,830	1,818	1,805	1,807	1,800	1,156
ES	1,841	1,823	1,830	1,804	1,801	1,203
FI	193	575	970	970	973	451
FR	1,822	1,812	1,803	1,802	1,806	1,315
GR	383	665	970	970	970	481
IE	192	575	969	970	970	459
IT	1,842	1,866	1,797	1,803	1,801	1,410
NL	520	696	940	936	944	730
PT	524	702	945	941	941	475
Total	**9,915**	**11,847**	**13,937**	**13,919**	**13,923**	**8,596**

Source: Authors calculations using the data provided by SAFE Survey from 2009 to 2014(H1).

Firstly, in order to identify the firms' need of financing and the success of their bank loan' application we will consider the following dummy variables*:* a) *Credit constrained;* b) *Discouraged loan application due to fear of a possible rejection;* c) *Refused bank loan application due to high costs;* d) *Rejected applications by banks* and e) *Denied applications due to sufficient internal funds*. All variables take value 1 if the firms are credit constrained in certain circumstances or 0 if the firms applied for a bank loan and were granted at their full request (See Appendix 1). Variables a) – d) represent supply factors constraints. The variable *Denied applications due to sufficient internal funds* is also consistent with our study since it covers an important part of a possible reason for the slowdown in credits and specifically the use of sufficient internal funds (credit demand factors). In this way, we will determine either the crisis impacted the slowdown in the loan granting since 2009, or the so-called "post crisis" effects on small businesses' financing.

Secondly, we will identify the main reasons of the slowdown in issuance of new loans and the investigation will be focused on the credit supply factors. Through the survey, firms are asked if: they used bank loans and other facilities provided by banks in the past 6 months; they applied for financing but were either rejected or granted a loan; and their need for a bank loan decreased or increased in the past 6 months. Also, the survey contains information concerning

whether companies used financing or not and what is the reason for not using financing. These information allowed us to determine whether the firms that did not apply for any credit or external financing was caused by increased costs, paperwork, fear of a possible rejection and/or other "credit supply" reasons, either they did not needed any financing within the last half a year due to sufficient internal sources and other reasons. This is particularly important because behind the credit supply factors responsible for the slowdown and tightened conditions in accessing credit, there might also be the demand factors such as use of internal sources or application to alternative sources of financing.

Moreover, in order to determine whether the banks were too demanding and selective in offering financing, the firms were asked if they applied for a loan and got everything, or only a limited part of it, or were rejected. Appendix 2 presents a clear definition and explanation of what mean credit supply factors and credit demand factors that contributed to the slowdown in loan granting.

T a b l e 2

Credit Applications for the Past 6 Months for 2009 – 2014 (in %)

	Applied	**Did not apply because of a possible rejection**	**Did not apply because of sufficient internal sources**	**Did not apply for other reasons**	**DK/NA**
AT	21.93	2.75	62.01	12.46	0.84
BE	25.99	5.22	50.18	16.89	1.73
DE	22.80	5.09	56.40	15.04	0.66
ES	32.91	7.01	36.48	22.98	0.61
FI	16.81	1.32	59.38	21.82	0.68
FR	31.31	5.87	40.96	21.51	0.36
GR	26.77	13.97	26.44	32.07	0.74
IE	16.20	14.11	49.67	17.44	2.57
IT	32.54	4.96	37.55	24.09	0.86
NL	13.72	9.37	52.40	22.25	2.26
PT	19.97	6.48	32.91	39.32	1.32

Source: Authors calculations using the data provided by SAFE Survey from 2009 to 2014(H1).

Table 2 presents the bank loan applications in the past 6 months from 2009 to 2014 by country. Countries with the highest level of bank loan applications is Spain with 32.91% of firms, followed by Italy with 32.54%, France with 31.31%, Greece with 26.77% and others. Countries with the highest reported percentage of firms that did not apply for a bank loan because of a possible rejection are Ireland with 14.11% and Greece with 13.97%. Some of the presented statistics could be explained by the fact that such countries as Greece, Italy, Spain, Portugal were more affected by the banking sector stresses after the crisis, while such countries as Austria, Finland, Germany and Belgium the low level of applications to external financing is due to sufficient internal sources and a better management of own capital.

Overall, the summary statistics point out at the fact that high proportion of European small businesses are relying on external financing which means that these could be more affected by the financial crisis, and banks could be the main reason for contraction in loans (the so-called, "supply factors"). At the same time, the decrease in credits could be affected in some countries by the high level of sufficient funds and a good management of own capital (the so-called, "demand factors"). However, these statements need further inquiry and investigation.

