Did the bank capital relief induced by the Supporting Factor enhance SME lending?*

Sergio Mayordomo
Banco de España

María Rodríguez-Moreno**
Banco de España

Abstract

The introduction of the SME Supporting Factor (SF) allows banks to reduce capital requirements for credit risk on exposures to SME. This means that banks can free up capital resources that can be redeployed in the form of new loans. Our study documents that the SF alleviates credit rationing for medium-sized firms that are eligible for the application of the SF but not for micro/small firms. These results suggest that European banks were aware of this policy measure and optimized both their regulatory capital and their credit exposures by granting loans to the medium-sized firms, which are safer than micro/small firms.

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* Mayordomo: Banco de España, ADG Economics and Research, C/ Alcalá 48, 28014, Madrid, Spain. Email: sergio.mayordomo@bde.es. Rodríguez-Moreno: Banco de España, Financial Stability Department, C/ Alcalá 48, 28014, Madrid, Spain. Email: maria.rodriguezmoreno@bde.es. We are very grateful for comments from Natalia Andries, Henrique Basso, Roberto Blanco, Ángel Estrada, Miguel García-Posada, Gabriel Jiménez, Germán López-Espinosa, Javier Mencía, Enrique Moral-Benito, Antonio Moreno, Steven Ongena, Omar Rachedi, Carlos Trucharte, Jorge de Velasco, as well as audiences at the Fourth Research Workshop of the MPC Task Force on Banking Analysis for Monetary Policy (Oesterreichische Nationalbank) and the Financial Stability Department Internal Seminar (Banco de España). The views expressed in this paper are those of the authors and do not necessarily coincide with those of the Banco de España and the Eurosystem.

** Corresponding author.

1. Introduction

Article 501(1) of the Capital Requirements Regulation (CRR) introduces the small and medium enterprises (SME) Supporting Factor (SF) according to which "capital requirements for credit risk on exposures to SMEs shall be multiplied by the factor 0.7619". This capital discount was introduced in January 2014 for all EU countries except Spain, which introduced the SF in September 2013 through national legislation. The firms that qualify for this capital requirement deduction are those with a turnover of below 50 million of Euros. As stated in the European Banking Authority (EBA) (2016) report, the purpose of this deduction is to allow credit institutions to increase lending to SMEs following the crisis, and to alleviate regulatory changes, such as the Capital Conservation Buffer (CCB), that were expected to have a negative impact on SME lending. After the implementation of the CCB, banks had to hold a minimum capital requirement of 8% plus an additional CCB of 2.5% of their risk weighted exposures. The implementation of the SME SF, which is equal to the ratio 8 over 10.5, required that banks held a total of 8% of their risk weighted exposures to SME, cancelling out the impact of the CCB.

The introduction of the SME SF brought about a mechanical increase in the capital ratios as a result of applying the deduction on the SME exposures already held by the institutions and the new loans granted to SMEs. This means that banks freed up capital resources that could be redeployed in the form of new loans. According the EBA (2016) estimations, the capital relief resulting from the implementation of the SME SF led to an increase of 0.16 percentage points of an average Core Equity Tier 1 ratio of 13.1% and a decrease of the minimum capital requirements of EUR 11.7 billion as of the third quarter of 2015. However, the SF is a temporary measure rather than a permanent mechanism to alleviate the effects of lending to SMEs during the crisis and it is intended to be gradually withdrawn as the economy recovers. For this reason, it seems necessary to gain a thorough understanding of its effects on the credit flows to SMEs.

Our paper aims to contribute to the discussion on the need and effectiveness of the SF on SME lending by answering the following questions. Does the SF reduce the credit constraints suffered by the SME to obtain funding? Is the SF more effective for specific types of SME? Our analysis based on the Survey on the Access to Finance of Enterprises (SAFE) documents an ease in credit constraints faced by medium-sized firms after the introduction of the SF. As a complementary experiment, we conduct an analysis based on Spanish bank-firm matched microdata in which the treatment group consists of firms that, according to their exposure to each specific bank, are effectively eligible for the application of the SF. Although it is restricted to Spain, the unique dataset employed in this analysis enables us to discard the effect of potential confounding events, to study the effect of the SF on banks' credit supply depending on their capital ratios, and to perform a regression discontinuity design for a better estimation of the causal impact of the SF. In sum, these analyses support the effectiveness of the SF.

There is extensive literature studying the effect of capital requirements on bank lending. Although higher capital requirements enhance financial stability and make bank lending more stable over time, they could also damage credit supply leading to a significant credit contraction (Francis and Osborne, 2009; Cosimano and Hakura, 2011; Hyun and Rhee, 2011; Aiyar, Calomiris, and Wieladek, 2014 and 2016; Bridges, Gregory, Nielsen, Pezzini, Radia, and Spaltro, 2014; Schoenmaker and Peek, 2014; Fraisse, Lé, and Thesmar, 2015; Mésonnier and Monks, 2015; De Jonghe, Dewachter, and Ongena, 2016; among others). At this respect, Fraisse, Lé, and Thesmar (2015) report that an increase of one percentage point in capital requirements reduces lending by 10% based on loans extended by French banks to French firms over the 2008-2011 period. This effect is especially harmful during the recent crisis and particularly so for small firms, which are highly dependent on bank lending, and even more problematic if those firms are dependent on banks with low capital ratios and with recorded losses on financial assets (Popov and Udell, 2012). The scenario we are analyzing is the one in which the SF offers a capital

requirement deduction from the existing and new loans to SMEs. In this context, we document that banks increased lending to a specific segment of SMEs that led to lower capital requirements: medium-sized firms.

Besides the role of capital requirements on lending, there is another line of research that examines the impact of capital requirements on bank risk-taking. One stream of this literature supports the idea that under certain circumstances capital requirement is effective in controlling risk-taking incentives (Furlong and Keeley, 1989; Rochet, 1992; Repullo, 2004). More concretely, Berger and Udell (1994) and Albertazzi and Marchetti (2010) note that when banks face higher capital requirements they cut lending to the riskier borrowers. De Haan and Klomp (2012) find that capital regulation reduces 'capital and asset risk' of banks and Barth, Caprio, and Levine (2004) document that banks facing more stringent capital regulations have fewer nonperforming loans. However, another stream of the literature states that more stringent capital regulation may lead to higher bank risk-taking (Blum, 1999) although this could depend on the initial capital position of banks and the stringency of the capital rules (Calem and Rob, 1999). We add to this literature, examining a regulatory change that alleviates banks capital ratios and show evidence which suggests that lower capital requirements do not necessarily lead to higher risk taking. In fact, we reveal that less stringent capital requirements led to lower risk taking given that credit flowed to medium-sized firms, which are known to be less risky than micro-small firms (see EBA, 2016). Moreover, credit flowed more to medium-sized firms than to other larger firms whose loans were able to benefit from the SF but which were less productive than medium-sized firms.

In 2014, there were 22.3 million active SMEs in the non-financial business sector of the European Union (EU). These firms employed almost 90 million people and generated more than EUR 3.7 trillion in added value. SMEs can usually only access capital through banks and so they are highly vulnerable to banking crises compared to firms with alternative sources of capital

(Chava and Purnanandam, 2011). This evidence emphasizes the role of SME finance in real economic activity and the negative effect that credit rationing could have on it. Thus, Duygan-Bump, Levkov, and Montoriol-Garriga (2015) find that small businesses were laying off workers in the 2007-2009 recession in the United States due to credit constraints. Given the importance of SMEs in the real economy our analysis suggests that the decision to eliminate the SF should be carefully reviewed given that its positive effects on SMEs access to funding could vanish, ultimately affecting employment and investment.

The existing evidence on the effectiveness of the SF is rather mixed. EBA (2016) conducted an exercise to evaluate the effectiveness of the SF and failed to "identify any increase in access to finance for SMEs relative to large firms following the introduction of the SME SF". As a response to the EBA discussion paper, the European Banking Federation (EBF) performed a descriptive analysis according to which it is not obvious that the effect of the SF is so negligible.[1] In this context, our paper studies in detail all the factors associated with the implementation of the SF and conducts further and new analyses which provide fresh evidence that makes its positive effects on SME lending clearly visible. We document that this effect is not consistently positive across the different groups of SMEs due to its heterogeneity. Specifically, the SF contributes strongly to alleviating credit rationing faced by medium-sized firms but not by micro/small firms; consistent with the idea that banks optimize their regulatory capital by granting loans to those SME that require less capital (i.e., with lower RWA) and which, moreover, present less risk.

From a different angle, Dietsch, Düllmann, Fraisse, Koziol and Ott (2016) find that the SF may be justified for SMEs in the Advanced Internal Rating Based (IRBA) corporate exposure class, given that the current IRBA calibration is conservative compared to the riskiness of these exposures. The

[1] The EBF's message is in line with the one presented in the Bank of Spain Financial Stability Report 05/2014.

authors find that it is also justified under the Standardized Approach (SA) for both corporate and retail exposure classes. Our results, complemented with the ones obtained by Dietsch, Düllmann, Fraisse, Koziol and Ott (2016), provide detailed evidence supporting the correct functioning of the SF and give support for its implementation and maintenance. However, it is essential to monitor its effectiveness to understand how it is currently functioning. Some potential variations could be considered based on the firms to which it applies. In addition, further measures are needed to guarantee the extension of lending to all types of SMEs (i.e., not only medium-sized firms).

The remainder of this paper is organized as follows. Section 2 describes the data and the main variables employed in our analysis. Sections 3 and 4 present the methodology and the results, for different identification strategies, on the impact of the SF on SME lending. Section 5 contains the results for an experiment based on Spanish bank-firm level data. Section 6 concludes.

2. Data

Our primary dataset is the Survey on the Access to Finance of Enterprises (SAFE) that is conducted on behalf of the European Commission (EC) and the European Central Bank (ECB). The microdata for the SAFE are collected through a survey of companies in the European Union and contain comparable, timely, and frequent data on the access to finance of these enterprises. This survey has been available since 2009 on a semiannual basis being the first wave of the survey held in June-July 2009. The SAFE is run by the ECB every six months for a limited number of euro area countries (12 countries)[2] whereas the more comprehensive survey, run in

[2] The countries covered in the ECB round are: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, and Spain. Since 2014 Slovakia has been included in the sample in each survey round, while initially it was included only every two years (2009H1, 2011H1 and 2013H1). The smallest countries in the euro area (i.e., Estonia, Cyprus, Latvia, Lithuania, Luxembourg, Malta and Slovenia) were

cooperation with the EC, covers all EU countries plus some neighboring countries totaling 28 countries.[3] The survey that covers all EU countries was initially conducted every two years (in the first half of 2009 and 2011) but since the first half of 2013 it has been conducted once a year, in October, whereas the ECB round is conducted around April. Each wave of the survey collects information on the funding needs and financing constraints faced by micro, small, medium-sized and large firms during the six months under study. In fact, large firms were included to make it possible to compare developments for SMEs with those for large enterprises. The firms in the sample are selected randomly and the sample is stratified by country, enterprise size class and economic activity. The number of firms in each of these strata was adjusted to increase the accuracy of the survey across activities and size classes. Moreover, the survey provides weights to guarantee that the proportions of each type of firm in terms of their size, industry and country are similar to their economic weight, which is measured based on the number of persons employed.[4]

2.1. Sample selection

The baseline analysis focuses on those firms that applied for a loan or for a credit line (or both) in the six months prior to the survey date. Thus, we exclude those firms answering that did not apply for a loan or credit line, reject them because they are too costly, or those for which the resolution is still pending or missing.[5] This is to guarantee that our analysis evaluates

excluded because they represent less than 3% of the total number of employees in the euro area, which suggests a very marginal impact on the results for the euro area as a whole.

