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Why discouraged borrowers exist? An empirical (re)examination from less developed countries☆

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ABSTRACT

Using the fourth-round database of the Business Environment and Enterprise Performance Survey (2008/09 BEEPS), this study examines the determinants of discouragement in less developed countries in Eastern Europe and Central Asia. The results show that whereas firms' opaqueness, demographic factors, and distance between lenders and borrowers better explain the discouragement due to tough loan prices and/or loan application procedures, firm risk and banking concentration explain the incidence of discouraged borrowers due to the fear of rationing. Innovator status, the legal protection of creditors and lenders in the event of default, and the coverage of information sharing instruments help explain discouragement in a transversal way.

1. Introduction

During the past decades, there has been increased interest from policy makers, regulators, and practitioners in the functioning of the financial markets that fund small businesses. In particular, there is concern that small businesses may face difficulties in accessing formal financing due to their informational opacity and risky nature. Much of this concern stems from the recognition that small businesses serve as an engine of economic growth and innovation. In most countries small businesses employ a large percentage of the private sector workforce, which increases the importance of their needs to policy makers and explains why governments worldwide have prompted supply-side initiatives such as loan guarantee schemes and seed capital funds (Levenson and Willard, 2000; Cressy, 2002). Considering the economic and social importance of the small business sector, questions about the particular nature of the private debt of small business finance are at the core of the research agenda (Ortiz-Molina and Penas, 2008).

Bank loans are the most widely used form of small and medium-sized enterprise (SME) financing (Berger and Udell, 1995), though these exchange relationships often suffer from market imperfections, such as information asymmetries. Information asymmetries occur because lenders lack reliable information regarding the default risk of the loan applicants. The mostly unlisted small businesses also tend to lack audited financial statements, so they have difficulties signaling their quality to financial institu-

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tions. Such information asymmetries can be so severe that they eventually lead to credit rationing (Stiglitz and Weiss, 1981). Lenders may reject part of firms' loan amount requests (type I rationing), simply turn down the credit (type II rationing; Steijvers and Voordeckers, 2009), or offer a menu of contracts that acts as a self-selection mechanism to distinguish good from bad borrowers (Bester, 1985). Alternatively, some firms do not apply for loans, even when they seek capital. These firms are the so-called discouraged borrowers. The literature defines a discouraged borrower as 'a good firm requiring finance that chooses not to apply to the bank because it feels its application will be rejected' (Kon and Storey, 2003:47).

According to Kon and Storey (2003), one of the most important determinants of discouragement is the unobservable quality of the borrower, which is, in principle, applicable to developed and less developed economies. Nevertheless, the majority of empirical studies are concentrated in developed economies (e.g., Chakravarty and Yilmazer, 2009 and Han et al., 2009, for the United States; Popov and Udell, 2010; Brown et al., 2011; and Popov and Ongena, 2011, for European markets) rather than in less developed countries, where the discouragement seems to be greater (e.g., Chakravarty and Xiang, 2013). Thus, we extend the literature by investigating the determinants of discouraged borrowers in less developed countries. The less developed countries, especially those in Eastern Europe and Central Asia, are a relevant sample to study because, since 2005, they experienced both strong credit market developments and considerable institutional changes, including the development of information sharing systems.

Historically, many reforms have been prompted by recessions or financial crises. The economies in Eastern Europe and Central Asia, the regions most affected by recent crises, have been the most active reformers in the world, partly due to easier access to finance, which became more difficult after 2008. Since 2005, close to two-thirds of new credit bureaus were created by these economies and the coverage of credit information instruments increased dramatically, including an improvement in the lending environment by establishing centralized pledged registries and/or by improving the position of creditors in bankruptcy procedures (Doing Business Report - DBR, 2010). Private sector credit in less developed countries in this region climbed from 24.2% of the gross domestic product in 2005 to 46.5% at the end of 2009. The quality of lending, however, worsened considerably, with the ratio of non-performing loans to total gross loans in banks' portfolios rising from 3.3% in 2005 to 7.2% at the end of 2009 (World Bank Data Indicators (WBDI), 2015). Hence, this study specifically examines the determinants of discouragement in less developed countries in Eastern Europe and Central Asia.

This paper contributes to the literature in two ways. First, we define as discouraged those borrowers who need banking credit but do not apply due to fear of being rejected/rationed and by tough explicit/implicit loan prices or tough loan application procedures. Based on this definition, we capture several differences predicting the probability of being discouraged between discouragement types, extending knowledge on discouraged borrowers in loan dynamics.[1] Second, this study examines the conditions under which both good and bad borrowers exist in less developed countries. In these countries, application costs and screening errors, which lie at the heart of the discouragement concept, are, in principle, higher than in other banking marketplaces. Hence, based on a country-level analysis, this study explicitly measures the impact on the probability of being discouraged resulting from changes in the depth and coverage of public and private information sharing instruments, as well as in the strength of the legal rights index, including improvements in the legal environment for secure lending (e.g., establishing centralized pledge registers or improving the position of creditors in bankruptcy procedures).

This study uses the fourth-round database of the Business Environment and Enterprise Performance Survey (2008/09 BEEPS), conducted from 2007 to 2009, which covers approximately 11,800 enterprises in 29 countries, including firms in both rural areas and large cities. This survey examines the quality of the business environment as determined by a wide range of interactions between firms and the state, including research facilities, and serves as input to the policy dialogue of countries in Central Asia and Eastern Europe. Our data set comprises 10,571 SMEs with coherent information regarding discouragement status, including 2207 firms that did not apply for loans during the last fiscal year although they needed them (i.e., discouraged borrowers), 4084 firms that did not apply for loans because they did not need them (i.e., non-applicants), and 4280 firms that applied for loans in the last fiscal year (i.e., loan applicants). This data set covers the most recent contextual changes faced by several developed countries, such as the deterioration in access to finance, crime, or corruption that may influence the number of discouraged borrowers.

The results show that, whereas firms' opaqueness, demographic factors, and distance between lenders and borrowers better explain the discouragement due to tough loan prices and/or loan application procedures, firm risk and banking concentration explain the incidence of discouraged borrowers due to the fear of rationing. Innovator status, the legal protection of creditors and lenders in the event of default, and the coverage of information sharing instruments help to explain the discouragement in a transversal way.

The organization of this paper is as follows. Section 2 reviews the theoretical and empirical literature on discouraged borrowers. Section 3 describes the data, variables, and method. Section 4 discusses the empirical results. Section 5 presents the robustness test and Section 6 concludes the paper.

2. Empirical and theoretical background literature

Traditionally, academic studies on small business finance have concentrated much of their attention on firms that apply for funding and, specifically, on the problem of credit rationing (e.g., Stiglitz and Weiss, 1981; Bester, 1985; Chan and Kanatas, 1985; Besanko and Thakor, 1987; Bigsten et al., 2003). However, they often indicate low rates of loan rejection (e.g., Cosh and Hughes, 2003; Fraser, 2004) and it appears entirely plausible that the great majority of these firms were not creditworthy

[1] See Appendix A to identify discouraged borrowers.

(Freel et al., 2012). For example, Levenson and Willard (2000) for the United States[2] and Freel et al. (2012) for the United Kingdom[3] find that the percentage of small businesses discouraged from applying for a bank loan is (almost) twice as high as the rate of rejected loans. Given their significant numbers in the population, discouraged borrowers cannot be thought of as mere random samples; therefore, they cannot be excluded from any formal analysis of the determinants of availability and/or the cost of capital (Chakravarty and Yilmazer, 2009). Hence, the discouragement may be a relevant phenomenon, even for firms that do not apply for credit, if the prospects for acceptance discourage firms that do not reach the stage where their loan applications might be accepted (Levenson and Willard, 2000).

This is the problem of credit-constrained borrowers, which goes beyond the type I or II rationing problem. These borrowers are so-called discouraged borrowers. Cavalluzzo et al. (2002) define a discouraged borrower as a business owner who avoids applying for credit for fear of being rejected, thus labelling the process as a 'prescreening and self-selection issue'.[4] Jappelli (1990) argues that omitting this group of borrowers could lead to biased estimates of the probability of borrowers being credit constrained, since the self-selection of applicants could induce intermediaries to adopt screening rules that differ from those that would prevail if discouraged borrowers were also to apply. Hence, if the extent of discouragement is indeed great or significantly larger than the extent of rejection, then addressing the fears of discouraged borrowers may be a more appropriate means of intervention than traditional supply-side mechanisms (Freel et al., 2012).

Studying the relevance of this topic, in the context of small business finance, Kon and Storey (2003) provided a heuristic framework modelling the application behavior of firms and loan granting decisions by banks in a pooling equilibrium involving both the discouragement and rejection of loan applications. According to the authors, one of the most important determinants of discouragement is the unobservable quality of the borrower. Ideally, lenders would like to encourage good borrowers and discourage bad borrowers, but they do not know or do not know exactly the borrower's quality due of information asymmetries (Berger and Udell, 1998). Hence, if the loan application is costly and banks possess imperfect screening instruments of loan applicants, good borrowers are discouraged from applying for a bank loan. Therefore, the authors hypothesize that the discouragement depends on three factors: screening errors, the scale of application costs, and the difference in interest rates between banks and other moneylenders.

Diagne (1999) shows that borrowers' decisions to apply for a loan are primarily determined by their expectations of the likely value of the credit limit.[5] Chakravarty and Yilmazer (2009) examine the impact of banking relationships on a small borrower's decision to apply for credit based on the likelihood of loan application acceptance and on the interest rate that the borrower can obtain if the application is approved.[6] Consequently, borrowers with adverse expectations about the credit limit or loan price are self-selected, staying out of the credit markets even though they need a bank loan. This self-selection could also put aside good borrowers who are wrong in their expectations, since they might be able to obtain worthwhile loans at reasonable costs. Such borrowers are defined as falsely discouraged (Diagne, 1999). Han et al. (2009) suggest, however, that discouragement is an efficient self-rationing mechanism, because riskier borrowers are more likely to be discouraged.[7] The authors find that riskier borrowers have a higher probability of discouragement that increases with longer financial relationships. Therefore, imperfect information lies at the heart of the concept of discouraged borrowers, which may depend of the borrower quality.

Empirically, the quality of small business is measured in several ways, such as by Dun and Bradstreet scores (e.g., Elsas and Krahnen, 2000; Han et al., 2009), by internal banking ratings, and from firms' financial ratios (e.g., Booth and Booth, 2006; Chakraborty and Hu, 2006; Menkhoff et al., 2006). Other authors use bankruptcy events (e.g., Cavalluzzo et al., 2002; Jiménez et al., 2006) or overdue tax/utility payments (Hanedar et al., 2014) to measure firm risk. In addition, the attribution of public quality certifications to small enterprises means that banks view such enterprises as less likely to default on loans, influencing the incidence of discouraged borrowers (Kon and Storey, 2003). Firm age and firm size are also frequently used as proxies for firm viability (e.g., Avery et al., 1998). A positive relation between firm age/size and creditworthiness is derived by Jovanovic (1982) and, despite several other authors testing their non-monotonic relation as a proxy for firm risk (e.g., Jensen and McGuckin, 1997), Levenson and Willard (2000) suggest that external financing is directed toward the pool of older and larger firms that have a higher probability of repayment as a whole and relatively low screening costs. Furthermore, as a function of lifecycle, older and larger firms are likely to have a greater need for finance than their younger and smaller counterparts (e.g., Vos et al., 2007). Ceteris paribus, small firms are also likely to be seeking to raise small amounts of funding, which banks may be less willing to provide because they incur proportionately greater costs and hence yield lower profit margins (Treichel and Scott, 2006). Empirically, Cosh and Hughes (2003) show older and larger companies submitting more frequent credit applications and obtaining higher success rates.

Because small businesses are mainly non-listed firms, not followed by analysts and lacking audited financial statements, they often have difficulties signaling their qualities to financial institutions (Craig et al., 2007; Freel, 2007; Zambaldi et al., 2011). Moreover, these firms are not always willing to release any information, since it is time-consuming (costly) to do so (Berger and Frame, 2007). Thus, the acquisition of reliable information from small, opaque borrowers is a concern to lenders (Ang, 1991). Therefore,

[2] The authors used data provided by the 1988–1989 United States National Survey of Small Business Finance (US NSSBF).

[3] Their study was conducted based on data provided by the biannual survey of small business attitudes and opinions undertaken on behalf of the Federation of Small Business in the United Kingdom.

[4] In the labor market, a discouraged worker is defined as an individual who wants a job and is available for work but does not look for a job because he or she anticipates not getting one (e.g., Kodrzycki, 2000; Benati, 2001).

[5] This study specifically addresses the discouragement problem in the household sector in the formal and informal markets in Malawi.

[6] Their study was conducted based on 1993, 1995, 1998, and 2003 data provided by the US NSSBF.

