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ENTREPRENEURS' GENDER AND FINANCIAL CONSTRAINTS:

EVIDENCE FROM INTERNATIONAL DATA

Abstract

This paper studies gender discrimination against entrepreneurs by financial institutions. Based on the cross-country Business Environment and Enterprise Performance Survey (BEEPS) our analysis suggests that, compared to male-managed counterparts, female-managed firms are less likely to obtain a bank loan. In addition, we find that female entrepreneurs are charged higher interest rates when loan applications are approved. There is also some evidence that the gender differences in access to financing vanish with the level of financial development, which is consistent with the Becker-type discrimination. The results of our analysis are robust to a number of specification checks.

Keywords: entrepreneurship, financial constraints, gender, discrimination.
JEL: G21, J16, L26.

1   Introduction

The entrepreneurship and finance literature has long suggested the existence of financial constraints, implying that firms are unable to raise external financing to fund all their desired investments (e.g., Evans and Jovanovic (1989) and Fazzari, Hubbard and Petersen (1988)). Recently, a number of studies have raised the question of whether the financial constraints facing entrepreneurs differ with respect to demographic groups, including gender. This interest was largely motivated by the well-documented importance of access to finance for the creation, and subsequent performance, of firms and by evidence of noticeable differences between men and women in self-employment, business ownership rates, start-up sizes, and financing patterns of their businesses. Carter and Shaw (2006) show that the share of women among the self-employed is disproportionately small, that they run smaller businesses, are less likely to rely on venture capital and that their firms have lower debt-equity ratios.

There are several explanations for the observed gender differences in the financing patterns, and, in particular, in the use of bank credit, which is the most important overall source of external funds for small firms. On the one hand, the observed gap can be the result of the supply-side discrimination, implying that bankers' decisions about loan applications are different for men and women whose businesses are similar in terms of solvency and creditworthiness. On the other hand, the gap can arise from differences in the characteristics of male and female entrepreneurs, with regard to human capital, personal wealth and risk aversion. These heterogeneous characteristics may stem from the experience of entrepreneurs in other markets, as in the case of wealth (lower employment rates and lower pay for women are well documented), or may be determined by nature (risk aversion). For example, the higher risk aversion of women (Jianakoplos and Bernasek (1998)) may carry over to female entrepreneurs (Sexton and Bowman-Upton (1990)) and would imply, *ceteris paribus*, that their demand for bank loans is lower.

Previous investigations of these alternative explanations, and, in particular, of the presence of gender discrimination in the credit market, have failed to provide unam-

biguous evidence. Two major types of studies can be distinguished in this strand of literature. One is based on data from household surveys and identifies financial constraints from the effect of personal wealth on the probability of being self-employed. While useful for detecting the existence of constraints, this approach has certain limits. In particular, it does not allow the different dimensions of restricted access to financing, such as the probability of obtaining a loan and the loan interest rate, to be considered. Moreover, with this approach it is impossible to take into account differences in the types of business chosen by men and women. Therefore, few studies that focus on the gender aspects of financial constraints adopt this framework (e.g., Georgellis, Sessions and Tsitsianis (2005)).

The other approach relies on firm-level data and identifies financial constraints from credit applications, loan denials, interest rates charged, and other similar indicators (e.g., Cavalluzzo, Cavalluzzo and Wolken (2002)). Few such studies are currently available, and most provide no convincing evidence of gender-based discrimination. A natural question is whether this general result is country-specific, because almost all the existing studies are based on data from the US which is known for its strong anti-discriminatory policies in various markets. Another issue concerns how sensitive this general result is to alternative econometric specifications, in particular those that address the issues of omitted variables and self-selection. The importance of these issues has been widely discussed in the literature (Blanchflower, Levine and Zimmerman (2003) and Cole (2008)).

This paper adopts the second of these approaches in order to investigate, in an international perspective, whether female-owned businesses face more severe financial constraints than male-owned firms do.[1] Among the different sources of external financing, we restrict our attention to bank loans, which is the major source of external funds for small firms (Berger and Udell (1998)). Thus, the hypothesis that banks discriminate against female entrepreneurs is at the heart of our study.

We explore gender discrimination against entrepreneurs using the Business Environment and Enterprise Performance Survey (BEEPS) that has been carried out by the

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[1]Because our analysis focuses on entrepreneurs, we use the terms "entrepreneur", "manager" and "owner" interchangeably.

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European Bank for Reconstruction and Development (EBRD) and the World Bank since 1999. The survey has been implemented in 34 countries, mostly the transition states of Central and Eastern Europe, but also in some countries of Western Europe and Asia. Because the survey is based on a random sampling from national registries of firms or their equivalents, most of the firms sampled are small and medium sized enterprises, with among them a considerable share of entrepreneurial ventures. The BEEPS data provide key figures for the firms, such as ownership, competition, performance and management. The survey also contains a large section on financing which allows various proxies for firms' financial constraints to be constructed.

This paper offers several contributions to the literature. First, it sheds light on the issue of gender-based discrimination against entrepreneurs outside the US for which evidence is still scarce. Second, the paper offers a comparative perspective on the link between entrepreneurs' gender and financial constraints by exploiting the cross-country nature of the BEEPS dataset. Specifically, it investigates whether gender differences in financial constraints are related to a country's level of financial development. To the extent that better financial development is associated with more competitive financial markets, our analysis provides a test for a key prediction of the Becker's theory of discrimination: according to Becker, discrimination should vanish when there is more competition among suppliers of finance. Third, the paper considers multiple indicators of financial constraints. In addition to loan approvals, it focuses on interest rates charged and collateral required. Finally, our study tries to address several econometric issues identified in previous studies as crucial (see, e.g, Blanchard, Zhao and Yinger (2008)). In particular, in order to avoid possible self-selection biases we model an entrepreneur's decision to apply for a loan. To mitigate the omitted variables problem, we include in the econometric models an extensive list of variables characterizing firms and the local business environment in which they operate. A number of specifications checks in the spirit of Blanchflower et al. (2003) is performed in order to see whether the results derive from the omission of important characteristics of entrepreneurs not available in the BEEPS.

Our empirical results are consistent with the hypothesis of discrimination against female entrepreneurs. Specifically, we find that the probability of receiving a loan is about 5 percent lower for female-owned/managed firms than for male-owned/managed enterprises. Furthermore, the data suggest that female entrepreneurs pay higher interest rates, about 0.5 percentage points more than male entrepreneurs do. These results hold after controlling for important characteristics of firms that are related to their creditworthiness and performance. There is also some evidence that gender-based discrimination is lower in countries with more developed financial markets. This is reflected in lower rejection rates and lower collateral requirements for female entrepreneurs in more financially developed economies.

The rest of the paper is organized as follows. The next Section provides a literature review. Section 3 describes the data and sample. Section 4 presents methodology and empirical results. Finally, Section 5 concludes.

2   Literature review

The economics and finance literature suggests the pervasiveness of financial constraints in both small businesses and large listed firms. For established businesses, the evidence comes from the analysis of the link between internally generated cash flows and investment levels (Fazzari et al. (1988) and Hubbard (1998)). For new start-ups, the evidence mostly comes from the studies that focus on the impact of personal wealth on the propensity to become an entrepreneur (Evans and Jovanovic (1989), Holtz-Eakin, Joulfaian and Rosen (1994), and Blanchflower and Oswald (1998)).

There is small but growing literature that investigates whether financial constraints pertaining to entrepreneurs differ across demographic groups. Given the well-known importance of external finance for the creation and operation of businesses, a number of scholars study whether the lower rates of self-employment and lower rates of business ownership among minority groups, which are widely documented, results from unequal access to external financing. A large group of these investigations focus on the role of race, ethnicity, and gender as determinants of credit applications, loan denials, interest

rates charged, and other dimensions of restricted access to finance (Bates (1991), Cavalluzzo and Cavalluzzo (1998), Bostic and Lampani (1999), Raturi and Swamy (1999), Cavalluzzo et al. (2002), Blanchflower et al. (2003), Storey (2004), and Cavalluzzo and Wolken (2005)). Essentially, these works raise an important question about discrimination against borrowers who belong to various minority groups.