[3] The list of countries covered in this round consists of those covered in the ECB round plus the small euro area countries plus Bulgaria, Croatia, Czech Republic, Denmark, Hungary, Poland, Romania, Sweden, and United Kingdom.

[4] For more details see the ECB SAFE-survey methodological information on the survey and user guide for the anonymized micro dataset: https://www.ecb.europa.eu/stats/pdf/surveys/sme/methodological_information_survey_and_user_guide.pdf?90b92a69548b7bb76fa4fe96f68acdd3

[5] The detailed question (and answer) of the SAFE questionnaire used to select the firms in the sample is Q7A: https://www.ecb.europa.eu/stats/pdf/surveys/sme/SME_survey_Questionnaire_publication201411.pdf?0bda6a4ff53af3a13b781a5abfe6f693 .

the effects of the SF implementation exclusively from the supply side rather on self-rationing.

Given that the SME SF was implemented in early 2014 in all EU countries, apart from Spain (September 2013), our baseline sample consists of EU countries among which Spain is not included (EU-27). This sample consists of two waves: the ninth wave that covers the pre-SF period (April – September 2013) and the eleventh wave that covers the post-SF period (April – September 2014). We exclude Spain from this sample because the SME SF was implemented four months earlier than the other EU countries and the eighth and tenth waves (i.e., the waves that strictly define the pre- and post-SF period for Spain) are only available for the euro area (EA) countries. We exclude the tenth wave because it covers both pre- and post-SF periods.

The time span used in the baseline sample is determined by the existence of other coetaneous events. Besides the effectiveness of the SF, credit supply and credit conditions could also have been affected by the coetaneous non-standard monetary policies adopted by the ECB. Thus, in August 2012, the ECB announced that it would undertake Outright Monetary Transactions (OMT), if certain conditions were met, in secondary sovereign bond markets aimed "at safeguarding an appropriate monetary policy transmission and the singleness of the monetary policy". In fact, Ferrando, Popov, and Udell (2016a) find that the ECB's OMT program had an immediate positive impact on access to finance during the first six months after its announcement in countries that were affected more severely by the crisis. However, this announcement was made eight months before the beginning of our sample period and as of the end of our sample period, OMT had not yet been put into action. Moreover, if it were the case that OMT exhibited a positive effect on bank lending, they should affect SMEs and large firms in a similar way.

In addition, in 2013, the EU adopted a legislative package to strengthen the regulation of the banking sector and to implement the Basel III agreement

in the EU legal framework. This package came into force as of 1st January 2014. The main changes included in this package are the ones in the level of capital requirements and the quality of capital. Changes relating to the quality of capital were implemented in 2014 (i.e., in conjunction with the SME SF) while most of the new provisions relating to the quantity of capital are to be phased-in between 2016 and 2019. Changes in the quality of capital could impact on the banks' cost of capital, which is directly transferred in the form of higher lending rates and lower lending volumes. Although the SME SF and the changes in the quality of capital derived from Basel III are introduced simultaneously, they cannot be considered as confounding events since: i) their potential impacts on the lending volumes go in the opposite direction and ii) the SME SF only affects SMEs whereas the other measure does not target a specific segment of firms.

Finally, in June 2014, the ECB announced the introduction of the Targeted Longer-Term Refinancing Operations (TLTROs) whose primary objective was to improve bank lending to the euro area's non-financial private sector. This program was designed in a series of eight operations conducted at quarterly intervals starting at the end of September 2014, just at the very end of the eleventh wave. As it occurs with the OMT, this program should affect similarly both SMEs and large firms.

The implementation of these additional measures and programs that may have an impact on lending could blur the effects associated with the SF and make it difficult to disentangle the specific supply side shifts through econometric modelling. For that reason, and to avoid the results from being clouded by the role of those measures, we restrict the baseline sample and the corresponding analyses to the SAFE waves around the SF (i.e., waves nine and eleven). By restricting the sample period to include just the waves immediately before and after the SF, we can be confident that the effect identified is that inherent to the SF. In addition, we dedicate Section 5 to rule out the possibility that our results are affected by confounding effects

based on a dataset that contains the monthly outstanding balances of credit that a given Spanish firm has in a given Spanish bank.

In addition and to study the effect of the SF on firms in the EA, we use a second sample that consists of firms in 10 EA countries among which Spain is not included for comparability reasons (EA-10). In this sample, we also use the ninth and the eleventh waves for the pre- and post-SF period, respectively. The set of countries is the same, excluding Spain, used in the EBA (2016) report and in other recent papers that use SAFE to study firm's access to finance such as Casey and O'Toole, (2014) or Ferrando, Popov, and Udell (2016a, 2016b), among others.

Finally and to show that the results are not driven by the exclusion of Spain, we use a third sample for an extended analysis of the EA countries among which Spain is now included (EA-11). Given that the SF was applied in Spain earlier than in the rest of Europe, we exclude the ninth wave for Spain. Thus, to have observations for Spanish firms in the pre-SF period, the sample includes the eighth and ninth waves for the pre-SF period (October 2012 – September 2013) and the eleventh and twelfth waves for the post-SF period (April 2014 – March 2015).

2.2. Variables and descriptive statistics

2.2.1. Firm size

We classify a given firm as an SME based on the European Commission Recommendation 2003/361/EC of 6 May 2003 according to which the category of SMEs is made up of enterprises which employ fewer than 250 persons and have an annual turnover that does not exceed EUR 50 million. The SME category is further split into two categories micro/small and medium-sized firms. The former category is composed of those enterprises which employ fewer than 50 persons and whose annual turnover does not exceed EUR 10 million whereas the medium-sized category consists of the rest of the SMEs. The rest of the firms are considered as large firms according to this criterion.

In the application of the SF large firms could benefit from the SF whenever their turnover does not exceed EUR 50 million. We exclude those firms from the baseline analysis in order to isolate the impact of the SF on SMEs. Otherwise, the treatment group would not be formed exclusively by SMEs or the control group would be contaminated by large firms that could be potential benefactors of the SF but that exhibit a low turnover. In addition, we exclude from the sample all listed firms because they have access to alternative sources of funding and those firms for which we do not have information either about the turnover or the number of employees and so, cannot be classified according to the size criterion. We deal with those large firms with access to the SME SF in Section 3.3.2 and with listed firms in Section 3.3.3 to provide further evidence and robustness on the effect of the SME SF.

Table 1 reports the descriptive statistics for the three samples depending on the coverage of countries detailed before. The statistics are obtained using weights designed to restore the proportions of the economic weight of each size class, economic activity, and country. The descriptive statistics are fully consistent across the three samples. Thus, we observe that around 70% of the firms in the three alternative samples can be classified as SMEs according to the European Commission Recommendation. Around 20% of the firms in the three alternative samples can be classified as medium-sized firms while around 50% of the firms are micro/ small firms.

[Insert Table 1 here]

2.2.2. Firm financial constraints

The dependent variable in our analysis (D. Credit Constrained) is a dummy that equals one when the firm is constrained and zero otherwise. In line with Casey and O'Toole (2014), we consider that a firm is constrained when it applied and tried to negotiate for any loan/credit line contract over the past six month and the application was rejected or only received a limited part of it (between 1% and 74%). Hence, the unconstrained firms are those

companies that apply for a loan or a credit line and received more than 75% of the amount requested.[6] As can be observed in Table 1 for the three alternative samples, around 19% of the firms are constrained in the three alternative samples.

We exclude from the sample those firms that: i) refuse the loan/credit line because it was too costly; or ii) do not apply for a loan/credit line because of possible rejection. The first case refers to those situations in which the bank accepts the loan application but charging an interest rate that is supposed to be high according to the firm standards. These firms are not necessarily credit constrained and they could reject the loan because their investment opportunities do not provide a positive net present value given the interest rate offered by the bank. Indeed, only 3% of the companies refused the loan/credit line because it was too costly. The second case refers to those firms that do not apply for a loan/credit line because they consider that their application will be denied. However, the bank did not reject the credit application and our interest is to understand the role of the SF on bank credit supply. Moreover, it is very difficult to claim that the SMEs were aware of the existence of the SF, and the potential advantages that it could have on their access to credit and their credit supply.

2.2.3. Firm characteristics

The SAFE also provides information on the firm age, its financial autonomy, financial health, and ownership. Due to the nature of the information in the survey, firm characteristics are identified by means of dummy variables which are denoted with the prefix D. before the definition of the variables.

Thus, we use dummy variables corresponding to four intervals referring to the firm age: less than 2 years (*D.Age<2*), between 2 and 5 years (*D.5>Age>2*), between 5 and 10 years (*D.10>Age>5*), and more than 10 years (*D.Age>10*). Besides the firm age, this variable can be understood as a proxy

[6] The specific question (and answer) of the SAFE questionnaire used to define the dependent variable is Q7B.

for relationship lending since the older firms are more probable to have had previous interactions with the bank. The vast majority of firms in the baseline sample (80%) were registered more than 10 years ago whereas the proportion of young firms, registered in the two years previous to the date in which the survey was conducted, is very low (2%).

We use two dummy variables that define the nature of the firm: individual or family firm (*D.Individual or Family Firm*) and autonomous (*D.Autonomous*). The first one distinguishes between individual or family firms and other type of firms. The second variable distinguishes between autonomous profit-oriented enterprises and subsidiary firms. According to Table 1 and as expected, given the dominance of SMEs, most of firms in the sample are individual or family firms (83%) and autonomous profit-oriented enterprises (90%).

To control for the firm credit quality we use a series of dummy variables that take value one in the case that the firm capital has improved (*D. Firm Capital Improved*) or the firm economic outlook have improved (*D. Firm Economic Outlook Improved*), and zero otherwise. In addition, we use two dummy variables that are equal to one in the case that the firm credit history (interest expenses) deteriorates (decreases) and zero otherwise.[7] The last two dummy variables are denoted as *D. Firm Credit History Deteriorated* and *D. Firm Interest Expenses Decreased*, respectively. We observe from the three alternative samples that around 30% (19%) of firms improved their capital (firm economic outlook) while around 24% of firms benefited from lower interest expenses. In addition, only 16% of firms suffered from the deterioration of their credit history.

The SAFE survey also provides information relative to the sector in which the firms operate. Firms are classified in four sectors: industry, construction, trade and services. According to the published results of the survey for the ninth and eleventh waves, around the 34% of firms belong to

[7] The interest expense is defined as the difference between the interests that the firm pays for its debts minus the interest the firm receives for its assets.

the sector services; industry and trade sectors cover around 27% of firms each; while 11% of firms belong to the construction sector. However, in the application of the statistical disclosure controls, microdata are anonymized for large firms. Thus, while we observe the sector of individual SMEs, this information is not available for large firms. For that reason, we do not use the sector in the baseline analysis as an additional control variable in the form of fixed effects; given that besides the sectorial effect it could reflect a size effect that is the one we aim to capture in our analysis with the variables defined for such purpose.[8]

2.2.4. Country characteristics

We also include a set of country specific variables that enables us to control for the country economic activity and the main characteristics of the banking sector. Concretely, the economic activity is proxied by the GDP growth and the leverage of the private sector measured through the private debt to GDP ratio. The banking sector is characterized in terms of its efficiency through the cost-to-income ratio and its riskiness measured from the problem loans to gross customer loans. We observe sizeable differences across countries. For example, the leverage ratio ranges from 52% (Lithuania) to 328% (Luxembourg), the non-performing loans ratio ranges from 1% (Sweden) to 36% (Bulgaria) whereas the efficiency ratio ranges from the 38% (Malta) to 94% (Slovenia).