[7] This study was conducted using 1998 data from the US NSSBF.

some authors (e.g., Godlewski and Weill, 2011; Chakravarty and Xiang, 2013) use businesses' annual financial statements by an external auditor to address the quality and transparency of information. Since the greater quality and availability of a firm's financial information reduce informational asymmetries, such public statements are expected to decrease the likelihood of being discouraged. Voordeckers and Steijvers (2006) use business trade credit ratios and Petersen and Rajan (1994) business cards and credit lines to measure the information transparency of a business. Trade credit can play an important role in the credit decision process of banks, because suppliers have private information about their customers (Biais and Gollier, 1997), which they can convey to the banks (Voordeckers and Steijvers, 2006; Gama et al., 2015). Petersen and Rajan (1994) and Han et al. (2009) argue that business credit card holders and users of lines of credit tend to be less informationally opaque because their creditworthiness is assessed in the external credit market.

Kon and Storey (2003) suggest that screening errors and application costs arising from information asymmetries are the main determinants of discouragement. Hence, one could argue that the discouraged are a function of pre-existing relationships with banks. According to Han et al. (2009), banks can better collect information on borrowers by monitoring transactions on their current accounts, whereas this ability is limited among other types of lenders. Hence, seeking funding from banks; firms are likely to face lower application costs and lenders to commit lower screening errors. Since reliable information on small businesses is rare and costly, relationship lending is often considered the most appropriate lending technique for banks to collect soft information on small businesses (e.g., Degryse and Van Cayseele, 2000; Baas and Schrooten, 2006; Zambaldi et al., 2011). Relationship lending should improve a bank's knowledge of the characteristics of both the firm and its projects (Boot and Thakor, 1994). The lender also learns more about the hidden attributes and actions of the borrower, thus reducing information asymmetries (Jiménez et al., 2006). This knowledge should lead to improving the availability (Petersen and Rajan, 1994) and reducing costs (Berger and Udell, 1995) of small business financing. Similarly, closer relationships should translate into ameliorated perceptions regarding the availability of debt and its price, contributing to mitigating the incidence of discouragement (e.g., Chakravarty and Yilmazer, 2009; Chakravarty and Xiang, 2013). However, when the relationship is exclusive, a lender can take advantage of its monopolist position and require high borrowing costs, exerting its information monopoly and its ex post superior bargaining power, as in the so-called hold-up problem (Sharpe, 1991; Detragiache et al., 2000). Hence, multiple borrowing relationships provide the opportunity for competition between finance providers and avoid the possibility of rent extraction. This strand of literature suggests that lower borrowing concentration reduces borrowing costs because a sole lender can charge a premium by 'locking in' a small business (Degryse and Van Cayseele, 2000). Empirically, Han et al. (2009) and Chakravarty and Xiang (2013) find that the number of sources of financial services is negatively related with the incidence of discouragement. However, Cavalluzzo et al. (2002) report an opposite result.

Another important determinant of discouragement is the physical distance between the bank and the small business. Despite contradictory results provided by the empirical literature in regard to the influence of physical distance on lending terms (e.g., Hainz, 2003; Inderst and Mueller, 2007; Jiménez et al., 2009; Hanedar et al., 2014), it seems consensual that a non-local lender has an unfair disadvantage compared to local lenders regarding the collection of soft information on borrowers (Jiménez et al., 2009). Hence, the costs of gathering and processing site-specific soft information about potential borrowers increase with distance (Petersen and Rajan, 2002). Likewise, we anticipate that the application costs should increase with distance, which could suggest that businesses located closer to the bank have a lower tendency of becoming a discouraged borrower.[8] Additionally, some authors (e.g. Cavalluzzo et al., 2002[9]; Han et al., 2009; Chakravarty and Xiang, 2013) assume that the discouragement is affected by the degree of concentration in local banking markets. According to Brown et al. (2011), the degree of difficulty in accessing a loan could increase with the level of bank market concentration. Hence, we could expect banking concentration to be positively related to discouragement.

While it is consensual that increasing the informational flows between small businesses and lenders decreases screening errors and application costs, there is no empirical evidence of these effects on the likelihood of being discouraged. The theory suggests that sharing information between banks and borrowers increases the volume of lending (e.g., Pagano and Jappelli, 1993; Brown et al., 2009). Empirically, some authors show that the depth of information sharing instruments extends the credit to new, previously unfunded firms (e.g., Hanedar et al., 2014) and its coverage impacts the explicit and/or implicit loan price (e.g., Djankov et al., 2007; Qian and Strahan, 2007; Godlewski and Weill, 2011). Accordingly, if information sharing instruments are important in facilitating access to finance, particularly for small businesses (Djankov et al., 2007), we could expect that they increase the confidence of borrowers in applying for bank loans (Brown et al., 2011), reducing the incidence of discouraged borrowers.

Finally, recent literature shows that credit constraints may depend on entrepreneurial and demographic characteristics. For example, there is a large literature on the extent to which female-owned business are discriminated against in credit markets, especially in the small business context (e.g., Cavalluzzo et al., 2002; Vos et al., 2007). Likewise, some authors (e.g., Cavalluzzo et al., 2002; Han et al., 2009; Storey, 2004) find that the incidence of discouragement varies with owner/manager gender. Similarly, some studies explore the link between entrepreneurial experience and credit constraints (e.g., Cavalluzzo et al., 2002; Han et al., 2009). Westhead et al. (2005) suggest that portfolio entrepreneurs are characterized by their more diverse experiences in comparison to serial or novice peers. Hence, we anticipate that entrepreneurial experience likely decreases the incidence of discouragement.

[8] However, foreign banks may be more reluctant than domestic banks to lend to opaque firms (i.e., small and young firms) but poach depositors and safe borrowers from domestic financial intermediaries while remaining unwilling to lend to local entrepreneurial firms (Detragiache et al., 2008).

[9] This study was conducted using 1993 data from the US NSSBF.

In models of entrepreneurial finance prevailing in the small business context (Hart and Oulton, 1999), ownership structure is very important in predicting credit conditions. For example, traditional agency models predict that concentrated ownership and owner–management firms will lead to a minimum (or even zero) level of agency costs between owners and managers (Jensen and Meckling, 1976; Fama and Jensen, 1983). This model assumes that concentrated ownership is motivated and mainly concerned with the firm's long-term survival (Ang, 1991), which promotes the alignment of interests between lenders and firms, reducing risk (Diamond, 1989). Some studies, however, contest the traditional agency view, arguing that agency costs in concentrated ownership could be even higher than in firms with fractional ownership due to possible negative effects of self-control and parental altruism on management efficiency (e.g., Schulze et al., 2001; Schulze et al., 2003). In line with this strand of literature, Cavalluzzo et al. (2002) and Han et al. (2009) find that family-owned firms have a higher probability of being discouraged. Finally, some authors extend the study of the relationship between entrepreneurial activity and credit constraints to dimensions such as innovation (e.g., Freel, 2007; Freel et al., 2012) and the export profile of a business (e.g., Brown et al., 2011), concerned with demonstrating that differences in funding outcomes are attributable to the specific characteristic in question, rather than some other source of firm-level heterogeneity.

In summary, screening errors, application costs, and consequently the prevalence of discouragement are likely to be associated with the profile of the entrepreneur/business, the quality of the borrower, as well as the nature of relationship lending and the location of the business. Because the focus of this study is to examine discouragement across a pool of small businesses operating in less developed countries, we expect that the scale of discouragement also depends on country-specific characteristics, such as the banking sector, credit environment, and macroeconomic characteristics.

3. Data, variables, and method

3.1. Data

The majority of studies around the topic of discouraged borrowers are undertaken within a single country with a relatively sophisticated small business financing marketplace (e.g., Levenson and Willard, 2000; Chakravarty and Yilmazer, 2009; Han et al., 2009; Freel et al., 2012, for the United States; Brown et al., 2011, for European markets), providing results that should not be extrapolated to less developed financial markets, where credit application costs and screening errors are greatly amplified.

Contrary to previous studies, this paper investigates the problem of discouragement in less developed countries using a cross-country approach. Less developed countries, especially those in Eastern Europe and Central Asia are a relevant sample to study because, since 2005, they experienced both strong credit market development and considerable institutional changes, including the development of information sharing systems. Hence, this study uses the fourth-round database of the 2008/09 BEEPS, conducted from 2007 to 2009, which covers approximately 11,800 enterprises in 29 countries, including firms in both rural areas and large cities. This survey examines the quality of the business environment as determined by a wide range of interactions between firms and the state that serve as input to the policy dialogue of countries in Central Asia and Eastern Europe. The BEEPS is a joint initiative of the European Bank for Reconstruction and Development (EBRD) and the World Bank Group. The survey was first undertaken on behalf of the EBRD and the World Bank in 1999–2000, when it was administered to approximately 4000 enterprises in 26 countries of Eastern Europe and Central Asia to assess the environment for private enterprise and business development. In the second round, the BEEPS survey was administered to approximately 6500 enterprises in 27 countries in 2002. In the third round, in 2005, this survey included approximately 9500 enterprises in 28 countries.

The 2008/09 BEEPS survey underwent several improvements offering numerous advantages compared with previous rounds. First, the new BEEPS allows for greater comparability of Europe and Central Asia countries with countries in other regions. Second, this survey was restructured to make it compatible with the Enterprise Surveys of the World Bank's Enterprise Analysis Unit, which collect feedback from enterprises in EBRD countries of operation on the state of the private sector, as well as to help in building a panel of enterprise data. Hence, contrary to previous rounds, this data set makes it possible to track changes in the business environment over time. Finally, this database covers the most recent contextual changes faced by several developed countries, such as the deterioration of access to finance, crime, or corruption that can influence the number of discouraged borrowers. To the best of our knowledge, only Brown et al. (2011) use similar data set (i.e., the third round of the BEEPS, 2005) to compare access to bank credit for firms in Eastern Europe and Western European countries, providing fresh evidence regarding the determinants of credit application and discouragement. However, unlike our study, the authors adopt the lack of need for a bank loan as the base outcome to test the determinants of discouragement, testing between non-applicants that simply do not need loans and non-applicants seeking loans. This approach hurts Jappelli's (1990) concept of discouraged borrowers and fails to provide guidelines for practitioners and policy makers about the incentives that should be tested and implemented to lead firms that actually need loans to apply for them.[10]

To complement the BEEPS information, we also use the Bankscope database and indicators provided by the World Bank (i.e., WBDIs and DBRs) as well as by the Global Financial Development Database.

To reconcile the definition of an SME with both the BEEPS definition and Organisation for Economic Co-operation and Development conventions, we define SMEs to be firms with a maximum of 250 full-time employees.[11] Thus, the data set comprises

[10] Furthermore, in their study, Brown et al. (2011) aggregate small and larger firms; this may bias the results, considering that larger firms have easier access to other sources of finance, such as the stock market.

[11] The BEEPS definitions of enterprise sizes are as follows: small firms have 1 to 49 employees, medium firms have 50 to 249 employees, and large firms have 250 to 9999 employees.

10,571 SMEs[12] with coherent information regarding discouragement status, including 2207 (20.88%) firms that did not apply for loans during the last fiscal years although they needed them (i.e., discouraged borrowers), 4084 (38.63%) firms that did not apply for loans because they did not need them (i.e., non-applicants), and 4280 (40.49%) firms that applied for loans in the last fiscal year (i.e., loan applicants).[13] See Appendix A for the definition of discouraged borrowers.[14]

We find that the prevalence of discouraged borrowers is almost three times higher than that of rejected loans, representing an increase of 50% compared to the results of Levenson and Willard (2000) and Freel et al. (2012). Furthermore, the ratio of discouraged borrowers to loan seekers in our data set is 34%, which is higher (14.6%) than that reported by Freel et al. (2012). This result shows that the discouragement is a problematic issue in SME financing in less developed countries. Since the goal of this study is to analyse the problem of discouragement, we exclude from the analysis those firms that did not state a desire for credit (i.e., firms that indicated they did not apply for a loan because they had no need for credit). Thus, our final data set comprises 6487 SMEs stating a desire for credit (i.e., loans seekers) among loan applicants and discouraged borrowers.

3.2. Variables

To examine the determinants of discouragement, we use the variable *DBorrower* a binary variable as a dependent variable that equals one if the firm was discouraged from applying external funding and zero otherwise (i.e., if the firm applied for credit).[15] The independent variables are divided into six groups: characteristics of the business and entrepreneur/manager, the quality of the borrower, the nature of the relationship lending, application costs, characteristics of the banking sector, and characteristics of the credit environment; macroeconomic, country dummies and industry indummies are control variables. These variables closely follow the literature on the credit constraints and financing obstacles of SMEs (e.g., Cavalluzzo et al., 2002; Beck et al., 2005; Chakravarty and Yilmazer, 2009). See Table 1 for the definitions of the variables.