Discrimination in the credit market occurs when lenders' decisions on loan applications are influenced by personal characteristics - such as gender and race of the entrepreneurs - that are not relevant to the transaction. In the classical model of discrimination by Becker (1957), discrimination arises due to the taste-based preferences of the lender who is willing to pay a price in order not to be associated with certain groups of borrowers. Becker (1957) also notes that such discrimination tends to vanish with competition among lenders as they are no longer able to bear the cost of the non-economically motivated choices. The alternative, statistical model of discrimination, suggests that, as long as borrowers' demographic characteristics are correlated with their creditworthiness, lenders may use the former as a proxy for the risk factor associated with loans. This is the case when lenders cannot observe the risk factors or do not collect relevant information due to the cost involved (Phelps (1972) and Arrow (1973)). Importantly, the economic effects of the two types of discrimination need not be the same: statistical discrimination of minorities, for example, may be consistent with profit maximization by lenders while the Becker-type discrimination is not. Nevertheless, both are considered to be socially unacceptable and, as a result, are banned by law.

Empirical studies that aim at detecting the existence of discrimination in the credit market usually follow the legal approach and do not differentiate between the two models of discrimination (Blanchflower et al. (2003)). Cavalluzzo et al. (2002) is one of the few papers that provide an indirect test for the Becker-type discrimination by looking at the effect of concentration in the local lender market on loan approval rates for female-owned firms. These and most other similar studies make use of a multivariate regression framework with dependent variables that characterize access to, or cost of, loans and independent variables that describe borrowers' characteristics, including de-

mographics. In this setup, evidence of discrimination is found if the coefficients on the gender, race or ethnicity variables remain statistically significant after controlling for applicants' solvency and creditworthiness.

Most of the existing empirical papers provide some evidence of bankers' discrimination against entrepreneurs from different minority groups. The strongest results are obtained for racial discrimination, especially for black entrepreneurs. For example, Bostic and Lampani (1999) report different approval rates for white-owned and black-owned firms in the US, but no statistically significant differences between white-owned firms and firms owned by Asians and Hispanics. Blanchflower et al. (2003) also find that black-owned firms in the US face obstacles in obtaining credit that are unrelated to their creditworthiness. The study by Raturi and Swamy (1999) is an exception in this strand of literature: it confirms that access to financing is a greater issue for black-owned firms in Zimbabwe, but attributes the result to their greater demand for loans rather than to discrimination.

The picture is far less clear with respect to the gender-based discrimination. Cavalluzzo et al. (2002) find evidence of a credit access gap between firms owned by white males and white females in the US, with female denial rates increasing with lender concentration. In contrast, Cavalluzzo and Cavalluzzo (1998), Blanchflower et al. (2003), Storey (2004), and Cavalluzzo and Wolken (2005) find no statistically significant effect of gender. With the exception of Storey (2004), all the above-mentioned papers present evidence for the US; moreover, they use the same dataset, the National Survey of Small Business Finances (SSBF), though not necessarily the same waves.[2]

Several problems in econometric modeling of discrimination in the financial market are well known in the literature (see e.g., Blanchard et al. (2008)). The major issue is the difficulty of controlling for all possible factors that are used by lenders in assessing the quality of borrowers and that are potentially correlated with the demographic characteristics of the latter. As a result, estimates may be biased due to omitted variables. There are also sample selection issues: dependent variables, such as loan denials, collateral

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[2]There is a related literature that considers discrimination in the mortgage credit market (e.g., Munnell, Tootell, Browne and McEneaney (1996)). For a review see LaCour-Little (1999).

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requirements and interest rates, are not observed for all firms in a random sample. In particular, entrepreneurs, who anticipate rejection of their applications or unfavorable terms and conditions of credit, may not consider bank loans as a source of financing at all.

A number of scholars have attempted to address these pitfalls explicitly. For example, Cavalluzzo and Wolken (2005) pay particular attention to the role of entrepreneurs' personal wealth in explaining loan denial rates. In the absence of detailed data on entrepreneurs' finances, Blanchflower et al. (2003) use several sample splits and compare regression results for groups of firms that differ in the extent to which personal wealth should influence loan decisions. Cavalluzzo et al. (2002), Cavalluzzo and Wolken (2005), and Blanchard et al. (2008) are among the few analyses of the gender difference in entrepreneurs' access to finance that explicitly deal with the issue of self-selection.

The above discussion suggests a scarcity of rigorous evidence for gender-based discrimination against entrepreneurs. Most of the previous research has been implemented using US data and little is known about other countries.[3] The virtual absence of international evidence is remarkable and needs to be addressed. A particularly interesting issue is whether discrimination in the credit market is correlated with the degree of a country's financial development. Previous research has shown that financial development has an effect on the severity of financial constraints facing the firms (Love (2003)), but, to the best of our knowledge, there have been no studies investigating its effect on discrimination. A proper inquiry into this issue requires a cross-country approach based on similar survey instruments and empirical methodologies. In the next sections we follow that path and explore, using data from 34 countries, whether loan applications of male and female business owners are treated differently by banks and whether a country's financial development plays any role there.

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[3]There are many international studies of the effect of gender on access and cost of external financing in the management literature, but most of them are purely descriptive and are rarely based on representative samples.

3 Data and sample

3.1 BEEPS overview

This study is based on the data from the Business Environment and Enterprise Per-
formance Survey (BEEPS), an establishment level survey conducted by the EBRD and
the World Bank since 1999. As suggested by the name of the survey, it was originally
intended to study the business environment, mostly in the transition countries of Central
and Eastern Europe. In 2004 and 2005 it was extended to include a range of countries
from Western Europe and East Asia. The survey is based on face-to-face interviews
with a person who normally represented the company for official purposes, that is, who
normally dealt with banks or government agencies/institutions.[4] The respondents pro-
vided key figures about the firms, such as ownership, competition, performance and
management, including the gender of the principal owner and whether the owner was
the manager. The survey also asked several questions about the most recent borrowing
experience during the 3 years before the survey.

We use the two most recent waves of the survey, BEEPS-2004 and BEEPS-2005
covering 14,108 firms in 34 countries, mostly the transition countries of Central and
Eastern Europe, but also in Western Europe and Asia. The earlier waves of the survey,
BEEPS-1999 and BEEPS-2002, are left out as they do not provide information on the
gender of the principal owner/manager of the firm.

The BEEPS survey samples were constructed by random sampling from a national
registry of firms or equivalents. The firms covered were drawn from industry and services;
the distribution between these sectors was determined according to these sectors' relative
contribution to the GDP in each country. The sample does not cover firms operating
in sectors subject to government price regulation and prudential supervision (banking,
electric power, rail transport, and water and waste water). As to size, companies that

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[4]The job titles range from Chief Executive and Finance Officer to Owner or Partner. Respondents
with several job titles were requested to name the one they considered the most important. In the sub-
sample of entrepreneurial firms (which for the purpose of this paper are defined as individually-owned
firms where the majority owner holds at least 50 percent of shares and is also the manager), over 50
percent of respondents declared themselves to be owners/partners of the business ventures.

had 10,000 employees or more were excluded from the sample, as were the firms that started their operations before 2002. Like the population of firms in countries all around the world, around three quarters of the firms sampled are small enterprises. The details of the sample characteristics can be found in the respective reports on sampling and implementation provided by the EBRD.[5]

The strengths of the survey are the use of a consistent survey instrument across a large number of countries and the inclusion of a large set of 3 year retrospective questions. The main weakness of the BEEPS is the small sample size for individual countries stemming from the wide coverage and finite budgets of the surveys. Even in the 2005 round of the survey, that was by far the biggest, most country samples have fewer than 400 firms. The number falls dramatically if only entrepreneurial firms are considered. This is shown in the next section that describes the sample used in this study.