3. The effect of the Supporting Factor on SMEs access to credit as compared to large firms

In this section we study whether the introduction of the SF contributed to alleviating credit constraints faced by SMEs (treatment group) by

[8] The sector will be employed in a later analysis based on the specific matching estimation technique to confirm the robustness of our results to its use.

comparing them to large firms (control group) whose credit was not affected by the SF.

3.1. SMEs versus large firms

Identification strategy

Our goal is to carry out a formal test to evaluate how the application of the SF leads to a change in lending constraints to SMEs as compared to large firms, to which the capital discount is not applicable. To this end we propose a regression analysis in which the dependent variable *D. Credit Constrained* is regressed on a dummy variable denoted as *SME* that takes value one for SMEs (i.e., the group of treated firms) and zero otherwise, a dummy that is equal to one after the implementation of the *SF* (i.e., the treatment) and zero before that event, the interaction of these two dummy variables, and a series of firm characteristics, country characteristics, and country (*j*) fixed effects:

$$D.\,Credit\ Constrained_{ijt} = \alpha + \beta_1 SME_i + \beta_2 SF_t + \beta_3 SME_i\ x\ SF_t + \Gamma Firm\ Charact s_{it} + \Upsilon Country\ Charact s_{jt} + \Phi_j + \epsilon_{ijt} \quad (1)$$

where coefficient β_1 can be interpreted as the difference in the probability that SMEs are credit constrained as compared to large firms before the introduction of the SF. The coefficient β_2 represents the difference in the probability that large firms are credit constrained after the introduction of the SF as compared to their state before that event. Finally, the coefficient β_3 can be understood as a difference-in-differences estimator and can be interpreted as the change in the probability that SMEs are credit constrained after the introduction of the SF minus the change in that probability for large firms. Thus, if the introduction of the SF contributes to alleviate credit constraints faced by SMEs as compared to large firms, the coefficient β_3 should be negative and statistically different from zero.

The characteristics of firm i that appear in the wave conducted at time t include age, firm nature, and firm proxies of creditworthiness. The country

characteristics refer to the economic activity and the banking sector characteristics at time t,[9] while the term Φ_j corresponds to a matrix that contains country fixed effects. The country specific variables and the fixed effects help us to control for specific supply factors affecting all the firms in a given country. Equation (1) is estimated using a weighted least squares (WLS) regression.[10] The standard errors are clustered at country-wave-SME (SME and large firms) level.[11] This methodology enables us to analyze whether the banks changed their loan policy after the introduction of the SF, increasing their lending to SMEs as compared to large firms.

This analysis is similar to the one conducted in the EBA (2016) report on the SME SF. EBA's (2016) differentiates between the EU and EA samples and uses the SAFE database. However, there are several differences worth mentioning between our study and that conducted by the EBA. One of the differences between the analyses is the time period. While we restrict our analysis to the waves before and after the implementation of the SF, the pre-SF period in the EBA report consists of all waves from the fifth to the ninth (i.e., April 2011 - September 2013) whereas the post-SF period corresponds to the eleventh and twelfth waves (i.e., April 2014 - March 2015). The pre-SF used in the EBA report is significantly longer than the one in our study. In addition, the period around the SF was especially intense in terms of the use of non-standard measures such as the announcement and implementation of the two 3-year Longer-Term

[9] We consider the whole banking sector of a given country because contrary to the tightening of monetary policy, which mainly affects small banks, the tightening of capital requirements reduces the supply of lending by both small and large banks (see Aiyar, Calomiris, and Wieladek, 2016).

[10] Other papers based on SAFE survey such as Ferrando, Popov, and Udell (2016a, 2016b) also use weights to obtain summary statistics and in their regression analysis.

[11] Similar results are obtained using robust standard errors, clustered standard errors at country level or country-wave level. We opt for the clustered standard errors at country-wave-SME level as the baseline specification following Rogers' (1993) seminal work, which suggests that no cluster should contain more than five per cent of the data. In addition, Nichols and Schaffer (2007) suggest that the data should have at least 20 balanced clusters or 50 reasonably balanced clusters. While in the EU-27 sample the bias of the country cluster standard errors could be potentially low; the bias for the other two samples, with a much lower number of countries, could be especially pervasive since any of the above mentioned conditions is satisfied.

Refinancing Operations (LTRO) or the announcement of the OMT that could have affected lending activity. A second difference is the definition of SMEs given that the EBA (2016) report relies only on the turnover criteria. This leads to the inclusion in the group of SMEs of firms that, according to the European Commission Recommendation, are large firms (more than 250 employees) but with a turnover of lower than 50 million EUR and so, potential beneficiaries of the SF. However, these firms are in essence large firms with low turnover and probably are not the best candidates for banks to grant loans. In addition, our study differs from the EBA (2016) report in some estimation technicalities.[12] In our view, these differences could cloud the identification of the impact of the SME SF and so, could explain any difference in terms of the results obtained in both studies.

Results

Table 2 reports the results of the estimation of equation (1). Each column in this table refers to the three different samples considered in our analysis: EU-27, EA-10, and EA-11. Independently of the sample employed, we find that the coefficient β_1 is positive and statistically significant confirming that SMEs were significantly more constrained than large firms before the introduction of the SF. Moreover, in line with the EBA report, we note that the SME SF did not have a significant impact on the SME group as compared to large firms (i.e., β_3 is not statistically different from zero). The dummy SF itself does not exhibit a statistically significant effect for the first two samples which confirms that the SF did not exert a change in the credit constraints faced by large firms (i.e., the control group). In fact, the loans to large firms do not lead to potential benefits for banks derived from the lower capital requirements after the SF. However, the previous dummy variable exhibits a statistically significant effect for the sample that consists of EA-11 countries and two waves before and after the SF. As discussed in Section

[12] In the interest of an easier interpretation of the estimates, our model is formulated as a linear probability model (LPM) instead of a probit model as in the EBA report. In this sense, Ai and Norton (2003) document that the magnitude of the interaction effect in nonlinear models (e.g., probit model) does not equal the marginal effect of the interaction term, and its statistical significance is not calculated by standard software.

2.1, the use of this sample leads to a pre-SF period that spans from October 2012 to September 2013, and so, the estimated coefficient is affected by the role of the announcement of the OMT that is consistent with a positive impact on lending on the three types of firms (i.e., both SMEs and large firms). This result reinforces the use of the baseline sample.

The coefficients obtained for the control variables also suggest some interesting findings. Thus, individual or family firms are significantly more constrained than the rest of firms. This is probably due to the reduced size of these firms but also to the existence of informational asymmetries that could limit the access to funding. The fact that the access to credit significantly improves as the firm becomes older confirms the previous statement given that firm age can be considered as a proxy for relationship lending. Certainly, the firm credit quality is also an important input for banks given that firms become more constrained as the economic outlook or their credit history deteriorates. Most of the country specific factors are not significant due to the presence of the country fixed-effects. Only the efficiency variable exhibits a positive and significant effect, suggesting that the less efficient banking systems tend to restrict credit to a higher extent.

[Insert Table 2 here]

3.2. Micro/small and medium-sized firms versus large firms

Identification strategy

SMEs are not a homogenous group of firms in terms of their size, risk, and profitability among other features; neither, consequently, in terms of their access to credit. Thus, Dietsch and Petey (2004) show, from a sample of French and German SMEs, that the larger SMEs exhibit a lower average default risk and their performance is less sensitive to systematic risk. The SAFE does not report information on the firms' level of risk but contains information on whether the firm credit history has deteriorated in the last

six months. We find that the percentage of micro/small firms in the baseline sample for which credit history deteriorates is higher than the one corresponding to medium-sized firms (i.e., 20% vs 12%). Indeed, according to the EBA (2016) report, SMEs and large firm's riskiness show a cyclical pattern. During recessions, the indicators deteriorate for all firms, being more severe for small firms than for medium and large firms. In addition, micro/small firms are more opaque and have typically less collateral than medium-sized corporations (see Beck and Demirgüç-Kunt, 2006). The EBA (2016) report also states that medium-sized firms are relatively better performers. This evidence is corroborated by Schiffer and Weder (2001) who show that micro/small firms consistently report higher growth obstacles than medium-size or large firms. The higher growth obstacles are also more constraining for their operation and growth than in the case of medium-size firms (see Beck, Demirgüç-Kunt, and Maksimovic, 2005).

Although the group of SMEs is heterogeneous, banks benefit from the SF independently of whether they lend to micro/small firms or medium-sized firms. In light of the differences between firms' characteristics depending on their size, it appears plausible that banks do not treat micro/small firms as they do medium-sized firms and decide to benefit from the lower capital charge offered by the SF by lending to medium-sized firms. This result would be consistent with Beck, Demirgüç-Kunt, Laeven, and Maksimovic (2006), who find that the micro/small firms have more financing obstacles than medium-sized firms. For this reason, it seems relevant to make a distinction between different types of SMEs.

We modify equation (1) by splitting the treatment group of SMEs into two dummy variables depending on whether the firms are micro/small firms or medium-sized firms plus their interaction with the SF. We propose the following specification to disentangle the effect of the SF on the two groups of SMEs:

$$
\begin{aligned}
&D.\,Credit\ Constrained_{ijt} \\
&\quad = \alpha + \beta_1 Micro/Small_i + \beta_2 Medium_i + \beta_3 Micro/Small_i\ x\ SF_t \\
&\quad + \beta_4 Medium_i\ x\ SF_t + \beta_5 SF_t + \Gamma Firm\ Charact s_{it} \\
&\quad + \Upsilon Country\ Charact s_{jt} + \Phi_j + \epsilon_{ijt}
\end{aligned} \tag{2}
$$

where the coefficients β_1 and β_2 can be interpreted as the difference in the probability that micro/small and medium-sized firms, respectively, are credit constrained as compared to large firms before the introduction of the SF. The coefficients β_3 and β_4 can be interpreted as the change in the probability that micro/small and medium-sized firms, respectively, are credit constrained after the introduction of the SF minus the change in that probability for large firms. Thus, if the introduction of the SF contributes to alleviate credit constraints faced by micro/small (medium-sized) firms, the coefficient β_3 (β_4) should be negative and statistically different from zero. Equation (2) is estimated using a WLS regression with standard errors clustered at country-wave- size (micro/small, medium and large firms) level.

Results

Table 3 reports the results for the estimation of equation (2) for the three alternative samples: i) EU-27 countries (column (1)); ii) EA-10 countries (column (2)); iii) EA-11 using two waves to define the pre- and two waves to define the post-SF period (column (3)). We find that both micro/small and medium-sized firms were significantly more credit constrained than large firms before the introduction of the SF. However, credit rationing seems to be more severe for micro/small firms. These results are consistent for the three samples employed in our analysis. Specifically, when we use the EU-27 sample, the likelihood that micro/small firms face credit constraints before the introduction of the SF is about 10% higher than for large firms whereas it is around 6.6% higher in the case of the other group of SMEs (i.e., medium-sized firms). This finding is in line with the fact that micro/small firms are riskier than medium firms, and hence, they are not

treated equally to medium-sized firms by banks. However, we find that after the introduction of the SF, medium-sized firms are significantly less constrained than before the introduction of this policy. In fact, the probability of being credit constrained for medium-sized firms is 5% lower after the implementation of the SF, as compared to large firms. On the contrary, micro/small firms do not undergo a significant change with regard to the pre-SF period.[13]

All these findings support the idea that banks tend to use the capital relief from the implementation of the SF to grant more loans exclusively to medium-sized firms but not to the whole spectrum of SMEs. The lower riskiness of medium-sized firms suggests that lower capital requirements do not necessarily lead to an increase in banks' risk-taking.