Characteristics of the business and entrepreneur/manager include the firm's age (*Fage*), measured in years (e.g., Freel et al., 2012); firm size (*FSize*), measured by the number of full-time employees (e.g., Han et al., 2009; Chakravarty and Xiang, 2013); *TradeCredit* (%), which is the share of a firm's purchases of material inputs and services paid on credit (e.g., Voordeckers and Steijvers, 2006; Gama et al., 2015); *ExtAud,* a binary variable equals one if the firm has its annual financial statements checked and certified by an external auditor and zero otherwise (e.g., Chakravarty and Xiang, 2013); *Ownership* (%), the share of the firm that is owned by the principal owner (e.g., Cavalluzzo et al., 2002); *M_Woman,* a binary variable equals one if the firm's top manager is female and zero otherwise (e.g., Han et al., 2009); *M_Exp*, the experience of the firm's top manager, measured by the number of years working in the sector[16] (e.g., Cavalluzzo et al., 2002); *Innovation,* a binary variable equals one if the firm introduced new products or services in the last three years and zero otherwise (e.g., Freel, 2007); and *Export,* the percentage of sales (%) that goes directly to exportation (e.g., Brown et al., 2011).

The quality of the borrower is measured by the variables *Overdue* and *Qualcert,* where *Overdue* is a binary variable that equals one if the firm has utility payments that are overdue by more than 90 days and zero otherwise (e.g. Hanedar et al., 2014) and *Qualcert* also a binary variable equals one if the firm has an internationally recognized quality certification, such as ISO 9000 or ISO 9002, and zero otherwise (e.g., Hanedar et al., 2014).

To measure the nature of the relationship lending, due to data limitations we employ only one variable, *Overdrafts,* which is a binary variable equals one if the business has an overdraft facility and zero otherwise. We expect that banks better screen firms with contracted services/products such as overdraft facilities. Unfortunately, our data cannot help us to extend this analysis to the effect of the exclusive relation or the length of the relationship lending on the incidence of discouraged borrowers. The application costs are measured by the variable *City*, which is a binary variable equals one if the firm is located in the capital or in a city with a population over 1 million and zero otherwise (e.g., Hanedar et al., 2014).[17]

[12] The distribution of SMEs by country is as follows: Albania (1.52%), Armenia (3.35%), Azerbaijan (3.33%), Belarus (2.14%), Bosnia and Herzegovina (3.10%), Bulgaria (2.44%), Croatia (1.27%), Czech Republic (2.10%), Estonia (2.33%), Macedonia (3.15%), Georgia (3.22%), Hungary (2.41%), Kazakhstan (4.64%), Kosovo (2.35%), Kyrgyz Republic (2.10%), Latvia (2.26%), Lithuania (2.33%), Moldova (3.07%), Mongolia (3.15%), Montenegro (1.01%), Poland (4.33%), Romania (4.29%), Russia (9.75%), Serbia (3.10%), Slovak Republic (2.31%), Slovenia (2.22%), Tajikistan (3.21%), Turkey (9.33%), Ukraine (7.03%), and Uzbekistan (3.16%).

[13] Among these firms, 692 (16.17%) had their loan application rejected and 3588 (83.83%) had their loans approved.

[14] This study focuses on the responses to three questions of the BEEPS survey:

i) Referring to the last fiscal year, did this establishment apply for any loan or line of credit? [*yes*; *no*]

ii) What was the main reason this establishment did not apply for any loan or line of credit? [*no need for a loan; list of discouraging factors*]

iii) In the last fiscal year, did this establishment apply for any new loan or line of credit that was rejected? [*yes*, *no*].

[15] Discouraging factors are: the application procedures for loans are complex, interest rates are not favourable, collateral requirements are too high, the size of the loan and maturity are insufficient, informational payments are necessary to obtain bank loans, did not think it would be approved, and others (based on Chakravarty and Xiang, 2013).

[16] Han et al. (2009) use the owner's information (e.g., owner's age, owner's college degree, and the owner's experience in the business). However, our survey does not report such information for the firm owner. Hence, we use the information for the firm's top manager. We should note that, usually, for small firms, the top manager is also the owner of the firm.

[17] Our data set does not report information about the distance between the firm and the primary institution. Alternatively, we use the variable *City* based on the assumption that big cities have a higher density of banks' branches, reducing the distance between borrowers and lenders, which increases the share of soft information. New informational technologies (Han, 2008) mainly directed at the treatment of hard information should also reduce application costs, even though we note that the dissemination of these technologies is more moderate in less developed countries.

Table 1
Variables definitions.

Variable	Definition	Source
Identifying discouraged borrowers		
LSeeker	Demands bank loans (0,1)	BEEPS
DBorrower	Discouraged borrower (0,1)	BEEPS
Characteristics of the business and entrepreneur/manager		
FAge	Age of the firm, measured in years	
FSize	Size of the firm, measured by the number of full-time employees	BEEPS
TradeCredit	Share of the firm's purchases of material inputs and services paid on credit (%)	BEEPS
ExtAud	Firm has its annual financial statements checked and certified by an external auditor (0,1)	BEEPS
Ownership	Share of the firm that is owned by the principal owner (%)	BEEPS
M_Woman	Top manager is a woman (0,1)	BEEPS
M_Exp	Top manager's experience, measured by the number of years of experience working in this sector	BEEPS
Innovation	Firm introduced new products or services in the last three years (0,1)	BEEPS
Export	The sales that goes directly to exportation (%)	BEEPS
Quality of borrower		
Overdue	Firm has utility and/or tax payments that are overdue by more than 90 days (0,1)	BEEPS
Qualcert	Firm has an internationally recognized quality certification, such as ISO 9000 or ISO 9002 (0,1)	BEEPS
Nature of the relationship lending		
Overdraft	Firm has an overdraft facility (0,1)	
Application costs		
City	Firm is located in the capital or in a city with a population over 1 million (0,1)	BEEPS
Characteristics of the banking sector		
Cr	Share of the assets of the three largest banks in the whole banking system's assets (%)	BANKSCOPE
Foreign	Share of the assets of foreign banks in the entire banking system's assets (%)	WBDI
Characteristics of the credit environment		
LegalRights	Strength of legal rights index (0 = weak to 12 = strong)	WBDI
CreditInfo	Depth of credit information index (0 = weak to 6 = strong)	DBR
Privcbr	Number of individuals or firms listed by a private credit bureau with current information on repayment history, unpaid debts, or credit outstanding (% of the adult population)	WBDI
Pubcreg	Number of individuals or firms listed by a public credit registry with current information on repayment history, unpaid debts, or credit outstanding (% of the adult population)	WBDI
Macroeconomic variables		
GDPpcppp	Gross domestic product per capita based on purchasing power parity (constant 2005 international dollars)	WBDI
Loan application: approval/denial		
Approved	Loan application (during the last fiscal year) was approved	BEEPS
Rejected	Loan application (during the last fiscal year) was rejected	BEEPS
Control variables		
IND_GroupD	Firm operating in the sector of group D (i.e., manufacturing sector) (0,1)	BEEPS
IND_GroupF	Firm operating in the sector of group F (i.e., construction sector) (0,1)	BEEPS
IND_GroupGH	Firm operating in the sector of group G or H (i.e., service sector) (0,1)	BEEPS
IND_GroupI	Firm operating in the sector of group I (i.e., transport and storage sector) (0,1)	BEEPS
IND_GroupK	Firm operating in the sub-sector 72 of group K (i.e., informational technologies) (0,1)	BEEPS

This table presents the variable definitions and sources of the study data. BEEPS stands for the Business Environment and Enterprise Performance Survey (2009); WBDI stands for the World Bank Development Indicators of the World Bank; and EBRD stands for the European Bank for Reconstruction and Development. The industry classification follows ISIC classification, revision 3.1.

To measure the characteristics of the banking sector, we employ variables related to market concentration. Hence, we define the variable *Cr,* which measures the share (%) of the assets of the three largest banks in the entire banking system's assets (e.g., Brown et al., 2011) and the variable *Foreign,* which corresponds to the percentage of the assets of foreign banks in the whole banking system's assets.[18]

The characteristics of the credit environment include the variable *LegalRights*, a categorical variable that measure the strength of legal rights protecting creditors and borrowers, ranging from zero (weak) to 12 (strong). We also include the depth of information sharing instruments, measured by *CreditInfo,* which is a categorical variable ranging from zero (weak) to 6 (strong) (e.g., Hanedar et al., 2014), as well as their coverage, measured by *Privcbr*, which is the number of firms listed by a private credit bureau with current information on repayment history, unpaid debts, or credit outstanding as a percentage of the adult population, and by *Pubcreg,* the number of firms listed by a public credit registry with current information on repayment history, unpaid debts, or credit outstanding as a percentage of the adult population (e.g, Qian and Strahan, 2007).

[18] During a period of financial crisis, credit constraints are expected to vary between national banks and foreign banks more exposed to the risk of contagion. Furthermore, a foreign-owned bank can be a distant lender. We thank the panel of the Fifth International Conference of the Financial Engineering and Banking Society for these comments.

Table 2
Descriptive statistics.

Variable	SMEs					SMEs (NON-LOAN SEEKERS)				
	Obs.	Mean	Std. Dev.	Min	Max	Obs.	Mean	Std. Dev.	Min	Max
LSeeker	10,571	0.61	0.49	0	1	4084	–	–	–	–
DBorrower	6487	0.34	0.47	0	1	–	–	–	–	–
FAge[a]	10,343	13.09	11.32	0	181	4012	13.01	11.20	0	163
FSize[a]	10,480	47.21	55.25	1	250	4046	43.21	52.56	1	250
TradeCredit[a]	6440	60.44	32.34	0	100	2222	64.55	31.88	0	100
ExtAud	10,386	0.44	0.50	0	1	4004	0.40	0.49	0	1
Ownership[a]	10,040	79.21	26.60	1	100	3904	80.28	26.51	1	100
M_Woman	10,495	0.20	0.40	0	1	4070	0.21	0.41	0	1
M_Exp[ab]	10,274	16.48	10.30	1	75	3962	16.79	10.57	1	66
Innovation	10,533	0.53	0.50	0	1	4075	0.49	0.50	0	1
Export[a]	10,536	7.46	21.45	0	100	4068	6.92	21.10	0	100
Overdue	10,497	0.07	0.26	0	1	4056	0.05	0.21	0	1
Qualcert	10,210	0.24	0.43	0	1	3982	0.24	0.43	0	1
Overdrafts	9834	0.43	0.50	0	1	3706	0.37	0.48	0	1
City	10,571	0.40	0.49	0	1	4084	0.41	0.49	0	1
Cr[a,b]	10,323	56.27	18.15	31.81	100	3914	56.43	17.36	31.81	100
Foreign[a,b]	9767	54.81	30.82	6.60	99.20	3681	56.51	31.57	6.60	99.20
LegalRights[b]	10,323	5.77	2.44	2	10	3914	5.89	2.45	2	10
CreditInfo[2]	10,323	4.17	1.55	0	6	3914	4.22	1.54	0	6
Privcbr[a,b]	10,088	20.41	24.52	0	91.90	3821	20.42	23.58	0	91.90
Pubcreg[a,b]	10,323	3.63	5.85	0	28.10	3914	3.25	5.05	0	28.10
GDPpcppp[a,b]	10,323	10,885.00	5788.54	1660.86	27,225.50	3914	11,370.02	5923.90	1660.86	27,225.50
Rejected	4280	0.162	0.368	0	1	–	–	–	–	–
IND_GroupD	10,571	0.44	0.50	0	1	4084	0.41	0.49	0	1
IND_GroupF	10,571	0.09	0.28	0	1	4084	0.08	0.28	0	1
IND_GroupGH	10,571	0.42	0.49	0	1	4084	0.44	0.50	0	1
IND_GroupI	10,571	0.05	0.21	0	1	4084	0.05	0.21	0	1
IND_GroupK	10,571	0.01	0.10	0	1	4084	0.01	0.12	0	1

This table reports the descriptive statistics of key variables in different groups.
[a] In the empirical modelling, these variables are transformed into the natural logarithm of the real value plus the unit value.
[b] These variables vary across countries.

As a macroeconomic variable, we used *GDPpcppp,* that is, the gross domestic product per capita based on purchasing power parity (constant 2005 international dollars), which proxies for economic development (e.g., Godlewski and Weill, 2011). We include five industry dummies as control variables: *IND_GroupD* is a dummy variable that takes the value one if the firm sector is part of group D (i.e, the manufacturing sector)[19]; *IND_GroupF* is a dummy variable that takes the value one if the firm sector is part of group F (i.e., the construction sector); *IND_GroupGH* is a dummy variable that takes the value one if the firm sector is part of group G or H (i.e., the service sector); *IND_GroupI* is a dummy variable that takes the value one if the firm sector is part of group I (i.e., the transport and storage sector); *IND_GroupK* is a dummy variable that takes the value one if the firm belongs to sub-sector 72 of group K (i.e., informational technologies) and zero otherwise. Appendix B reports the correlation matrix.

3.3. Method

To examine the conditions under which borrowers are discouraged from applying for a loan, this paper uses a binary probit model[20] (e.g. Freel et al., 2012) mathematically expressed as follows:

$$\begin{aligned}\Pr(DBorrower_i = 1|X_i) = \phi(\beta X') = \beta_1 \text{ Characteristics of the business and entrepreneur/manager}_i + \beta_2 \text{ Quality of borrower}_i + \beta_3 \text{ Nature of the relationship lending}_i + \beta_4 \text{Application costs}_i + \beta_5 \text{ Characteristics of the banking sector}_i + \beta_6 \text{ Characteristics of the credit environment}_i + \beta_7 \text{ Macroeconomic variables}_i + \beta 8 \text{ Industry variables } \varepsilon_i,\end{aligned} \quad (1)$$

where $\varepsilon_i \sim N(0, \sigma^2)$ for $i = 1,\ldots, N$.