3.2   The sample

Both the overall design of the BEEPS and the exact wording of the gender question dictate a specific procedure for selecting a sample that would be appropriate for the analysis of gender-based discrimination against entrepreneurs. To ensure a focus on entrepreneurs, we immediately exclude from the BEEPS dataset those firms where the largest owner was represented by general public, legal persons and the government, keeping only those enterprises where the largest shareholder was an individual or family. Moreover, as the questionnaire is not very precise about intra-family allocation of ownership and decision making in the family-owned firms (the gender question in the BEEPS refers not to *the manager*, but to *the principal owner* or *one of the principal owners* of the firm), we drop family-owned firms and focus only on those where the largest owner was an individual who had a majority stake (at least 50 percent stake in the enterprise). Finally, the sample is restricted to the firms where the largest owner (whose gender is known) was also the manager. By following these steps, we keep only

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[5]http://www.ebrd.com/country/sector/econo/surveys/beeps.htm, as available in May 2008.

individually-owned firms with no separation of ownership and management and with a clear indication of whether the principal owner (and the manager) was a man or a woman. Since the 2004 and 2005 waves of the BEEPS cover firms created before 2002 only, the empirical analysis focuses on the period between 2002 and 2005 and excludes firms that provide no information about loan applications for these years or whose loan applications were pending at the time of the survey.

The final sample contains 5,534 observations. As the number of entrepreneurial firms in many countries is quite small (e.g., 46 in Georgia, 54 in Estonia and 56 in Slovakia, with only a handful of female-owned businesses among them), we present the information on sample composition in Table 1 in an aggregated form. According to this table, 23.9 percent of the firms in the sample come from the old member states of the EU, 20.8 percent are from the countries that acceded to the EU in 2004, further 14.0 percent are from South-Eastern Europe, 15.3 percent are of the middle-income countries of the CIS (the Commonwealth of Independent States, which includes most countries from the former Soviet Union), 13.5 percent are from low-income CIS countries and 12.5 percent come from Korea, Turkey and Vietnam. The table also shows that the share of female-owned businesses constitutes 26.0 percent of all firms in the sample, varying from 19.1 percent in the low-income CIS group to 33.3 percent in the middle-income CIS countries. These shares appear to be well above the 12 percent reported in Cavalluzzo and Cavalluzzo (1998) and the 18 percent reported in Cavalluzzo et al. (2002) for the US. However, they are comparable with the 28 percent share in the data used by Blanchard et al. (2008), and are in line with the study of Cavalluzzo and Wolken (2005) in which the female share varies between 20 percent (among white applicants) and 29 percent (among Hispanic applicants). The Global Entrepreneurship Monitor GEM 2006 also shows that the ratio of gender specific prevalence rates of entrepreneurial activity varies within the range of 25 percent in Belgium and 92 percent in Thailand (Allen, Langowitz and Minniti (2007)). To the extent that the relevant population is by and large equally distributed, this ratio implies, for example, in the case of Belgium that 20 percent of all entrepreneurs in 2006 were women.

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4   Empirical analysis

4.1   Preliminary evidence from the BEEPS

It is worthwhile starting the analysis with the self-evaluation of financial constraints facing the firms by the respondents. The BEEPS asks them to answer two relevant questions. One is how problematic is access to financing (e.g., collateral requirements) and the other is how problematic is cost of financing (e.g., interest rates and charges) for the operation and growth of the business. These are evaluated on a scale from 1 (no obstacle) to 4 (major obstacle). In the entire sample, the answers indicate that female entrepreneurs face somewhat less severe constraints than their male counterparts: 2.20 versus 2.24 for access to financing and 2.41 versus 2.42 for cost of financing, but the differences are not statistically significant at the conventional significance levels in a two-sided t-test. Note, however, the subjective character of these data. The observed pattern (which contradicts our expectations of greater financial constraints facing women) may simply reflect the fact that female beliefs and perceptions are systematically different from those of males (Minniti and Nardone (2007)).

A different picture emerges from the answers to the questions about the actual share of bank loans in financing of fixed investments. On average, female-owned firms turn out to have smaller fraction of bank financing than male-owned ones, 6.7 percent versus 10.4 percent (the difference is significant at the 1 percent level in a two-sided t-test). Accordingly, the share of retained earnings is higher in female-owned firms, 74.0 percent versus 67.2 percent.

Evidence on financial constraints is also available from information on loan applications and approval/rejections by banks. The BEEPS instrument collects information about the most recent loans received and also asks the firms that had no bank loan why they did not use bank financing. As long as firms reported no need for a loan as the sole reason for the absence of bank financing (without mentioning other options such as too tough collateral requirements, high interest rates, fear that an application for a loan would not be approved), we classify these firms as having no demand for bank loans

(*non-borrowers*). The complementary group (*potential borrowers*) consists of firms that applied for bank financing (*loan applicants*) and those that did not apply in the anticipation of adverse lending conditions or an outright rejection (*discouraged borrowers*). The former group, in turn, is comprised of *unsuccessful borrowers* (whose applications were rejected) and *successful borrowers* (whose applications eventually were approved).[6] A graphical representation of the loan application process is shown in Figure 1.

Table 2 summarizes data on loan applications across the sub-groups introduced in Figure 1. It shows considerable differences by gender. First, the share of non-borrowers among women and men is different, 44.5 percent versus 40.3 percent respectively. Second, there are proportionally more discouraged borrowers among females than males, 26.0 percent versus 20.2 percent. Conditional on needing a loan, these numbers rise to 46.9 percent and 33.8 percent. The rejection rates by gender, however, are pretty close in the full sample, 2.6 percent for females and 2.9 percent for males. Conditional on applying for loans, these numbers rise to 8.9 percent and 7.4 percent, respectively. Finally, loans were extended to 26.9 percent of female-owned businesses and 36.6 percent of male-owned firms (conditional on loan application, these numbers amount to 91.1 percent versus 92.6 percent respectively).

The above pairwise comparisons illustrate the difficulties of inferring gender discrimination using information on loan applications. A straightforward approach for identification of discrimination would be to focus on loan approval rates conditional on applying for loans. However, this is fraught with incorrect inference because of self-selection. Indeed, women may anticipate discrimination and therefore refrain from applying for loans. More than that, the problem may be exacerbated by the lower overconfidence of females (e.g., Barber and Odean (2001)), which reduces the share of female applicants even further. As a result, the pool of female applicants is likely to consist of women whose businesses have superior characteristics of performance and creditworthiness. This would narrow the gender gap in the probability of obtaining credit and underestimate discrimination. Another approach would be to associate the negative outcome in ob-

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[6]Note that this classification is based on retrospective testimonies of entrepreneurs and reflects their beliefs and perceptions.

taining bank financing with both unsuccessful and discouraged borrowers, by pooling these groups together. The problem with this approach is that the lower overconfidence of women compared with men (resulting in lower application rates among female-owned firms) would imply overestimation of female denial rates and, consequently, of discrimination.[7]

Complimentary evidence on gender discrimination can be obtained from analysis of terms and conditions of loans. In particular, the BEEPS data allow a check to be made of whether female-managed firms face higher interest rates and have to pledge higher collateral than male-owned counterparts, conditional on obtaining a loan. With regard to the interest rate, female-owned businesses turn out to pay, on average, about 1 percentage point more than male-owned firms. There are also differences in the size of collateral: female-owned firms are requested to pledge collateral whose value is about 4 percent higher than that of male-owned businesses. The difference in the interest rates is statistically significant at the 1 percent level in a two-sided test, while the difference in the value of collateral is insignificant at the conventional levels.

These, and other characteristics of the firms sampled, are summarized in Table 3 and Table 4. Table 3 gives the definitions of variables and basic descriptive statistics for the entire sample while Table 4 disaggregates these by gender.[8] Several differences in terms of gender are obvious. In particular, female-owned firms tend to be smaller and younger, are less likely to export, face a lower degree of competition and are less connected to business networks. Table 5 shows the distribution of the firms sampled by industry and gender of their managers. It confirms the stylized fact that female-owned businesses are rare in construction and manufacturing, but are common in the service sector. All these are confounding factors that may account for a part of the gender gap in access to/cost of financing.

