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Entrepreneurs' gender and financial constraints: evidence from international data*

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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 Business Environment and Enterprise Performance Survey (BEEPS) that covers firms in several countries of Western Europe as well as in the transition countries of Eastern Europe, our analysis suggests that female-managed firms are less likely to obtain a bank loan compared with male-managed counterparts. In addition, there is some evidence that female entrepreneurs are charged higher interest rates when loan applications are approved. Disaggregation of the sample by country groups suggests that these results are driven by firms in the least financially developed countries of the region.

Keywords: entrepreneurship, gender, financial constraints.

JEL: G21, J16, L26.

1 Introduction

The entrepreneurship and finance literature has long suggested the existence of financial constraints implying the inability of firms to raise external financing in order to fund all desired investments (e.g., Evans and Jovanovic (1989), Fazzari, Hubbard and Petersen (1988)). Recently, a few studies have raised the question of whether the financial constraints facing entrepreneurs differ in terms of 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 (e.g., Taylor (2001)) and by evidence of noticeable differences in self-employment and business ownership rates among men and women, start-up sizes, and financing patterns of their businesses. As surveyed in Carter and Shaw (2006), females constitute a disproportionally small share of self-employed, run smaller businesses, are less likely to rely on venture capital and their firms have lower debt-equity ratios.

A crucial question, especially from the policy perspective, is whether the observed differences between males and females in the use of financing arise due to supply-side discrimination against female entrepreneurs or can be explained by other factors. Discrimination, whether the Becker-type or the statistical-type,[1] implies that financiers' decisions on loan application differ for men and women who have similar creditworthness and other relevant characteristics. The discrimination hypothesis is challenged by alternative explanations that emphasize differences in other characteristics of male and female entrepreneurs, such as human capital, personal wealth and risk aversion. These may stem from the experience of entrepreneurs in other markets, as in the case of wealth (lower employment rates and lower pay among females are widely documented), or may be determined by nature (risk aversion). For example, higher risk aversion of women (e.g., Jianakoplos and Bernasek (1998)), implies, *ceteris paribus*, lower demand for bank loans by female-owned firms.

The link between gender and access to financing can be studied using two approaches from the literature on financial constraints. One is based on data from household sur-

[1] See Becker (1957) and Arrow (1973).

veys and identifies the 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 different dimensions of financial constraints, such as the probability of obtaining a loan and loan interest rate, to be considered. Moreover, with this approach it is impossible to take into account differences in the types of businesses 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)). Another approach to the study of financial constraints relies on firm-level data and identifies these 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 report no convincing evidence of gender-based discrimination. Moreover, the bulk of these studies is based on US data, while evidence from other regions of the world remains scarce.

This paper adopts the second of the approaches mentioned to investigate whether female-owned businesses face more severe financial constraints than male-owned firms. Among the different sources of external financing, we restrict our attention to bank loans as representing the most important overall 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 conducted by the European Bank for Reconstruction and Development (EBRD) and 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. The survey covers firms of different ages and is not restricted to recent start-ups. The data provide key figures about the firms, such as ownership, competition, performance and management. The survey also contains a large section on financing that allows various proxies of firms' financial constraints to be constructed.

This paper offers three main contributions to the literature. First, it sheds light on

the issue of gender-based discrimination against entrepreneurs outside of the US which 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. In particular, we are able to relate the evidence from the mature market economies of Western Europe that have well-developed financial sectors to that from the transition countries of Central and Eastern Europe where financial systems are less developed. Third, in our analysis we pay specific attention to sample selection issues. In doing so, we take advantage of the rich information on firms available in the BEEPS, including variables that may be interpreted as measures of enterpreneurs' risk aversion.

Our empirical analysis finds some evidence of discrimination against female entrepreneurs in the entire sample of firms. This result is obtained after controlling for important characteristics of firms that are related to their creditworthiness and performance. Specifically, we find that female-managed firms have 5.4 percent lower probability of receiving a loan than male-managed ones. Furthermore, we find that the former pay higher interest rate than the latter do. As to the regional dimension, the results here are mixed. The only substantial evidence of gender-based discrimination comes from the CIS countries.[2] The new member states of the EU, which acceded in 2004, and the countries of South-Eastern Europe, in contrast, do not exhibit any visible discrimination. We relate these results to the substantial differences in the financial development across the European countries.

The rest of the paper is organized as follows. Section 2 provides a literature review. Section 3 describes the data and sample. Section 4 presents methodology and empirical results. Section 5 concludes.