The variable $DBorrower_i$ is a binary variable coded one if firm *i* was discouraged from applying for external funding and zero otherwise; β_i is the vector of parameters of the independent variables X to be estimated, and ε is the error term.

[19] According to the International Standard Industrial Classification (ISIC), revision 3.1.
[20] According to the authors, the loss of nuance from using the binary probit model is relatively minor compared to using the logit model. For an overview regarding the logit versus the probit model, see Gujarati (1995).

SMEs (LOAN SEEKERS)					APPLICANT BORROWERS					DISCOURAGED BORROWERS				
	Mean	Std. Dev.	Min	Max	Obs.	Mean	Std. Dev.	Min	Max	Obs.	Mean	Std. Dev.	Min	Max
6487	1.00	0.00	1	1	4280	1.00	0.00	1	1	2207	1.00	0.00	1	1
6487	0.34	0.47	0	1	4280	0.00	0.00	0	0	2207	1.00	0.00	1	1
6331	13.13	11.40	0	181	4192	13.58	11.70	0	181	2139	12.25	10.74	0	181
6434	49.72	56.75	1	250	4253	57.96	60.34	1	250	2181	33.64	44.81	1	250
4218	58.28	32.37	0	100	3097	59.90	31.78	0	100	1121	53.82	33.55	0	100
6382	0.46	0.50	0	1	4214	0.53	0.50	0	1	2168	0.34	0.47	0	1
6136	78.52	26.63	1	100	4060	77.04	26.99	2	100	2076	81.42	25.69	1	100
6425	0.19	0.40	0	1	4255	0.18	0.38	0	1	2170	0.23	0.42	0	1
6312	16.28	10.12	1	75	4181	16.72	10.17	1	75	2131	15.41	9.97	1	58
6458	0.56	0.50	0	1	4262	0.60	0.49	0	1	2196	0.47	0.50	0	1
6468	7.80	21.66	0	100	4268	9.44	23.49	0	100	2200	4.61	17.14	0	100
6441	0.09	0.28	0	1	4255	0.09	0.28	0	1	2186	0.08	0.28	0	1
6228	0.24	0.43	0	1	4108	0.28	0.45	0	1	2120	0.16	0.37	0	1
6128	0.47	0.50	0	1	4091	0.57	0.50	0	1	2037	0.26	0.26	0	1
6487	0.39	0.49	0	1	4280	0.41	0.49	0	1	2207	0.34	0.48	0	1
6409	56.17	18.62	31.81	100	4251	55.54	18.96	31.81	100	2158	57.40	17.87	31.81	100
6086	53.79	30.31	6.60	99.20	4078	54.59	30.56	6.60	99.20	2008	52.17	29.75	6.60	99.20
6409	5.70	2.43	2	10	4251	5.69	2.35	2	10	2158	5.71	2.59	2	10
6409	4.14	1.56	0	6	4251	4.17	1.56	0	6	2158	4.08	1.55	0	6
6267	20.40	25.09	0	91.90	4120	22.70	25.82	0	91.90	2147	16.00	22.98	0	91.90
6409	3.86	6.28	0	28.10	4251	4.24	6.44	0	28.10	2158	3.11	5.87	0	27.60
6409	10,588.80	5684.43	1660.86	27,225.50	4251	11,137.20	5820.02	1660.86	27,225.50	2158	9508.51	5243.47	1660.86	27,225.50
–	–	–	–	–	4280	0.162	0.368	0	1	–	–	–	–	–
6487	0.46	0.50	0	1	4280	0.46	0.50	0	1	2207	0.46	0.50	0	1
6487	0.09	0.28	0	1	4280	0.09	0.29	0	1	2207	0.08	0.27	0	1
6487	0.40	0.49	0	1	4280	0.39	0.49	0	1	2207	0.41	0.49	0	1
6487	0.05	0.21	0	1	4280	0.05	0.22	0	1	2207	0.04	0.20	0	1
6487	0.01	0.08	0	1	4280	0.01	0.08	0	1	2207	0.01	0.07	0	1

4. Results

4.1. Descriptive statistics

Table 2 reports the descriptive statistics. This table shows that more than half of the SMEs included in our data set are loans seekers (i.e., 6487). Among these firms, 4280 (66%) applied for a loan and 2207 (34%) are classified as discouraged borrowers. On average, loan applicants are relatively young (i.e. 13 years old) and have 50 employees. The typical loan applicant pays more than 58% of its material inputs and services on credit and 46% are audited by an external entity. The large majority of firm shares belongs to a single person (i.e. the mean value of ownership concentration is 78%) and is managed by a man (80%) with 16 years of experience in the business. Loan applicants launched at least one innovation in the market in the last three years (56%), particularly oriented to domestic consumption (only 7.8% of outputs were exports), and 76% of these firms did not have a quality certification or were overdue on payments in the last three years (only 9% of loan applicants reported having been overdue on payments). Furthermore, loan seekers usually have overdraft facilities (47%) with a bank. The traditional loan applicant (i.e., 61%) operates in a small city or a rural area and operates in countries with satisfactory indices of legal rights (i.e., six out of 12) and depth of information sharing instruments (i.e., four out of six) but with a low coverage level. Public (private) credit bureaus cover only 4% (20%) of the population.

A discouraged borrower is not much younger (i.e., 12 years old) but is smaller (i.e. 34 employees vs. 58 employees for applicants borrowers) and buys less on credit (i.e. 54% of its material inputs and services). Typically, discouraged borrowers are not externally audited (i.e. only 34% were audited). The ownership structure is more highly concentrated (i.e., 81%). Furthermore, the manager is less experienced (i.e. with 15 years). The firms are less innovative (i.e. only a minority of discouraged borrowers launched at least one innovation in the market in the last three years) and have a lower ratio of exportations (i.e. 4.61% vs. 9.44% of applicant borrowers). However, they have a similar incidence of overdue events (i.e. 8%) but a lower incidence of quality certifications (i.e. 16% vs. 24% for applicant borrowers). Additionally, the percentage of these firms with overdraft facilities is lower (i.e. 26% vs. 57% for applicant borrowers). The number of firms working in small cities is higher among discouraged borrowers (i.e., 34%) and the banking concentration is higher (57.40%). Finally, discouraged borrowers operate in countries with lower indices of legal rights and less depth and lower coverage of information sharing instruments. Applicant borrowers face a rejection rate of 11% (i.e., 629/6487).[21]

[21] Recall that the percentage of discouraged borrowers in the sample is 34%.

Table 3
Univariate tests.

Variables	Applicant borrowers (N = 4280)	Discouraged borrowers (N = 2207)	Mean differences	p-Value
Characteristics of the business and entrepreneur/manager				
FAge	13.580	12.254	−1.326	0.000
FSize	57.965	33.638	−24.327	0.000
TradeCredit	59.896	53.822	−6.074	0.000
ExtAud	0.526	0.340	−0.186	0.000
Ownership	77.039	81.424	43.385	0.000
M_Woman	0.175	0.230	0.055	0.000
M_Exp	16.717	14.413	1.303	0.000
Innovation	0.604	0.468	−0.136	0.000
Export	9.442	4.609	−4.834	0.000
Quality of borrower				
Overdue	0.089	0.085	−0.004	0.550
Qualcert	0.278	0.158	−0.120	0.000
Nature of the relationship lending				
Overdrafts	0.570	0.264	−0.306	0.000
Application costs				
City	0.413	0.345	−0.068	0.000
Characteristics of the banking sector				
Cr	55.542	57.395	1.853	0.000
Foreign	54.585	52.168	−2.417	0.002
Characteristics of the credit environment				
LegalRights	5.688	5.712	0.024	0.729
CreditInfo	4.174	4.082	−0.092	0.001
Privcbr	22.698	15.997	−6.701	0.000
Pubcreg	4.238	3.114	−1.124	0.000
Macroeconomic characteristics				
GDPpcppp	11,137.200	9508.513	−1628.687	0.000

This table reports the results of the univariate tests of the key variables. The *Wilcoxon–Mann–Whitney* test is conducted for continuous variables at the mean and a z-test is applied to binary variables at the median. H_0: mean (y = 0) = mean (y = 1); difference = mean (y = 1) − mean (y = 0).

4.2. Univariate tests

This section reports univariate tests comparing the characteristics of loan applicants and discouraged borrowers (Table 3). The results confirm that discouraged borrowers are younger (*FAge*) and smaller (*FSize*) than loan applicants. Furthermore, discouraged borrowers have a lower ratio of operational inputs bought on credit (*TradeCredit*). These borrowers tend to be externally audited less often (*ExtAud*) and have a higher ownership concentration (*Ownership*). Additionally, they have a higher ratio of women as business managers (*M_Woman*), with less experience in the business (*M_Exp*). Moreover, loan applicants are more innovative (*Innovation*) and have an exportation volume twice as high as that of discouraged borrowers (*Export*). The incidence of quality certification is also higher among loan applicants (*Qualcert*). These borrowers are more likely to have overdraft facilities (*Overdrafts*) than discouraged borrowers are. The results also suggest that the loan application costs are higher for discouraged borrowers (*City*). We find that, on average, discouraged borrowers operate in a more concentrated banking system environment (*Cr*). Univariate tests also indicate that loan applicants operate in a more favourable context in regards to the development of information sharing instruments (*CreditInfo*, *Privcbr,* and *Pubcreg*). Finally, the results suggest that loan applicants operate in countries with higher economic development. These results seem to confirm that informational opacity is the main determinant of discouraged borrowers, whereas the quality of borrowers (*Overdue*) and the legal context in which they operate (*LegalRights*) seem to be statistically insignificant in explaining discouragement. See the correlation matrix in Appendix B.

4.3. Incidence of discouraged borrowers

Table 4 reports the estimations regarding the determinants of discouragement.[22] Since our data set includes several specific characteristics of the banking sector and credit environment variables, we estimate different specifications to avoid collinearity problems. Therefore Eq. (1) reports the baseline model with control for cross-country variation, Eqs. (2) and (3) discriminate among banking sector characteristics, Eqs. (4) to (7) discriminate among credit environment variables, and Eq. (8) includes the macroeconomic variable.

[22] The model specifications control for industry dummy variables. The results are not tabulated here but are available from the authors upon request.

Table 4
Determinants of discouraged borrowers: probit estimations.

	Baseline - 1	2	3	4	5	6	7	8
Characteristics of the business and entrepreneur/manager								
Ln(Fage + 1)	0.035	0.051	0.033	0.035	0.041	0.083*	0.036	0.054
	(0.048)	(0.044)	(0.045)	(0.044)	(0.043)	(0.045)	(0.044)	(0.044)
Ln(FSize + 1)	−0.237***	−0.231***	−0.226***	−0.229***	−0.232***	−0.245***	−0.242***	−0.235***
	(0.043)	(0.026)	(0.027)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)
Ln(TradeCredit + 1)	−0.087**	−0.093***	−0.086***	−0.096***	−0.083***	−0.070**	−0.074***	−0.075***
	(0.044)	(0.027)	(0.028)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)
ExtAud	−0.181***	−0.196***	−0.210***	−0.190***	−0.182***	−0.210***	−0.157***	−0.180***
	(0.068)	(0.052)	(0.053)	(0.052)	(0.052)	(0.052)	(0.052)	(0.052)
Ln(Ownership + 1)	−0.062	−0.082	−0.062	−0.071	−0.069	−0.045	−0.075	−0.070
	(0.074)	(0.051)	(0.053)	(0.051)	(0.051)	(0.052)	(0.051)	(0.051)
M_Woman	0.105	0.117*	0.148**	0.114*	0.121**	0.117*	0.119**	0.125**
	(0.075)	(0.060)	(0.062)	(0.061)	(0.060)	(0.061)	(0.061)	(0.060)
Ln(M_Exp + 1)	−0.093**	−0.093**	−0.064	−0.099**	−0.098**	−0.090**	−0.087**	−0.091**
	(0.047)	(0.040)	(0.042)	(0.040)	(0.040)	(0.041)	(0.041)	(0.040)
Innovation	−0.144*	−0.152***	−0.143***	−0.154***	−0.148***	−0.141***	−0.149***	−0.141***
	(0.074)	(0.050)	(0.052)	(0.051)	(0.050)	(0.051)	(0.051)	(0.051)
Ln(Export + 1)	−0.037	−0.041**	−0.045**	−0.041**	−0.038*	−0.020	−0.030	−0.034*
	(0.026)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
Quality of borrower								
Overdue	−0.029	−0.043	0.024	−0.034	−0.035	−0.026	−0.017	−0.041
	(0.104)	(0.086)	(0.089)	(0.086)	(0.086)	(0.087)	(0.086)	(0.086)
Qualcert	−0.067	−0.058	−0.087	−0.061	−0.057	−0.022	−0.048	−0.044
	(0.056)	(0.064)	(0.066)	(0.064)	(0.064)	(0.065)	(0.064)	(0.064)
Nature of the relationship lending								
Overdrafts	−0.607***	−0.603***	−0.613***	−0.644***	−0.624***	−0.574***	−0.635***	−0.607***
	(0.090)	(0.051)	(0.051)	(0.051)	(0.050)	(0.052)	(0.050)	(0.051)
Application costs								
City	−0.149	−0.113**	−0.105**	−0.131**	−0.136***	−0.155***	−0.109**	−0.141***
	(0.107)	(0.052)	(0.052)	(0.051)	(0.051)	(0.052)	(0.052)	(0.051)
Characteristics of the banking sector								
Ln(Cr + 1)		0.206**						
		(0.083)						
Ln(Foreign + 1)			0.051					
			(0.037)					
Characteristics of the credit environment								
LegalRights				0.032***				
				(0.010)				
CreditInfo					−0.007			
					(0.016)			
Ln(Privcbr + 1)						−0.072***		
						(0.017)		
Ln(Pubcreg + 1)							−0.083***	
							(0.024)	
Macroeconomic characteristics								
Ln(GDPpcppp + 1)								−0.098**
								(0.039)
Constant	1.745***	0.944*	1.276***	1.640***	1.777***	1.585***	1.837***	2.577***
	(0.500)	(0.560)	(0.495)	(0.458)	(0.460)	(0.480)	(0.456)	(0.562)
#	3.505	3475	3413	3475	3475	3344	3475	3475
Log-Likelihood	−1738.05	−1738.02	−1645.53	−1736.41	−1741.02	−1691.36	−1735.16	−1737.95
Wald chi2	710.93							
LR chi2		467.48	430.60	470.70	461.48	459.39	473.22	467.64
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pseudo-R2	0.115	0.119	0.116	0.119	0.117	0.120	0.120	0.119