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[7]Additionally, estimates of gender discrimination may be affected by selection into the group of potential borrowers.

[8]We dropped 2 percent of observations from the tails of the distributions of interest rate and collateral size as outliers. Since a few firms were reportedly founded as early as in the 19th century, we truncated firm age at 30 years (truncation at 40 or 50 years does not affect our results in any important way). Note that, due to the large share of dummy variables in the BEEPS dataset, the requirements for outlier cleaning in this study are rather modest.

Overall – while providing some support for the discrimination hypothesis – a simple descriptive analysis of gender-based bias in external financing fails to establish a clear pattern. Analysis in the multivariate framework that accounts for confounding factors and, possibly, sample selection is needed. The rest of this section describes the econometric strategy that we employ to investigate gender-based discrimination against entrepreneurs by banks and presents the empirical results from multivariate analysis.

4.2 Basic econometric analysis

The basic econometric model used in this study to investigate the link between the gender of entrepreneurs and their access to bank financing/cost of bank financing has the following form:

$$Y_i = \alpha + \beta Female_i + X_i \gamma + \epsilon_i \tag{1}$$

where Y can be either a binary variable for accepted loan applications or a variable measuring the terms of loans, such as interest rate charged and collateral required; $Female$ is a dummy variable which is equal to 1 if the principal owner/manager of a firm is a female and zero otherwise; X is a vector that characterizes the creditworthiness and the resources of a firm from the banks' viewpoint and that also includes a set of usual controls such as sector and country fixed effects, and ϵ is an error term. Depending on the outcome variable, the models are estimated using either probit or OLS, allowing for heteroskedasticity and clustering of errors by country.

Vector X is intended to capture a firms's creditworthiness and embraces all relevant measures available in the BEEPS. In particular, it contains two measures of firm performance, which is a key factor from a lender's viewpoint: profitability dummy ($Profit$) and capacity utilization ($Capacity$). Lagged values of these variables are used in order to mitigate the problem of endogeneity (receipt of a loan may affect firm performance). Additionally, the decision to grant a loan and its contractual conditions (e.g., the interest rate) crucially depend on the associated risk and the capability of a firm to secure its debt. These, however, are not directly measured in the BEEPS and we therefore

proxy them with a number of variables. The share of sales coming from the main area of business activity, represented by variable *Concentr*, reflects diversification, and is employed as a direct measure of a firm's exposure to business fluctuations. A binary variable for multiple establishments firms, variable *Multiple*, proxies a firm's potential to secure a loan. The idea is that enterprises with several establishments may be better able to provide an inside collateral for a loan. Furthermore, possible effects of participating in networks for the relaxation of financial constraints are proxied by an indicator of membership in business associations *(Network)*. Participation in networks affects the availability of information on training opportunities, business partners, and the access to new markets. Additionally, networking might improve not only an entrepreneur's view on future development and capital requirements, but also could lower barriers when acquiring bank loans (Verheul and Thurik (2001)). Two further variables in vector X measure transparency of a firm, a dummy for using International Accounting Standards (*Accounting*), and a dummy for employing an external auditor (*Audit*).

Consistent with previous analyses, vector X includes a measure of export opportunities – a dummy indicating whether a firm exports or not (*Export*). Also included are the age of the firm in 2002 (*Age*), age squared (*Age^2*), and firm size proxied by employment in 2002, $log(Labor)$. Larger and older firms, for example, may have better reputations, credit histories and longer term relationships with banks than small newly established ventures. Additionally, vector X incorporates a dummy for many competitors (4 and more) facing the firm in 2002 (*Competition*), a dummy for firms located in capital cities or large ones, with more than 1 million inhabitants (*City*), a dummy for firms located in rural areas or small towns (*Rural*) as controls for the environment in which the firms operate.

Two additional variables, a dummy for loans denominated in foreign currency (*ForCurrency*), and a variable for the term of a loan measured in months (*Term*) are introduced in the specifications with interest rate and collateral as dependent variables. Further details concerning the variables used in the multivariate analysis are provided in Table 3.

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A common method of detecting gender-based discrimination by banks is to focus on the sub-sample of firms that actually applied for loans. The positive outcome in the binary regression is thus associated with approvals of loan applications and the negative outcome with rejections. As argued in Section 4.1, this approach may underestimate discrimination. An alternative is to associate the negative outcome with both unsuccessful and discouraged borrowers.[9] Such a pooling is usually justified by substantial similarity of characteristics of discouraged borrowers and unsuccessful borrowers, which is also observed in this study.[10] Moreover, pooling is also facilitated by the fact that outright rejections constitute just a small fraction among the firms in the combined group. As shown in Table 2, almost 90 percent of firms that wanted a loan but did not have one, are those that did not apply (anticipating, perhaps correctly, rejection of their applications). However, as discussed in Section 4.1, this second approach based on pooling of the two groups of firms may overestimate discrimination. In what follows we therefore use both these methods to obtain estimates that may be regarded as upper and lower bounds for discrimination.

The main estimation results are reported in Table 6. Column (1) shows the results from estimating the likelihood of obtaining a loan using the probit model. The dependent variable is a dummy variable *Loan*, which is equal to one if a firm received a loan between 2002 and 2005 and zero if the firm was either discouraged from applying or denied a loan. Marginal effects estimated at the mean are reported for all variables.[11] The coefficient on variable *Female*, which is of major interest in this study, is negative and statistically (and also economically) significant. According to the estimates, female-owned/managed businesses have about 6 percent lower probability of getting a desired loan than male owned firms. Relative to the proportion of firms that received loans (58 percent conditional on needing a loan), this is a fairly large number, indicating a substantial difference in financial constraints for male and female managed firms. The

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[9]Pooling discouraged and rejected borrowers is not uncommon in the literature. See, for example, Berkowitz and White (2004) for an analysis of firms, Gropp, Scholz and White (1997) for an analysis of individuals and Cavalluzzo et al. (2002) for a study of gender discrimination in lending.

[10]These statistics are available from the authors upon request.

[11]Marginal effects estimated at the median are very similar.

estimation results also suggest that profitable and large firms are likely to have lower financial constraints; the latter result is consistent with findings of Gertler and Gilchrist (1994), who report that smaller firms face greater difficulties in securing external financing. Exporting firms have a higher probability of loan approval, which implies that banks consider companies marketing their products abroad as lower risk firms. In line with the existing literature (e.g., Berger, Klapper and Udell (2001)), we also find that more transparent firms, those that are audited and use International Accounting Standards, have easier access to bank financing. Consistent with our prior expectations, membership in business associations or in a chamber of commerce increases the likelihood of loan approval.

Column (2) shows the results from estimating the same model, conditional on applying for loans. In contrast to the model in Column (1), discouraged borrowers are excluded from the estimation sample. The dependent variable, *Loan*, equals 1 if a firm's application for a loan was successful, and zero if the application was rejected. Marginal effects at the mean are reported for all variables. The results still show lower acceptance rates for loan applications submitted by female entrepreneurs, but the respective coefficient lacks statistical significance. It is not fully clear if the lack of significance is due to the low number of loan denials in the sample: as shown in Table 2, of 2 042 firms in the sample there are only 157 enterprises that were denied loans, of which 38 are female-owned. In any case, the lower coefficient on the female dummy in column (2) compared with the estimate in column (1) is consistent with the interpretation of these estimates as lower and upper bounds for discrimination.

A closely related question is whether female-owned/managed businesses face less favorable loan terms. We examine whether, *ceteris paribus*, female entrepreneurs are charged higher interest rates than their male counterparts and whether they are more likely to be asked for larger collateral. Column (3) of Table 6 contains OLS estimates of the effect of gender on loan interest rates. The regression estimates imply that female-owned firms pay, on average, about 0.45 percentage points higher interest rates than male-owned ones. The results also show that interest rates are lower for longer term

loans and those denominated in foreign currencies. As regards the last result, it may simply reflect high inflation rates in a number of less developed countries covered by the BEEPS. The coefficient on the dummy for single establishment firms is positive and statistically significant. As argued above, single establishment firms may find it more difficult to provide inside collateral and therefore face higher interest rates. In contrast to the results on loan approvals, we do not find any statistically significant association between firm performance and size on the one hand, and interest rate charged on the other hand.