[2]CIS stands for the Commonwealth of Independent States and embraces 11 of the 15 constituent states of the former Soviet Union.

2 Literature review

Many studies indicate the existence of financial constraints for both small businesses and large listed firms. For large companies, the evidence comes from the corporate finance literature that has established a firm link between internally generated cash flows and investment levels (Fazzari et al. (1988), 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); Lindh and Ohlsson (1996); and Blanchflower and Oswald (1998)). The reason behind financial constraints is information asymmetry which makes it difficult for capital providers to assess and price the risk of loan applicants. As a result, providers of capital choose a rationing strategy (Stiglitz and Weiss (1981)).

There is small but growing literature investigating 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, some authors study whether the lower rates of self-employment and lower rates of business ownership among minority groups, which are widely documented, are driven by unequal access to external financing. A large group of these investigations focuses 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, Levine and Zimmerman (2003), Storey (2004), Cavalluzzo and Wolken (2005)). Essentially, these works raise an important question about discrimination against borrowers who belong to various demographic 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 well-known model of discrimination by Becker (1957), discrimination arises due to the taste-based preferences of the lender so that he 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 in the relevant market as lenders are no longer able to bear the cost of the non-economically motivated choices. An 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 occurs when lenders cannot observe the risk factors or do not collect relevant information due to the costs involved (see e.g., Phelps (1972) and Aigner and Cain (1977)).[3]

Empirical testing for discrimination in the credit market is usually implemented in a multivariate regression framework with dependent variables that characterize access to or cost of loans and independent variables that describe borrowers' characteristics, including demographics. In this framework, 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. Such an approach has several pitfalls. The major issue is the difficulty of controlling for all possible factors that are used by lenders in assessing the quality of borrowers and which 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 requirements and interest rates, are not observed for all firms in a random sample. Some entrepreneurs may not need a loan and this may be related to the demographic factors. For example, there is compelling evidence that risk attitude and risk tolerance are not the same between the genders: women tend to be more risk averse than men (Jianakoplos and Bernasek (1998), Barber and Odean (2001), and Dohmen, Falk, Huffman, Sunde, Schupp and Wagner (2005)). As a result, female entrepreneurs prefer to invest smaller amounts of personal wealth and to maintain lower debt-equity ratios in their businesses, possibly avoiding borrowing altogether.

Most of the existing empirical studies provide some evidence of bankers' discrimination against entrepreneurs from different demographic groups. The strongest results are obtained for racial discrimination, especially for black entrepreneurs. For exam-

[3]Besides demographic characteristics, discrimination may be based on other factors, such as private versus public ownership of firms (Brandt and Li (2003)).

ple, Bostic and Lampani (1999) report different approval rates for white-owned and black-owned firms, 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 face obstacles in obtaining credit that are unrelated to their creditworthiness. The picture is 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 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, though not necessarily the same waves. The studies differ, however, with respect to the indicators of restricted access to finance, sets of independent variables and econometric specifications. For example, Cavalluzzo and Wolken (2005) pay particular attention to the role of entrepreneurs' personal wealth in explaining loan denial rates.[4]

The above discussion suggests a scarcity of the available evidence on gender-based discrimination against entrepreneurs. Most of the previous research has been implemented using the US data and little is known about other countries.[5] The virtual absence of international evidence is remarkable and needs to be addressed. Such international evidence would also be more valuable if it were based on similar survey instruments and empirical methodologies, thus allowing easy comparisons across countries. Overall, there is a scope for cross-country analysis which may provide more rigorous evidence of gender-based discrimination against entrepreneurs. In the next sections we use cross country data to explore credit treatment by banks of male and female business owners/managers.

[4]There is a related strand of literature that considers discrimination in the mortgage credit market (e.g., Gilbert (1977), Munnell, Tootell, Browne and McEneaney (1996) and Ladd (1998)). LaCour-Little (1999) and Turner and Skidmore (1999) offer reviews of these studies.

[5]There are many 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 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 Performance Survey (BEEPS), an establishment level survey conducted by the EBRD and 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. It was extended in 2004 and 2005 to include a range of comparator countries from Western Europe and East Asia. The interviews with firm managers, besides focusing on a set of business environment indicators, also provided key figures about the firms, including ownership, gender of the principal owner, whether the owner is the manager, as well as figures for the degree of competition, sales, inputs, and some other characteristics.