[Insert Table 3 here]

We next test whether the probability that micro/small and medium-sized firms are credit constrained after the introduction of the SF is higher/lower than the probability that large firms are constrained after the same policy event. That is, whether the SF led banks to treat micro/small and medium-sized firms similarly to large firms after this policy event. To this end, we conduct an *F-test* to evaluate whether the linear combination of the coefficients obtained for the dummy variables referring to the two types of SMEs and for their interactions with the SF dummy are statistically different from zero (i.e., the combination of β_1 and β_3 in equation (2) for micro/small firms and β_2 and β_4 for medium-sized firms).

Table 4 reports the linear combination of those coefficients. We observe that after the implementation of the SF, there are no significant statistical differences between medium and large firms in terms of credit constraints due to the beneficial effect that the SF had on the former. On the contrary,

[13] We have considered as an alternative definition of credit constraints a dummy that is equal to one when the company does not apply for a loan/credit line because of possible rejection. Consistent with these arguments, we find that there are no significant changes in the decision not to apply because of possibly rejection after the implementation of the SF.

micro/small firms continue to be more constrained than large firms. In fact, the order of magnitude of the credit constraints suffered by micro/small firms before and after the appearance of the SF, as compared to large firms; are of a similar order of magnitude.

[Insert Table 4 here]

3.3. Additional evidence on the role of the Supporting Factor

In this subsection we provide additional evidence on how the application of the SF leads to a change in lending constraints to micro/small and medium-sized firms as compared to large firms. We first try to disentangle the effect of the SF being dependent on the loan size given that the SF is only applied when the exposure of the bank to the firm is below a given threshold. Second, in a separate analysis, we deal with those large firms with access to the SME SF (i.e., firms with more than 250 employees but with a turnover of below 50 million). Third, in a separate analysis, we examine the effect of the SF on listed firms that can obtain funding through financial markets.

3.3.1. Dealing with loan size restrictions

Identification strategy

One may argue that previous results should be interpreted with caution given that it is not possible to identify exactly which SMEs benefited from the existence of the SME SF. To be able to benefit, the total amount owed to the lending institution should not exceed EUR 1.5 million. In the previous analysis we assumed that all loans granted to SMEs could benefit from the SME SF but this is not the case if the exposure exceeds that amount.

For the eleventh wave onwards (i.e., post-SF period) the SAFE includes a question relative to the requested loan amounts. The answer refers to several intervals of the loan size. The EUR 1-million-threshold is the one

corresponding to the highest interval.[14,15] Around 4% (0.7%) of medium-sized (micro/small) firms apply for a loan that amounted to more than EUR 1 million. The implicit assumption is that any given bank receiving a loan application for more than EUR 1 million is more likely to have total exposure to that firm, in the case that the loan is finally granted, thereby exceeding the maximum exposure to be able to benefit from the SME SF (i.e., EUR 1.5 million). Given that SMEs totally depend on bank funding, it is reasonable to assume that those SMEs applying for a loan of more than EUR 1 million could have other loans with the same bank.

We now go one step further and extend equation (2) by splitting the micro/small and the medium categories for the post-SF period into two groups depending on whether they apply for a loan that exceeds EUR 1 million. The control group remains unchanged and consists of large firms that did not benefit from the SF:

$$
\begin{aligned}
D.Credit\ Constrained_{ijt} &= \alpha + \beta_1 Micro/Small_i + \beta_2 Medium_i \\
&+ \beta_3 Micro/Small > €1M_i x SF_t + \beta_4 Medium > €1M_i x SF_t \\
&+ \beta_5 Micro/Small < €1M_i x SF_t + \beta_6 Medium < €1M_i x SF_t \\
&+ \beta_7 SF_t + \Gamma Firm\ Charact s_{it} + \Upsilon Country\ Charact s_{jt} + \Phi_j \\
&+ \epsilon_{ijt}
\end{aligned}
\tag{3}
$$

where $Micro/Small > EUR1M_i x\ SF_t$ and $Medium > EUR1M_i x\ SF_t$ ($Micro/Small < EUR1M_i x\ SF_t$ and $Medium < EUR1M_i x\ SF_t$) are two dummy variables that are equal to one if a micro/small or medium-sized firm, respectively, applied for a loan of more (less) than EUR 1 million after the introduction of the supporting factor, and zero otherwise. The coefficients of interest β_3 and

[14] Firms should choose between the following intervals: i) up to EUR 25,000; ii) more than EUR 25,000 and up to EUR 100,000; iii) more than EUR 100,000 and up to EUR 250,000; iv) more than EUR 250,000 and up to EUR 1 million; v) over EUR 1 million.

[15] In addition, the ninth wave of the SAFE contains a related question about the size of the last loan that the firm has obtained in the last two years. However, we do not use this variable as, contrary to the other questions, it applies to the previous two years and so, does not necessarily refer to the loan described in the survey that applies to applications during the last six months.

β_4 (β_5 and β_6) can be interpreted as the change in the probability that micro/small and medium-sized firms, respectively, that requested a loan of more (less) than EUR 1 million are credit constrained after the introduction of the SF minus the change in that probability for large firms. In the case that the lower credit constraints faced by medium-sized firms after the implementation of the SF is due to that policy event, the coefficient β_6 should be negative and statistically different from zero whereas β_4 should not.

Results

The results obtained from the estimation of equation (3) are contained in Table 5. In line with our expectations, those SMEs that apply for a loan after the introduction of the SF that exceeds EUR 1 million do not experience an improvement in their access to credit when compared to large firms. Indeed, we observe that access to credit of those micro/small sized firms that apply for a loan above the EUR 1-million-threshold significantly worsens. Moreover, medium-sized firms with loan applications below EUR 1 million were less likely to be constrained after the policy event, in comparison to large firms, whereas the other medium-sized firms with applications above that amount were not. This result supports the effectiveness of the SF but could be also linked to the regulatory treatment of SMEs with high credit exposure. SMEs are classified as retail exposures as long as their credit exposures do not exceed EUR 1 million in which case they are classified as corporate exposures.[16] According to the EBA report (2013) on risk weighted assets (RWA), the average risk weights applied to SME retail exposures are significantly smaller than the ones applied to SME corporate exposures. Either from the side of the SF or from that of the firm classification as a retail or corporate institution, the results confirm that banks optimize their regulatory capital by granting loans to those

[16] This regulatory treatment of SME was in force before the introduction of the SME SF.

SMEs that require less capital (i.e., with lower RWA) and which, in addition, are less risky.[17]

[Insert Table 5 here]

3.3.2. Dealing with large firms with access to the Supporting Factor

Identification strategy

For a proper design of the identification strategy, we have excluded from the analysis those firms that can be considered as large firms according to the definition used by the European Commission (more than 250 employees) but with a turnover of below EUR 50 million and which therefore are potential beneficiaries from the SF. We now extend the sample to include this group of firms and estimate a variation of equation (2) in which we add a dummy variable for this specific group of firms and its interaction with the SF dummy. The control group remains unchanged and consists of large firms that did not benefit from the SF (i.e., turnover higher than EUR 50 million):

$$\begin{aligned} D.Credit\ Constrained_{ijt} &= \alpha + \beta_1 Micro/Small_i + \beta_2 Medium_i + \beta_3 Large\ w/SF_i \\ &+ \beta_4 Micro/Small_i x SF_t + \beta_5 Medium_i x SF_t \\ &+ \beta_6 Large\ w/SF_i x SF_t + \beta_7 SF_t + \Gamma Firm\ Charact s_{it} \\ &+ \Upsilon Country\ Charact s_{jt} + \Phi_j + \epsilon_{ijt} \end{aligned} \quad (4)$$

where *Large w/SFi* is a dummy variable that is equal to one for those large firms according to the European Commission definition (i.e., more than 250 employees) but with a turnover lower than 50 million EUR and thereby affected by the SF. The coefficients of interest β_4, β_5, and β_6 can be

[17] As an additional robustness test, we restrict the sample to firms with a turnover higher than EUR 10 million and compare firms with EUR 10-50 million in turnover relative to those with more than 50 million. Results are based on the same three samples used in Table 5 and are consistent with those obtained in this table confirming that the SF is effective for the firms that qualify for its application whenever the loan application is lower than EUR 1 million.

interpreted as the change in the probability that micro/small, medium, and large firms affected by the SF, respectively, are credit constrained after the introduction of the SF minus the change in that probability for large firms not affected by the SF. In agreement with the previous evidence, the coefficient β_5 should be negative and statistically different from zero. Regarding the coefficient associated to the new group of firms (i.e., *Large w/SFi*), a negative and significant effect would indicate that, as is the case with medium-sized firms, the SF has contributed to alleviate their constraints.

Results

Results are shown in Table 6. We reveal that large firms affected by the SME SF were more constrained than other large firms with a higher turnover before the establishment of the SME SF. This suggests the existence of good lending practices given that these firms exhibit a lower productivity per employee than other large firms. This low productivity is also decisive in understanding the role that the SF has on this type of firm given that it does not contribute to improving their lending conditions in comparison to large firms. Not surprisingly, banks seem to prefer lending to medium-sized firms with a lower operating leverage such that they require a lower number of employees to obtain a similar level of turnover. It confirms that credit flowed in the right direction and the banks considered the quality of the firm to which they were lending within the group of firms that could lead to lower capital requirements.

[Insert Table 6 here]

3.3.3. Dealing with listed SMEs

Identification strategy

Some of the firms included in the SAFE are listed firms. The type of market in which they are listed is not specified but among the listed firms there are

SMEs. The number of listed SMEs is very small: 105 and 70 in the waves immediately before and after the SME SF, respectively. This offers a proper opportunity to analyze whether the SME SF had any effect on these firms and more importantly, whether the exclusion of these firms under the argument that they can obtain funding in financial markets is convincing. Thus, we now extend the sample with the group of listed SMEs (*Listed SME*) and estimate a variation of equation (2) in which we add a dummy variable for this specific group of firms and its interaction with the SF dummy.

$$
\begin{aligned}
&D.Credit\ Constrained_{ijt} \\
&\quad = \alpha + \beta_1 Micro/Small_i + \beta_2 Medium_i + \beta_3 Listed\ SME_i \\
&\quad + \beta_4 Micro/Small_i x SF_t + \beta_5 Medium_i x SF_t \\
&\quad + \beta_6 ListedSME_i x SF_t + \beta_7 SF_t + \Gamma Firm\ Charact s_{it} \\
&\quad + \Upsilon Country\ Charact s_{jt} + \Phi_j + \epsilon_{ijt}
\end{aligned}
\tag{5}
$$

where $Micro/Small_i$ and $Medium_i$ are two dummy variables that are equal to one if a micro/small or medium-sized firm, respectively, is not listed, and zero otherwise. The coefficients of interest β_4, β_5, and β_6 can be interpreted as the change in the probability that non-listed micro/small and medium-sized firms and listed SMEs, respectively, are credit constrained after the introduction of the SF minus the change in that probability for large firms. In agreement with the previous evidence, the coefficient β_5 should be negative and statistically different from zero. The coefficient β_6 associated to the effect of the SF on the listed SMEs would indicate whether this policy measure was also effective for firms that do not depend exclusively on banks to have access to funding.