The results from estimating equation 1 where the dependent variable is the size of collateral (as a percentage of loan value) are shown in column (4) of Table 6. According to the estimates, female-owned firms are required to pledge higher collateral, but the result is not statistically significant. The effects of the other variables generally follow the patterns observed in columns (1) - (3).

4.3   Discrimination and a country's financial development

Recent research has shown that the degree of financial constraints faced by firms and the level of a country's financial development are related (Love (2003) and Menkhoff, Neuberger and Suwanaporn (2006)). However, little is known about the relationship between financial development and gender-based differences in access to financing. Our paper attempts to fill in this gap.

The analysis is based on the specifications introduced in Section 4.2, which we augment with a variable measuring the level of financial development of the countries covered in the BEEPS. In line with Levine (2002), we use the ratio of lending from banks and non-depository institutions to GDP in 2003 as a measure of financial system development ($FinDevelopment$).[12] The interaction between this indicator and gender variable, $FemaleXFinDev$, allows us to test whether the level of financial development affects the gap between male and female entrepreneurs in the likelihood of obtaining a loan. In

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[12]The data were accessed at http://siteresources.worldbank.org/INTRES/Resources/469232-1107449512766/FinStructure_60_04_final.xls in March 2008. Note that financial development measures are missing for Serbia and Montenegro as well as Uzbekistan.

order to avoid perfect multicollinearity between the financial development measure and country dummies, the latter are replaced with dummies for country groups, as described in Table 1. In addition, the specification of the interest rate equation is modified to include a country-level inflation rate.[13]

Table 7 reports the results of estimating equation 1 augmented with the level of financial development $FinDevelopment$ and interaction term $FemaleXFinDev$. The estimated coefficients on the former variable suggest a negative relationship between financial development and the severity of financial constraints. Statistically significant results in column (1) and column (3) indicate that entrepreneurs in more financially developed countries are more likely to receive loans and pay lower interest rates. The coefficients on the interaction term are statistically significant in columns (2) and (4) and imply that female business owners are more likely both to get loans and to face lower collateral requirements in more financially developed economies.[14] We interpret the latter results in the following way. To the extent that financial development and the degree of competition in the national financial markets are correlated (Beck, Demirguc-Kunt and Maksimovic (2004) and Clarke, Cull and Martinez Peria (2006)), our findings are consistent with Becker's view on discrimination: competition among providers of capital reduces the scope for their discriminatory behavior.[15]

4.4 Robustness checks

The basic results presented above may suffer from the sample selection and omitted variable biases, the problems commonly identified in the literature on discrimination against minority entrepreneurs by financial institutions. In order to evaluate the sensitivity of our results to these issues, in this section we introduce a number of specification checks.

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[13]Proxied by the consumer price index in 2003 as reported in the World Development Indicators (WDI) database.

[14]Note that the coefficient on the gender dummy is significant in specification (2), which estimates, according to the above discussion, the lower bound for discrimination.

[15]One caveat concerning this result is a selected sample on the level of countries: the BEEPS mostly covers transition economies of Central and Eastern Europe which need not be representative of the world.

4.4.1 Sample selection

The problem of sample selection arises because some entrepreneurs may have chosen not to apply for credit in anticipation of their applications being rejected or of their being offered unfavorable contractual conditions due to discrimination. In the survey data we may observe such non-applicants among both discouraged borrowers (firms acknowledging a need in bank financing, but not applying) and non-borrowers (firms claiming that a loan is not needed).

In dealing with the above problem, most studies consider selection into loan application and exclude non-borrowers, that is, firms claiming that they do not need a loan, from the estimation sample (e.g., Cavalluzzo et al. (2002) and Blanchard et al. (2008)). The dependent variable in these analyses shows the outcome of the actual application, that is, whether it was approved or rejected by banks.[16] We follow this approach, but in addition consider another approach in which selection into the pool of firms reporting a need for bank financing is modeled. These two approaches are natural extensions of the models considered in Section 4.2.

We employ the binary response model with sample selection introduced by Van de Ven and Van Praag (1981) in the case where the dependent variable indicates loan approval. The main equation is the same as in (1). The selection equation is as follows:

$$Prob(Observed_i = 1) = \Phi(\tilde{\alpha} + \tilde{\beta}Female_i + X_i\tilde{\gamma} + \tilde{\psi}Instrument_i) \qquad (2)$$

where $Observed$ is equal to one if a firm applies for (or reports needing) a loan and zero otherwise, and $Instrument$ denotes the variable that identifies the selection equation. The full model, comprising the main equation (1) and the selection equation (2), also assumes the joint normality of the error terms and non-zero correlation ρ between them. If $\rho \neq 0$ then the standard probit model without selection produces biased and inconsistent estimates.

Identification of the selection equation requires a variable that determines demand for a loan but is irrelevant in the main equation of interest, in other words, does not

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[16]A formal model which leads to the Heckman-type estimation was introduced in Bloom, Preiss and Trussell (1983) and later replicated in other studies, e.g., Cavalluzzo et al. (2002).

affect the probability of loan approval. A variable indicating the percentage of the actual workforce a firm reports to authorities is a candidate instrument available in the BEEPS.[17] Our argument is based on interpretation of this variable as a measure of risk aversion/overconfidence. Indeed, reporting less than 100 percent of the actual workforce implies tax evasion and, if detected by the authorities, is subject to fines. Thus, entrepreneurs who under-report should have a high propensity to take risk or should be more overconfident in the sense that they believe detection is unlikely. We hypothesize that more risk-averse or less overconfident owners would have a lower demand for bank loans. This is exactly what the BEEPS data show as *LaborReported* is correlated with the demand for loans. In particular, firms that needed loans reported lower percentages of workforce than non-borrowers, the exact numbers being 89 and 92 percent. The data also show that female-owned businesses reported higher percentages of actual labor than male-owned firms (92 versus 90 percent), which is in line with the view that women are more risk averse or less overconfident than men.[18] The instrument discussed is valid because the banks do not normally observe under-reporting of workforce by firms and hence cannot base their decisions concerning loan applications on this information.

We also consider sample selection models in which the dependent variable is either interest rate or collateral. In these particular cases, the dependent variable is observed only for firms that actually obtained loans. Therefore, the selection equation models receipt of a loan. We associate the negative outcome in the selection equations with both unsuccessful and discouraged borrowers and positive outcomes with successful borrowers. Since non-borrowers are excluded from the estimation sample, the analysis is conditional on needing a loan. The modeling strategy is the standard Heckman selection model and

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[17]The actual question asked in the BEEPS is the following: "Recognizing the difficulties that many firms face in fully complying with labor regulations, what percentage of total workforce would you estimate the typical firm in your area of business reports for tax purposes?"

[18]Lower overconfidence and higher risk aversion of women are confirmed in most studies (e.g., Barber and Odean (2001), Jianakoplos and Bernasek (1998) and Dohmen, Falk, Huffman, Sunde, Schupp and Wagner (2005)) with only few exceptions (e.g., Schubert, Brown, Gysler and Brachinger (1999)). A more subtle question is whether these results carry over to women entrepreneurs. While the evidence is scarce, some analyses suggest that female entrepreneurs are indeed more risk averse, e.g., Sexton and Bowman-Upton (1990).

the selection equation is similar to (2) except for the instrument. Identification of the selection equation is achieved by using the variable that measures the percentage of senior managers' time spent on dealing with public officials. Since managerial time is scarce, managers who spend much time in dealing with officials may find it difficult to fulfill carefully all formalities related to applying for a loan and are therefore less likely to have one.[19]

The results from estimating the Heckman-type selection models are reported in Table 8. Column 1 contains the regression for the probability of receiving a loan that makes use of the entire dataset and models demand for loans in the selection equation. Column 2 contains the regression for the probability of receiving a loan that drops non-borrowers and models applications for loans in the selection equation. Column 3 reports estimation results for the Heckman selection model of interest rate, and column 4 – for the model of required collateral. The instruments chosen are significant in all regressions, except for the second one that estimates the probability of obtaining a loan conditional on needing one. However, evidence of selection is only found in the first regression, which models the probability of receiving a loan using the entire sample of firms. In this regression, the estimated coefficient on the female variable is significant and negative, albeit somewhat smaller in absolute value than the coefficient in the same model without selection (-0.039 versus -0.059, respectively). Not surprisingly, the other three selection models produce results that are very similar to the original models without selection. In particular, the estimated difference in the interest rates paid by male and female entrepreneurs is about 0.45 percentage points in both cases.