We use the two most recent waves of the survey, BEEPS-2004 covering 4,453 enterprises in seven countries: Germany, Greece, Ireland, Portugal, Spain, South Korea and Vietnam and BEEPS-2005 covering 9,655 enterprises in 26 transition countries in Central and Eastern Europe and also Turkey. 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 had 10,000 employees or more were excluded from the sample, as were the firms that started their operations in 2002 or later. Like the population of firms in countries all around the world, around 90 percent of the sampled firms are small and medium sized enterprises. The details of the sample characteristics can be found in the respective

reports on sampling and implementation provided by the EBRD.[6]

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 – by far the biggest – most country samples have fewer than 400 firms. The implication is that a high degree of disaggregation of the data is fraught with systematic differences across countries being swamped by noise in the data. In our analysis we therefore retain a considerable degree of aggregation of the data across countries.

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 is 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 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 is an individual who has a majority stake (at least 50 percent stake in the enterprise). Then, we restrict the sample to the firms where the individual is also the manager. By following these steps we keep only individually-owned firms with no separation of ownership and management and with a clear indication whether the principal owner (and the manager) is a male or a female. Since the 2004 and 2005 vawes of the BEEPS cover firms created before 2002 only, in our empirical analysis we focus on the period between 2002 and 2005 and

[6] http://www.ebrd.com/country/sector/econo/surveys/beeps.htm, as available in May 2007.

exclude firms that provide no information on loan applications for these years.[7]

In the resulting sample, the number of firms in each country varies from 48 in Georgia to 484 in Poland. As the average number of observations per country (162) is too small for a meaningful country-level analysis, we aggregate the data into four country groups: mature market economies (members of the EU before the 2004 enlargement - Germany, Greece, Ireland, Portugal and Spain), new member states of the EU (the countries that joined the EU in 2004 - the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia), South-Eastern Europe (Albania, Bosnia and Herzegovina, Bulgaria, Croatia, FYR Macedonia, Romania, Serbia and Montenegro) and the CIS countries (the former USSR except for the Baltic States).[8] We drop Korea, Turkey and Vietnam as these countries cannot be attributed to any of the groups constructed. The final sample contains 5,022 observations of which 1,358 are from the old members of the EU, 1,178 from the new member states (2004 enlargement), 803 from the SEE region and 1,683 from the CIS countries. Female-owned businesses constitute 26.7 percent of all the firms in the constructed sample. The variation across the regions is not very high: 27.0 percent in the old members of the EU, 29.five percent in the new member states of the EU, 21.9 percent in South-Eastern Europe and 26.7 in the CIS countries.[9]

4 Empirical analysis

4.1 Gender and financial constraints: evidence from the BEEPS

It is worthwhile starting the analysis with the self-evaluation by managers of financial constraints facing their firms. The BEEPS asks managers to answer two relevant questions. One is how problematic is access to financing (e.g., collateral requirements) and the other one is how problematic is cost of financing (e.g., interest rates and charges). These are evaluated using a scale from 1 (no obstacle) to 4 (major obstacle). In the

[7] In particular, the firms that obtained their most recent loans before 2002 are excluded.
[8] Note that the BEEPS does not cover Turkmenistan.
[9] Hereafter, we proceed without using any country weights.

entire sample, the answers indicate that female entrepreneurs face somewhat less severe constraints than their male counterparts: 2.22 versus 2.27 for access to financing and 2.47 versus 2.49 for cost of financing, but the differences are not statistically significant at conventional significance levels in a double-sided t-test. Analysis at the country group level, however, reveals very diverse patterns. In South-Eastern Europe, female-owned firms report fewer constraints in access and cost of financing than male-owned businesses do (2.20 vs 2.46 in access to financing, the difference is statistically significant at five percent level, and 2.54 vs 2.73 in cost of financing, significant at 10 percent level). Female entrepreneurs also appear to be less financially constrained in terms of cost of financing in the new member states of the EU (2.57 for females vs 2.69 for males, significant at 10 percent level). However, cost of financing represents a greater constraint for female-owned businesses in the old member states of the EU: 2.32 vs 2.18 and the difference is significant at five percent level. Figure 1 provides the details. Note that these data refer to all types of financing and not only bank loans.

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, 6.8 versus 10.8 percent (the difference is significant at one percent level). In contrast, the share of retained earnings is higher in female-owned firms, 75.7 versus 68.five percent. As Figure 2 shows, this pattern is observed in all the regions.

