Banking stability and borrower discouragement: A multilevel analysis for SMEs in the EU-28

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Abstract The promotion of a more stable European banking system has become a priority which, not doubt, will bring important benefits to firms. However, bank stability comes with stronger regulations that could harm the access to finance of small and medium-sized enterprises (SMEs), which are highly dependent on bank financing. We provide new evidence on the association between the stability of a country's banking system and SMEs access to finance through the study of borrower discouragement. We analyze 20,207 observations gathered among 16,382 firms operating in the EU-28 during the period 2011-2018. Applying multilevel methodology, our results show that SMEs operating in countries with more stable banking systems are less likely to be discouraged from applying for a loan. Working to achieve a more stable banking system does not seem to harm the access to finance of SMEs.

Keywords Financial constraints Z-score Financial integration Two-level model Information asymmetries

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1 Introduction

A deeper integration of the European banking system, with the aim of promoting the safety and soundness of the financial landscape (Constâncio 2017), has become an urgent priority in response to the recent financial crisis. The European Commission recognizes that the banking union will bring financing opportunities to firms of all sizes (European Commission 2017a), although small and medium-sized firms (SMEs) are, compared to large companies, likely to experience a deeper effect. These firms are especially sensitive to changes in the structure of a country's banking system (Han et al. 2017; Mol-Gómez-Vázquez et al. 2019) because they are highly dependent on bank financing (ECB 2015). The aim of this paper is to analyze whether a more stable European banking system reduces SMEs financial constraints by ameliorating the problem of borrower discouragement.

Discouraged borrowers are firms that decide not to incur in the time and money consuming process of applying for a bank loan for fear of being rejected due to screening mistakes (Kon and Storey 2003). A more stable banking system reduces asymmetric information problems (Mishkin 1999) and also enables banks and firms to build stronger and longer relationships (Hernández-Cánovas and Koëter-Kant 2010), reducing screening errors, loan applications costs and interest rates that retain firms from applying for financing. However, the structure and nature of the banking system is likely to change to adapt to new regulations that bring larger compliance costs and the need for higher operational efficiency. Mergers and acquisitions to achieve higher efficiency, and the use of lending technologies that demand a lower investment, are likely to reduce the deployment of relationship banking, and thus interfere with the flow of information between SMEs and banks. Moreover, to underpin a more stable banking system, the European Commission has promoted stronger prudential requirements for banks, higher protection for depositors and rules for managing failing banks (European Commission 2017b). For example, the implementation of Basel III agreement in the EU legal framework increases the capital requirements imposed to banks for those assets with a higher risk. Then, one could wonder whether stricter regulations could negatively affect SMEs, which are perceived to be more opaque and riskier than large companies (ECB 2015). Banks, for instance, could favor the more transparent and safe large companies to reduce the impact of regulations on their financial statements, harming SMEs access to finance. Recognizing that there might be an inadequate flow of credit to SMEs, the Capital Requirements Regulations (CRR) introduced the small and medium enterprises Supporting Factor (SF), defined as a capital discount aimed at ameliorating the negative repercussions of increased minimum capital requirements. Consequently, the process towards a more stable banking system may have positive and negative effects on borrower discouragement for SMEs.

We analyze whether the stability of the European banking system influences the likelihood of being discouraged from applying for a loan using a survey dataset of 20,207 observations gathered among 16,382 firms operating in the EU-28 during the period 2011-2018.

Our article offers several contributions. First, we add to the banking literature by analyzing financial constraints in the credit market for European SMEs. Up to the best of our knowledge, there is not empirical evidence on the association between the stability of a country's banking system and SMEs access to finance through the study of borrower discouragement. The importance of this phenomenon has recently increased the attention of academics and policy makers. The economic impact of discouraged borrowers is higher than that of those being denied a credit (Freel et al. 2012; Gama et al. 2017). In our sample,

the magnitude of discouraged borrowers (18.41%) is more than two times larger than that of rejected firms (8.21%)[1]. In addition, although previous evidence argues that borrower discouragement is an efficient self-rationing mechanism (Han et al. 2009), more recent evidence shows that the majority of discouraged borrowers are good firms that would have obtained the credit if they had applied for it. Specifically, for a sample of US small business, Cole and Sokolyk (2016) estimate that as much as 37% of discouraged borrowers would have received credit if they had been convinced to apply for it. In addition, they find that one third of discouraged borrowers in their sample make inexact evaluations of their relative financial strengths, because their financial indicators are quite similar or even better than those of firms with approved credit. Therefore, discouraged borrowers should not be considered a random draw of the population because of its significant economic impact (Cowling et al. 2016). Our results show that SMEs operating in countries with more stable banking systems are less likely to be discouraged from applying for a loan. Second, we add to the existing borrower discouragement literature by providing a more recent evidence applying multilevel methodology. In the social sciences, multilevel or hierarchical structures are the norm. Examples include individuals nested within geographical areas or institutions, and repeated observations over time on individuals. When individuals form groups or clusters, we might expect that two randomly selected individuals from the same group will tend to be more alike than two individuals selected from different groups. In our research, this methodology enables us to consider that financing decisions (i.e. not applying for a loan) taken on by the same individuals at different occasions will tend to be more highly correlated than two measurements from different individuals. The LR tests provided in the result section confirm that the two-level model used in this paper offers a significantly better fit to the data than the single-level model.

The remainder article is organized as follows. Section 2 discusses previous literature and develops the hypothesis of this study. Section 3 presents the data and the variables. Section 4 presents the methodology and the results, and Section 5 concludes.

2 Theory and hypothesis development

Informational asymmetries in credit markets significantly influence the demand for and access to debt financing for SMEs, that suffer from severe credit constraints (Beck et al. 2008). Imperfect information between the lender and borrower lies at the heart of the so-called discouragement phenomenon.

According to Kon and Storey (2003), borrower discouragement arises from asymmetric information problems. Specifically, screening errors, application costs and the extent to which interest rates differ from that charged from moneylenders are the main determinants of borrower discouragement. Under imperfect information, banks can mistakenly assess good firms as bad firms, originating screening errors. Application costs involve the costs incurred by the borrower during the process of seeking and applying for a bank which include financial, in-kind and psychic costs (Kon and Storey 2003). In addition, the existence of alternative funding from moneylenders, whose interest rates do not differ significantly from that charged by traditional financial institutions, may also discouraged firms from applying for bank financing. These factors could be especially important for SMEs because of their risky nature. These firms are less able to provide

[1] The percentage of rejected firms decreases from 8.21% to 6.70% if we compute it over the whole sample, as we do with the percentage of discouraged firms, instead of using just those firms that did apply for a loan. Data provided by the Survey on the Access to Finance of Enterprises (SAFE) carried out by the European Commission and the European Central Bank between 2011-2018.

collaterals, audited financial statements and historical records, which exacerbates informational asymmetries (Rahman et al. 2017).