2.2. Empirical Model

Following Ferrando, Udell and Popov (2015), we used the Difference-in-Difference approach to assess the impact of the recent European sovereign debt crisis on the financing of European SMEs. The analysis focuses on two directions, firstly on testing the effects of the sovereign debt crisis on the small Euro area businesses' access to finance and second on the firm heterogeneity. In order to avoid the heterogeneity across Euro area countries, we divide our sample into two categories: a) stressed countries – the countries that have suffered most from the sovereign debt crisis (Greece, Ireland, Italy, Portugal and Spain and includes 33,294 observations); and b) non-stressed countries – the countries that have been less affected by the crisis (Austria, Belgium, Finland, France, Germany and Netherlands and includes 38,214 observations). Since we are particularly interested in determining the effects of the crisis on the firms' financing, we will focus on stressed economies as the treatment group of countries and use the non-stressed economies as the "control" group. The reasoning behind the categorization and grouping of countries is that the behavior of firms from stressed economies in terms of financing is different from the behavior of firms from non-stressed economies.

In order to determine the consequences of the crisis on the financing of small businesses from stressed economies after the crisis unfolded, we estimate following probability choice model:

$$\Pr(Credit\_constrained = 1) = \varphi(b Post \times Stressed + b Xisct + b\varphi sc + b\eta t + e isct) \quad (1)$$

The dependent variable *credit_constrained* is a dummy variable (binary) equal to 1 in the following cases: a) if firms were discouraged in their bank loan application in the past 6 months due to fear of a possible rejection; b) if firms refused to apply for a bank loan in the past 6 months because of high costs; c) if the firms were rejected by the bank in their loan applications in the past 6 months; and d) if the firms denied bank loan applications in the past 6 months due to sufficient internal funds. Consequently, the dependent variable *credit_constrained* is equal to 0 if: a) firms applied for a bank loan in the past half a year; b) the firms applied for a bank loan in the past 6 months and were granted at their full

request; and c) the firms applied for a bank loan in the past 6 months and were granted at least 75% of their request. The dependent variables enhance the choice of firms to not use external financing, therefore some bank lending constraints.

The variable *stressed* is a dummy variable equal to 1 if the firm *i* is in the sector *s* and from country *c* from one of the stressed economies and equal to 0 if otherwise. *Post* is a dummy variable equal to 1 for the period between 2012 and 2014(H1) or the so-called post-crisis period and equal to 0 for the period between 2009 and 2012, or the pre-crisis period. *Xisct* is a vector of time-varying firm-level control variables; φ*sc* is an interaction of sector and country fixed effects; η*t* is a time fixed effect which corresponds to each survey wave; and e*isct* is an error term.

The vector of firm-specific variables *X* controls for the credit demand considering the age, size, sector in which the firm is operating, turnover, corporate governance as well as the management of the internal sources and of external financing sources. All these indicators are important, since multiple research papers point out to the fact that negative profitability increases the demand for external financing (Almeida and Campello, 2010).

Since we are particularly interested in the effects of the sovereign stress on the financing of SMEs it is important to eliminate the firm heterogeneity effect. Since the firms with different size, age and turnovers behave differently, it is necessary to identify whether this different characteristics affect the need for financing and which firms are more credit constrained than others.

In the second model we estimate a difference in difference in differences model, by creating a triple interaction *Postt* × *Stressedisc* × *Riskisc* , where *Riskisc* is any of the proxies for firm risk discussed above.

$$\Pr(Credit\_constrained = 1) = \varphi(b Post \times Stressed \times Riskisc + b Xisct + b\varphi sc + b\eta t + e isct) \quad (2)$$

This model measures the difference in credit access, right after crisis unfolded as well as the difference between risky and non-risky enterprises from stressed economies versus non-stressed economies. By risk we mean firms that tend to have more uncertain projects, lower quality collateral and increased incidence of going bankrupt. The measure of risk is undertaken from the survey data, therefore allowing us to group firms in terms of their risk profile. Also, in the third model we include country controls, firm-specific controls and time controls.

The categorization of stressed versus non-stressed Euro area countries will allow us to identify the impact of the crisis for small firms from both categories, but will help us understand the effects of the crisis on credit availability from countries that were more exposed by the sovereign debt crisis in comparison with those that were less exposed.