Evidence on financial constraints can also be obtained 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 zero demand for bank loans. The complementary group consists of firms that applied for the financing and those that did not apply because they were discouraged.

The data suggest that 62.4 percent of male-owned, and 57.7 percent of female-owned, firms in the entire sample needed a loan. The pattern that females have a lower need for bank financing than males is observed in all the regions, apart from the CIS countries, where the relation is the opposite. Among those firms that needed a loan, 43.five percent of male-owned, and 55.9 percent of female-owned, firms had none because their applications were rejected or because they were discouraged from applying.[10] These numbers suggest quite a significant difference in terms of gender in the probability of obtaining a loan - more than 12 percent. Large differences in terms of gender in the share of firms that obtained a loan are visible in all the regions, see Figure 3 for details.

We now check whether, when granted a loan, female-managed firms face less favorable contractual terms than male-owned counterparts. The BEEPS data show a difference in the interest rates paid by male- and female-owned firms in South-Eastern Europe and in the CIS countries (Figure 4). However, evidence concerning differences in the size of collateral, terms of loans and number of days needed to obtain a decision for a loan application is less suggestive of gender-based discrimination. Figures 5-7 provide the details by region.[11]

Basic characteristics of the firms sampled are summarized in Table 1 - Table 4. Table 1 gives the definitions of variables and basic descriptive statistics for the entire sample, Table 2 disaggregates these by gender and Table 3 - Table 4 summarize the data by gender and region. Note, in particular, that the female-owned firms tend to be smaller and younger in both the entire sample and all the constructed regional sub-samples.

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 next section describes the econometric strategy that we employ to investigate gender-based discrimination against entrepreneurs by banks.

[10] Among those firms that wanted a loan, but did not get it, outright rejections constitute just a small fraction, less than five percent.

[11] These data are cleaned of outliers (one percent of the number of observations).

4.2 Econometric models

The first question our study addresses is whether the probability of getting a loan depends on the entrepreneurs' gender. Obviously, the loan may be obtained only by those firms that had non-zero demand for bank financing. However, a straightforward analysis based on a subsample of firms with non-zero demand for loans may be inappropriate as it ignores potential sample selection.[12] In what follows, therefore, we consider the binary response model with sample selection introduced by de Ven, Wynand and Van Praag (1981).[13]

To test our hypothesis we specify the following main equation:

$$Prob(Loan_i = 1) = \Phi(\alpha + \beta Female_i + \gamma X_i + \epsilon_i) \quad (1)$$

where *Loan* equals one if a firm received a loan between 2002 and 2005 and zero otherwise; $Female$ is a dummy variable which is equal to 1 if the manager of the firm is a female and zero otherwise; and X is a vector of firm specific characteristics.

Vector X combines variables that characterize creditworthiness of the firm from the banks' viewpoint. In general, the decision to grant a loan and its contractual conditions (e.g., the interest rate) crucially depend on the associated risk and the availability of collateral. These, however, are not directly measured in the BEEPS and we therefore proxy them by the share of sales coming from the main area of business activity (this measures the diversification of a firm, and hence, risk) represented by variable *Concentr* and with a binary variable for single establishment firms, variable *Single* (the idea is that firms with several establishments may be better able to provide collateral for a loan).

In addition, vector X contains two measures of firm performance (lagged capacity utilization and profitability dummy), a dummy for many (4 and more) competitors facing the firm in 2002, age of the firm in 2002, a dummy that equals unity if the firm was

[12] It is plausible that firms that do not need bank financing (e.g. because they generate enough cash themselves) would be more likely to get a loan had they applied. We also know that females, due to their higher risk aversion, are less likely to apply for bank financing.

[13] Similar econometric strategy was used by Cavalluzzo et al. (2002), but they considered selection into loan application.

created in the former communist economies before 1990, a dummy for firm location in a big city (either a capital or a city with more than 1 mln inhabitants), firm size in 2002 (measured by log employment) and sector dummies.[14] We also include country dummies.

The selection equation distinguishes between the firms that needed a loan and those that did not:

$$Prob(Need_i = 1) = \Phi(\tilde{\alpha} + \tilde{\beta} Female_i + \tilde{\gamma} X_i + \tilde{\psi} Z_i + \tilde{\epsilon}_i) \quad (2)$$

where $Need$ is equal to one if a firm needs a loan and zero otherwise; and Z is a vector of variables that identify the selection equation (instruments). The model comprising equations (1) and (2) also assumes that $\epsilon \sim N(0,1)$, $\tilde{\epsilon} \sim N(0,1)$, and $corr(\epsilon, \tilde{\epsilon}_i) = \rho$. If $\rho \neq 0$ then the standard probit model without selection produces biased estimates.