In a context of banking instability, that exacerbates asymmetric information problems, it could be expected that borrower discouragement is at its highest (Cowling et al. 2016). For example, the uncertainty caused by financial instability puts additional pressure on the screening process (Mishkin 1999), where banks may become more rigorous and quality firms more afraid of being rejected. It would be also logical to think that firms may bear higher applications costs since banks will seek to reduce the risk of their portfolios asking borrowers for additional information and more complicated loan applications. In addition, asymmetric information arising from banking instability could increase interest rates charged by banks. This will reduce the extent to which the bank interest rate differs from that charged by the alternative moneylenders (Mishkin 1999), discouraging firms from applying for bank loans. The above arguments would lead to an increase in borrower discouragement resulting from increased bank instability.

However, achieving a more stable banking system also comes at the cost of tougher regulations, such as those increasing capital requirements for financial institutions, that might constrain the supply of lending (Hyun and Rhee 2011). The bank risk-taking literature shows that the increase of capital requirements has a direct impact on the behavior of banks. This literature can be divided in two lines. The first one shows that banks, trying to reduce their risk-taking, might choose to supply credit to larger companies, which are perceived as less risky, but being eventually financially worse than others, a priori, riskier firms such as SMEs (Blum 1999; Calem and Rob 1999). In addition, banks would try to reduce the potential negative effects produced by additional capital requirements by strengthening the screening and the loan application process in order to increase the quality of their portfolios, or increasing the interest rate trying to maintain their profits (BIS 2010; Taylor and Goodhart 2006). The second line shows that the existence of a minimum capital ratio could incentivize banks to continue lending to their most troubled borrowers in order to maintain their capital ratios above, or not close to, the minimum required (Peek and Rosengren 2005). This misallocation of credit, known as the zombie firms phenomenon, is a perverse lending behavior where firms artificially stay in business thanks to banks that are unwilling to recognize bad loans (Peek and Rosengren 2005). Zombie firms drain a significant amount of resources that could be used to fund good and quality firms (Acharya et al. 2019; Caballero et al. 2008), that instead are left with worse borrowing opportunities (Andrews and Petroulakis 2019). Therefore, one could also expect an increase in borrower discouragement resulting from higher bank stability. Existing evidence shows that higher capital requirements lead to a decrease in the supply of credit to riskier borrowers (Fraisse et al. 2020), while the decrease in bank risk-taking can be seen as a positive aspect because non-performing loans decrease with tougher regulations (Barth et al. 2004). This means that the disadvantages of improving bank stability would mainly apply to riskier and less quality firms, while good quality firms would be less discouraged from applying for a loan.

In addition, stronger regulations that aim to increase the stability of banking system come at the expense of larger compliance costs and the need for higher operational efficiency. This is expected to affect relationship banking, and thus lending to SMEs in different ways. Firstly, this lending technology is, compared to transactional banking, better suited to ameliorate informational asymmetries and, therefore, to reduce screening errors, application costs and interest rates. But, obtaining hard and soft information from opaque SMEs requires an initial investment (Mol-Gómez-Vázquez et al. 2019), that banks under cost efficiency pressures might not be willing to make. Secondly, banks also aim to achieve more stability through mergers and acquisitions that make them more cost

efficient, but also hamper the transmission of soft information through their large and hierarchical structures (Berger et al. 2001). Thirdly, regulations are also the driving factor behind the conversions of stakeholder banks (cooperatives and savings banks) into shareholder banks (Kalmi 2017). The stakeholder banks add a value-based perspective to the banking activity that is important when dealing with SMEs.

However, gathering hard and soft information through relationship banking requires a commitment from both sides, that may be strengthen with a stable banking system that reduces the likelihood that the relationship ends prematurely. On the one hand, compared with transactional banking, relationship banking requires a larger initial investment that can only be recovered if the relationship has a long duration and a wide scope (Mol-Gómez-Vázquez et al. 2019). On the other hand, firms that establish close and lasting banking relationships reduce the extent to which they are known by other banks, which can be a problem if the firm is forced to seek financing outside the relationship (Mahrt-Smith 2006). The termination of a relationship due to the bank instability throughs away the information that the firm has provided and leaves the bank without recovering the initial investment. Consequently, we expect that the stability of the banking system helps more than harms the deployment of banking relationships and the flow of information, reducing borrower discouragement.

Based on the above arguments, the hypothesis of this study is as follows:
Hypothesis. Borrower discouragement decreases with higher levels of banking stability.

3 Data and variables

3.1 Data

Firm-level data is obtained from the Survey on the Access to Finance of Enterprises (SAFE) carried out by the European Central Bank and the European Commission since 2009 on a semiannual basis. The sample is stratified by firm size class, economic activity and country. The number of firms in each of these strata was adjusted to increase the accuracy of the survey across activities and size classes[2]. The SAFE contains information on the firm's general characteristics (such as size, sector, age or turnover) and on the firm's assessment of its financing needs and its access to finance during the six months under study. The sample contains only non-financial firms and excludes firms in agriculture, public administration and financial services. The survey is divided into two categories named ECB rounds and Common rounds. ECB rounds include a limited number of euro area countries (12 countries)[3]. However, Common rounds include a more comprehensive survey including all EU countries and some neighboring countries[4]. As

[2] For more information about the fieldwork, sample selection and weighting of the survey, see https://www.ecb.europa.eu/stats/ecb_surveys/safe/html/index.en.html - Annex 3 to the methodological information on the survey and user guide for the anonymized micro dataset.

[3] ECB rounds include the following countries: 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 only included every two years (2009H1, 2011H1 and 2013H1). ECB rounds exclude the smallest countries (Cyprus, Estonia, Latvia, Lithuania, Luxembourg, Malta and Slovenia) which represent less than 3% of the total number of employees in the euro area because, as ECB states, the inclusion of the above countries had only a very marginal impact on the results for the euro area as a whole.

[4] The list of the countries included in Common rounds consists in those included in the ECB rounds plus the smallest euro area countries plus Bulgaria, Croatia, Czech Republic, Denmark, Hungary, Poland,

Table 1 shows, our analyses exploit seven Common rounds trying to maximize the number of countries under analysis, arriving to a final sample of 28 countries comprising the period 2011-2018[5]. The survey period covers the aftermath of the global financial crisis, which give us the opportunity to analyze SMEs financial restrictions in a period of economic recession and the subsequent recovery.

[Insert Table 1]

3.2 Dependent variable

The dependent variable *discouraged* is obtained from the survey question: Have you applied for a bank loan in the past 6 months?, with a response choice: 'Applied; No, because of possible rejection; No, because of sufficient internal funds; No, for other reasons; DKNA'. Our analysis considers the response 'No, because of possible rejection' as the value one in our dummy dependent variable, and the value zero for the response 'Applied'. Following Mac an Bhaird et al. (2016), we do not include in our analyses the response 'No, because of sufficient internal funds' because of the different factors between this group of firms which does not require external financing and that which it does. Finally, we arrive to a final sample of 20,207 observations within 16,382 SMEs. There are 16,487 (81.59%) loan applications and 3,720 (18.41%) discouraged borrowers. Table 1 shows that the percentage of discouraged borrowers ranges from 15.92% to 21.14%, with an increase during the earliest years until wave 11 followed by a progressive decrease in the remaining period.