Results

Results for the corresponding estimation can be found in Table 7. Contrary to the results obtained for non-listed SMEs, listed SMEs were not significantly more constrained than large firms before the introduction of the SF. Listed SMEs may be more financially sound and transparent than

other SMEs since being listed involves the disclosure of much more information. Although, in column (1) of Table 7 a negative coefficient is observed, as expected, for the interaction of the dummy variables corresponding to listed SMEs and SF; it is not significantly different from zero. The introduction of the SF does not affect the degree of financial constraints faced by the listed SMEs compared to large firms because they were already treated similarly before that event. In the case of non-listed micro/small and medium-sized firms, the results are similar to those obtained in the baseline analyses.

[Insert Table 7 here]

Another interesting feature of the SF is also revealed here; it is especially positive and effective for those SMEs that did not have access to alternative sources of funding and for which bank loans are the only recourse for funding further investments. This supports the implementation of the SF and advocates the need for a thorough analysis to deal with the situation of SMEs in order to define the optimal date for its withdrawal.

4. The effect of the Supporting Factor on access to credit within each group of firms

In this section we provide two additional pieces of evidence based on the direct comparison of similar types of firms before and after the event. It helps us to confirm that the lower credit constraints faced by medium-sized firms after January 2014, as previously documented, are due to the introduction of the SF and not to other economic conditions that may have affected median and large firms differently, with knock-on effects to loan application success.

4.1 Analysis based on the nearest neighbor matching technique

We first complement the previous results with an analysis based on the specific matching estimation technique developed in Abadie and Imbens

(2002). This technique implements a nearest neighbor matching estimation for average treatment effects. The goal of this analysis is to estimate the average effect of the SME SF on the lending constraints. To this end, we compare outcomes between treated and control observations using the nearest neighbor matching approach across time-invariant firm characteristics, which are unrelated to the application of the SF. For each group size, we implement exact matching in terms of the country in which the firm is located, the sector, and two dummy variables: one that indicates whether the firm is an individual/family firm or not and another one indicating whether the firm is autonomous or not. Note that the information on the sector of the firm is only available for SMEs and so could not be used in the previous analyses because the control group consisted of large firms for which this information is not reported. Additionally, firms are matched using the nearest neighbor in terms of their age. Thus, by means of this technique we compare firms that are similar across several dimensions and only differ in the date in which they appear in the survey and apply for a loan: before or after the appearance of the SME SF.

Table 8 reports the results of the matching estimation for a sample that covers the ninth and the eleventh waves for all the firms located in the European Union (EU-28), except for Spain, for which we use the eighth and tenth waves. Given that we match firms that belong to the same country before and after the implementation of the SME SF, we can include Spain in the analysis.

Column (1) of Table 8 reports the results for the analysis in which the treated group consists of micro/small-sized firms after the implementation of the SME SF whereas the control group consists of similar micro/small-sized firms, before the regulatory change. Columns (2) – (4) of Table 8 reports the same analysis for medium firms, large firms potentially eligible for the SME SF, and large firms that are not eligible, respectively. A negative coefficient in Table 8 indicates that the group of firms under study is, on average, less credit constrained after the implementation of the SF. When comparing

medium-sized firms, we observe that they are significantly less constrained following the introduction of the SF. However, we do not find significant differences for the group of micro/small firms and the two groups of large firms.

[Insert Table 8 here]

4.2 Analysis based on the baseline specification

We can also formally check whether the SF helped alleviate the credit constraints faced by medium-sized and micro/small firms as compared to the same group of firms, based on the results obtained from the estimation of equation (2). The linear combination of coefficients β_3 and β_5 (β_4 and β_5) can be interpreted as the difference in the probability of being credit constrained before and after the introduction of the SF in the group of micro/small (medium-sized) firms. Moreover, coefficient β_5 represents the difference in the probability of being credit constrained before and after the introduction of the SF in the group of large firms. To obtain the difference in the probability of being credit constrained before and after the SF in the group of large firms affected by the SF we linearly combine coefficients β_6 and β_7 that appear in equation (4). Table 9 contains the previously detailed linear combinations of coefficients, their standard errors, and the degree of statistical significance to check whether they are statistically different from zero. This test also helps us evaluate the consistency of the results obtained from the nearest-neighbor matching methodology. This analysis is implemented based on the sample of 27 European countries and so, the coefficients to test the magnitude of credit constraints for micro/small, medium-sized, and large firms are obtained from column (1) of Table 3 whereas the ones for large firms affected by the SF come from column (1) of Table 6.[18]

[18] The samples used in the nearest neighbour matching analysis in Section 4.1 and the baseline analysis whose results are used to study the effect of the SF on access to credit for each group of firms in Section 4.2; are slightly different because Spain is not included in the

[Insert Table 9 here]

The only significant coefficient for the linear combinations previously detailed is the one associated to medium-sized firms confirming that the results obtained under the nearest-neighbor matching methodology are fully consistent with those obtained under the baseline specification. Moreover the only coefficient that is statistically different from zero exhibits an identical magnitude to the one reported in Table 8 (i.e., -0.029 vs -0.030, respectively). It supports the consistency of both analyses and adds robustness to the results obtained under the nearest neighbor matching technique, especially for those types of firms for which there is a lower number of observations (i.e., large firms affected and non-affected by the SF).

5. An additional experiment based on Spanish banks and firms

Instead of using the SAFE, in this experiment we use two databases at the Bank of Spain: the Central Credit Register (CIR) and the Integrated Central Balance Sheet Data Office survey (CBI by its Spanish name). The CIR contains detailed information on all bank credit to non-financial institutions above 6,000 euros such as the size of the credit instrument, the maturity, the creditworthiness, or the existence of collateral. Given that we are interested in the total exposure of a given bank to each firm to infer whether the new potential credit granted to the firm applies for the SF discount, we aggregate the outstanding amount of credit of each firm in each bank. Thus, at the end we have information on the total credit committed by each bank to each firm in each month, both drawn and undrawn, for several months before and after the introduction of the SF in Spain. In addition the CIR includes the fiscal identity of both borrower and lender, which enables us to construct a matched bank-firm dataset.

latter analysis. However, the Spanish firms represent only around 5% of the observations and so, its exclusion in Section 4.1 leads to similar results.

The CIR is merged with another dataset that is formed by those Spanish non-financial firms that respond to the Integrated Central Balance Sheet Data Office Survey (CBI), which includes the data reported to the Annual survey and the data from the accounts filed with the mercantile registries. The coverage of this dataset is quite extensive[19] and contains annual information of the firms' balance-sheets, the sector and the municipality in which the firm operates. Given the implementation date of the SF in Spain, we use the balance-sheet information available for December 2012.

The merge of the two datasets enables us to define the exposure of a given bank to each firm and also the characteristics of the firm. Thus, we can classify the firms as micro/small or medium-sized firms according to the European Commission Recommendation. But more importantly, we can now properly define whether each specific bank can benefit from the application of the SF to the credit granted to a given firm. A bank can benefit from the use of the SF on the lending to a given firm if the previous exposure to that firm is lower than EUR 1.5 million. Almost all the micro-small firms qualify for the application of the SF by September 2013, given that the exposure of the banks to this type of firm was below the threshold in more than 99% of the cases. Since the SF threshold is not binding for the vast majority of this type of firm and as the ones for which it is binding, could be highly indebted relative to their size, we focus our analysis on medium-sized firms. In this case, the number of bank-firm exposures that are above the threshold established in the regulation concerning the SF is not negligible (11%). In addition, we restrict our sample to bank-firm total credit exposures that range between EUR 1 million and EUR 2 million. Our aim is to focus on those firms for which the EUR 1.5 million threshold is more likely to be binding. Moreover, the restriction of credit exposures to this interval guarantees that all the observations considered in this analysis correspond to "corporate" exposures (i.e., the ones that exceed EUR 1 million) and as a

[19] The dataset includes information for more than 700,000 firms for the year used in our analysis.

consequence, they represent a homogenous sample of firms in terms of their risk weights. We end up with 1,961 bank-firm observations to conduct this analysis. We expect the distance to the threshold not to exhibit any statistically significant effect before the introduction of the SF but to do so after this date.

These datasets enable us to design an optimal experiment in which the treatment and the control groups consist of similar firms (medium-sized). Specifically, we propose a regression analysis in which the dependent variable ($\Delta Credit_{ij}$) is the increase (in millions of euros) in the total credit committed by bank j to firm i, both drawn and undrawn, from August 2013 (the month immediately prior to the introduction of the SF in Spain) to December 2013 (three months after the introduction date).

The dependent variable is regressed on a series of control variables and the variable of interest that is defined as the maximum between the difference of 1.5 minus the exposure of the bank i at the beginning of the period (i.e., August 2013) to a given firm j (in millions of euros) and zero ($max(1.5 - Exp, 0)$):

$$\Delta \text{Credit}_{ij} = \beta \max(1.5 - \text{Exp}_{ij}, 0) + \Theta \text{F}_i + \Gamma \text{B}_j + \zeta \text{RL}_{ij} + \gamma_{s,l} + \epsilon_{ij} \qquad (6)$$

where $max(1.5 - Exp_{ij}, 0)$ is higher than zero in the case that a given firm i represents an opportunity for bank j to benefit from the use of the SF (i.e., the exposure of the bank to that firm is below EUR 1.5 million on August 2013) and zero otherwise. F_i denotes a matrix of firm characteristics, B_j is a matrix that contains bank characteristics and RL_{ij} is a proxy for the firm-bank relationship lending measured from the age of that relationship. The set of firm characteristics include measures of leverage (equity over total assets), liquid assets (over total assets), profitability (ROA), and size (logarithm of total assets). The set of bank characteristics include size (logarithm of total assets); profitability (ROA); risk profile (share of non-performing loans and equity over total assets); liquid assets (over total assets); and business model (non-interest over interest income). Finally, $\gamma_{s,l}$

indicates the use of 3-digit industry-municipality fixed effects. The standard errors are clustered at bank and firm level.

The coefficient β measures the changes in supply after the introduction of the SF to those firms that represent potential opportunities in terms of capital reliefs for the bank. More specifically, it measures the increase in credit supply to those firms with an exposure below EUR 1.5 million for each euro that the exposure departs from the threshold, compared to those firms that do not qualify for the SF because their outstanding credit balance is higher than EUR 1.5 million.

The results obtained for this analysis are reported in column (1) of Table 10. In the interest of brevity the coefficients for the control variables are not reported. Consistently with previous results, we observe that those medium-sized firms to which the bank had an exposure below EUR 1.5 million were more likely to increase their outstanding credit balance after the introduction of the SF compared to other medium-sized firms to which the bank had an exposure above that threshold. Thus, a bank with an exposure of EUR 1 million to a given firm in August 2013 increases its exposure by EUR 108,000 (500,000 * 0.216) more than to a firm of similar characteristics but that does not qualify for the capital requirement deduction. These results are consistent and complement the evidence documented for the European firms.

[Insert Table 10 here]

Indeed, one may argue that the effect is not specifically due to the SF as one expects that the banks aim to limit excessive credit exposures and so, coefficient ß in equation (6) could be equally positive and statistically significant before the introduction of the SF. For that reason, we evaluate the magnitude of the coefficients in a different sample period before the dates used to evaluate the effectiveness of the SF. We consider the change in the outstanding balances of credit between January 2013 and May 2013. The results obtained under the same specification described in equation (6) are reported in column (2). A positive but not statistically significant

coefficient is obtained in the pre-SF period. The fact that the distance to the threshold does not affect credit supply before the implementation of the SF but that it does after this event, confirms the effectiveness of the SF in improving the credit supply to those medium-sized firms that offered the opportunity of capital reliefs.