3. Empirical Results

In this section we will present the main findings of the research. We first test the effect of the recent financial crisis on access to finance of small and medium--sized enterprises from Euro area countries.

3.1. The Impact of the Sovereign Debt Crisis on the Access to Finance

Table 3 presents the results from the Probit regression. We test the effects of deteriorated economic outlook on deteriorated access to external financing for firms in stressed countries (Greece, Ireland, Italy, Portugal and Spain) and non--stressed countries (Austria, Belgium, Germany, Finland, France and Netherlands).

T a b l e 3

The Impact of the Sovereign Debt Crisis on the Access to Finance

Dependent variable	**Credit constrained**	
	(1)	(2)
Post × Stressed	0.370**	0.177**
	(3.05)	(3.23)
Size1	0.277***	0.249***
	(3.64)	(4.00)
Size2	0.0290	0.00454
	(0.42)	(4.00)
Age2	0.332	0.233
	(1.93)	(1.54)
Age3	0.493**	0.413***
	(3.19)	(3.40)
Age4	0.239	0.226
	(1.19)	(1.31)
Turnover2	–0.170***	–0.254***
	(–3.55)	(–5.13)
Turnover3	–0.406***	–0.477***
	(–9.28)	(–8.30)
Turnover4	–0.394***	–0.451***
	(–4.47)	(–5.24)
Outlook improved	–0.0287*	–0.0259*
	(–.0147)	(0.0151)
Credit history improved	–0.0763***	–0.0689***
	(0.0203)	(0.0689)
Capital improved	–0.0320	–0.0313
	(0.0224)	(0.0240)
Constant	–1.042***	–1.446***
	(–5.13)	(–11.08)
Country × Industry FEs	NO	YES
R-squared	0.0706	0.1198
No. Observations	14,116	64,116

Note: t statistics in parentheses *p < 0.05, **p < 0.01, ***p < 0.001.

Source: Authors calculations using the data provided by SAFE Survey from 2009 to 2014(H1).

As already mentioned, the dependent variable *credit_constrained* is a dummy variable that is equal to 1 if the firm applied for a bank loan but was rejected by the bank and if the firm applied for a bank loan but refused it due to high costs of

financing, respectively it is equal to 0 if the firm applied for a bank loan and granted the whole amount and if the firm applied for a bank loan and got a part of it. In order to control for firm variables, we included the size of the firms (micro, small and medium sized), the age of the firms (less than 2 years, 2 years and more but less than 5 years, 5 years or more but less than 10 years and 10 years or more) and the turnover of the firms. This is done in order to anticipate the increased heterogeneity across countries that were mostly affected by the debt crisis of those that were less affected and avoid erroneous results. The results are divided into two columns in order to reflect the changes with inclusion of country and industry fixed effects.

Analyzing the results from Table 3, first column we can conclude that stressed economies were mostly affected by the debt crisis. The result is statistically significant at 5% level and economically meaningful as well. More specifically, it implies that 37% of the firms in the researched sample were either rejected on their loan application or their application was accepted but refused by the firm because of high costs. Also, from the obtained results micro firms are most likely to be denied credit, possibly because banks are more selective to micro and small firms due to the fact that these have less collateral and are more opaque. All of the enunciated results above are statistically significant at 1% level. Older firms are less likely to be rejected on their loan application possibly because of their trustworthiness and their lower informational opacity. Firms whose own capital and economic outlook improved within the past 6 months are less likely to be rejected on their loan application or have it refused due to high costs.

The second column from Table 3, again the rate of firms being credit constrained in a stressed economy is 17.7% higher than for firms from a non-stressed country. In order to get representative and reliable data, in the regression are also included size, age, turnover, growth prospects and credit history of the firms. The results are similar to those obtain in the first regression without including the country-industry and time fixed effects and in line with results obtained by Casey and O'Toole (2014) that reveal that the credit constraints is higher in countries that suffered particularly severe financial crises.

In order to identify the main determinants of credit constraint, we run a Probit regression with the dependent variable *Credit_constrained* but include in the estimation the following independent variables: *application_rejected*, *application_refused* (due to high costs), *application_discouraged* (fear of a possible rejection) and *application_denied* (did not apply due to sufficient internal funds). By delimiting the factors that could contribute to credit constrains we can draw important conclusions on the significance of credit demand factors in the contraction of loans.