3.3 Independent variables

This section describes the explanatory variables used in our empirical study. Table 2 provides detailed definitions of all the variables whereas Table 3 reports the correlations, where no collinearity problems are detected.

[Insert Table 2]
[Insert Table 3]

Banking stability. We measure the stability of a country's banking system using the variable *zscore*. This measure is commonly used in the empirical banking literature (Ijtsma et al. 2017; Uhde and Heimeshoff 2009, among others) and it captures the probability of default of a country's banking system. Higher values of this variable imply a higher degree of solvency. As Table 4 shows, it seems that most of western European countries present a high level of banking stability, being the banking system of Luxembourg the most stable (39.285). On the contrary, Slovenia and Croatia have the less stable banking systems (3.277 and 5.0978, respectively). In addition, an inspection of Table 4 shows that most of the countries whose percentage of discouragement is above the sample mean (0.1652), present low levels of the variable *zscore*, except for Slovakia

Romania, Sweden and United Kingdom plus some neighboring countries (i.e. Albania, Bosnia Herzegovina, Iceland, Israel, Kosovo, Liechtenstein, Macedonia, Montenegro, Norway, Serbia, Switzerland and Turkey).

[5] We do not include all the countries covered in Common rounds because of the unavailability of some key variables. We leave out for our analyses the first Common round (wave 1) because of the particular settings of this round in which not all the questions were asked to all firms.

and Denmark. This could suggest that firms in countries with higher levels of banking stability suffer from less borrower discouragement.

[Insert Table 4]

Institutional variables. We include several institutional variables to control for country's heterogeneity in our sample. To represent general economic conditions, we include the variables *GDP per capita* and *GDP growth* which have been used in recent financial literature to analyze the determinants of borrower discouragement (Chakravarty and Xiang 2013). We also include the variable *inflation* because it might influence the reliance of firms on bank financing (Beck et al. 2008). To control for the banking environment, we include the variable *CR5* as a measure of banking concentration following previous literature (Mol-Gómez-Vázquez et al. 2019).

Firm-specific variables. We include several firm-specific variables to control for firm heterogeneity in our sample. In order to control for firm size, we include the dummy variables *micro*, *small* and *medium* measured by the number of employees. *Age* is measured using the number of years that the firm has been in operation. Previous evidence shows that smaller and younger firms suffer from higher borrower discouragement due to the unavailability of reliable financial information (Chakravarty and Xiang 2013; Mac an Bhaird et al. 2016; Rostamkalaei et al. 2020). *Growth* is measured by a dummy variable that takes the value one if the firm has increased its level of turnover and zero otherwise. On the one hand, growing firms are expected to report lower borrower discouragement if past growth is associated with an optimistic outlook about the future and a healthier financial situation (Mac an Bhaird et al. 2016). On the other hand, firm growth could also be associated with cash constraints and, probably, collateral problems, which may foster the fear of loan rejection and thus, borrower discouragement (Freel et al. 2012). We also control for the main activity of the firm including four industry dummies[6]. Firms operating in knowledge-intensive and technology sectors suffer from higher information asymmetries and thus, they are expected to suffer from higher borrower discouragement (Freel et al. 2012). *Sole proprietorship* is a dummy variable that takes the value one if the firm is owned by a one natural person and zero otherwise. Rostamkalaei et al. (2020) find that single owner firms are less likely to make formal applications. Therefore, we expect that sole proprietorship firms suffer from higher borrower discouragement. Finally, in order to proxy for the quality of the firm, we include the variable *vulnerable* which is measured by a dummy variable that takes the value one if the firm simultaneously shows a decline in turnover and profits, and higher interest rates, and zero otherwise[7]. Less profitable firms are less willing to seek for finance (Romano et al. 2001), so are firms with lower turnover (Mac an Bhaird et al. 2016) and higher interest rates expenses (Brown et al. 2011). Thus, we expect that vulnerable firms suffer from higher borrower discouragement.

Table 5 shows a summary of statistic for the variables used in our regressions. Firms of our sample are in operation, on average, more than 5 years. 59.52% of firms have grown in terms of turnover and 32.72% of firms have only one owner. As for the institutional environment, on average firms in our sample are subject to a high level of banking concentration (79.28%), and to large differences in terms of economic development as shown by the variable *GDP per capita*.

[6] In the interest of brevity, the industry dummies are not shown in the tables and their results are not discussed.

[7] Due to data limitations, we do not have the ideal measure of firm risk in order to make a distinction between good and bad borrowers.

[Insert Table 5]

4 Methodology and results

4.1 Methodology

In the social sciences multilevel or hierarchical structures are the norm. Examples include individuals nested within geographical areas or institutions, and repeated observations over time on individuals. When individuals form groups or clusters, we might expect that two randomly selected individuals from the same group will tend to be more alike than two individuals selected from different groups. For example, measurements taken on the same individual at different occasions, e.g., financing decisions, will tend to be more highly correlated than two measurements from different individuals. Such dependencies can therefore be expected to arise, and we need multilevel models -also known as hierarchical linear models, mixed models, random effects models and variance components models- to analyse data with a hierarchical structure. Throughout this section we refer to the lowest level of observation in the hierarchy (measurements on a given occasion) as level 1, and the firm where these measurements are taken as level 2. In our research, there might be measures on a firm on different time occasions because the same firm might enter one or more waves of the survey. Therefore, we treat occasion as a level nested within firms. The structure is a strict hierarchy because each observation (occasion) belongs to one and only one firm (Steele, 2010).

One would not normally omit any firm because it has few observations. But at the same time, one will not be able to distinguish between-firm and between-observations variation if there is only one observation in each firm. Note that firms with only one observation still add information to the estimates of the effects of the explanatory variables on the mean. There are, of course, some contexts where some or all of the higher-level units will have only a few lower-level units. Our research is one of them, when there may be firms entering the study in just one wave of the survey. However, this is not a problem because multilevel models do not require that there are the same number of lower level units in each and every higher-level unit.

4.2 Multilevel modelling

We begin by considering the simplest possible two-level model: a two-level variance components model for firms' discouragement. This model is a special case of the two-level random intercept model where we make no adjustments for predictor variables. The model is therefore also often referred to as an ‘unconditional’, ‘null’ or ‘empty’ two-level model. This model includes only an intercept and firm random effects, and an observation level residual error term; the model makes no adjustments for predictor variables. The model simply decomposes the total variance in observations’ discouragement into separate firm variance components.

The two-level variance components model is written as

$$y_{ijk} = \beta_0 + u_j + e_{ij} \quad (1)$$

$$u_{jk} \sim N(0, \sigma_u^2) \quad (2)$$

$$e_{ijk} \sim N(0, \sigma_e^2) \quad (3)$$

where y_{ij} is the observed event (discouraged) for the observation (occurrence) i in the firm j, β_0 is the mean response across all firms, u_j is the effect of firm j, and e_{ij} is the

residual error term. The random effects and residual errors are assumed independent of one another and normally distributed with zero means and constant variances.
The indices are defined using unique identifiers:

i=1,…,N; j=1,…,J

where N denotes the total number of observations in the sample, and J denotes the total number of firms in the sample.