This table reports the results of the probit model. The dependent variable is DBorrower. We control for industry dummy variables. The results are not tabulated here but are available upon request from the author. The variable definitions are reported in Table 1. Standard errors are reported in parentheses.
*** p < 0.01.
** p < 0.05.
* p < 0.1.

The estimations report negative coefficients of *Ln*(*FSize* + 1) (p-value < 0.01 in all specifications), *ExtAud* (p-value < 0.01 in all equations), and *Ln*(*TradeCredit* + 1) (p-value < 0.05 in Eqs. (1) and (6); p-value < 0.01 in the remaining equations). These results are in line with the theoretical framework, that is, confirming that less opaque firms have a lower probability of being discouraged

from applying for credit. In line with Cavalluzzo et al. (2002), Freel et al. (2012) and Xiang et al. (2015), firm age is unrelated to discouragement. Similarly, we do not find a statistically significant effect of business ownership concentration on the likelihood of being discouraged, contrary to the results of Han et al. (2009). Nonetheless, the results provide strong evidence regarding gender discrimination explaining the incidence of discouragement. The positive coefficients of *M_Woman* (p-value < 0.05 in Eqs. (3), (5), (7), and (8); p-value < 0.1 in Eqs. (2), (4), and (6)) suggest that female managers tend to be more discouraged from applying for credit. The negative coefficients of *Ln(M_Exp + 1)* (p-value < 0.05 in all equation except Eq. (3)) confirm that firms with experienced managers/entrepreneurs have a lower probability of being discouraged. These results seem to confirm that demographic factors (i.e., gender and experience) have greater importance in less developed countries to predict discouragement, in line with Chakravarty and Xiang (2013).[23] This result can be justified by the privileged access to information of experienced managers/entrepreneurs and by the fight against gender discrimination started in the last decades in developed countries. The negative coefficients of *Innovation* (statistically significant in all equations at the 1% level), with the exception of Eq. (1) (p-value < 0.1) and business exportations (Ln (*Export + 1*)) (p-value < 0.05 in Eqs. (2) to (4); p-value < 0.1 in Eqs. (5) and (8)) confirm the results from univariate tests, that is, the likelihood of being discouraged from applying for a loan is lower for more innovative firms and firms operating in foreign markets.

The results reported in Table 4 also show that the quality of the borrower (i.e. *Overdue* and *Qualcert*) is unrelated with the incidence of discouragement. This evidence seems to contradict the theory that discouragement is an efficient self-selecting mechanism, that is, riskier borrowers show high probabilities of discouragement (Han et al., 2009), which may suggest the prevalence of falsely discouraged borrowers (Diagne, 1999) among self-selected businesses operating in less developed countries. We check the robustness of this result in Section 5.

The results on the nature of the banking relationship confirm that overdraft facilities are negatively related with discouraged borrowers (*p*-value <0.01 in all equations). This result is compatible with the view that discouragement increases in the absence of a relationship between the borrower and the lender. Hence, we confirm that if banking relationships pre-exist (e.g., Chakravarty and Yilmazer, 2009; Han et al., 2009), the private information about the borrower reduces screening errors and application costs and, consequently, the incidence of discouraged borrowers.

Firms located in big cities (*City*, p-value < 0.05 in Eqs. (2) to (4); p-value <0.01 in the remaining equations) have a lower likelihood of discouragement. This evidence confirms that the distance between the firm and a lender increases the screening and application costs, in line with Petersen and Rajan (2002). The positive coefficient of *Ln(Cr + 1)* (p-value < 0.05 - Eq. (2)) confirms that the degree of difficulty in accessing a loan increases with the level of bank market concentration, in line with Brown et al. (2011).

Contrary to our expectations, the positive coefficient of *LegalRights* (p-value < 0.01, Eq. (4)) suggests that the strength of the legal protection of creditors and borrowers increases the number of discouraged borrowers (we further explore this result in Section 5). The results also confirm that borrowers feel less discouraged from applying for a loan in countries with high coverage of public and private information sharing instruments (*Ln(Privcbr + 1)*, p-value < 0.01, Eq. [6]; *Ln(Pubreg + 1)*; p-value < 0.01, Eq. (7)). These results are in line with our predictions. Nonetheless, we do not find that the depth of information sharing instruments (*CreditInfo*, Eq. (5)) influences the incidence of discouraged borrowers. These results suggest that policy makers should direct their efforts in increasing the coverage of information sharing instruments to reduce the incidence of discouraged borrowers more than increasing the depth of these instruments, satisfactorily developed (for an overview of the differences detected between the coverage and depth of information sharing instruments across countries, see DBR, 2010). Furthermore, borrowers operating in more developed countries have a lower probability of being discouraged (*Ln(GDPpcppp + 1*, p-value < 0.01, Eq. (8)).

Table 5 reports the results of parsimonious model. The results broadly confirm the estimations of Table 4. Based on the parsimonious model and before proceeding to the robustness test section, we plot the estimated probabilities of being discouraged for nine hypothetical borrowers (with different levels of opacity, screening errors, and application costs) in a subsample analysis (by *FSize*, *ExtAud*, *Overdraft,* and *City*; see Appendices C to F). These plots show how changes in i) banking concentration (*Cr,* see Appendix *C*), ii) strength of creditor and borrower protection in the event of default (*LegalRights*, see Appendix D), and iii) coverage of private/public information sharing instruments (*Privcbr,* see Appendix E; *Pubcreg,* see Appendix F) affect the probability of each business being discouraged as a function of firm-specific characteristics. These plots provide a representation regarding the marginal effects of the unitary variation (above the mean) of the market variables (i.e. *Cr, LegalRights*, *Privcbr*, *Pubcreg*) in terms of the probability of being discouraged. Hence, they provide interesting input for policy makers predicting the likelihood of discouragement as a function of contextual reforms.

The plots reported in Appendices C to F broadly confirm that, for the mean values of the variables *Cr* (Appendix C), *LegalRights* (Appendix D), *Privcbr* (Appendix E), and *Pubcreg* (Appendix F), the estimated probability of being discouraged is higher among smaller firms, externally unaudited businesses, firms without overdraft facilities, and firms operating in a small city or rural area. Furthermore, Appendix C confirms that an increase in banking concentration increases the estimated probability of being discouraged, with the exception of the estimated probability for businesses operating in small cities or rural areas, which is negatively related to banking concentration. Interestingly, we find that the most notable marginal effects occur for business with overdrafts and borrowers located in big cities. We also find that, starting at a given point, these businesses would be more likely to be discouraged than others. This result seems to suggest that in a more highly concentrated banking market, those firms with a closer and more intense relationship with a bank are more likely to be discouraged from applying for a loan than distant

[23] Despite some authors (e.g., Jappelli, 1990; Cavalluzzo et al., 2002; Han et al., 2009; Freel et al., 2012) predicting that the discouragement problem varies across gender and the experience of entrepreneurs/managers, empirical evidence does not report a statistically significant likelihood of discouragement in developed countries. On the contrary, for developing countries, Chakravarty and Xiang (2013) report significant effects of experience and gender as predictors of discouragement.

Table 5
Determinants of discouraged borrowers: probit estimations (parsimonious model).

	Baseline - 1	2	3	4	5	6
Characteristics of the business and entrepreneur/manager						
Ln(FSize + 1)	−0.220***	−0.213***	−0.213***	−0.223***	−0.225***	−0.216***
	(0.036)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)
Ln(TradeCredit + 1)	−0.062*	−0.068***	−0.072***	−0.046*	−0.048*	−0.053**
	(0.037)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)
ExtAud	−0.180**	−0.188***	−0.184***	−0.196***	−0.150***	−0.174***
	(0.078)	(0.049)	(0.049)	(0.049)	(0.049)	(0.049)
M_Woman	0.110	0.124**	0.119**	0.125**	0.122**	0.131**
	(0.071)	(0.058)	(0.058)	(0.059)	(0.058)	(0.058)
Ln(M_Exp + 1)	−0.064	−0.061*	−0.071**	−0.054	−0.058	−0.060*
	(0.044)	(0.036)	(0.036)	(0.036)	(0.036)	(0.036)
Innovation	−0.166**	−0.174***	−0.177***	−0.162***	−0.169***	−0.164***
	(0.065)	(0.048)	(0.048)	(0.048)	(0.048)	(0.048)
Ln(Export + 1)	−0.046*	−0.048***	−0.049***	−0.028	−0.037**	−0.042**
	(0.024)	(0.018)	(0.018)	(0.019)	(0.019)	(0.018)
Nature of the relationship lending						
Overdrafts	−0.608***	−0.602***	−0.641***	−0.578***	−0.631***	−0.605***
	(0.089)	(0.048)	(0.048)	(0.049)	(0.048)	(0.048)
Application costs						
City	−0.153	−0.122**	−0.136***	−0.159***	−0.112**	−0.145***
	(0.102)	(0.049)	(0.048)	(0.049)	(0.049)	(0.048)
Characteristics of the banking sector						
Ln(Cr + 1)		0.173**				
		(0.078)				
Characteristics of the credit environment						
LegalRights			0.032***			
			(0.010)			
Ln(Privcbr + 1)				−0.056***		
				(0.016)		
Ln(Pubcreg + 1)					−0.088***	
					(0.023)	
Macroeconomic characteristics						
Ln(GDPpcppp + 1)						−0.085**
						(0.036)
Constant	1.297***	0.576	1.142***	1.286***	1.330***	2.023***
	(0.277)	(0.465)	(0.339)	(0.355)	(0.335)	(0.462)
#	3.808	3808	3808	3808	3808	3808
Log-Likelihood	−1953.94	−1922.60	−1919.69	−1877.37	−1917.70	−1922.35
Wald chi2	715.25					
LR chi2		483.07	488.88	470.78	492.87	483.58
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000
Pseudo-R2	0.109	0.112	0.113	0.111	0.114	0.112

This table reports the results of the parsimonious probit model based on the estimations of Table 4. The dependent variable is DBorrower. We control for industry dummy variables. The results are not tabulated here but are available upon request from the author. The variable definitions are reported in Table 1. Standard errors are reported in parentheses.
*** $p < 0.01$.
** $p < 0.05$.
* $p < 0.1$.

borrowers. This is reasonable if we assume that these firms are more likely rely on banks as their primordial source of finance, becoming locked in by the superior bargaining power of the credit provider in a context of low competition (Sharpe, 1991; Detragiache et al., 2000). In turn, this bargaining power could discourage businesses from applying for new loans.

Appendix D also confirms the positive relation between the strength of legal rights and discouragement. Nonetheless, we find that this effect is very low, especially for businesses with overdrafts and firms operating in small cities or rural areas.

Appendices E and F broadly confirm that an increase in the coverage of private (*Privcbr*) and public (*Pubcreg*) information sharing instruments, respectively, decreases the estimated probability of being discouraged, independently of the nature of business opacity, screening errors, or application costs.

5. Robustness tests

Some empirical studies show that strong conditions of creditor protection expand the availability of favourable-term loans (e.g., Qian and Strahan, 2007; Djankov et al., 2007), particularly in situations involving severe adverse selection problems in

Table 6
Determinants of discouraged borrowers: ML estimations.