T a b l e 4

Factors Contributing to Constraints in Accessing Credits

Dependent variable	**Application rejected** (1)	**Application refused** (2)	**Application discouraged** (3)	**Application denied** (4)
Post × Stressed	0.0805 (1.72)	0.0505*** (0.0107)	0.149** (3.20)	0.0502 (1.10)
Firm-specific controls	Included	Included	Included	Included
Country × Industry FEs	Included	Included	Included	Included
No. Observations	17,892	17,892	17,119	17,119
R-squared	0.0732	0.0322	0.0602	0.0346

Note: The variable "stressed" is a dummy variable equal to 1 if the firm is from one of the countries that have been more exposed by the sovereign debt crisis. The variable "Post" stands for the post-crisis period and specifically 2012 – 2014(H1). The firm-specific variables such as size, age and turnover were included in the regressions, as well as country-industry fixed effects. The standard errors are clustered at the country level and appear in the parentheses. *** Denotes statistical significance at 1% level, ** at the 5% level, and * at the 10% level.

Source: Authors calculations using the data provided by SAFE Survey from 2009 to 2014(H1).

Therefore, the regressions estimation' output leads us to the following conclusions: the firms in the stressed countries are most likely to be refused in their bank loan application after the crisis unfolded with a probability of about 5%. The obtained result is statistically significant at 1% level for a sample of 17,892 firms. Another finding of the second regression model is that firms from stressed economies have a probability of almost 15% of not applying to a bank loan (due to the fear of a possible rejection) compared to the firms from the non-stressed economies. The result is statistically significant on a 5% level including a sample of 69,325 firms. Since the independent variables are dummy variables, the selected sample is different in each of the cases. The other variables such as rejected applications and denied applications do not appear to be statistically significant, therefore these are not representative for our study. Our results are in line with Ferrando et al. (2015) that find that sovereign stress had a large negative impact on access to finance even after controlling for a wide variety of firm characteristics.

3.2. Heterogeneity Tests

Since we already took into consideration the increased variation across countries and grouped them into stressed economies and non-stressed economies, it is also important to take into consideration the increased firm heterogeneity for the need and use of external financing. Theory suggests that banks adopt few strategies when according credit to firms. One is the *"flight to quality"*, which supposes that banks reduce credit allocation to less creditworthy borrowers (to this regard we already included firm-specific controls such as size, age, turnover, improved credit history, better profits and we obtained reliable results), such firms defined in some research papers as informationally opaque and risky (Albertazzi and Marchetti,

2010). As a basic feature, small businesses tend to have lower quality collateral, an increased incidence of going bankrupt comparing to large businesses and more uncertain projects. Even so, specifically micro and small firms are mostly reliable on external financing and these suffer most from constraints imposed by banks, especially during a financial shock affecting the economy as a whole.

In order to make sure there is were not omitted any important factors and at the same time gauge the differential impact of the crisis on firms of different riskiness in stressed economies (as these were mostly affected by the crisis) we further estimate a difference in difference in differences model, by creating a triple interaction *Postt* × *Stressedisc* × *Riskisc*, where *Riskisc* is any of the proxies for firm risk discussed above. This model measures the difference in credit access, right after crisis unfolded as well as the difference between risky and non-risky enterprises from stressed economies versus non-stressed economies. Table 5 presents the results with inclusion of the later model in the main test. In the regressions were also included the firm-specific controls, country and industry fixed effects and time controls. The obtained results are significant and economically meaningful too.

T a b l e 5

Firm' Heterogeneity in Stressed Economies in the Post-crisis Period

Dependent variable	**Credit constrained** (1)	**Application discouraged** (2)	**Application denied** (3)	**Application refused** (4)	**Application rejected** (5)
Stressed × Post × Outlook improved	–0.124 (–1.64)	–0.0113 (–0.26)	–0.0339 (–1.16)	–0.00813 (–0.07)	–0.160* (–2.28)
Stressed × Post × Capital better	–0.175* (–2.32)	–0.0883 (0.0545)	0.0869** (0.0204)	–0.0100 (–0.08)	0.0326 (0.0425)
Stressed × Post × Credit history improved	–0.175* (–2.32)	–0.0944* (–2.05)	0.0331 (1.12)	–0.0294 (–0.23)	–0.169* (–2.46)
Firm-specific controls	Included	Included	Included	Included	Included
Country × Industry FEs	Included	Included	Included	Included	Included
Time controls	Included	Included	Included	Included	Included
No. Observations	14,116	17,119	17,119	17,892	17,892
R-squared	0.1065	0.0606	0.0392	0.0391	0.0752