In vector Z we include three variables: percent of sales (1) and percent of workforce (2) reported to tax authorities as well as a dummy variable for subsidies received by the firm (3). The intuition behind these instruments is the following. The former two can be considered as measures of the entrepreneurs' risk aversion. Indeed, more risk-averse owners/managers would be reluctant to underreport sales/workforce in order to save on taxes as detection of underreporting is subject to fines. We also assume that more risk-averse managers would have a lower demand for bank loans. This is exactly what the BEEPS data show: both variables are correlated with the demand for loans - firms that needed a loan reported lower percentages of sales and workforce than their counterparts with zero demand for loans. The numbers are 88.2 percent versus 90.3 percent for sales (the difference is significant at 1 percent level) and 89.6 percent versus 92.8 percent for employment (again, significant at one percent level).[15] The dummy for firms receiving subsidies is introduced on the grounds that these firms are more likely to be in need of external finance.[16]

[14]Definitions of the variables and their descriptive statistics are shown in Tables 1 -4.

[15]Consistent with the interpretation of these variables as measures of risk aversion is the fact, that in the BEEPS data, female-owned businesses report higher percentages of actual sales and labour than male-owned firms. The respective numbers are 89.6 vs 88.8 for sales and 91.9 vs 90.5 for labor.

[16]The exclusion of the intruments from the main equation is justified by the fact that banks do not observe the relevant factors.

The second question we address is whether female-owned businesses are charged higher interest rates than male-owned ones, other things being equal. Our analysis is conditional on firms that received loans.[17] The model is specified with the interest rate variable on the left-hand-side and a number of covariates, including the female dummy, on the right-hand-side. We consider the following regression equation:

$$Interest_i = \alpha + \beta Female_i + \gamma X_i + \epsilon_i \tag{3}$$

where $Interest$ is the reported interest rate of the current loan, and X is a vector of controls. Compared with equation 1, the list of regressors includes additional variables - a dummy for collateral, a dummy for loans denominated in foreign currency and a variable for the term of the loan measured in months. We also include time dummies for years 2002–2005 in order to account for changes in the level of interest rates over the period.

4.3 Results and discussion

Table 5 gives results for the entire sample of the firms. Column (1) shows Heckman probit estimation results for the model described in equations (1) and (2). It reports marginal effects estimated around mean points.[18] The coefficient on variable $Female$, which is of major interest in this study, is negative and significant. This result is consistent with the hypothesis that female-managed firms have a lower propensity to receive a loan. In particular, female-managed businesses appear to have 5.4 percent lower probability of getting a needed loan than businesses managed by males. Relative to the proportion of firms that received loans (53.4 percent), this is a fairly large number, indicating a substantial difference in financial constraints for male and female managers.

[17] As discussed above this may be fraught with sample selection problems. Similar to Cavalluzzo et al. (2002) we attempted the Heckman selection correction for the sample of firms that had non-zero demand for bank loans (distinguishing between the firms that obtained a loan on the one hand and those that were discouraged from applying or whose application was rejected on the other hand). However, we found little evidence of sample selection, and, therefore, stuck to the OLS model as more parsimonious. The Heckman estimation results are similar and are available from the authors on request.

[18] Estimation of marginal effects around median points suggests similar results.

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 small firms face greater difficulties in securing external financing than large firms.[19] Regression results also indicate that firms operating in more competitive environments are less likely to obtain a loan. This is consistent with the view that competition increases firms' demand for financial resources and amplifies the level of financial constraints (Povel and Raith (2004)).

The selection equation (2) is statistically significant.[20] The coefficients on the instruments have the expected signs (negative for the risk aversion measures and positive for the subsidy variable) and are significant at one percent level. The negative and statistically significant value of ρ, the correlation coefficient of the error terms in the main and selection equations, suggests a negative selection: firms that need a loan have characteristics that make them less likely to get one.

Column (2) of Table 5 shows results for the effect of gender on the level of interest rates. Regression estimates imply that female-owned firms on average pay 0.6 percent higher interest rates than male-owned ones. They also show that the 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 in the BEEPS.