Since the first regression includes no fixed part predictor variables and so is equivalent to the restricted model, Wald test is not provided. Table 6, column 1, shows that the intercept is -2.6194 with standard error 0.0787. Thus, the mean observation is predicted to have a probability of being discouraged of 6.79%, computed as the anti-log of 2.6194:

$$\left[\frac{\exp(-2.6194)}{1+\exp(-2.6194)}\right] = 6.79\% \quad (4)$$

σ_u^2 is the between-firm variance in the log-odds of being discouraged, but it is difficult to assess the size of the firm effects when using the log-odds scale. Instead we can calculate predicted probabilities of being discouraged, assuming different values for the firm effect σ_u^2. We have already calculated the probability for an "average" firm with $u_j = 0$. Under the assumption that u_j follow a normal distribution, we would expect approximately 95% of countries to have a value of u_j within 2 standard deviation of the mean of zero, i.e. between approximately $-2\sqrt{5.5162} = -4.6973$ and 4.6973. This type of interval is sometimes called coverage interval. Using these values and our estimates for the intercept, we would expect the probability of borrower discouragement to lie between 0.07% and 88.88% for 95% in the middle 95% of firms.

Next, we have information about the estimated variance component, showing that the between-firm variance (σ_u^2) is 5.5162. Considering that the variance of e_{ij} is fixed at 3.29, we can compute the interclass correlation (IC) which, in a null model, reports the proportion of the observed response variation that is explained by the grouping structure of the hierarchical model. The firm IC is calculated as:

$$VPC_u = \frac{\sigma_u^2}{+\sigma_u^2+\sigma_e^2} = \frac{5.5162}{5.5162+3.29} = 62.64\% \quad (5)$$

If the interclass correlation approaches 0, then the grouping by firms is of no use (we may run a simple one level regression as well). If the IC approaches 1, then there is no variance to explain at the individual level (all the measurements within a firm are the same). IC therefore allows us to establish the relative importance of firms as sources of variation of borrower discouragement. We see that 62.64% of the variation in borrower discouragement lies between firms, which justifies the use of the multilevel methodology.

Finally, we report an LR test which compares the current model to a single-level model with no firm effects. The LR test rejects the null hypothesis, which means that the two-level is preferred to the single-level model because it offers a significantly better fit to the data. Therefore, we can conclude that the 20,207 observations do not act as 20,207 independent observations; rather, observations are clustered within firms.

4.3 Results of the multilevel analysis

Next in column 2, Table 6, we introduce firm-specific characteristics. In line with our expectations, firms with a more concentrated ownership, with a shorter track record and with a small dimension are more likely to be discouraged from applying for a loan, confirming the role of informational asymmetries in explaining this phenomenon. Borrower discouragement also increases for SMEs in a vulnerable situation, although one could also think that riskier firms self-select out of the credit market. The likelihood of being discouraged from applying for a loan decreases for those firms which are growing and, probably, having a more optimistic outlook about its future.

The estimate of the between-firm variance drops to 3.9726, while the IC is 0.547. Thus 54.70% of the variation unexplained by any predictors in the model can be attributed to the grouping variable as compared to the overall unexplained variance (within and between variance).

Column 3, Table 6, adds the variable *zscore*, which shows a negative and statistically significant coefficient. In longitudinal designs like ours, where the clusters are individuals, the coefficient of the variable is often referred to as the *subject-specific* or *unit-specific* effect. The subject-specific effect of one explanatory variable is the effect of a 1-unit change in that variable for a given individual, that is holding constant the combination of unobserved individual characteristics represented by the random effect. Therefore, the coefficient for the variable *zscore* represents the effect on a firm likelihood of being discouraged of increasing the *zscore* by one unit. Specifically, it is the effect of the variable *zscore* holding constant the time-invariant individual characteristics represented by u_j. This means that for a given firm, the risk of developing a fear for applying for a loan decreases as the stability of the banking system moves above its sample average. In short, controlling for firm differences, we would expect the odds of being discouraged to decrease by a factor $\exp(-0.7677) = 0.4641$ after increasing bank stability above the sample average. We would therefore expect the odds of being discouraged to be 0.4641 smaller for an observation in a more stable banking system than for an observation in the same firm but in banking system with lower stability.

In column 4, Table 6, we add the remaining country variables. Results show that the likelihood of being discouraged decreases with the level of development of the economy, while it increases with the concentration of the banking system. Comparing these results with those in columns 3, the coefficient of the variable *zscore* decreases, in absolute terms, when the country fixed effects are added. The odds of being discouraged now decrease by a factor $\exp(-0.6014) = 0.548$, compared with the factor 0.4641 in the previous regression. We might expect that z-score is associated with country-level determinants of borrower discouragement, that are now proxied by the added country fixed effects, such as, for example, the availability and quality of banking services to fulfil loan applications. If better services are offered in more stable banking systems, and these markets have lower incidence of borrower discouragement, we would expect that controlling for these country characteristics in the multilevel model will reduce the effect of the variable *zscore*.

[Insert Table 6]

4.4 Additional analyses

Basel III agreement was introduced through the "CDR package" (commonly refers to both CDR IV and CRR) whose application started in January 2014. Basel III standards are aimed at improving the ability of the banking sector to absorb shock arising from

financial and economic distress. To achieve this objective, Basel III standards include significant changes related to both the quality of capital and capital requirements for financial institutions. In this context, the use of capital has become a critical variable in credit allocation which could negatively affect to SMEs. These firms are perceived to have a higher probability of default and higher informational opacity (ECB 2015) so financial institutions might turn their lending towards larger and more transparent firms. To ensure an adequate flow of credit to SMEs, Article 501(1) of the Capital Requirements Regulations (CRR) introduced the small and medium enterprises Supporting Factor (SF). This capital discount, that banks can profit from when lending to SMEs, aims to alleviate the negative repercussions of increased minimum capital requirements. However, recent empirical evidence shows that the SF fails to alleviate financial constraints to micro and small firms, whereas it seems to be an effective tool for the medium-sized and the healthiest firms (Dietsch et al. 2019; Mayordomo and Rodríguez-Moreno 2018). Focusing on discouraged borrowers, the European Bank Authority (EBA) shows that SMEs have the same probability to be discouraged than larger firms during the period immediately after the introduction of the SF (EBA 2016). However, the EBA recognized that it is necessary to analyze a longer period to draw stronger conclusions of the effect of the SF on SMEs lending. Therefore, we add the dummy variable *SF*, that indicates whether the observation was collected before (takes on the value zero) or after (takes on the value 1) 2014, the year of implementation of the SF[8]. Our results in Table 7, column 1, show that the coefficient for the variable *SF* is not statistically significant, which means that the SME SF is not achieving the desired results. One explanation could be that the SF is enhancing the incentive of banks to lend additional resources to small zombie firms. This misallocation of credit might be draining funds and leaving worse borrower opportunities to the more productive and healthier firms (Andrews and Petroulakis 2019), which cannot benefit from the SF[9].