Overall, the sample selection models based on the instruments available in the BEEPS hardly convey additional information about the gender based discrimination of entrepreneurs. The introduction of the selection equation does little to influence our estimates. This result concerning sample selection is similar to that reported in Cavalluzzo et al. (2002).

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[19]Several other potential instruments, including *LaborReported*, have been tried, but the results shown below were virtually unchanged.

4.4.2   Omitted variables

Even though the BEEPS contains a rich set of firm-level variables, little information about characteristics of firm owners/managers is available. Previous research has shown that characteristics such as education and personal wealth of an entrepreneur may be important factors taken into account by banks when deciding on loan applications. Thus, there is a risk that the results of our study are affected by omission of some individual-level variables.

Our approach to tackling this problem is similar to that of Blanchflower et al. (2003). We use several sample splits and compare regression results for groups of firms that differ in the extent to which personal wealth and entrepreneurial quality should influence loan decisions. In particular, the sample is divided on the basis of the perceived financial constraints, which is a subjective measure reported by the respondents, on size and age of firms, and on their participation in networks, such as business association and/or chamber of commerce. The perceived financial constraints can be regarded as a proxy for personal wealth because wealthier entrepreneurs, *ceteris paribus*, require fewer external funds and are less likely to complain about restricted access to external financing. The idea behind splitting the sample based on size and age of firms is that large and/or mature firms are less likely to rely on owner's funds to repay loan obligations. The assumption behind splitting the sample based on network participation is that such participation may provide an idea about an entrepreneur's ambition or talent, information on which is not available in the BEEPS.

The results from estimating the basic models for the subsamples are reported in Table 9.[20] As in the above analysis, the dependent variables measure loan acceptance, loan interest rate and collateral size. For space considerations, the table shows only the coefficients on the gender dummy, *Female*, estimated for each pair of subsamples. Panel A shows the results for the sample split based on the severity of self-reported financial constraints. Firms claiming that access to financing is a minor obstacle or no obstacle for their operation and growth are placed in the first subsample "Minor

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[20]The models are identical to those reported in columns (1), (3) and (4) of Table 6.

obstacle" while firms claiming that access to financing is an important issue are placed into the second sub-sample "Major obstacle". Despite some differences in the coefficients on the gender variable in the two sub-samples, none of the differences is statistically significant. Similarly, there are no statistically significant differences in the coefficients on the female dummy in the sample split based on network participation (see Panel B). Panels C and D show the results for the sample splits based on median age and median size of firms, respectively. Again, cross-model comparison of the estimated coefficients on the gender dummy suggests no statistically significant differences across the sub-samples. We therefore conclude that the basic results for gender discrimination obtained in this study are sufficiently robust and are unlikely to be driven by the omission of essential variables in the regressions.

5   Conclusion

Financial constraints are regarded as a crucial impediment for starting up new businesses and for the survival of existing firms. It has long been hypothesized that lower debt-equity ratios, less frequent use of venture capital and smaller size of firms run by minority entrepreneurs stem from the supply-side discrimination against these entrepreneurs by financial institutions. This paper provides new evidence on the relationship between the gender of managers/owners of business ventures and their access to bank financing. Ours is one of the few studies in this area, and it differs from others in that we (i) present evidence from outside the US, (ii) take a comparative perspective and identify the impact of the level of financial development on the gender bias in financing, (iii) use multiple measures of financial constraints – the probability of obtaining a loan, interest rate charged, and collateral required – and finally (iv) carefully consider a number of modeling issues, such as sample selection and omitted variables, which were identified in previous research as crucial.

The results of our analysis, which is based on data from 34 countries covered in the BEEPS, are consistent with the hypothesis of discrimination against female entrepreneurs. In particular, we find that firms managed by females face some 5 percent

lower probability of receiving a loan and pay higher (about half a percentage point) interest rates. The gender-based differences in access to financing also appear to depend on the level of a country's financial development. The likelihood of female entrepreneurs receiving a bank loan is higher in more financially developed countries while the size of required collateral is lower. This result may be interpreted as providing support for the Becker's theory: higher financial development, by intensifying competition among providers of capital, leaves less room for the taste-based discrimination.

A number of caveats should be mentioned. One is related to the problem of omitted variables, which makes almost any econometric analysis subject to criticism. Obviously, the BEEPS does not provide all information about firms that is typically requested by banks when they consider loan applications. The inability to control for all factors that are in the bankers' information set is thus a shortcoming of the paper that we would like to acknowledge. However, we believe that the set of variables available in the BEEPS does capture the most essential factors relevant for obtaining bank financing so that the results of our study are not invalidated. This view is also supported by evidence from the robustness checks based on the sample splits described in the paper.

Much space in our study has been devoted to the discussion of various sample selection issues. However, one such issue of great importance has not yet been touched on. It concerns selection into entrepreneurship, which needs not be gender-neutral. In particular, the decision to start an own business is itself a function of access to external financing, which, in turn, depends on the amount of gender discrimination. Therefore, estimating financial constraints based on samples of established businesses induces a sample selection bias. What is important, however, is that this type of selection *reduces* the estimate of the gender gap in access to external financing. In other words, the estimates provide *a lower bound* for gender-based discrimination against entrepreneurs. This interpretation is similar to what one finds in the labor market studies (Jarrell and Stanley (2004)). The fact that in this paper such a lower bound of the gender-based gap in access to bank financing is found statistically significant contributes to our confidence that this gap exists in the population as a whole.

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Table 1: Sample composition by country groups.

Country group	Countries	N obs.	Share of female-owned firms
Old member states of the EU	Germany, Greece, Ireland, Portugal, Spain	1,321	0.272
New member states of the EU (2004)	Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia	1,150	0.298
South-Eastern Europe	Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Macedonia, Romania, Serbia and Montenegro	773	0.223
Middle-income CIS countries	Belarus, Kazakhstan, Russia, Ukraine	848	0.333
Low-income CIS countries	Armenia, Azerbaijan, Georgia, Kyrgyzstan, Moldova, Tajikistan, Uzbekistan	748	0.191
Others	Korea, Turkey, Vietnam	694	0.205
All countries		5,534	0.260
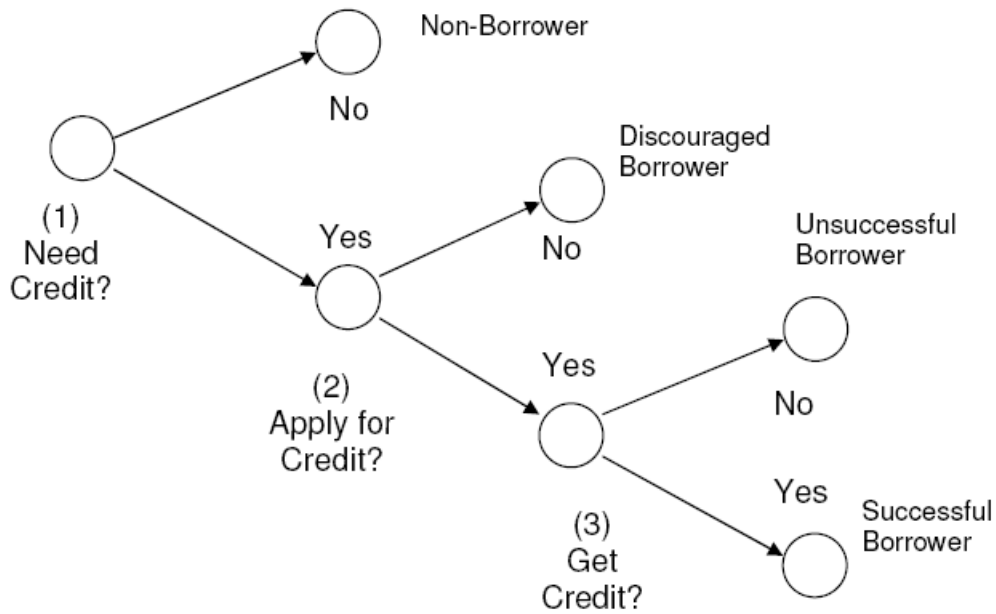
Figure 1: Loan application process (borrowed from Cole (2008)).