	Baseline - 1		2		3		4	
	Price Procedures	Rationing	Price Procedures	Rationing	Price Procedures	Rationing	Price Procedures	Rationing
Characteristics of the business and entrepreneur/manager								
Ln(Fage + 1)	0.081	−0.077	0.100	0.034	0.092	−0.180	0.081	−0.079
	(0.086)	(0.180)	(0.078)	(0.202)	(0.080)	(0.204)	(0.078)	(0.198)
Ln(FSize + 1)	−0.391***	−0.572***	−0.382***	−0.572***	−0.381***	−0.507***	−0.379***	−0.563***
	(0.073)	(0.155)	(0.047)	(0.127)	(0.048)	(0.131)	(0.047)	(0.125)
Ln(TradeCredit + 1)	−0.164**	0.102	−0.170***	0.078	−0.162***	0.124	−0.173***	0.059
	(0.071)	(0.142)	(0.047)	(0.150)	(0.047)	(0.151)	(0.047)	(0.145)
ExtAud	−0.332***	−0.137	−0.356***	−0.206	−0.390***	−0.101	−0.351***	−0.153
	(0.119)	(0.252)	(0.093)	(0.245)	(0.095)	(0.255)	(0.092)	(0.243)
Ln(Ownership + 1)	−0.118	−0.098	−0.142	−0.224	−0.100	−0.221	−0.130	−0.141
	(0.132)	(0.185)	(0.091)	(0.228)	(0.095)	(0.235)	(0.090)	(0.232)
M_Woman	0.161	0.223	0.180*	0.238	0.237**	0.299	0.178*	0.254
	(0.129)	(0.267)	(0.106)	(0.271)	(0.108)	(0.283)	(0.106)	(0.270)
Ln(M_Exp + 1)	−0.149*	−0.217	−0.149**	−0.199	−0.101	−0.160	−0.156**	−0.244
	(0.085)	(0.180)	(0.072)	(0.180)	(0.074)	(0.189)	(0.071)	(0.179)
Innovation	−0.204	−0.634***	−0.215**	−0.716***	−0.194**	−0.705***	−0.220**	−0.719***
	(0.125)	(0.227)	(0.089)	(0.234)	(0.092)	(0.245)	(0.089)	(0.234)
Ln(Export + 1)	−0.065	−0.056	−0.071**	−0.062	−0.074**	−0.097	−0.071**	−0.060
	(0.047)	(0.115)	(0.036)	(0.099)	(0.037)	(0.106)	(0.036)	(0.099)
Quality of borrower								
Overdue	−0.164	0.583**	−0.182	0.552*	−0.076	0.737**	−0.174	0.646**
	(0.185)	(0.288)	(0.159)	(0.315)	(0.162)	(0.328)	(0.159)	(0.316)
Qualcert	−0.178*	0.302	−0.163	0.364	−0.201*	0.184	−0.165	0.331
	(0.098)	(0.325)	(0.117)	(0.291)	(0.121)	(0.309)	(0.117)	(0.290)
Nature of the relationship lending								
Overdrafts	−1.034***	−1.118***	−1.041***	−1.023***	−1.054***	−1.030***	−1.088***	−1.294***
	(0.173)	(0.282)	(0.092)	(0.259)	(0.093)	(0.261)	(0.092)	(0.257)
Application costs								
City	−0.278	−0.090	−0.234**	0.114	−0.210**	0.063	−0.253***	−0.024
	(0.185)	(0.248)	(0.092)	(0.238)	(0.093)	(0.247)	(0.091)	(0.235)
Characteristics of the banking sector								
Ln(Cr + 1)			0.221	1.515***				
			(0.145)	(0.398)				
Ln(Foreign + 1)					0.049	0.294		
					(0.065)	(0.179)		
Characteristics of the credit environment								
LegalRights							0.038**	0.185***
							(0.018)	(0.049)
Constant	2.846***	1.223	1.985**	−4.767**	2.300***	−13.039	2.713***	0.623
	(0.789)	(1.741)	(0.972)	(2.376)	(0.838)	(806.149)	(0.795)	(1.763)
#	3.505	3475	3314	3475				
Log-Likelihood	−2038.34	−1993.37	−1880.18	−1992.97				
LR chi2	488–63	507.63	459.51	508.43				
Prob > chi2	0.000	0.000	0.000	0.000				
Pseudo-R2	0.107	0.113	0.110	0.113				

	5		6		7		8	
	Price/procedures	Rationing	Price/procedures	Rationing	Price/procedures	Rationing	Price/procedures	Rationing
Characteristics of the business and entrepreneur/manager								
Ln(Fage + 1)	0.089	−0.039	0.153*	0.077	0.082	−0.046	0.116	−0.035
	(0.078)	(0.197)	(0.080)	(0.202)	(0.078)	(0.196)	(0.078)	(0.197)
Ln(FSize + 1)	−0.383***	−0.573***	−0.403***	−0.602***	−0.403***	−0.557***	−0.389***	−0.577***
	(0.046)	(0.125)	(0.047)	(0.126)	(0.047)	(0.126)	(0.047)	(0.125)
Ln(TradeCredit + 1)	−0.159***	0.141	−0.137***	0.176	−0.139***	0.119	−0.147***	0.147
	(0.047)	(0.145)	(0.047)	(0.148)	(0.047)	(0.144)	(0.047)	(0.144)
ExtAud	−0.342***	−0.054	−0.383***	−0.186	−0.286***	−0.139	−0.340***	−0.085
	(0.092)	(0.243)	(0.093)	(0.242)	(0.093)	(0.244)	(0.092)	(0.241)
Ln(Ownership + 1)	−0.127	−0.147	−0.089	−0.086	−0.141	−0.125	−0.131	−0.141
	(0.090)	(0.231)	(0.091)	(0.235)	(0.090)	(0.234)	(0.090)	(0.232)
M_Woman	0.184*	0.295	0.175	0.286	0.180*	0.284	0.191*	0.290
	(0.106)	(0.269)	(0.107)	(0.271)	(0.106)	(0.270)	(0.106)	(0.269)

Table 6 (*continued*)

Ln(M_Exp + 1)	−0.155**	−0.242	−0.140*	−0.207	−0.134*	−0.272	−0.141**	−0.237
	(0.071)	(0.178)	(0.072)	(0.180)	(0.072)	(0.178)	(0.072)	(0.178)
Innovation	−0.211**	−0.683***	−0.200**	−0.664***	−0.215**	−0.672***	−0.200**	−0.661***
	(0.089)	(0.232)	(0.090)	(0.233)	(0.089)	(0.232)	(0.089)	(0.232)
Ln(Export + 1)	−0.068*	−0.049	−0.038	−0.005	−0.052	−0.066	−0.061*	−0.046
	(0.036)	(0.099)	(0.036)	(0.099)	(0.036)	(0.100)	(0.036)	(0.100)
Quality of borrower								
Overdue	−0.175	0.588*	−0.164	0.607*	−0.136	0.570*	−0.193	0.604*
	(0.159)	(0.314)	(0.160)	(0.316)	(0.159)	(0.315)	(0.159)	(0.314)
Qualcert	−0.164	0.358	−0.113	0.464	−0.148	0.326	−0.141	0.345
	(0.117)	(0.291)	(0.119)	(0.293)	(0.118)	(0.291)	(0.118)	(0.291)
Nature of the relationship lending								
Overdrafts	−1.064***	−1.185***	−0.986***	−0.974***	−1.083***	−1.174***	−1.032***	−1.164***
	(0.091)	(0.255)	(0.093)	(0.260)	(0.091)	(0.255)	(0.092)	(0.258)
Application costs								
City	−0.259***	−0.025	−0.284***	−0.069	−0.206**	−0.087	−0.269***	−0.036
	(0.091)	(0.235)	(0.091)	(0.237)	(0.092)	(0.239)	(0.091)	(0.235)
Characteristics of the credit environment								
CreditInfo	−0.002	−0.105						
	(0.028)	(0.067)						
Ln(Privcbr + 1)			−0.107***	−0.262***				
			(0.030)	(0.077)				
Ln(Pubcreg + 1)					−0.172***	0.143		
					(0.043)	(0.106)		
Macroeconomic characteristics								
Ln(GDPpcppp + 1)							−0.178***	−0.115
							(0.067)	(0.170)
Constant	2.857***	1.681	2.525***	1.072	3.031***	1.144	4.358***	2.246
	(0.797)	(1.762)	(0.842)	(1.771)	(0.791)	(1.752)	(0.973)	(2.242)
#	3475	3344	3475	3475				
Log-Likelihood	−2000.33	−1948.81	−1991.71	−1997.94				
LR chi^2	493.70	493.15	510.96	498.49				
Prob > chi^2	0.000	0.000	0.000	0.000				
Pseudo-R^2	0.110	0.112	0.114	0.111				

The dependent variable in this table is *DBorrower_Reason*. The base outcome in the ML model is *applied for credit*. The left-hand column provides the determinants of discouragement due to tough loan prices or loan application procedures (i.e., *DBorrower_Reason = Price/Procedures*). The right hand-column provides the determinants of discouragement due to fear of rationing. We control for industry dummies. The results are not tabulated here but are available from the authors upon request. The variable definitions are reported in Table 1. Standard errors are reported in parentheses.

*** $p < 0.01$.

** $p < 0.05$.

* $p < 0.1$.

the financial markets (e.g., Pagano and Jappelli, 1993), thus promoting the development of financial markets (Claessens and Yurtoglu, 2013). Nonetheless, we found that an increase in the legal protection of creditor rights has not been proven an instrument to reduce the incidence of discouraged borrowers. Instead, in countries with stronger creditor rights, the borrower is more likely to be discouraged from applying for a loan that they need. This result is not surprising if we assume that an increase in creditor/lender protection facilitates lending to SMEs on collateral basis. If we show that this assumption is true, we may expect collaterally constrained borrowers to be less encouraged to apply for a loan if they expect lenders will offer credit under a collateralized contract. To test such an assumption, we investigate the impact of *LegalRights* on the likelihood of the lender requesting collateral to accept the loan application. Based on BEEPS (2008/2009) information regarding loan applicants with ultimately approved loans, we built the variable *Collateral* (a binary variable coded one if the lender requests collateral to approve the loan and zero otherwise).[24] Then we run a probit model on *Collateral* over *LegalRights* and the set of specific firm variables included in this study.[25] The probit model reports a positive coefficient for *LegalRights* (p-value < 0.05), suggesting that strong credit rights increase the reliance on collateral to extend bank loans. Interpreting this result, we must highlight that this test reports only information about firms with approved loan application, which therefore passed the lender's credit evaluation. Hence, it could be argued that the strength of legal rights positively affects the approval of loan requests.

To test this assumption, based on Hanedar et al. (2014), we investigate the impact of *CreditInfo* in extending credit. Hence, we built the variable *ProbRejected* (a binary variable coded one if the firm reported access to finance as a severe problem and zero

[24] We built the final sample based on answers to the following survey questions: 'At this time, does this establishment have a line of credit or loan from a financial institution?' [*Yes*, *No*, *Don't know*] and 'Referring only to this most recent loan or line of credit, did financing require collateral?' [*Yes*, *No*, *Don't know*].

[25] These estimations are not tabulated here but are available upon request from the authors.

otherwise[26]), which is used as the dependent variable.[27] Then, we run a probit model on *ProbRejected* over *LegalRights* and the set of independent variables.[28] The probit model reports a negative coefficient for *LegalRights* (p-value < 0.05), confirming that credit access is less constrained for firms operating in countries with better credit protection laws. This result sheds more light on the relation between legal rights, credit rationing, and the incidence of discouraged borrowers, leading us to conclude that reliable credit protection laws decrease banks' reluctance in extending credit under terms that may discourage borrowers from applying for a loan, despite the fact that these terms increase the odds of accepted loan applications.

These results confirm that discouragement exists beyond the fear of rationing. In fact, Appendix G shows that the proportion of loans seekers that do not apply for a loan from fear that the loan application would be rejected/rationed in the global sample is lower than the proportion of borrowers discouraged by tough loan prices or application procedures. Hence, to test if our model fits well in explaining both discouragement due to fear of rationing and negative perceptions about loan prices or given the complexity of the loan application's procedures, we re-estimate the results reported in Table 4, splitting the sample into two types of discouraged borrowers. Hence, using a multinomial logit (ML) model (e.g. Brown et al., 2011),[29] we extend the test for the self-selection theory for three categories of discouragement. In this model let $DBorrower\_Reason_{ij} = 1$ if the *i*th observation chooses alternative *j*, $j = 1, 2, 3$, which is treated as an unordered choice set. The situation of interest in this study, *i*, represents the firm and *j* represents the discouragement status. There are three choices, with probability π_{f1} (applicants, 65.98% of the sample), π_{f2} (the firm did not apply for a bank loan given its price or procedures, 30.46% of the sample), and π_{f3} (the firm did not apply for a bank loan due to fear of rationing, 3.56% of the sample) for individual *i*. This means that $\sum_{j=1}^{3} DBorrower\_Reason_{ij} = 1$ and $\sum_{j=1}^{3} \pi_{ij} = 1$ (Baltagi, 2002). As in the binary response model, we are interested in how changes in the elements of χ (i.e. independent variables) affect the response probabilities π_{ij}, $j = 1, 2, 3$, ceteris paribus. Thus, for the generalized multinomial model (Pinder, 1996) is:

$$\pi_{ij} = \frac{\exp\left(\alpha_j + \beta_j X_i\right)}{\sum_{j=1}^{a} \cdot \exp\left(\alpha_j + \beta_j X_i\right)} \tag{2}$$

The variable $DBorrower\_Reason_{ij}$ is a categorical variable coded one if the firm *i* applied for external funding (i.e. applicant); two if the main reasons for discouragement were high interest rates, collateral, the complexity of application procedures, the necessity of making informational payments to obtain a bank loan, or other reasons that make the procedure the main reason for discouragement; or three if the main reason for discouragement was the fear of credit rationing[30] (e.g., Brown et al., 2011; Chakravarty and Xiang, 2013). The term **X** is the vector of independent variables and β_i is the vector of parameters to be estimated.