As a robustness check, we also consider that the percentage of successful credit applications during the previous wave might well create an overall sentiment among businesses that could influence their willingness to apply for financing. Our new analysis in column 2 of Table 7, shows that the variable *granted*, which equals the average percentage of successful loan applications at the country level during the previous wave, has a negative and significant coefficient. Therefore, the higher the average percentage of successful loan applications the lower the likelihood of borrower discouragement.

Finally, we check the persistence in borrower discouragement by adding the variable *Ldiscouraged*, that equals the value of the variable *discouraged* for each firm in the previous wave. Results show a positive and significant coefficient in column 3 of Table 7. This means that those firms that report discouragement in the previous wave are more likely to report discouragement in the current wave. Consequently, we do believe that the borrower discouragement phenomenon is affected by persistence. However, due to the reduced number of firms with complete data in all surveys, we cannot make any strong claim on the duration of this persistence[10]. A larger dataset, with a more balanced panel

[8] Following Mayordomo and Rodríguez-Moreno (2018), we drop observations from Spain because the SME SF was implemented four months earlier than the other EU countries.

[9] An increase in the number of zombies also reduces the collateral value of good firms in the industry, and hence tightens any financial constraints (Caballero et al. 2008).

[10] Introducing the first lag already reduces the sample size to 2,320 observations, and 1,803 firms, which leads to the large reduction in the interclass correlation, and a LR test that accepts the null hypothesis that the single-level model could be used instead of the two-level model. Since running a single-level logistic regression does not qualitative

data sample, would be necessary to perform an accurate analysis regarding the persistence of borrower discouragement.

5 Conclusion

Structural changes and new banking standards are expected to show up in a near future in the European Union. The ECB is encouraging the consolidation of the banking sector as a measure to solve its overcapacity and profitability problems. According to de Guindos (2020), COVID pandemic is rising concerns about risks to financial stability due to a significant drop of 8% in the estimated GDP for the euro zone at the end of 2020. In addition, bank entities will have to face the final stage of Basel III framework, the so-called Basel IV agreement. This re-regulation aims to restore trust in the banking sector, diminished, among other reasons, by differences in the calibration of market risk across banks and jurisdictions that the existence of different internal approaches to compute capital requirements has created (Feridun and Özün 2020). Although Basel IV does not pursue to increase capital requirements (BIC 2017), an increase of nearly 24% is expected (EBA 2018), which will lead to a shortfall in total capital of almost 125 billion euro (EBA 2019). Consequently, increasing banking stability continues raising the concerns of policy makers, professional and academics. Both benefits and problems of financial stability are expected to be disproportionally larger for SMEs, which are, compared to large companies, more dependent on bank financing. Besides being rationed, SMEs can suffer financial constraints if they are discouraged from applying the financing they need for their investments. On this basis, borrower discouragement phenomenon merit further research attention. This paper provides new evidence into this problem analyzing the association between borrower discouragement and the stability of the European banking system using 20,207 observations gathered among 16,382 firms operating in 28 European countries during the period 2011-2018.

After applying multilevel methodology, our results show that SMEs operating in a more stable banking system are less likely to be discouraged from applying for a loan. In addition, we report that 62.64% of the variation in borrower discouragement lies between firms, which justifies the use of the multilevel methodology. The results also show that the likelihood of being discouraged decreases with the level of development and inflation of the economy, while it increases with the concentration of the banking system.

Our study contains evidence with clear implications for firms, financial institutions, policy makers and academics. Firstly, firms should be aware of the opportunities and also the risks that the ongoing transformation of the European banking might trigger in the future. Secondly, the capacity of banks to supply credit to SMEs depends on the latter being willing to apply for financing. The demand side should therefore be a concern for financial institutions. Thirdly, SMEs serve as engine of economic growth, innovation and job creation, consequently policymakers should be concerned with completing an integration of the European banking system that actually helps SMEs rather than harms them. Finally, academics could improve our empirical contribution using a dataset that includes information from firms' financial statements, which would allow for robustness checks regarding the quality of borrowers. Future contributions could also shed additional

change our results and conclusions, we decide to keep the same estimation method as in the previous regressions to make our results comparable.

light on the effect that differences in banking structures across European countries have on the strength and type of banking relationships, and thus on SMEs access to finance.

References

Acharya, V. V., Eisert, T., Eufinger, C., & Hirsch, C. (2019). Whatever It Takes: The Real Effects of Unconventional Monetary Policy. *The Review of Financial Studies*, *32*(9), 3366–3411. https://doi.org/10.1093/rfs/hhz005.

Andrews, D., & Petroulakis, F. (2019). Breaking the shackles: zombie firms , weak banks and depressed restructuring in Europe. *Working paper series No 2240 European Central Bank*. https://ssrn.com/abstract=3334840.

Barth, J. R., Caprio, G., & Levine, R. (2004). Bank regulation and supervision: What works best? *Journal of Financial Intermediation*, *13*, 205–248. https://doi.org/10.1016/j.jfi.2003.06.002.

Beck, T., Demirgüç-Kunt, A., & Maksimovic, V. (2008). Financing patterns around the world: Are small firms different? *Journal of Financial Economics*, *89*(3), 467–487. https://doi.org/10.1016/j.jfineco.2007.10.005.

Berger, A. N., Klapper, L. F., & Udell, G. F. (2001). The Ability of Banks to Lend to Informationally Opaque Small Businesses. *Journal of Banking & Finance*, *25*, 2127–2167. https://doi.org/10.1596/1813-9450-2656.

BIC. (2017). *Basel Committee on Banking Supervision Basel III: Finalising post-crisis reforms*. https://www.bis.org/bcbs/publ/d424.htm. Accessed 16 December 2020.

BIS. (2010). *An assessment of the long-term economic impact of stronger capital and liquidity requirements*. https://www.bis.org/publ/bcbs173.pdf. Accessed 16 December 2020.

Blum, J. (1999). Do capital adequacy requirements reduce risks in banking? *Journal of Banking & Finance*, *23*, 755–771. https://doi.org/10.1016/S0378-4266(98)00113-7.

Brown, M., Popov, A., Steven, O., & Pinar, Y. (2011). Who needs credit and who gets credit in Eastern Europe? *Economic Policy*, *26*(65), 93–130. https://doi.org/10.1111/j.1468-0327.2010.00259.x.

Caballero, R. J., Hoshi, T., & Kashyap, A. K. (2008). Zombie lending and depressed restructuring in Japan. *American Economic Review*, *98*(5), 1943–1977. https://doi.org/10.1257/aer.98.5.1943.

Calem, P., & Rob, R. (1999). The impact of capital-based regulation on bank risk-taking. *Journal of Financial Intermediation*, *8*(4), 317–352. https://doi.org/10.1006/jfin.1999.0276.

Chakravarty, S., & Xiang, M. (2013). The international evidence on discouraged small businesses. *Journal of Empirical Finance*, *20*(1), 63–82. https://doi.org/10.1016/j.jempfin.2012.09.001.