Table 2: Loan applications and approval rates by gender.

| | Male owned firms | | Female owned firms | | All firms | |
	N.obs	%	N.obs	%	N.obs	%
Non-borrower	1,650	40.31	641	44.48	2,291	41.40
Discouraged	826	20.18	375	26.02	1,201	21.70
Unsuccessful	119	2.91	38	2.64	157	2.84
Successful	1,498	36.60	387	26.86	1,885	34.06
Total	4,093	100.00	1,441	100.00	5,534	100.00

Table 3: Definitions of variables and their descriptive statistics.

Variable	Definition	μ	σ	N
Female	1 if the manager is female, else 0	0.26	0.44	5,534
FinDevelopment	ratio of financial institutions' lending to GDP in 2003	49.52	40.69	5,282
FemaleXFinDev	interaction of *Female* and *FinDev* variables	13.49	30.93	5,281
Loan	1 if the firm got a loan in 2002-2005	0.34	0.47	5,534
Interest	interest rate charged	12.19	6.28	1,803
Collateral	% of required collateral	123.73	73.70	1,918
Profit	1 if firm was profitable in 2003, else 0	0.90	0.31	5,329
Capacity	% of capacity utilization in 2002	82.85	18.80	5,417
Concentr	% of sales from the main business activity	96.31	9.82	5,534
Multiple	1 if the firm consists of multiple establishments, else 0	0.17	0.37	5,530
Accounting	1 if the firm uses international accounting standards, else 0	0.09	0.29	5,087
Audit	1 if the firm was audited, else 0	0.37	0.48	5,427
Networks	1 if the firm is a member of business association or chamber of commerce, else 0	0.40	0.49	5,534
Export	1 if the firm exports, else 0	0.09	0.28	5,534
log(Labor)	logarithm of the number of employees	2.12	1.32	5,488
Age	age of the firm in 2002	8.58	7.70	5,530
Age2	age squared divided by 100	1.33	2.28	5,530
Competition	1 if the firm faces four or more competitors in 2002, else 0	0.80	0.40	5,250
City	1 if the firm is in a capital or large city (more than 1 mln), else 0	0.31	0.46	5,534
Rural	1 if the firm is in a rural area	0.32	0.47	5,534
Term	loan maturity in months	32.06	27.47	1830
ForCurrency	1 if the loan is in foreign currency, else 0	0.14	0.35	1,886
Inflation	CPI in 2003	7.60	8.21	5,534
TimeLoss	% of time, which senior management spent in dealing with public official	3.40	8.13	5,305
LaborReported	% of workforce showed	90.92	15.56	5,336
AccessFin	Access to financing (1 - no obstacle, 4 - major obstacle)	2.23	1.13	5,315
CostFin	Cost of financing (1 - no obstacle, 4 - major obstacle)	2.42	1.14	5,350
OwnFunds	% of new fixed investment financed from retained earnings	68.89	40.32	3,903
BankFunds	% of new fixed investment financed by banks	9.40	24.73	5,534

Note: μ stands for the mean, σ for the standard deviation, and N for the number of observations.

Table 4: Descriptive statistics by gender.

	Male			Female		
	μ	σ	N	μ	σ	N
$FinDevelopment$	48.89	40.49	3,891	51.27	41.20	1,390
$Loan$	0.37	0.48	4,093	0.27	0.44	1,441
$Interest$	11.98	6.25	1,436	13.02	6.35	366
$Collateral$	122.93	73.04	1,513	126.75	76.23	404
$Profit$	0.90	0.30	3,940	0.88	0.32	1,388
$Capacity$	82.32	19.06	4,018	84.39	17.95	1,398
$Concentr$	96.09	10.07	4,093	96.91	9.07	1,441
$Multiple$	0.18	0.38	4,090	0.13	0.34	1,439
$Accounting$	0.10	0.30	3,770	0.06	0.24	1,316
$Audit$	0.38	0.48	4008	0.33	0.47	1,418
$Networks$	0.42	0.49	4,093	0.34	0.47	1,441
$Export$	0.10	0.30	4,093	0.06	0.23	1,441
$log(Labor)$	2.25	1.34	4,056	1.74	1.16	1,431
Age	9.00	7.90	4,090	7.39	6.98	1,439
$Age2$	1.43	2.38	4,090	1.03	1.96	1,439
$Competition$	0.81	0.40	3,878	0.77	0.42	1,371
$City$	0.32	0.47	4,093	0.28	0.45	1,441
$Rural$	0.32	0.46	4,093	0.32	0.47	1,441
$Term$	32.19	27.43	1,451	31.56	27.72	378
$ForCurrency$	0.15	0.35	1,498	0.13	0.34	387
$Inflation$	7.79	8.43	4,093	7.06	7.52	1,441
$TimeLoss$	3.49	8.13	3,910	3.15	8.13	1,394
$LaborReported$	90.38	15.90	3,956	92.46	14.44	1,379
$AccessFin$	2.24	1.13	3,935	2.20	1.13	1,379
$CostFin$	2.42	1.13	3,902	2.41	1.15	1,365
$OwnFunds$	67.20	40.65	2,941	74.03	38.87	962
$BankFunds$	10.37	25.83	4,093	6.65	21.07	1,441

Note: μ stands for the mean, σ for the standard deviation, and N for the number of observations.

Table 5: Prevalence of female owned/managed firms by industry.

Industry code	N obs.	Share of female-owned firms
Construction	577	0.102
Manufacturing	1,831	0.217
Transport	298	0.171
Trade	1,588	0.290
Real estate	549	0.319
Hotels & restaurants	408	0.341
Other services	283	0.562
Total	5,534	0.260

Table 6: Determinants of financial constraints.

	Loan	Loan	Interest	Collateral
	(1)	(2)	(3)	(4)
Female	-0.059**	-0.012	0.457**	2.543
	(0.030)	(0.010)	(0.224)	(4.964)
Profit	0.125***	0.067***	-0.294	-7.745
	(0.030)	(0.025)	(0.351)	(5.059)
Capacity	-0.001*	0.000	-0.006	-0.039
	(0.001)	(0.000)	(0.007)	(0.106)
Concentr	-0.003*	0.000	-0.017**	-0.029
	(0.001)	(0.000)	(0.007)	(0.163)
Multiple	0.072**	0.002	-0.397	-3.073
	(0.034)	(0.013)	(0.237)	(5.103)
Accounting	0.109**	0.025***	-0.366	-13.187
	(0.048)	(0.010)	(0.309)	(7.806)
Audit	0.087***	0.025**	-0.063	-11.793
	(0.029)	(0.010)	(0.250)	(7.327)
Networks	0.137***	0.017	0.010	0.508
	(0.028)	(0.012)	(0.248)	(4.744)
Export	0.062*	0.028***	-0.610	5.008
	(0.035)	(0.011)	(0.401)	(6.326)
log(Labor)	0.096***	0.016***	-0.024	6.960***
	(0.011)	(0.005)	(0.114)	(2.319)
Age	0.008	0.001	-0.032	1.045
	(0.006)	(0.002)	(0.038)	(0.860)
Age2	-0.031*	-0.000	0.059	-2.406
	(0.016)	(0.005)	(0.132)	(2.756)
Competition	-0.034	-0.006	0.003	-0.043
	(0.028)	(0.010)	(0.138)	(5.013)
City	-0.085***	-0.013	-0.425	-20.840***
	(0.032)	(0.017)	(0.263)	(6.139)
Rural	0.037	0.009	-0.141	-3.727
	(0.024)	(0.011)	(0.222)	(5.137)
Term			-0.005*	0.230**
			(0.002)	(0.112)
ForCurrency			-2.175**	5.977
			(0.870)	(6.821)
N obs	2,685	1,642	1,473	1,466
R^2	0.19	0.15	0.71	0.18