The effect of changes in bank capital on lending may be heterogeneous across banks, depending on how capitalized they are. We consider that a bank *j* has a low Tier 1 capital ratio if it is in the bottom quintile of the distribution of individual banks' Tier 1 capital ratios (Low_Tier1_j). We analyze the differential effect of the SF on credit supply depending on the banks' Tier 1 capital ratios to understand whether the banks with worse capital ratios benefitted to a higher extent. For that aim, we propose the following regression equation:

$$\begin{aligned}\Delta\text{Credit}_{ij} = {} & \beta_1 \max(1.5 - \text{Exp}_{ij}, 0) + \beta_2 \text{Low\_Tier1}_j \\ & + \beta_3 \max(1.5 - \text{Exp}_{ij}, 0) \cdot \text{Low\_Tier1}_j + \Theta \text{F}_i + \Gamma \text{B}_j + \zeta \text{RL}_{ij} \\ & + \gamma_{s,l} + \epsilon_{ij}\end{aligned} \quad (7)$$

where coefficient β_3 measures the differential effect of the SME SF on the credit supply of those banks with worse capital ratios the month before its introduction. Results are reported in column (3) of Table 10. Coefficient β_2 confirms that those banks with a lower Tier 1 capital ratio lend less to medium-sized firms. However, the coefficient β_3 is positive and statistically significant. Thus, given that banks' lending decisions are sensitive to capital requirements, those banks with worse capital ratios benefit to a higher extent from the introduction of the SME SF. A bank with a low capital ratio and an exposure of EUR 1 million to a given firm in August 2013 increases its credit supply to firms that qualify for the capital requirement deduction by EUR 300,500 (500,000 * (0.143+0.458)) more than to other firms with similar characteristics but that do not qualify for this deduction. This increase is much lower in the case of a better capitalized bank (i.e., EUR 71,500). Importantly, this result is not found in a placebo test based on the pre-SME SF period (column (4)) in which the distance to the threshold

compatible with being eligible for the application of the SME SF capital deduction does not play a significant role to determine the credit supply independently of how capitalized banks are.

Although it is restricted to Spain, the dataset employed in this analysis is useful to test the effect of potential confounding events. The earlier adoption of the SF in Spain and the use of this dataset enable us to design an experiment through which we can isolate more efficiently the effect of the SF from that of other coinciding events such as the announcement of the TLTRO in June 2014 (and its later implementation in September 2014) or the introduction of the CRR/CRD IV in January 2014. The analysis around the introduction of the SF is based on the variation of credit from August 2013 to December 2013. Although the previous period is prior to any of two potential confounding events, we perform an additional analysis in which we shorten the length of the time interval around the implementation of the SF in Spain (September 2013). The results are reported in Table 11. The first column corresponds to the baseline analysis (August – December 2013) and is included in the interest of comparability. Column (2) in Table 11 corresponds to the case in which the dependent variable is the increase (in millions of euros) in the outstanding credit balance of a given bank to a firm from August to November 2013 whereas column (3) contains the results for the variation in credit between August and October. The coefficient of interest decreases as the time interval shortens but it is positive and statistically significant for any of the three intervals around the policy event. It suggests that the results are not driven by the potential confounding events.

To further confirm the validity of the baseline results in column (1) of Table 10 we perform a couple of robustness tests based on alternative windows around the SME SF eligibility threshold. Columns (4) and (5) in Table 11 report the results obtained for two different samples that comprise credit exposures between zero and EUR 3 million and between EUR 1.25 million and EUR 1.75 million, respectively. Independently of the window width, we

obtain results consistent with the baseline specification, with the coefficient increasing as the interval narrows.

[Insert Table 11 here]

The previous analysis suggests that there is a discontinuity at the EUR 1.5 million of bank-firm credit exposure because this threshold determines whether a firm is eligible for the applicability of the SF. In an additional attempt to estimate the causal impact of the SF on the access to credit, we apply a regression discontinuity design to further exploit the previously documented increase in the credit supply to medium-sized firms.[20] The identifying assumption of the design is that while other firm and bank characteristics that are potential determinants of credit vary smoothly over the cutoff point (i.e., bank-firm exposure of EUR 1.5 million), the growth of credit of bank *j* to firm *i* varies discontinuously at that point. To formally test for discontinuities in credit supply at the bank-firm exposure EUR 1.5 million, we estimate the following equation:

$$\Delta \text{Credit}_{i,j} = \beta_1 \text{TExp1.5}_{ij} + \beta_2 f(\text{DifExp1.5}_{ij}) + \beta_3 \text{TExp1.5}_{ij} \cdot f(\text{DifExp1.5}_{ij}) + \Theta F_i + \Gamma B_j + \zeta RL_{ij} + \gamma_{s,l} + \varepsilon_{ij} \quad (8)$$

where $\Delta \text{Credit}_{i,j}$ is the increase (in millions of euros) in the total credit committed by bank *j* to firm *i*, both drawn and undrawn, from August 2013 to December 2013. The sample ends one month before the introduction of the CRR/CRD IV (January 2014), whose potential impact on the lending volumes goes in the opposition direction to that associated to the SF. The variable $TExp1.5_{ij}$ is a treatment indicator variable that equals one if the bank-firm exposure is equal or lower than EUR 1.5 million at August 2013 and $f(DifExp1.5_{ij})$ is a polynomial of the difference between 1.5 and the bank-firm credit exposure (in millions of euros) that depending on the specification can take either a lineal or quadratic form on both sides of the cutoff point. Under the identifying assumption that other determinants of credit are continuous at the credit exposure of EUR 1.5 million, β_1 will be an

[20] For a detailed description of the regression discontinuity design see Imbens and Lemieux (2008).

unbiased estimate of the effect of the bank-firm credit exposure on credit supply. Thus, this method should allow us to estimate cleanly the impact of the SME SF on the credit supply to medium-sized firms.

We narrow our identification strategy to the firms that fall just above and below the threshold of the bank-firm credit exposure that determines whether the credit to that firm could lead to capital reliefs for the bank through the SF. To confirm that the regression discontinuity design is valid, we test whether the firm, bank, and firm-bank predetermined characteristics, which are used as regressors in our analysis, vary smoothly across the EUR 1.5 million exposure cutoff using a test of means. We find that the difference between the means of each explanatory variable on both sides of the cutoff is not statistically different from zero for any of the cases. This supports the identifying assumption we are using in our analysis given that only the firm-bank credit exposure is discontinuous whereas the other determinants of credit are very similar to one another ex-ante. It allows us to estimate the causal effect of the SF eligibility on credit.

The regression discontinuity estimates are reported in Table 12. Column (1) shows the estimates from the analysis in which we limit our sample to the firm-bank exposure of EUR 500,000 around the cutoff and use a bandwidth of EUR 0.5 million on either side of the cutoff, and linear polynomial of $DifExp1.5_{ij}$. Coefficient β_1 is positive and significant confirming the existence of a discontinuity at the cutoff point such that the marginal impact of the SME SF at the cutoff is EUR 53,000, favoring the firms that can lead to capital reliefs for the bank. A similar significant increase in the credit balance is obtained if we use a quadratic function of $DifExp1.5_{ij}$ (column (2)) or a narrower interval of firm-bank exposures of EUR 250,000 around the cutoff and a bandwidth of the same size (column (3)).

Barreca, Guldi, Lindo and Waddell (2011) demonstrate that the estimates are highly sensitive to the exclusion of observations in the immediate vicinity of the cutoff. For this reason, we make another sample adjustment through which we exclude those firms with an exposure between EUR 1.494

and EUR 1.506 million (i.e., EUR 6,000 around the cutoff). The CRR includes all credit above EUR 6,000 and so, there could be variations in credit close to the threshold that we do not capture in our measure of the distance to that threshold.[21] Results for the new sample are shown in column (4) and are identical to the ones of the baseline specification.

[Insert Table 12 here]

6. Conclusions

The introduction of the SME SF allows banks to reduce capital requirements for credit risk on exposures to firms with a turnover below EUR 50 million. This means that banks freed up capital resources that can be redeployed in the form of new loans. The SF is a temporary measure rather than a permanent mechanism to alleviate the effects of lending to SMEs during the crisis and it is intended to be gradually withdrawn as the economy recovers. In this context, our paper aims to contribute to the discussion on the need and effectiveness of the SF on SME lending.

Our study documents that the SF alleviates credit rationing to medium-sized firms with access to the SF (i.e., with loans from a given bank that amount to less than EUR 1.5 million) but not to micro/small firms. Banks seem to differentiate between medium- and micro/small-sized firms, probably because the latter are riskier and could lead to higher costs of absorbing potential losses, to the extent that only the former benefit from the improvement in credit supply. Several extensions are used to isolate the effects of the SF on SME lending and make them clearly visible.

These results suggest that European banks have been aware of this policy measure and have optimized both their regulatory capital and their credit

[21] For instance, suppose that the exposure of a given firm to a bank is EUR 1.498 million, even if it is lower than the threshold compatible with the eligibility for the SF, a credit of the minimum size recorded in the CRR would make this firm no longer eligible as occurs with any of the firms beyond the cutoff. Indeed, the bank could grant a EUR 2,000 loan and still benefit from the capital relief offered by the SF but this loan would not be recorded in the CRR because of its size.

exposures by granting loans to the safest SMEs. However, the context of regulatory uncertainty about the duration of this policy measure could damage its effectiveness. Banks might be limiting their lending to SMEs that benefit from the SF if the duration of this measure is uncertain given that the withdrawal of this measure could mechanically increase their RWA, and lead them to require more capital in order to accommodate the regulatory ratios. Moreover, it seems necessary to monitor its effectiveness over time to improve our understanding and, probably, to consider potential variations. These variations should be devoted to guarantee a proper credit allocation to all types of SMEs (i.e., not only medium-sized firms).

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Table 1: Descriptive statistics

Table 1 reports the summary statistics obtained using weights designed to restore the proportions of the economic weight of each size class, economic activity and country. We provide the number of observations (N), the mean, standard deviation (SD), minimum (Min) and maximum (Max). We report the statistics for three samples: i) EU-27 refers to the European Union countries (without Spain) for the ninth and eleventh waves (i.e., April 2013 to September 2013 and April 2014 to September 2014); ii) EA-10 refers to ten Euro Area countries (Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands and Portugal) for the ninth and eleventh waves (i.e., April 2013 to September 2013 and April 2014 to September 2014);iii) EA-11 refers to eleven Euro Area countries (EA-10 and Spain) for the eighth, ninth, eleventh and twelfth waves (i.e., October 2012 to September 2013 and April 2014 to March 2015).