Cole, R. A., & Sokolyk, T. (2016). Who needs credit and who gets credit? Evidence from

the surveys of small business finances. *Journal of Financial Stability*, *24*, 40–60. https://doi.org/10.1016/j.jfs.2016.04.002.

Constâncio, V. (2017). Synergies between banking union and capital markets union. *Keynote speech at Conference of the European Commission and European Central Bank on European Financial Integration, Brussels*. https://bit.ly/2JXDCbL. Accessed 16 December 2020.

Cowling, M., Liu, W., Minniti, M., & Zhang, N. (2016). UK credit and discouragement during the GFC. *Small Business Economics*, *47*(4), 1049–1074. https://doi.org/10.1007/s11187-016-9745-6.

de Guindos, L. (2020). The euro area financial sector in the pandemic crisis. *ECB Speech.* https://bit.ly/389kwHp. Accessed 16 December 2020.

Dietsch, M., Fraisse, H., Lé, M., & Lecarpentier, S. (2019). Lower bank capital requirements as a policy tool to support credit to SMEs: evidence from a policy experiment. *EconomiX Working Papers 2019-12, University of Paris Nanterre, EconomiX*. https://bit.ly/34hmhRL

EBA. (2016). *EBA Report on SMEs and SME supporting factor*. https://bit.ly/2K0uEum. Accessed 16 December 2020.

EBA. (2018). *Basel III Monitoring exercise-results based on data as of 31 December 2017.* https://bit.ly/3lJ81rY. Accessed 16 December 2020.

EBA. (2019). *Basel III Reforms: Impact Study and Key recomendations - Macroeconomic Assessment, CVA and Market Risk and Corresponding Policy Advice on Basel III Reforms on CVA and Market Risks*. https://bit.ly/37lGXtR. Accessed 16 December 2020.

ECB. (2015). *The impact of the CRR and CRD IV on bank financing - Eurosystem response to the DG FISMA consultation paper*. https://bit.ly/3nsH7pa. Accessed 16 December 2020.

European Commission. (2017a). *Communication to the European Parliament, the Council, the European Central Bank, the European Economic and Social Committee and the Committee of the Regions on completing the Banking Union*. https://bit.ly/3nmojYD. Accessed 16 December 2020.

European Commission. (2017b). *Completing the Banking Union by 2018*. https://ec.europa.eu/commission/presscorner/detail/en/MEMO_17_3722.

Feridun, M., & Özün, A. (2020). Basel IV implementation: a review of the case of the European Union. *Journal of Capital Markets Studies*, *4*(1), 7–24. https://doi.org/10.1108/JCMS-04-2020-0006.

Fraisse, H., Lé, M., & Thesmar, D. (2020). The real effects of bank capital requirements. *Management Science*, *66*(1), 5–23. https://doi.org/10.1287/mnsc.2018.3222.

Freel, M., Carter, S., Tagg, S., & Mason, C. (2012). The latent demand for bank debt: Characterizing "discouraged borrowers." *Small Business Economics*, *38*(4), 399–418. https://doi.org/10.1007/s11187-010-9283-6.

Gama, A. P. M., Duarte, F. D., & Esperança, J. P. (2017). Why discouraged borrowers exist? An empirical (re)examination from less developed countries. *Emerging*

Markets Review, *33*, 19–41. https://doi.org/10.1016/j.ememar.2017.08.003.

Han, L., Fraser, S., & Storey, D. J. (2009). Are good or bad borrowers discouraged from applying for loans? Evidence from US small business credit markets. *Journal of Banking & Finance*, *33*(2), 415–424. https://doi.org/10.1016/j.jbankfin.2008.08.014.

Han, L., Zhang, S., & Greene, F. J. (2017). Bank market concentration, relationship banking, and small business liquidity. *International Small Business Journal: Researching Entrepreneurship*, *35*(4), 365–384. https://doi.org/10.1177/0266242615618733.

Hernández-Cánovas, G., & Koëter-Kant, J. (2010). The institutional environment and the number of bank relationships: An empirical analysis of European SMEs. *Small Business Economics*, *34*(4), 375–390. https://doi.org/10.1007/s11187-008-9140-z.

Hyun, J. S., & Rhee, B. K. (2011). Bank capital regulation and credit supply. *Journal of Banking & Finance*, *35*, 323–330. https://doi.org/10.1016/j.jbankfin.2010.08.018.

Ijtsma, P., Spierdijk, L., & Shaffer, S. (2017). The concentration–stability controversy in banking: New evidence from the EU-25. *Journal of Financial Stability*, *33*, 273–284. https://doi.org/10.1016/j.jfs.2017.06.003.

Kalmi, P. (2017). *The role of stakeholder banks in European banking sector*. *In: Miklaszewska, E. (ed.) Institutional Diversity in Banking : Small Country, Small Bank Perspectives. Palgrave Macmillan, Cham*. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-319.

Kon, Y., & Storey, D. J. (2003). A theory of discouraged borrowers. *Small Business Economics*, *21*, 37–49. https://doi.org/10.1023/A:1024447603600.

Mac an Bhaird, C., Vidal, J. S., & Lucey, B. (2016). Discouraged borrowers: Evidence for Eurozone SMEs. *Journal of International Financial Markets, Institutions and Money*, *44*, 46–55. https://doi.org/10.1016/j.intfin.2016.04.009.

Mahrt-Smith, J. (2006). Should banks own equity stakes in their borrowers? A contractual solution to hold-up problems. *Journal of Banking & Finance*, *30*(10), 2911–2929. https://doi.org/10.1016/j.jbankfin.2005.12.003.

Mayordomo, S., & Rodríguez-Moreno, M. (2018). Did the bank capital relief induced by the Supporting Factor enhance SME lending? *Journal of Financial Intermediation*, *36*, 45–57. https://doi.org/10.1016/j.jfi.2018.05.002.

Mishkin, F. S. (1999). Global financial instability: framework, events, issues. *Journal of Economic Perspectives*, *13*(4), 3–20. https://doi.org/10.1257/jep.13.4.3.

Mol-Gómez-Vázquez, A., Hernández-Cánovas, G., & Koëter-Kant, J. (2019). Bank market power and the intensity of borrower discouragement: analysis of SMEs across developed and developing European countries. *Small Business Economics*, *53*(1), 211–225. https://doi.org/10.1007/s11187-018-0056-y.

Peek, J., & Rosengren, E. S. (2005). Unnatural selection: perverse incentives and the misallocation of credit in Japan. *American Economic Review*, *95*(4), 1144–1166. https://doi.org/10.1257/0002828054825691.

Rahman, A., Rahman, M. T., & Belas, J. (2017). Determinants of SME finance: evidence

from three central European countries. *Review of Economic Perspectives*, *17*(3), 263–285. https://doi.org/10.1515/revecp-2017-0014.

Romano, C. A., Tanewski, G. A., & Smyrnios, K. X. (2001). Capital structure decision making: A model for family business. *Journal of Business Venturing*, *16*(3), 285–310. https://doi.org/10.1016/S0883-9026(99)00053-1.