Table 6 reports the estimations of the ML model. There are three outcomes per firm in this model: *Applied for credit*; discouraged - *Price/Procedures*; and discouraged - *Rationing*. Our base outcome is *Applied for credit* (not tabulated). The coefficients in this table report the impact of each explanatory variable on the relative probability of being discouraged by tough loan *price,* application *procedures* complexity, and *fear of rationing*. The Eq. (1) presents the baseline model, the Eqs. (2) to (8) control for banking sector characteristics, the credit environment, and macroeconomic variables to avoid potential multicollinearity problems.

The results reported in the left-hand column of Table 6 (i.e. *DBorrower_Reason = Price/Procedures*) broadly confirm the estimations provided in Table 4, except for banking concentration (*Ln*(*Cr* + 1)), which does not relate to the probability of being discouraged by tough loan prices or application procedures. Nonetheless, the right-hand column (i.e. *DBorrower_Reason = Rationing*) reports several differences with the estimations provided in Table 4.

Namely, only firm size (Ln(*FSize* + 1)) and innovator status (*Innovation*) remain statistically significant in explaining the incidence of discouraged borrowers. Furthermore, contrary to previous results, we confirm that the quality of the borrower is positively related to discouragement. We find that firms reporting being past overdue on payments (*Overdue*, p-value < 0.05 in Eqs. (2) to (4); p-value < 0.1 in the remaining equations) are more likely to be discouraged from applying for a loan. This result is in line with Han et al. (2009), indicating that discouragement is a self-rationing mechanism for high-risk borrowers only in the context of fear of rationing. We also find that the distance between a lender and borrowers (*City*) is not related to discouragement due to fear of rationing. The variables *Ln*(*Pubcreg* + 1) and *Ln*(*GDPpcppp* + 1) lose statistical significance in explaining this profile of discouraged borrowers. The positive coefficient of *LegalRights* (p-value < 0.01) seems to suggest the existence of falsely discouraged borrowers, since we confirm that, contrary to the expectations of these discouraged borrowers, the strength of creditor and borrower protection increases the likelihood of receiving a loan.

[26] The question in the survey is as follows: 'Is access to finance, which includes availability and cost, interest rates, fees and collateral requirements, no obstacle, a minor obstacle, a moderate obstacle, a major obstacle or a very severe obstacle to the current operations of this establishment?'.

[27] We assume that the difficulty accessing financing predicts in some way the likelihood of firms being discouraged from applying for a loan or having their loan applications rejected.

[28] The estimations are not tabulated here but are available upon request from the authors.

[29] Because of the need to evaluate multiple integrals of the normal distribution, the probit model for multiples choices has been found to be of rather limited use in this setting. The logit model for multiple choices (i.e. the ML model), in contrast, has been widely used in many fields, including economics, market research, and transportation engineering (Greene, 2003).

[30] Here, we define the fear of rationing as the fear of loan rejection or fear that the size of the loan and/or its maturity will be insufficient.

These results suggest that the determinants of discouragement vary across discouraged borrowers. Accordingly, we find that, whereas firm opaqueness, demographic factors (i.e. the gender and experience of the manager), and location better explain discouragement due to negative perceptions about loan price and/or loan application procedures, firm quality and banking concentration explains the incidence of discouraged borrowers due to fear of rationing. Innovator status, the legal protection of creditors and lenders in the event of default, and the coverage of information sharing instruments help to explain discouragement in a transversal way.

6. Concluding remarks

Using data from the 2007–2009 BEEPS, this study examines the determinants of discouragement in less development countries. We use a probit model to analyse which factors better explain why borrowers are discouraged from applying for a bank loan when they seek capital. We define a business as a discouraged borrower if it does not apply for a loan for different reasons, such as tough loan prices or loan contract procedures or fear of rationing, that is, the scale of discouragement as a function of bank screening errors, application costs, and the difference in interest rates between the bank and other money lenders (Kon and Storey, 2003).

In addition, this study uses an ML model to compare the group of borrowers discouraged by tough loan prices or loan application procedures to those discouraged by a fear of rationing, considering the applicant status as the base outcome. The results show that whereas the firm's opaqueness, demographic factors (i.e. gender and owner experience), and distance from a lender better explain discouragement due to tough loan prices and/or loan application procedures, firm risk and banking concentration better explain the incidence of borrowers discouraged by the fear of rationing. Namely, the results indicate that a borrower discouraged by tough loan prices is more opaque, is managed by a less experienced woman, and operates far from the credit provider. Alternatively, a borrower discouraged by fear of rationing is riskier and operates in a more highly concentrated banking sector.

Additionally, the findings report that both types of discouraged borrowers are smaller and less innovative, and do not have a pre-existing relationship with the banks. Nonetheless, the results suggest that, in a more highly concentrated banking market, those firms with closer and more intense relationship with a bank are more likely to be discouraged from applying for a loan than distant borrowers. This finding is reasonable if we assume that those firms are more likely to rely on banks as their primordial source of finance, becoming locked in by the superior bargaining power of the credit provider in a context of low competition (e.g., Sharpe, 1991; Detragiache et al., 2000). In turn, this bargaining power could discourage the business from applying for new loans.

Furthermore, we find the development of the credit environment to have mixed effects on the probability of being discouraged. In particular, we find that the strength of the legal rights index relates positively with the likelihood of being discouraged, despite reducing the likelihood of type I and type II credit rationing. This could suggest the existence of falsely discouraged borrowers among businesses that do not apply for a loan due to fear of rationing. The positive relation between legal rights and discouragement due to tough loan prices (including tough interest rates and collateral requirements) can be justified by the positive relation between this index and the incidence of collateralized contracts, which may discourage assets constrained businesses from applying for a loan. On the other hand, we conclude that discouraged borrowers (broadly measured) operate in countries with poor coverage of public/private information sharing instruments. These results suggest that the discouragement may also act as an efficient mechanism to weed out low-type SMEs (in line with Han et al., 2009) or informationally opaque borrowers, operating in less developed countries, from applying, thus minimizing adverse selection and moral hazard problems. Additionally, the results consistently highlight that the dissemination of (public and private) information sharing mechanisms acts as a substitute for discouragement as a self-selection tool for opaque firms, providing comprehensive insights for policy makers.

Appendix A. Identifying discouraged borrowers

	Is the firm a loan seeker?	Did the firm apply for a loan?	Did the firm apply for loans that were accepted?	Borrower classification		
SMEs *Obs.*: 10,571	Yes *Obs.*: 6487	Yes *Obs.*: 4280	Yes *Obs.*: 3588	SMEs *Obs.*: 10,571	Loan applicants *Obs.*: 4280	Rejected *Obs.*: 692
			No *Obs.*: 692			Accepted *Obs.*: 3588
		No *Obs.*: 2207			Non-applicants Obs.: 6291	Does not need loans *Obs.*: 4084
	No *Obs.*: 4084					Discouraged *Obs.*: 2207

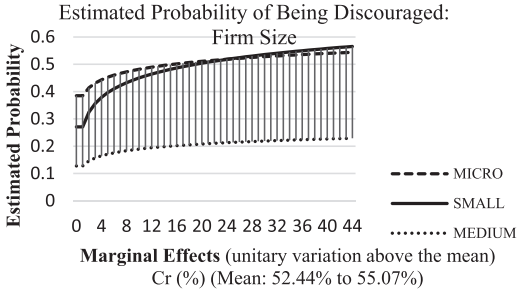
This table summarizes the responses of firms to questions about credit needs in the 2008/2009 BEEPS.

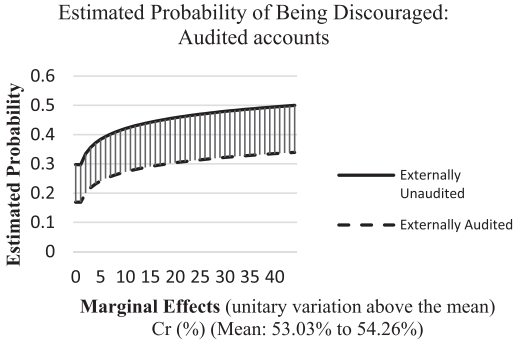
Appendix B. Correlation matrix

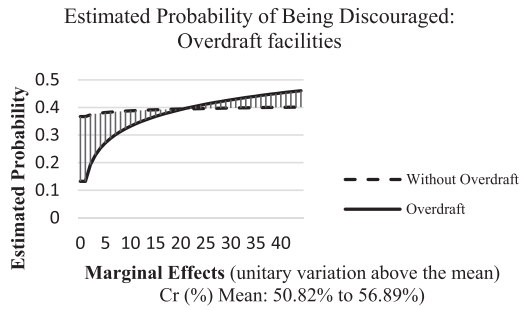
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
FAge	1	1.000																				
FSize	2	0.212	1.000																			
		0.000																				
TradeCredit	3	0.067	0.065	1.000																		
		0.000	0.000																			
ExtAud	4	0.117	0.279	0.065	1.000																	
		0.000	0.000	0.000																		
Ownership	5	−0.142	−0.139	−0.047	−0.099	1.000																
		0.000	0.000	0.000	0.000																	
M_Woman	6	−0.010	−0.089	0.025	−0.049	0.057	1.000															
		0.326	0.000	0.047	0.000	0.000																
M_Exp	7	0.254	0.057	0.087	0.043	−0.137	−0.030	1.000														
		0.000	0.000	0.000	0.000	0.000	0.002															
Innovation	8	0.025	0.078	−0.013	0.074	−0.025	0.000	−0.003	1.000													
		0.012	0.000	0.285	0.000	0.012	0.966	0.792														
Export	9	0.054	0.212	0.077	0.127	−0.055	−0.033	0.052	0.036	1.000												
		0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000													
Overdue	10	0.044	0.008	0.006	0.041	0.005	−0.021	−0.004	−0.018	−0.002	1.000											
		0.000	0.442	0.635	0.000	0.589	0.029	0.663	0.065	0.865												
Qualcert	11	0.112	0.273	0.095	0.216	−0.093	−0.064	0.058	0.087	0.176	−0.006	1.000										
		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.525											
Overdraft	12	0.055	0.054	0.031	0.043	−0.031	−0.031	0.041	0.066	0.041	−0.040	0.021	1.000									
		0.000	0.000	0.016	0.000	0.002	0.002	0.000	0.000	0.000	0.000	0.035										
City	13	0.057	0.142	0.046	0.109	−0.050	−0.053	0.087	0.099	0.092	−0.013	0.140	0.124	1.000								
		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.193	0.000	0.000									
Brpc	14	0.004	0.036	−0.070	0.072	−0.077	−0.021	0.046	0.038	0.004	0.000	0.100	0.028	0.060	1.000							
		0.680	0.000	0.000	0.000	0.000	0.029	0.000	0.000	0.698	0.975	0.000	0.005	0.000								
Cr	15	0.032	−0.003	−0.017	0.052	0.027	0.039	0.012	0.001	0.021	−0.032	0.034	−0.010	−0.062	−0.040	1.000						
		0.002	0.759	0.170	0.000	0.007	0.000	0.233	0.925	0.038	0.002	0.001	0.307	0.000	0.000							
Foreign	16	−0.145	−0.046	0.116	0.064	0.147	0.045	−0.149	−0.001	−0.002	0.013	−0.076	−0.118	−0.158	−0.128	−0.004	1.000					
		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.903	0.859	0.195	0.000	0.000	0.000	0.000	0.661						
LegalRights	17	0.064	−0.009	0.192	0.076	0.096	0.044	0.012	0.012	0.071	−0.029	0.054	0.023	0.029	−0.170	0.363	0.237	1.000				
		0.000	0.373	0.000	0.000	0.000	0.000	0.249	0.246	0.000	0.005	0.000	0.023	0.006	0.000	0.000	0.000					
CreditInfo	18	0.031	−0.012	0.166	0.016	0.050	0.059	0.019	0.016	0.045	−0.003	0.029	−0.099	0.090	−0.080	−0.202	0.120	0.530	1.000			
		0.002	0.235	0.000	0.105	0.000	0.000	0.059	0.097	0.000	0.756	0.004	0.000	0.000	0.000	0.000	0.000	0.000				
Pubcreg	19	0.050	0.039	0.013	0.078	−0.017	−0.018	0.060	−0.023	0.019	−0.037	0.097	0.008	0.033	0.009	0.143	−0.233	0.186	−0.224	1.000		
		0.000	0.000	0.313	0.000	0.096	0.065	0.000	0.022	0.059	0.000	0.000	0.404	0.001	0.371	0.000	0.000	0.000	0.000			
Privcbr	20	0.206	0.045	0.147	0.037	0.036	−0.019	0.136	0.050	0.065	0.054	0.120	0.091	0.187	−0.058	0.033	−0.337	0.270	0.112	0.298	1.000	
		0.000	0.000	0.000	0.000	0.000	0.061	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000		
GDPpcppp	21	0.003	−0.012	0.023	0.154	−0.056	−0.005	0.066	0.009	0.073	0.058	0.064	−0.155	0.044	0.203	0.188	0.179	−0.144	−0.021	0.037	−0.132	1.000
		0.757	0.240	0.070	0.000	0.000	0.588	0.000	0.355	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.037	0.000	0.000	

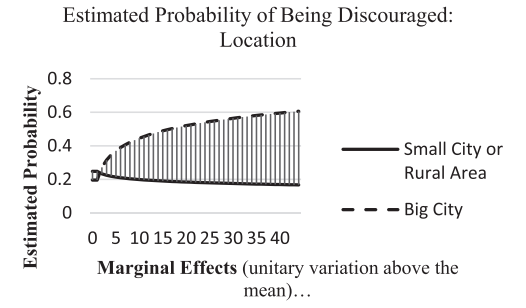
This table reports the pairwise correlation matrix. In the first row for each variable, we report the *rho* value and above we report the p-value.