Note: '*Post'* is a dummy variable equal to 1 if the time period is related to 2012 – 2014(H1) or the after sovereign debt crisis period and is equal to 0 if the period is between 2009 – 2012, or before the sovereign debt crisis unfolded; '*stressed'* is a dummy variable if the firms are from one of the countries mostly exposed by the sovereign debt crisis; '*capital better'* is a dummy variable if the firms have reported improved capital in the past half a year; '*credit history better'* is a dummy variable equal to 1 if the firms have reported improved credit history in the past half a year; '*outlook better'* is a dummy variable equal to 1 if the firms have indicated improved economic outlook in the past half a year. All regressions include fixed effects as mentioned above. Standard errors are clustered at the country level and are indicated in the parentheses. *** Denotes statistic significance at 1% level, ** at the 5% level, and * at the 10% level.

Source: Authors calculations using the data provided by SAFE Survey from 2009 to 2014(H1).

Therefore, we find that stressed firms with an improved economic outlook over the last 6 months are less likely to be rejected on their loan application, on average with 16% less than firms with unchanged economic outlook within the

last half a year. The result is statistically significant at 10% level on a sample of 17,892 firms. Another finding is that stressed firms with improved capital over the last half a year are less likely to be credit constrained. The result is statistically significant at 10% level on a sample of 14,116 firms. Also stressed firms with improved capital over the last half a year are 8.7% more likely to refuse the loan application due to sufficient internal funds. Another finding at this point is that stressed firms in the post crisis period that have improved their credit history in the past 6 months are on average 17.5% less likely to be credit constrained, as well as 9.44% less likely to avoid external financing due to high costs and 16.9% less likely to have their loan application rejected.

3.3. Robustness Check

As a robustness check, we tested if the firms were more credit constrained after the sovereign debt crisis in the stressed countries versus the non-stressed countries by using the logistic model.

T a b l e 6

Robustness Check Using the Logistic Model

Dependent variable	**Credit constrained**	
	(1)	(2)
Post × Stressed	0.649**	0.344***
	(3.16)	(3.38)
Size1	0.487***	0.453***
	(3.65)	(4.11)
Size2	0.0596	0.0272
	(0.47)	(0.25)
Age2	0.567	0.405
	(1.88)	(1.53)
Age3	0.869***	0.736***
	(3.15)	(3.38)
Age4	0.379	0.398
	(1.10)	(1.35)
Turnover2	–0.272***	–0.418***
	(–3.67)	(–5.44)
Turnover3	–0.721***	–0.834***
	(–9.05)	(–7.99)
Turnover4	–0.672***	–0.776***
	(–3.96)	(–4.57)
Outlook improved	–0.539**	–0.540***
	(–3.21)	(–3.52)
Credit history improved	–0.354***	–0.308***
	(–3.32)	(–4.73)
Capital improved	–0.463***	–0.440***
	(–4.68)	(–5.72)
Constant	–1.760***	–2.536***
	(–4.84)	(–10.87)
Country × Industry FEs	NO	YES
R-squared	0.0691	0.1157
No. Observations	14,116	14,116

Note: t statistics in parentheses *p < 0.05, **p < 0.01, ***p < 0.001.

Source: Authors calculations using the data provided by SAFE Survey from 2009 to 2014(H1).

The robustness check is important for ensuring that the obtained results are not sensitive to the selection of the distributional assumptions. The results are listed in the table 6 and these hold for all cases.

As in the Probit regression model, we estimated the results first by not including country-industry fixed effects in the regression (first column) and second by including them (second column). We obtained that firms are most likely to be credit constrained after the crisis if they are domiciled in one of the stressed countries (Greece, Ireland, Italy, Portugal and Spain) with a probability of about 65%. The result is statistically significant at 1% level covering a sample of 14,116 firms. If including the country-industry fixed effects, we obtain that firms domiciled in one of the stressed countries have a probability of being credit constrained of 34.4%, which is statistically significant at 1% level. Also, micro and younger firms are most likely to be credit constrained than small and medium-sized and older firms. The same results are found in the first model, which points out at the idea that the obtained results hold.