Rostamkalaei, A., Nitani, M., & Riding, A. (2020). Borrower discouragement: the role of informal turndowns. *Small Business Economics*, *54*(1), 173–188. https://doi.org/10.1007/s11187-018-0086-5.

Steele, F. (2010) Module 5: Introduction to Multilevel Modelling Concepts. LEMMA VLE, University of Bristol, Centre for Multilevel Modelling. Accessed at https://www.cmm.bris.ac.uk/lemma/.

Taylor, A., & Goodhart, C. (2006). *Procyclicality and volatility in the financial system: the implementation of Basel II and IAS 39*. *Procyclicality of Financial Systems in Asia*. Palgrave Macmillan, London. https://doi.org/10.1057/9781137001535_2.

Uhde, A., & Heimeshoff, U. (2009). Consolidation in banking and financial stability in Europe: Empirical evidence. *Journal of Banking & Finance*, *33*, 1299–1311. https://doi.org/10.1016/j.jbankfin.2009.01.006.

Table 1 Survey description

Wave	Survey round	Reference period	Firms	Discouraged (%)	Countries
5	2011H1	April-September 2011	2686	18.69	28
9	2013H1	April-September 2013	3018	18.82	28
11	2014H1	April-September 2014	3235	21.14	28
13	2015H1	April-September 2015	3061	18.59	28
15	2016H1	April-September 2016	2941	18.23	28
17	2017H1	April-September 2017	2684	16.77	28
19	2018H1	April-September 2018	2582	15.92	28

We do not include survey round 2012H1 because it was categorized as ECB rounds rather than Common round, which are the ones that we use in this study.

Table 2 Variables, description and data sources

Variable name	Definition
Dependent variable:	
Discouraged[a]	Dummy variable that takes the value one if the firm states that did not apply for a bank loan because of possible rejection and zero if the firm applied for it over the past six months.
Banking stability:	
Zscore[b]	Dummy variable that takes the value one if the value of z-score is above the sample mean and zero otherwise. It captures the probability of default of a country's commercial banking system. Z-score compares the buffer of a country's commercial banking system (capitalization and returns) with the volatility of those returns. A higher z-score implies a lower probability of insolvency.
Institutional environment variables:	
GDP per capita[c]	GDP is the natural logarithm of GDP per capita expressed in current U.S. dollars, divided by total population.
GDP growth[c]	Ratio of GDP growth expressed in current prices in US dollars.
Inflation[b]	Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services.
CR5[d]	A measure of market power in the banking sector, calculated as a fraction of assets held by the five largest banks to total commercial banking assets.
SF[a]	Dummy variable that takes the value zero for the observations collected before 2014 (i.e. observations from waves 5 and 9) and one for the observations collected during and after 2014 (i.e. observations from waves 11, 13, 15, 17 and 19).
Firm-specific variables:	
Size[a]	An indicator of the firm size which we use to define three dummy variables following the European Commission Recommendation of 6th May 2003 (2003/361/CE): micro takes the value one when the firm has less than 10 employees and zero otherwise, small takes the value one when the number of employees is between 10 and 49 and zero otherwise, and medium takes the value one when the number of employees is between 50 and 249 and zero otherwise.
Age[a]	Categorical variable which ranges from one for those firms that have been in operation less than 2 years to four for those firms that have been in operation 10 years or more.
Growth[a]	Dummy variable that takes the value one if the firm has growth in terms of turnover over the past three years and zero otherwise. Dummy variable that takes the value one if the firm has increased the level of turnover over the past three years and zero otherwise.
Sector[a]	An industry classification of the firm obtained from the answer to the survey question: What is the main activity of your enterprise?, which we use to define four industry dummies. Each variable takes the value 1 if the firm belongs to one of the following sectors: construction, industry (including manufacturing, mining and electricity, gas and water supply), wholesale and transport, and zero otherwise.
Sole proprietorship[a]	Dummy variable that takes the value one if the firm is owned by one natural person and zero otherwise.
Vulnerable[a]	Dummy variable that takes the value one if the firm states simultaneously lower turnover, decreasing profits and higher interest rates and zero otherwise.
Granted[a]	This variable equals the average percentage of successful loan applications at the country level during the previous wave.
Ldiscouraged[a]	This variable equals the value of the variable discouraged for each firm in the previous wave.

Data sources:
[a] SAFE.
[b] World Development Indicators, the World Bank.
[c] International Monetary Fund.
[d] Global Financial and Development Database, the World Bank.

Table 3 Correlations

	Discouraged	Zscore	GDP per capita	GDP growth	Inflation	CR5
Zscore	-0.1091***					
GDP per capita	-0.0370***	0.4097***				
GDP growth	-0.0351***	0.0889***	-0.0088			
Inflation	-0.0505***	-0.0366***	-0.0158**	-0.2736***		
CR5	0.1102***	-0.0243***	0.2595***	-0.0191***	-0.1880***	
Micro	0.2141***	-0.0403***	0.0131**	-0.0439***	-0.0703***	0.0436***
Small	-0.0279***	0.0204**	0.0434***	-0.0131*	0.0307***	0.0311***
Medium	-0.1789***	0.0187***	-0.0555***	0.0553***	0.0374***	-0.0728***
Age	-0.0628***	0.0305***	0.0343***	0.0039	-0.0449***	0.0265***
Growth	-0.1673***	0.0238***	0.0015	0.1515***	-0.0212***	0.0149**
Sole proprietorship	0.0623***	0.0121*	-0.0145**	0.0802***	-0.0298***	-0.0100
Vulnerable	0.0770***	-0.0276***	-0.0171**	-0.1198***	0.0645***	-0.0243***
	Micro	Small	Medium	Age	Growth	Sole proprietorship
Small	-0.4763***					
Medium	-0.4938***	-0.5294***				
Age	-0.1809***	0.0325***	0.1424***			
Growth	-0.1525***	0.0180**	0.1293***	-0.0603***		
Sole proprietorship	0.1854***	-0.0196***	-0.1595***	-0.0675***	0.0048	
Vulnerable	0.1001***	-0.0183***	-0.0786***	0.0094	-0.2065***	0.0046

Definitions and sources of all the variables are reported in Table 2. *, **, *** denote significance at the levels of 10%, 5%, and 1%, respectively.