	EU-27					EA-10					EA-11 (2 Waves)				
Variable	N	Mean	SD	Min	Max	N	Mean	SD	Min	Max	N	Mean	SD	Min	Max
D. Credit Constrained	6015	0.18	0.38	0	1	3694	0.19	0.39	0	1	8268	0.19	0.40	0	1
D. Micro or Small Firm	6015	0.48	0.50	0	1	3694	0.49	0.50	0	1	8268	0.50	0.50	0	1
D. Medium Firm	6015	0.24	0.43	0	1	3694	0.21	0.41	0	1	8268	0.22	0.41	0	1
D. Large Firm	6015	0.28	0.45	0	1	3694	0.30	0.46	0	1	8268	0.28	0.45	0	1
D. Individual or Family Firm	6015	0.83	0.38	0	1	3694	0.85	0.35	0	1	8268	0.83	0.37	0	1
D. Autonomous	6015	0.90	0.29	0	1	3694	0.92	0.28	0	1	8268	0.91	0.29	0	1
D. Age >10	6015	0.80	0.40	0	1	3694	0.82	0.39	0	1	8268	0.83	0.38	0	1
D. 10>Age>5	6015	0.13	0.33	0	1	3694	0.12	0.33	0	1	8268	0.12	0.32	0	1
D. 5>Age>2	6015	0.05	0.22	0	1	3694	0.04	0.20	0	1	8268	0.04	0.20	0	1
D. Firm Capital Improved	6015	0.34	0.47	0	1	3694	0.32	0.47	0	1	8268	0.32	0.47	0	1
D. Firm Economic Outlook Improved	6015	0.19	0.39	0	1	3694	0.15	0.36	0	1	8268	0.21	0.41	0	1
D. Firm Credit History Deteriorated	6015	0.16	0.36	0	1	3694	0.18	0.38	0	1	8268	0.18	0.39	0	1
D. Firm Interest Expenses Decreased	6015	0.24	0.43	0	1	3694	0.26	0.44	0	1	8268	0.28	0.45	0	1
Problem Loans/ Gross Customer Loans (%)	6015	8.74	7.63	1.17	36.25	3694	7.47	6.05	1.52	35.04	8268	8.08	5.95	1.35	35.31
GDP Growth (%)	6015	0.69	1.41	-3.20	5.20	3694	0.18	1.11	-3.20	5.20	8268	0.40	1.29	-3.20	5.20
Private Sector Debt to GDP (%)	6015	126.71	37.67	52.30	327.90	3694	129.14	31.80	99.50	266.70	8268	132.42	32.30	98.90	266.70
Cost-to-Income Ratio (%)	6015	66.37	7.43	37.38	94.00	3694	68.33	4.63	56.79	91.77	8268	66.53	6.46	51.45	91.77

Table 2: Effect of the Supporting Factor on the SME access to credit as compared to large firms

Table 2 reports the WLS estimates of equation (1) for the three periods detailed in Table 1. The dependent variable (D. Credit Constrained) is a dummy that equals one when the firm applies for a loan or credit line and receives less than 75% of the requested amount (including the total rejection). The variable takes zero whenever the firm applies for a loan and receives more than the 75%. The variables of interest are: D. SME, D. After SF and D.SME x D. After SF. D.SME is a dummy variable that is equal to one if the firm is an SME and zero otherwise. D.After SF is a dummy variable that takes value one after the implementations of the SME SF and zero before. D.SME x D. After SF is the interaction of the two previous dummy variables. The set of control variables is self-explanatory in the way they are labeled. Standard errors are clustered at country-wave-SME (SME and large firms) level and are reported in brackets.*, ** and *** indicate statistical significance at the

	(1)	(2)	(3)
	EU-27	EA-10	EA-11 (2-Waves)
D. SME	0.088***	0.076***	0.086***
	[0.021]	[0.023]	[0.015]
D. SME x D. After SF	-0.023	-0.012	-0.017
	[0.028]	[0.034]	[0.020]
D. After SF	0.026	0.033	0.038*
	[0.026]	[0.033]	[0.019]
D. Individual or Family Firm	0.032**	0.038**	0.013
	[0.014]	[0.018]	[0.015]
D. Autonomous	-0.015	-0.027	-0.016
	[0.020]	[0.025]	[0.017]
D. Age >10	-0.217***	-0.232**	-0.137*
	[0.077]	[0.100]	[0.072]
D. 10>Age>5	-0.162**	-0.165*	-0.092
	[0.071]	[0.093]	[0.066]
D. 5>Age>2	-0.099	-0.122	-0.040
	[0.085]	[0.113]	[0.079]
D. Firm Capital Improved	-0.030**	-0.027*	-0.003
	[0.012]	[0.015]	[0.012]
D. Firm Economic Outlook Improved	-0.050***	-0.057***	-0.083***
	[0.015]	[0.019]	[0.014]
D. Firm Credit History Deteriorated	0.183***	0.177***	0.189***
	[0.019]	[0.021]	[0.018]
D. Firm Interest Expenses Decreased	-0.060***	-0.069***	-0.065***
	[0.015]	[0.020]	[0.013]
Problem Loans/ Gross Customer Loans (%)	0.004	-0.006	-0.004
	[0.012]	[0.021]	[0.005]
GDP Growth (%)	0.013	0.014	0.011
	[0.014]	[0.041]	[0.015]
Private Sector Debt to GDP (%)	0.003	-0.000	0.003
	[0.003]	[0.008]	[0.003]
Cost-to-Income Ratio (%)	0.004**	0.002	0.004**
	[0.002]	[0.002]	[0.002]
Observations	6,015	3,694	8,268
R-squared	0.134	0.145	0.141
Country FE	YES	YES	YES

Table 3: Effect of the Supporting Factor on medium, micro/small firms' access to credit as compared to large firms

Table 3 reports the WLS estimates of equation (2) for the three periods detailed in Table 1. The novelty with respect to Table 2 is the substitution of D. SME by two dummy variables depending on the SME size: D. Micro or Small firm and D. Medium firm. D. Micro or Small firm (D. Medium firm) is a dummy variable that takes value one if the firm is a micro/small (medium-sized) and zero otherwise. In addition, Table 3 includes the coefficients for the interaction of the two previous dummy variables with D. After SF. The set of control variables is self-explanatory in the way they are labeled. Standard errors are clustered at country-wave-SME size (i.e., micro/small, medium and large firms) level and are reported in brackets. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
	EU-27	EA-10	EA-11 (2-Waves)
D. Micro or Small Firm	0.105***	0.086***	0.102***
	[0.025]	[0.026]	[0.017]
D. Medium Firm	0.066***	0.064***	0.069***
	[0.020]	[0.021]	[0.016]
D. Micro or Small Firm x D. After SF	-0.005	0.015	-0.000
	[0.030]	[0.034]	[0.020]
D. Medium Firm x D. After SF	-0.053**	-0.067**	-0.050**
	[0.027]	[0.030]	[0.020]
D. After SF	0.024	0.032	0.038**
	[0.025]	[0.031]	[0.018]
D. Individual or Family Firm	0.023	0.031*	0.006
	[0.014]	[0.018]	[0.014]
D. Autonomous	-0.023	-0.036	-0.022
	[0.019]	[0.024]	[0.017]
D. Age >10	-0.204***	-0.220**	-0.125*
	[0.076]	[0.099]	[0.071]
D. 10>Age>5	-0.157**	-0.159*	-0.087
	[0.070]	[0.091]	[0.065]
D. 5>Age>2	-0.100	-0.122	-0.039
	[0.084]	[0.112]	[0.078]
D. Firm Capital Improved	-0.026**	-0.023	0.001
	[0.012]	[0.015]	[0.012]
D. Firm Economic Outlook Improved	-0.049***	-0.058***	-0.080***
	[0.015]	[0.018]	[0.014]
D. Firm Credit History Deteriorated	0.180***	0.174***	0.187***
	[0.019]	[0.021]	[0.018]
D. Firm Interest Expenses Decreased	-0.057***	-0.066***	-0.061***
	[0.015]	[0.020]	[0.013]
Problem Loans/ Gross Customer Loans (%)	0.003	-0.009	-0.005
	[0.010]	[0.017]	[0.006]
GDP Growth (%)	0.013	0.016	0.011
	[0.013]	[0.037]	[0.014]
Private Sector Debt to GDP (%)	0.003	0.000	0.003
	[0.003]	[0.008]	[0.002]
Cost-to-Income Ratio (%)	0.004**	0.003	0.004**
	[0.002]	[0.002]	[0.002]
Observations	6,015	3,694	8,268
R-squared	0.138	0.150	0.145
Country FE	YES	YES	YES

Table 4: Effect of the Supporting Factor on medium, micro/small firms' access to credit as compared to large firms (cont'd)

Table 4 reports the linear combination of the coefficients obtained for the dummy variables referring to the two types of SMEs and for their interactions with the SF dummy, which are reported in Table 3. These linear combinations enable us to test whether the probability that micro/small and medium-sized firms are credit constrained after the introduction of the SF is higher/lower than the probability that large firms are constrained after the same policy event. To this end, we conduct an F-test to evaluate whether the linear combination of the coefficients are statistically different from zero. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
	EU-27	EA-10	EA-11 (2-Waves)
Ho: B[Median] + B[Median x SF]=0	0.013	-0.003	0.020
	[0.019]	[0.022]	[0.014]
Ho: B[MS] + B[MSxSF]=0	0.100***	0.101***	0.101***
	[0.022]	[0.027]	[0.016]
Observations	6,015	3,694	8,268
R-squared	0.138	0.150	0.145
Country FE	YES	YES	YES

Table 5: Effect of the Supporting Factor on the SME access to credit depending on the loan size as compared to large firms

Table 5 reports the WLS estimates of equation (3) for the three samples detailed in Table 1. The novelty with respect to Table 3 is that the variables relative to the SME size (i.e., micro-small and medium) are split into two for the post-SF period depending on whether the firm has applied for a loan that exceeds EUR 1 million. The estimates for the control variables are not reported in the interest of brevity. Standard errors are clustered at country-wave-SME size (i.e., micro/small, medium and large firms) levels and are reported in brackets. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
	EU-27	EA-10	EA-11 (2-Waves)
D. Micro or Small Firm	0.105***	0.086***	0.102***
	[0.025]	[0.026]	[0.017]
D. Medium Firm	0.066***	0.065***	0.069***
	[0.020]	[0.021]	[0.016]
D. Micro or Small Firm Loan > EUR 1M x D. After SF	0.079	0.123*	0.186***
	[0.057]	[0.064]	[0.058]
D. Medium Firm Loan > EUR 1M x D. After SF	-0.007	-0.036	-0.020
	[0.025]	[0.031]	[0.021]
D. Micro or Small Firm Loan < EUR 1M x D. After SF	-0.004	0.015	-0.001
	[0.030]	[0.034]	[0.020]
D. Medium Firm Loan < EUR 1M x D. After SF	-0.049*	-0.060*	-0.042**
	[0.027]	[0.030]	[0.020]
D. After SF	0.024	0.031	0.037**
	[0.025]	[0.031]	[0.018]
Observations	6,015	3,694	8,268
R-squared	0.139	0.150	0.145
Country FE	YES	YES	YES
Firm Characteristics	YES	YES	YES
Country Characteristics	YES	YES	YES

Table 6: Dealing with large firms affected by the Supporting Factor

Table 6 reports the WLS estimates of equation (4) for the three periods detailed in Table 1. The novelty with respect to Table 3 is the introduction of a group of firms that has been excluded from the rest of the analyses. Those firms are large firms according to the European Commission definition (i.e. more than 250 employees) but with a turnover of lower than 50 million EUR and so, affected by the SF. There are two new variables with respect to the specification in equation (2): D. Large Firms w/SF, which is a dummy that takes one for those firms and zero otherwise, and its interaction with D. After SF. The estimates for the control variables are not reported in the interest of brevity. Standard errors are clustered at country-wave-SME size (i.e., micro/small, medium, large w/SF and large w/o SF firms) level and are reported in brackets. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1) EU-27	(2) EA-10	(3) EA-11 (2 Waves)
D. Micro or Small Firm	0.101***	0.081***	0.100***
	[0.025]	[0.025]	[0.017]
D. Medium Firm	0.066***	0.063***	0.068***
	[0.020]	[0.021]	[0.015]
D. Large Firms w/SF	0.055*	0.047	0.045*
	[0.030]	[0.032]	[0.026]
D. Micro or Small Firm x D. After SF	-0.006	0.016	0.000
	[0.031]	[0.034]	[0.020]
D. Medium Firm x D. After SF	-0.055**	-0.068**	-0.049**
	[0.027]	[0.030]	[0.019]
D. Large Firms w/SF x D. After SF	-0.015	0.005	-0.001
	[0.037]	[0.049]	[0.033]
D. After SF	0.029	0.034	0.040**
	[0.026]	[0.030]	[0.018]
Observations	6,274	3,800	8,498
R-squared	0.144	0.155	0.140
Country FE	YES	YES	YES
Firm Characteristics	YES	YES	YES
Country Characteristics	YES	YES	YES