Appendix C. Incremental variances of the estimated probability of being discouraged for a unit change of *Cr* above the mean

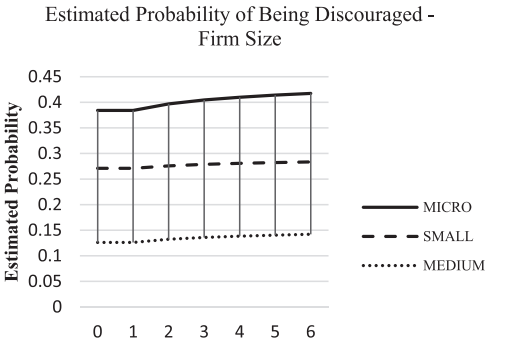


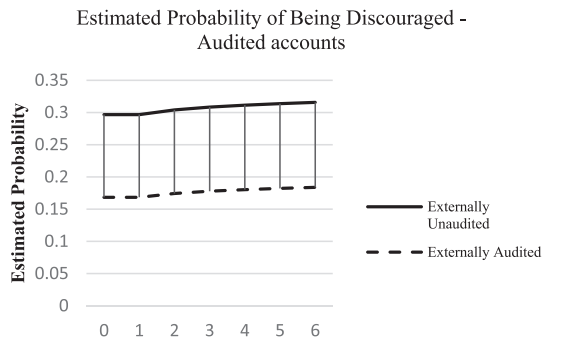


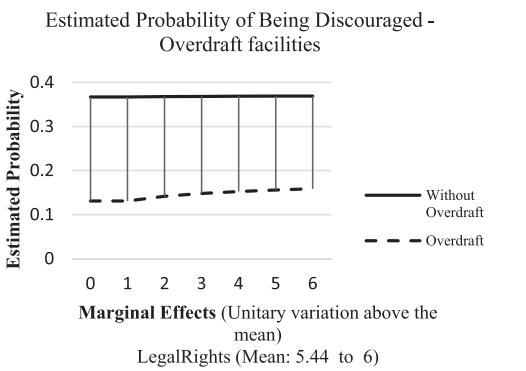


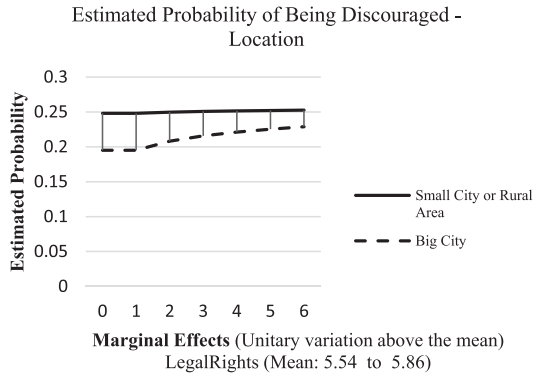


Appendix D. Incremental variances of the estimated probability of being discouraged for a unit change in *LegalRights* above the mean

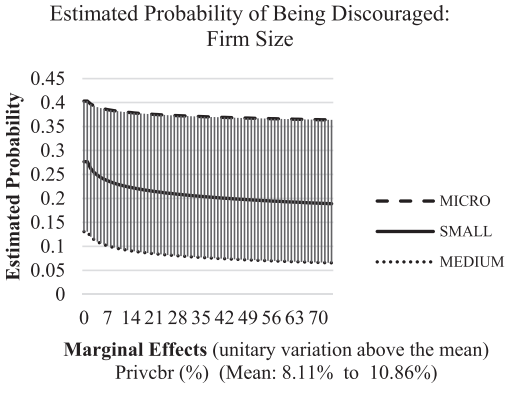


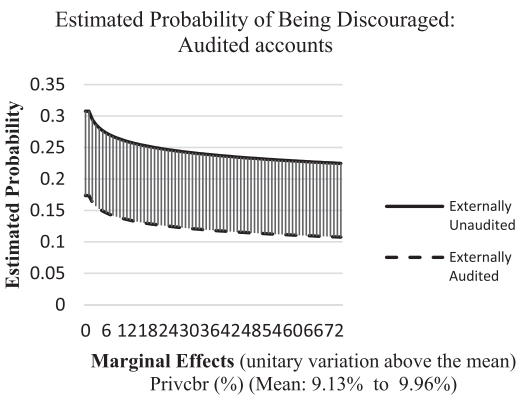


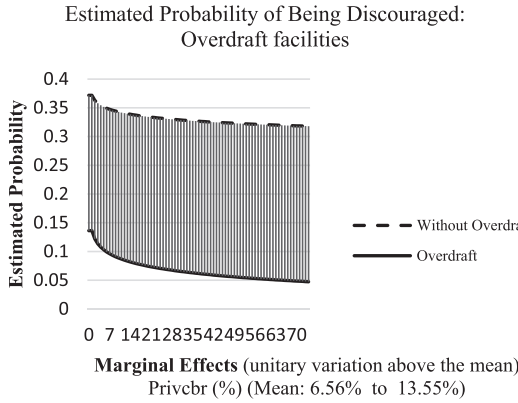


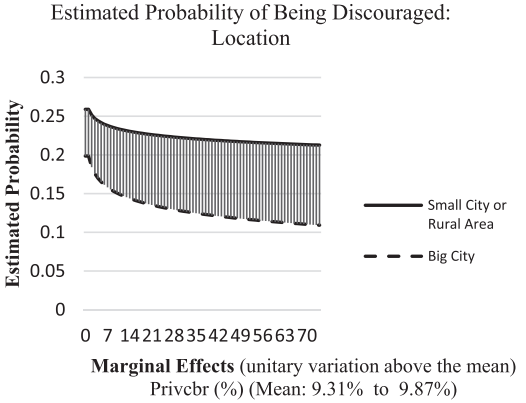


Appendix E. Incremental variances in the estimated probability of being discouraged for a unit change of *Privcbr* above the mean

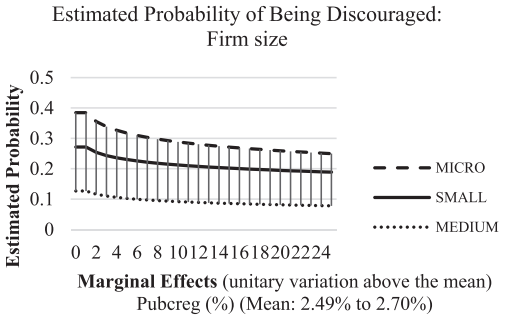


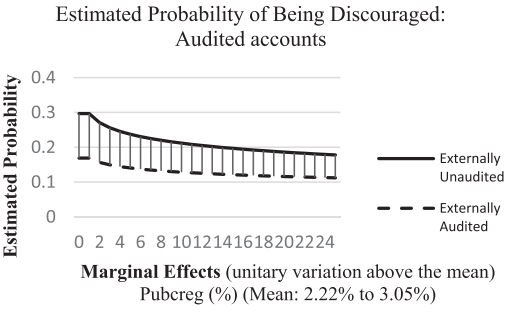


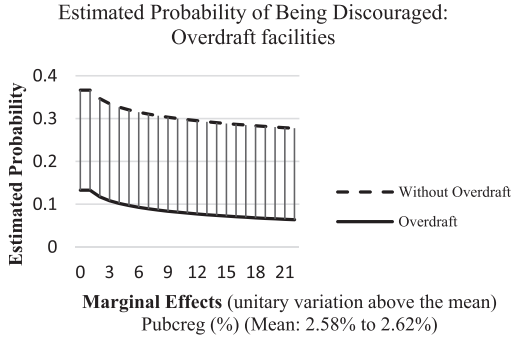


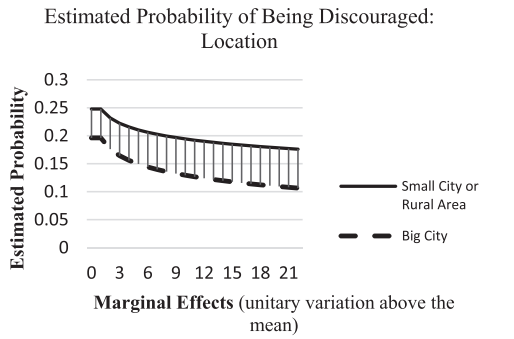


Appendix F. Incremental variances of the estimated probability of being discouraged for a unit change of *Pubcreg* above the mean

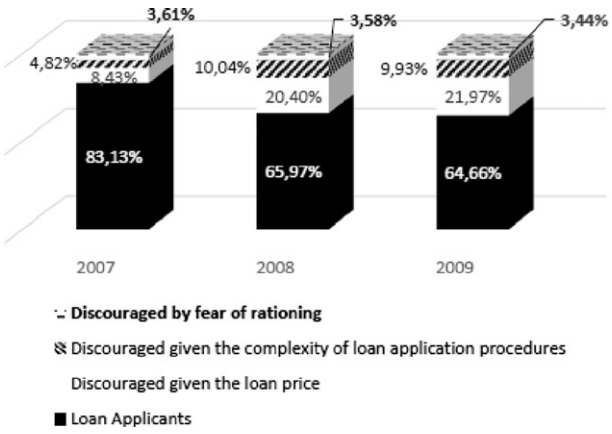








Appendix G. Identifying discouraged barrowers



Appendix H. Sample by country/year

	Total		Year					
			2007		2008		2009	
	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent
Albania	161	1.52	111	72.55	50	0.58	0	0
Belarus	226	2.14	0	0	226	2.6	0	0
Georgia	340	3.22	0	0	340	3.91	0	0
Tajikistan	339	3.21	0	0	339	3.9	0	0
Turkey	986	9.33	0	0	986	11.35	0	0
Ukraine	743	7.03	0	0	743	8.55	0	0
Uzbekistan	334	3.16	0	0	334	3.84	0	0
Russia	1031	9.75	0	0	513	5.9	518	29.98
Poland	458	4.33	0	0	168	1.93	290	16.78
Romania	454	4.29	0	0	454	5.22	0	0
Serbia	328	3.1	0	0	328	3.77	0	0
Kazakhstan	490	4.64	0	0	426	4.9	64	3.7
Moldova	325	3.07	0	0	274	3.15	51	2.95
Bosnia and Herzegovina	328	3.1	0	0	315	3.62	13	0.75
Azerbaijan	352	3.33	0	0	329	3.79	23	1.33
FYR Macedonia	333	3.15	0	0	328	3.77	5	0.29
Armenia	354	3.35	0	0	240	2.76	114	6.6
Kyrgyz Republic	222	2.1	0	0	167	1.92	55	3.18
Mongolia	333	3.15	0	0	206	2.37	127	7.35
Estonia	246	2.33	0	0	246	2.83	0	0
Kosovo	248	2.35	0	0	225	2.59	23	1.33
Czech Republic	222	2.1	0	0	65	0.75	157	9.09
Hungary	255	2.41	0	0	253	2.91	2	0.12
Latvia	239	2.26	0	0	239	2.75	0	0
Lithuania	246	2.33	0	0	143	1.65	103	5.96
Slovak Republic	244	2.31	0	0	235	2.7	9	0.52
Slovenia	235	2.22	0	0	130	1.5	105	6.08
Bulgaria	258	2.44	0	0	258	2.97	0	0
Croatia	134	1.27	42	27.45	47	0.54	45	2.6
Montenegro	107	1.01	0	0	83	0.96	24	1.39
Total	10,571	100.00	153	100.00	8690	99.98	1728	100.00

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