Table 4 Overview of county-specific characteristics in ascending order of the level of borrower discouragement

Country	Discouraged	Zscore	GDP per capita	GDP growth	Inflation	CR5	N
Finland	0.0827	10.2215	46546.45	0.008	0.0106	0.9435	556
Malta	0.0935	24.9944	24432.69	0.0604	0.0121	0.9712	107
Luxembourg	0.0971	39.285	108488.48	0.029	0.014	0.4752	103
Czech Republic	0.1050	14.1064	19410.94	0.0227	0.0143	0.7697	505
Sweden	0.1099	13.2884	54662.65	0.0269	0.0065	0.9516	373
Belgium	0.1186	15.6784	44258.17	0.0133	0.0159	0.8902	801
Slovenia	0.1208	3.277	22818.16	0.0153	0.0103	0.7167	240
Austria	0.1271	24.355	47841.83	0.0127	0.0168	0.7793	598
France	0.1305	19.5099	41364.46	0.0119	0.0087	0.7511	2629
Italy	0.1430	12.6544	33416.28	0.0013	0.0103	0.7236	2538
Germany	0.1433	21.6043	44305.85	0.0194	0.0115	0.8258	1417
Poland	0.1447	8.7076	13248.73	0.0309	0.011	0.543	1209
Croatia	0.1560	5.0978	13086.36	0.0063	0.0085	0.7705	327
Spain	0.1574	19.5135	28460.13	0.0094	0.0097	0.7701	2154
Slovakia	0.1730	17.8857	17313.39	0.0307	0.0091	0.8837	341
Lithuania	0.1765	6.7724	14970.99	0.0299	0.0133	0.9594	340
Hungary	0.1812	6.093	13335.19	0.0219	0.021	0.7615	425
Bulgaria	0.1967	8.1729	7498.18	0.0211	0.0086	0.6971	488
Denmark	0.2052	18.1362	58054.22	0.0166	0.0113	0.9215	268
United Kingdom	0.2170	9.4897	42322.65	0.0199	0.0182	0.722	751
Latvia	0.2244	6.5467	14133.61	0.0201	0.0072	0.7502	156
Estonia	0.2375	7.6355	18192.40	0.031	0.0181	0.975	80
Portugal	0.2428	10.37	21069.93	0.006	0.0095	0.9194	725
Romania	0.2511	5.8938	9357.61	0.0297	0.0195	0.7336	438
The Netherlands	0.3195	9.6201	49435.93	0.0124	0.0136	0.915	651
Ireland	0.3630	8.2615	56915.51	0.0703	0.0022	0.8766	686
Cyprus	0.3797	8.5525	26964.47	0.0037	-0.0003	0.9127	158
Greece	0.4541	5.5429	21114.31	-0.0206	0.0036	0.962	1143

The variables *zscore* and *GDP per capita* are measured in a continuous way, instead of using the dummy and logarithm definitions respectively.

Table 5 Summary statistics

	Mean	Std. dev	Min	Max	N
Discouraged	0.1841	0.3876	0	1	20207
Zscore	0.4806	0.4996	0	1	20207
GDP per capita	10.2866	0.5222	8.8164	11.6990	20207
GDP growth	0.0135	0.0270	-0.073	0.25	20207
Inflation	0.0107	0.0128	-0.0210	0.0609	20207
CR5	0.7928	0.1140	0.4287	1	20207
Micro	0.3076	0.4615	0	1	20207
Small	0.3380	0.4730	0	1	20207
Medium	0.3544	0.4783	0	1	20207
Age	3.7457	0.5835	1	4	20207
Growth	0.5952	0.4909	0	1	20207
Sole proprietorship	0.3272	0.4692	0	1	20207
Vulnerable	0.0832	0.2762	0	1	20207

Definitions and sources of all the variables are reported in Table 2.

Table 6 Regression analyses of borrower discouragement and banking stability

	(1)	(2)	(3)	(4)
Constant	-2.6194***	-2.0989***	-1.7361***	-1.1485*
	(0.0787)	(0.2160)	(0.2096)	(0.6289)
Firm-specific variables:				
Micro		1.8947***	1.8479***	1.7726***
		(0.0984)	(0.0959)	(0.0948)
Small		0.8826***	0.8758***	0.8353***
		(0.0821)	(0.0806)	(0.0801)
Age		-0.2020***	-0.1866***	-0.2169***
		(0.0477)	(0.0467)	(0.0465)
Growth		-1.0268***	-1.0021***	-1.0297***
		(0.0648)	(0.0635)	(0.0641)
Sole proprietorship		0.1628***	0.1825***	0.1939***
		(0.0623)	(0.0610)	(0.0608)
Vulnerable		0.3108***	0.2878***	0.3536***
		(0.0945)	(0.0926)	(0.0928)
Country-specific variables:				
Zscore			-0.7677***	-0.6014***
			(0.0619)	(0.0660)
GDP per capita				-0.3109***
				(0.0631)
GDP growth				0.6339
				(1.0490)
Inflation				-6.0973***
				(2.2763)
CR5				3.4820***
				(0.2898)
Industry effects	Yes	Yes	Yes	Yes
Observations	20,207	20,207	20,207	20,207
Number of firms	16,382	16,382	16,382	16,382
Wald test		0.0000	0.0000	0.0000
Var(_cons)	5.5162	3.9726	3.6019	3.4269
Interclass correlation	0.6264	0.5470	0.5226	0.5102
LR test	0.0000	0.0000	0.0000	0.0000

The dependent variable is *discouraged*. All specifications include industry effects. Descriptions and sources of all the variables are reported in Table 2. Standard errors are in parentheses. *, **, *** denote significance at 10%, 5% and 1%, respectively.

Table 7 Additional regressions of borrower discouragement and banking stability

	(1)	(2)	(3)
Constant	-1.1299*	0.6092	-3.3969*
	(0.6546)	(0.7245)	(1.8214)
Firm-specific variables:			
Micro	1.8080***	1.6884***	1.2641***
	(0.1019)	(0.0991)	(0.2067)
Small	0.8350***	0.7763***	0.4892***
	(0.0850)	(0.0857)	(0.1838)
Age	-0.2291***	-0.1951***	-0.2311*
	(0.0492)	(0.0508)	(0.1271)
Growth	-1.0235***	-1.0083***	-0.6677***
	(0.0687)	(0.0682)	(0.1441)
Sole proprietorship	0.2266***	0.2186***	0.0105
	(0.0647)	(0.0653)	(0.1458)
Vulnerable	0.3647***	0.3533***	0.3073
	(0.1022)	(0.1023)	(0.2174)
Granted		-2.8286***	
		(0.2739)	
Ldiscouraged			2.0178***
			(0.1514)
Country-specific variables:			
Zscore	-0.6346***	-0.0295***	-0.0395***
	(0.0735)	(0.0067)	(0.0135)
GDP per capita	-0.3155***	-0.2083***	0.0860
	(0.0648)	(0.0737)	(0.1796)
GDP growth	1.8961*	3.0878***	-0.0076
	(1.0970)	(1.0755)	(2.4269)
Inflation	-9.0315***	0.6851	-11.4117
	(2.8782)	(2.6341)	(7.1782)
CR5	3.6511***	2.2027***	1.8446***
	(0.3031)	(0.3261)	(0.6890)
SF	-0.1320		
	(0.0827)		
Industry effects	Yes	Yes	Yes
Observations	18,053	17,484	2,320
Number of firms	14,773	13,888	1,803
Wald test	0.0000	0.0000	0.0000
Var(_cons)	3.5543	3.3083	0.2116
Interclass correlation	0.5193	0.5014	0.0604
LR test	0.0000	0.0000	0.2537

The dependent variable is *discouraged*. All specifications include industry effects. Descriptions and sources of all the variables are reported in Table 2. Standard errors are in parentheses. *, **, *** denote significance at 10%, 5% and 1%, respectively.