Conclusions

The present paper examines the effects of the sovereign stress on the European SME's access to finance. Particularly, the main focus of the paper was pointed to whether firms in stressed economies from Euro area (Greece, Ireland, Italy, Portugal and Spain) have experienced a higher reduction in access to bank loans comparing to the period before sovereign debt crisis unfolded. The paper did not focused on how did firms reacted to the effects of the crisis and switch to other sources of financing, but whether banks during a shock are to blame in the reduction of credit.

The main findings of the paper are as follows: the firms in the stressed countries are most likely to be refused in their bank loan application after the crisis unfolded with a probability of about 5% versus the non-stressed economies. Also, firms from stressed economies have a probability of almost 15% of not applying to a bank loan (due to the fear of a possible rejection) compared to the firms from the non-stressed economies which leads us to the idea that the supply factors were prominent in contraction of loans, especially in Euro area countries that had suffered most from sovereign debt crisis. In order to make sure the results are conclusive and eloquent, we performed a robustness check by using a Logit regression estimation and the obtained results hold.

After analyzing the impact of the sovereign debt crisis on the financing of European small and medium sized enterprises we can state that credit supply factors played the most important role in credit availability to small firms. Also,

the firms from Euro area countries that were mostly affected by the crisis have been more restricted in access to finance than those from non-stressed countries.

This paper brings additional insights to the existing literature regarding the effects of the crisis on financing of small businesses. Even so, to the best of our knowledge, there is no research paper that focuses solely on the effect of the crisis on the most stressed Euro area economies versus the non-stressed economies. This distinction is very important, since the results would be erroneous by taking into account all the Euro area countries, especially taking into consideration the increased heterogeneity across Euro area countries.

One limit of our research is that we did not include in our analysis information relating to the interest rates changes, banking sector concentration or borrower-lender relationship. In terms of further research, characteristics of the borrower-lender relationship such as the number of banks that the firms have contracts with or the length of the relationship could be employed. The amount of collateral pledged by the business entity could also bring interesting results. Additionally, the configuration of the banking sector (types of banks) of each country could be analyzed, in order to depict a deeper decomposition of the credit rationing faced by the SMEs in their path of finding external financing for their operations.

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Appendix 1

Definition of the Main Indicators

Indicator	Definition
a) Credit constrained	Indicator = 1 if firms were discouraged in their bank loan application in the past 6 months due to fear of a possible rejection; if the firms refused to apply for a bank loan in the past 6 months because of high costs; if the firms have been rejected by the bank in attempt to obtain credit over the past 6 months; and if the firms denied bank loan applications in the past 6 months due to sufficient internal funds. Indicator = 0 if firms applied for bank loans since the last wave of survey; if the firms applied for bank loans in the past 6 months and were granted at their full request; and if the firms applied for a bank loan in the past 6 months and were granted at least 75% of their request.
b) Application denied	Indicator = 1 if firms did not apply for a bank loan in the past 6 months because of sufficient internal sources. Indicator = 0 if firms applied for bank loans.
c) Application rejected	Indicator = 1 if firms applied for a bank loan in the past 6 months and were rejected. Indicator = 0 if firms applied for a bank loan and were granted.
d) Application refused	Indicator = 1 if firms applied for a bank loan in the past 6 months and were granted a loan but refused it due to high costs (credit-rationed firms). Indicator = 0 if the firms used the bank loan.
e) Application discouraged	Indicator = 1 if firms did not apply for a bank loan in the past 6 months due to fear of a possible rejection. Indicator = 0 if firms applied for bank loans.

Note: The variables are derived from the data provided by SAFE Survey from 2009 to 2014(H1).

Source: Authors based on the SAFE Survey.

Appendix 2

Definition of Credit Supply and Demand Factors

Factors	Definition
Credit supply factors	In the analyzed context, credit supply factors refer to loan rejection, increased interest rate and cost of financing, deteriorated availability of credits, decreased willingness of banks to provide credits and accepted loan applications but refused by firms due to increased costs of financing. All these factors contribute to the decrease in loans
Credit demand factors	In the analyzed context credit demand factors refer to the firms' reasons of not using external financing due to sufficient internal sources, restrained expansion plans and other reasons.

Note: Clarification of defined terms is important for making correct statements and avoiding misinterpretations. These were derived from the data provided by SAFE Survey from 2009 to 2014(H1).

Source: Authors based on the SAFE Survey.