Table 7: Effect of the Supporting Factor on listed SMEs

Table 7 reports the WLS estimates of equation (5) for the three periods detailed in Table 1. The novelty with respect to Table 3 is the introduction of a group of firms that has been excluded from the rest of the analyses: listed SMEs. Non-listed micro/small and medium-sized firms are the same used in previous analyses. There are two new variables with respect to the specification in equation (2): D. Listed SME, which is a dummy that takes one for those firms and zero otherwise, and its interaction with D. After SF. The estimates for the control variables are not reported in the interest of brevity. Standard errors are clustered at country-wave-SME (i.e., non-listed micro/small, non-listed medium, listed SME and large firms) level and are reported in brackets. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
	EU-27	EA-10	EA-11 (2 Waves)
D. Listed SME	0.055	0.073	0.053
	[0.038]	[0.061]	[0.047]
D. Non-Listed Micro or Small Firm	0.104***	0.086***	0.101***
	[0.025]	[0.026]	[0.017]
D. Non-Listed Medium Firm	0.066***	0.064***	0.069***
	[0.020]	[0.021]	[0.016]
D. Listed SME x D. After SF	-0.060	-0.054	0.003
	[0.049]	[0.079]	[0.079]
D. Non-Listed Micro or Small Firm x D. After SF	-0.004	0.015	-0.000
	[0.030]	[0.034]	[0.020]
D. Non-Listed Medium Firm x D. After SF	-0.053**	-0.068**	-0.050**
	[0.027]	[0.030]	[0.020]
D. After SF	0.023	0.031	0.036**
	[0.025]	[0.030]	[0.018]
Observations	6,190	3,742	8,360
R-squared	0.141	0.153	0.146
Country FE	YES	YES	YES
Firm Characteristics	YES	YES	YES
Country Characteristics	YES	YES	YES

Table 8: The effect of the Supporting Factor on access to credit within each group of firms

Table 8 shows an analysis based on the matching estimation technique developed in Abadie and Imbens (2002). This technique implements a nearest neighbor matching estimation for average treatment effects. The table reports the average effect of the SF on the lending constraints by comparing outcomes between the treated and control observations, using the nearest neighbor matching across the firm characteristics. We require exact matching in terms of the country in which the firm is located, the sector, and two dummy variables: one that indicates whether the firm is an individual/family firm or not and another one indicating whether the firm is autonomous or not. Additionally, firms are matched using the nearest neighbor in terms of their age. The sample used in this analysis covers the ninth and eleventh waves for firms located in the EU with the exception of Spain (eighth and tenth waves). Column (1) reports the results for the analysis in which the treatment group consists of micro/small-sized firms after the implementation of the SF whereas the control group consists of similar micro/small-sized firms, in the same sector and located in the same country, before the regulatory change. Columns (2), (3) and (4) report the results for the groups of medium-sized firms, large firms with access to the SME SF and large firms without access to the SME, respectively. For each analysis we report the average treatment effect together with the standard errors and the number of observations. A negative coefficient in Table 8 indicates that firms are, on average, less credit constrained after the implementation of the SF. *, **, and *** denotes statistical significance at 10%, 5%, and 1% level, respectively. Standard errors are reported in brackets.

	(1)	(2)	(3)	(4)
	Micro & Small Firms	Medium Firms	Large w/SF Firms	Large Firms
Treatment Effect	-0.009	-0.030*	0.011	0.012
	[0.014]	[0.016]	[0.041]	[0.027]
Observations	4271	2607	320	678

Table 9: The effect of the Supporting Factor on access to credit within each group of firms (cont'd)

Table 9 reports the linear combination of the coefficients obtained for the SF dummy variable and for its interaction with dummy variables referring to the different types of firms affected by the Supporting Factor (both SME and large firms). This analysis is implemented based on the sample of 27 European countries and so, the coefficients to test the magnitude of credit constraints for micro/small, medium-sized, and large firms are obtained from column (1) of Table 3 whereas the ones for large firms affected by the SF come from column (1) of Table 6. The linear combinations of coefficients enable us to test the effect of the Supporting Factor on access to credit within each group of firms. To this end, we conduct an F-test to evaluate whether the linear combination of the coefficients are statistically different from zero. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)
	Micro & Small	Medium	Large w/SF	Large Firms
Linear combination of coefficients	0.020	-0.029*	0.014	0.024
	[0.023]	[0.017]	[0.026]	[0.025]

Table 10: Effect of the Supporting Factor on the Spanish SME access to credit depending on the firm-bank outstanding credit balance

Table 10 reports the OLS estimates of equation (6) in which the dependent variable in column (1) is the increase (in millions of euros) in the outstanding credit balance of bank j to firm i from August 2013 (the month immediately prior to the introduction of the SF in Spain) to December 2013 (three months after the introduction date). The dependent variable is regressed on a series of control variables and the variable of interest that is defined as the maximum between the difference of 1.5 minus the exposure of the bank j to a given firm i (in millions of euros) and zero: (max(1.5-Exp,0)). This variable is higher than zero in the case that a given firm i represents an opportunity for bank j to benefit from the use of the SF (i.e., the exposure of the bank to that firm is below EUR 1.5 million on August 2013) and zero otherwise. The control variables used in the regression analysis include firm, bank, and bank-firm characteristics plus industry-municipality fixed effects. The dependent variable in column (2) refers to a different time period (January to May 2013). In column (3) we report the results obtained from the estimation of equation (7) for the time period August to December 2013. This equation represents a variation of equation (6) in which we include a dummy that is equal to one if a given bank has a low Tier 1 capital ratio (i.e., if it is in the bottom quintile of the distribution of individual bank' Tier 1), which is denoted as Low Tier1, and its interaction with max(1.5-Exp,0). In column (4) we report the results obtained from the estimation of equation (7) for the period January to May 2013. All results are obtained for the sample of medium-sized firms for which the bank-firm total credit exposures range between EUR 1 million and EUR 2 million. The estimates for the control variables are not reported in the interest of brevity. Standard errors are clustered at bank and firm level and are reported in brackets. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)
Max(1.5 - Exp , 0)	0.216**	0.108	0.143*	0.109
	[0.086]	[0.089]	[0.080]	[0.088]
Low Tier1			-0.258***	-0.064
			[0.093]	[0.100]
Max(1.5 - Exp , 0) x Low Tier1			0.458***	-0.014
			[0.100]	[0.193]
Observations	1,961	1,815	1,961	1,815
R-squared	0.369	0.373	0.371	0.385
Firm Characteristics	YES	YES	YES	YES
Bank Characteristics	YES	YES	YES	YES
Firm-bank Characteristics	YES	YES	YES	YES
Industry-Municipality FE	YES	YES	YES	YES

Table 11: Effect of the Supporting Factor on the Spanish SME access to credit depending on the firm-bank outstanding credit balance (cont'd)

Table 11 reports the OLS estimates of equation (6) in which the dependent variable in column (1) is the increase (in millions of euros) in the outstanding credit balance of bank j to firm i from August 2013 (the month immediately prior to the introduction of the SF in Spain) to December 2013 (three months after the introduction date). The dependent variable is regressed on a series of control variables and the variable of interest that is defined as the maximum between the difference of 1.5 minus the exposure of the bank j to a given firm i (in millions of euros) and zero: (max(1.5-Exp,0)). This variable is higher than zero in the case that a given firm i represents an opportunity for bank j to benefit from the use of the SF (i.e., the exposure of the bank to that firm is below EUR 1.5 million on August 2013) and zero otherwise. The control variables used in the regression analysis include firm, bank, and bank-firm characteristics plus industry-municipality fixed effects. The dependent variables in column (2) on the one hand and (3) on the other refer to different time periods (August to November 2013 and August to October 2013, respectively). We restrict our sample in columns (1) – (3) to bank-firm total credit exposures that range between EUR 1 million and EUR 2 million. Columns (4) and (5) report the results obtained for two different samples that comprise credit exposures between zero and EUR 3 million and between EUR 1.25 million and EUR 1.75 million, respectively. All results are obtained for the sample of medium-sized firms. The estimates for the control variables are not reported in the interest of brevity. Standard errors are clustered at firm and bank level and are reported in brackets. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
Max(1.5 - Exp , 0)	0.216**	0.133**	0.117**	0.106***	0.438**
	[0.086]	[0.058]	[0.058]	[0.014]	[0.220]
Observations	1,961	1,961	1,961	29,328	635
R-squared	0.369	0.447	0.467	0.250	0.378
Firm Characteristics	YES	YES	YES	YES	YES
Bank Characteristics	YES	YES	YES	YES	YES
Firm-bank Characteristics	YES	YES	YES	YES	YES
Industry - Municipality FE	YES	YES	YES	YES	YES

Table 12: Regression discontinuity estimates of the effect of the SME SF on credit

This table contains regression discontinuity estimates of the effect of the SF on credit to medium sized firms as detailed in equation (8). The dependent variable is the increase (in millions of euros) in the total credit committed by a given bank to a firm, both drawn and undrawn, from August 2013 to December 2013. The treatment indicator variable ($TExp1.5_{ij}$) is equal to one if the bank-firm exposure is equal or lower than EUR 1.5 million (cutoff) at August 2013 and the polynomial of the difference between 1.5 and the bank-firm credit exposure (in millions of EUR) that depending on the specification can take either a lineal or quadratic form on both sides of the cutoff point. All estimates include controls for firm, bank and firm-bank characteristics plus industry-municipality fixed effects. We narrow our identification strategy to the firms that fall just above and below the cutoff. Column (1) shows the estimates from the analysis in which we limit our sample to the firm-bank exposure of EUR 500,000 around the cutoff and use a bandwidth of EUR 0.5 million on either side of the cutoff, and linear polynomial of DifExp1.5ij. In column (2) we use a quadratic function of DifExp1.5ij instead of a linear polynomial whereas the results in column (3) are obtained with a narrower interval of firm-bank exposures (EUR 250,000 around the cutoff) and a bandwidth of the same size. In column (4) we restrict the baseline sample by excluding those firms with an exposure between EUR 1.494 and EUR 1.506 million (i.e., EUR 6,000 around the cutoff). Standard errors are clustered at bank level and are reported in brackets. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)
$TExp1.5_{ij}$	0.053***	0.142***	0.097**	0.052***
	[0.020]	[0.031]	[0.043]	[0.020]
Observations	1,961	1,961	635	1,915
Firm Characteristics	YES	YES	YES	YES
Bank Characteristics	YES	YES	YES	YES
Firm-bank Characteristics	YES	YES	YES	YES
Industry-Municipality FE	YES	YES	YES	YES
Municipality Code FE	YES	YES	YES	YES
Polynomial	Linear	Quadratic	Linear	Linear
Bandwidth	0.5	0.5	0.25	0.5