Note: Columns (1) and (2) show marginal effects after probit estimation. Columns (3) and (4) show OLS results. Regressions include constant industry and country dummy variables. Asymptotic cluster-robust standard errors are reported in parentheses. Marginal effects are estimated around mean points. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 7: Determinants of financial constraints: Development augmented

	Loan	Loan	Interest	Collateral
	(1)	(2)	(3)	(4)
Female	-0.021	-0.032*	0.538	15.366*
	(0.045)	(0.018)	(0.579)	(8.845)
FinDevelopment	0.004***	-0.000	-0.049**	-0.023
	(0.001)	(0.000)	(0.021)	(0.236)
FemaleXFinDev	-0.001	0.000*	-0.004	-0.219**
	(0.001)	(0.000)	(0.009)	(0.097)
Profit	0.096***	0.086***	-1.058*	-0.756
	(0.030)	(0.028)	(0.546)	(6.875)
Capacity	-0.001*	0.000	0.001	-0.123
	(0.001)	(0.000)	(0.007)	(0.091)
Concentr	-0.003**	0.000	-0.011	-0.079
	(0.001)	(0.001)	(0.011)	(0.163)
Multiple	0.080**	0.007	-0.625**	-1.334
	(0.035)	(0.014)	(0.258)	(4.676)
Accounting	0.163***	0.029**	-1.516***	-11.552
	(0.046)	(0.012)	(0.420)	(8.474)
Audit	0.080**	0.025**	0.122	-10.919
	(0.032)	(0.012)	(0.333)	(6.685)
Networks	0.165***	0.019	-0.109	-5.042
	(0.037)	(0.013)	(0.421)	(5.426)
Export	0.081**	0.037***	-0.465	2.522
	(0.033)	(0.013)	(0.550)	(6.624)
log(Labor)	0.080***	0.016**	-0.010	8.302***
	(0.013)	(0.006)	(0.148)	(2.342)
Age	0.007	0.002	0.016	0.748
	(0.006)	(0.002)	(0.048)	(0.866)
Age2	-0.027*	-0.001	-0.025	-1.584
	(0.015)	(0.005)	(0.142)	(2.810)
Competition	-0.034	-0.006	-0.079	1.737
	(0.029)	(0.011)	(0.168)	(4.650)
City	-0.047*	-0.007	-1.013***	-20.300***
	(0.028)	(0.018)	(0.329)	(5.770)
Rural	0.042*	0.001	-0.355	-2.502
	(0.024)	(0.012)	(0.361)	(5.647)
Term			-0.012***	0.239**
			(0.004)	(0.106)
ForCurrency			-2.064**	7.106
			(0.915)	(6.409)
Inflation			0.169**	
			(0.081)	
N obs	2,573	1,634	1,419	1,411
R^2	0.14	0.11	0.59	0.12

Note: Column (1) and (2) show marginal effects after probit estimation. Columns (3) and (4) show OLS results. Regressions include constant, industry and country dummy variables. Asymptotic cluster-robust standard errors are reported in parentheses. Marginal effects are estimated around mean points. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 8: Determinants of financial constraints: Sample Selection

	Loan	Loan	Interest	Collateral
	(1)	(2)	(3)	(4)
Female	-0.039*	-0.007	0.447**	2.157
	(0.021)	(0.011)	(0.217)	(5.324)
Profit	0.108***	0.073**	-0.356	-8.010
	(0.029)	(0.036)	(0.360)	(10.854)
Capacity	-0.000	0.000	-0.007	-0.068
	(0.001)	(0.000)	(0.006)	(0.144)
Concentr	-0.001	0.000	-0.016**	-0.054
	(0.001)	(0.000)	(0.007)	(0.211)
Multiple	0.036	0.006	-0.427*	-2.049
	(0.027)	(0.012)	(0.226)	(5.799)
Accounting	0.078**	0.020*	-0.389	-13.254
	(0.036)	(0.012)	(0.306)	(9.916)
Audit	0.071***	0.022*	-0.049	-10.811
	(0.021)	(0.011)	(0.269)	(6.947)
Networks	0.079***	0.013	0.086	2.185
	(0.024)	(0.015)	(0.281)	(10.687)
Export	0.035	0.030**	-0.626*	6.160
	(0.024)	(0.012)	(0.378)	(6.765)
log(Labor)	0.059***	0.010	0.009	7.636
	(0.010)	(0.007)	(0.122)	(6.624)
Age	0.006	0.001	-0.024	1.095
	(0.004)	(0.002)	(0.040)	(1.017)
Age2	-0.021*	0.000	0.028	-2.605
	(0.012)	(0.004)	(0.135)	(3.382)
Competition	-0.033*	-0.003	-0.025	-0.550
	(0.018)	(0.012)	(0.126)	(5.437)
City	-0.042	-0.007	-0.523**	-22.451**
	(0.026)	(0.018)	(0.240)	(11.091)
Rural	0.025	0.001	-0.183	-3.607
	(0.020)	(0.011)	(0.227)	(4.335)
Term			-0.005**	0.227**
			(0.003)	(0.110)
ForCurrency			-2.154**	7.237
			(0.844)	(6.686)
Selection Equation Instruments:				
LaborReported	-0.008***	-0.026		
	(0.002)	(0.026)		
TimeLoss			-0.074***	-0.061***
			(0.010)	(0.014)
ρ	-0.757***	-0.381	0.054	0.103
	(0.108)	(0.283)	(0.079)	(0.727)
N obs.	4,363	2,501	2,589	2,588

Note: Columns (1) and (2) show marginal effects after heckprobit estimation. Columns (3) and (4) show heckman results. Regressions include constant, industry and country dummy variables. Asymptotic cluster-robust standard errors are reported in parentheses. Marginal effects are estimated around mean points. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 9: Determinants of financial constraints: Subsamples

Panel A: *Access to financing subsamples*

	Loan		Interest		Collateral	
	Minor obstacle	Major obstacle	Minor obstacle	Major obstacle	Minor obstacle	Major obstacle
Female	-0.058*	-0.075*	0.187	0.709*	1.495	-0.156
	(0.031)	(0.040)	(0.265)	(0.417)	(6.338)	(6.838)
N obs.	1,273	1,324	793	665	794	657

Panel B: *Member of a business association subsamples*

	Loan		Interest		Collateral	
	Yes	No	Yes	No	Yes	No
Female	-0.061*	-0.059	0.256	0.614**	10.953	-1.442
	(0.033)	(0.036)	(0.454)	(0.269)	(7.867)	(7.193)
N obs.	1,036	1,637	718	755	707	759

Panel C: *Size subsamples*

	Loan		Interest		Collateral	
	Small	Large	Small	Large	Small	Large
Female	-0.035	-0.076*	0.700*	0.234	0.234	5.000
	(0.041)	(0.040)	(0.344)	(0.264)	(8.790)	(5.764)
N obs.	1,193	1,492	515	958	509	957

Panel D: *Age subsamples*

	Loan		Interest		Collateral	
	Young	Old	Young	Old	Young	Old
Female	-0.040	-0.079*	0.558**	0.329	-2.811	5.281
	(0.040)	(0.044)	(0.260)	(0.416)	(6.391)	(7.471)
N obs.	1,484	1,179	752	721	760	706

Note: The models are identical to those reported in columns (1), (3) and (4) of Table 6. Asymptotic cluster-robust standard errors are reported in parentheses. Marginal effects are estimated around mean points. * significant at 10%; ** significant at 5%; *** significant at 1%.