Appendix 3

Variable Definitions

Variable	Definition	Sources
Credit constrained	Dummy variable equal to 1 if firms were discouraged to apply for a bank loan in the past half a year due to fear of a possible rejection; if the firms refused credit application in the past half a year because of high costs; if the firms were rejected in their credit application in the past half a year; and if the firms denied credit application in the past half a year due to sufficient internal funds. Credit_constrained = 0 if the firms applied for a bank loan in the past half a year; if the firms applied for a credit in the past 6 months and were granted at their full request; and if the firms applied for a bank loan in the past 6 months and were granted at least 75% of their request.	ECB SAFE Survey
Application denied	Dummy variable equal to 1 if firms did not intend to apply for a credit in the past half a year because of sufficient internal sources; equal to 0 if firms applied for a credit.	ECB SAFE Survey
Application discouraged	Dummy variable equal to 1 if firms did not apply for a bank loan in the past 6 months due to fear of a possible rejection, equal to 0 if the firms applied for a credit over the same period.	ECB SAFE Survey
Application refused	Dummy variable equal to 1 if firms applied for credit in the past half a year and obtained it but had to refuse because of high costs (credit-rationed firms); equal to 0 if otherwise.	ECB SAFE Survey
Application rejected	Dummy variable equal to 1 if firms applied for a credit in the past half a year but were rejected by the bank; equal to 0 if firms applied for a credit and obtained it.	ECB SAFE Survey
Size	'Size1' is equal to 1 if the firm engages from 1 to 9 employees. 'Size2' is equal to 1 if the firm engages from 10 to 49 employees. 'Size3' is equal to 1 if the firm engages from 50 to 259 employees.	ECB SAFE Survey
Age	'Age1' is equal to 1 if the firm activates for less than 2 years. 'Age2' is equal to 1 if the firm activates for more than 2 but less than 5 years. 'Age3' is equal to 1 if the firm activates for more than 5 years but less than 10 years. 'Age4' is equal to 1 if the firm activates for more than 10 years.	ECB SAFE Survey
Turnover	'Turnover1' is equal to 1 if the firm's annual turnover is less than EUR 2 mln. 'Turnover2' is equal to 1 if the firm's annual turnover is more than EUR 2 mln and less than EUR 5 mln. 'Turnover3' is equal to 1 if the firm's annual turnover is more than EUR 5 mln and less than EUR 10 mln. 'Turnover4' is equal to 1 if the firm's annual turnover is more than EUR 10 mln.	ECB SAFE Survey
Outlook improved	Dummy variable equal to 1 if the firm has reported that its outlook has improved in the past half a year.	ECB SAFE Survey
Credit history improved	Dummy variable equal to 1 if the firm has reported that its credit history has improved in the past half a year.	ECB SAFE Survey
Capital improved	Dummy variable equal to 1 if the firm has reported that its own capital has improved in the past half a year.	ECB SAFE Survey
Stressed	Dummy variable equal to 1 if the firm is from one of Euro area countries mostly exposed by the crisis (Greece, Ireland, Italy, Portugal or Spain).	ECB SAFE Survey
Post	Dummy variable equal to 1 if the period corresponds to the after sovereign debt crisis period and specifically, 2012 – 2014(H1).	ECB SAFE Survey

Source: Authors based on the SAFE Survey.

Appendix 4

Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Credit constrained	14,116	.1795835	.3838537	0	1
Application discouraged	17,119	.0654165	.2472612	0	1
Application denied	17,119	.4470105	.4971878	0	1
Application refused	17,892	.0238095	.1524596	0	1
Application rejected	17,892	.1178739	.3224678	0	1
Outlook improved	72,138	.1377637	.3446542	0	1
Credit history improved	72,138	.2043445	.4032246	0	1
Own capital better	72,138	.2407330	.4275315	0	1
Stressed	72,138	.4702653	.4991185	0	1
Size1	72,138	.3719676	.4833332	0	1
Size2	72,138	.3553883	.4786341	0	1
Size3	72,138	.2726441	.4453224	0	1
Age1	72,138	.7430480	.4369557	0	1
Age2	72,138	.1339793	.3406325	0	1
Age3	72,138	.0701433	.2553902	0	1
Age4	72,138	.0205024	.1417120	0	1
Turnover1	72,138	.4455488	.4970297	0	1
Turnover2	72,138	.2706479	.4442976	0	1
Turnover3	72,138	.1607613	.3673132	0	1
Turnover4	72,138	.0306357	.1723299	0	1

Source: Authors calculations using the data provided by SAFE Survey from 2009 to 2014(H1).