Table 6 reports results from estimating the binary response model with sample selection for the four regions. It appears that, compared with male-owned firms, female-managed firms have smaller chances of getting a bank loan in the CIS countries, the difference being 8.7 percent. However, the regressions suggest no statistically significant effect of gender on financial constraints in the old member states of the EU, new member states of the EU and countries of South-Eastern Europe. This means that the result obtained in the entire sample of firms was driven by firms in the CIS region.

Similar to the results from the full sample, we find that better performing and larger firms are more likely to get loans. The regional-level analysis also indicates negative

[19] See also Carpenter, Fazzari, Petersen, Kashyap and Friedman (1994) or Lizal and Svejnar (2002).

[20] The estimation results are available from the authors on request.

selection in the model, though not in South Eastern Europe (the correlation coefficient is large, but not statistically significant).

Results from estimating the interest rate model for the country groups are shown in Table 7. The figures suggest that female-owned businesses pay about one percent higher interest rate than male-owned ones in the CIS countries; the result is significant at five percent level. In the sample of the old members of the EU, the coefficient on $Female$ variable is smaller but still marginally statistically significant at 10 percent level. The same coefficient estimated on the sample of the South-Eastern European countries is large, but not statistically significant.

To summarize, our analysis of the BEEPS data provides some evidence of gender-based discrimination by financial institutions. This is visible in a univariate analysis and also holds in a multiple regression framework after controlling for industry, age, size, performance and other characteristics of firms and also after accounting for sample selection.

The region-level results provide little evidence of discrimination in the more developed countries and considerable evidence in the least developed region, the former USSR. Our tentative explanation for this remarkable pattern stresses two factors: the difference in historical, cultural and institutional conditions that shape the role of women in the society and the economy, and the different level of financial development across the states. The cultural and institutional differences may affect the magnitude of the "taste for gender discrimination" across the countries. The latter may be particularly high in the Central Asian states due to the long history of Islamic tradition.[21]

Huge differences in the financial development across the BEEPS countries are apparent. Leaving aside the developed economies, the EBRD indicators of the progress of

[21]We are aware of some studies claiming that, due to the experience of gender equalization policies during the communist period, the transition countries of Central and Eastern Europe may actually exhibit less gender-based discrimination than the mature market economies. Some authors, when speaking about entrepreneurs, go so far as to suggest that "the socialist system may have ... actually created more opportunities for women than the more democratic western one" (Pistrui, Welsch, Wintermantel, Liao and Pohl (2000). It should be noted that such conclusions are often based on evidence from Central Europe (the study cited refers to East and West Germany) and may have much less relevance for the former USSR).

banking reform in the transition countries show substantial variation. While in 1989 all these countries started with the index of banking reform equal to 1.00 (little progress beyond establishment of two-tier system), by 2006 Bulgaria, the Czech Republic, Estonia, Hungary, Lithuania, and the Slovak Republic had the highest score possible (4.00), implying full convergence of banking laws and regulations with the Bank of International Settlements standards and provision of a full set of competitive banking services. At the same time, Belarus and Turkmenistan have not made any improvements since the beginning of the transition period.[22]

There is a link between the level of financial development and the severity of financial constraints: the degree of competition in the national financial markets (Beck, Demirguc-Kunt and Maksimovic (2004), Clarke, Cull and Martinez Peria (2006)). Therefore, the fact that we find evidence of gender discrimination in the least financially developed countries is perfectly consistent with Becker's view on discrimination: competition among providers of capital should reduce the scope for their discriminatory behavior. Our results are broadly in line with the findings of Cavalluzzo et al. (2002) that show a link between the level of lender concentration and a credit access gap between female and male entrepreneurs.

5 Conclusion

Financial constraints may be a crucial impediment for starting up new businesses and for the survival of existing firms. In this paper, we present new evidence on the relationship between the gender of managers/owners and access to external financing. Ours is one of the first studies in this area, and it differs from others in that we (i) present new evidence from the European continent, (ii) apply sample selection techniques to the firm level data, (iii) take a comparative perspective and identify the gender bias in financing among different groups of countries with various degree of financial development.

Specifically we use the BEEPS dataset to test the presence of gender-based discrimination against entrepreneurs by banks. We consider two indicators of financial

[22]See also Berglof and Bolton (2002) for a discussion of the financial development in the region.

constraints: the probability of obtaining a loan and the interest rate charged. The results of our analysis are consistent with the hypothesis of discrimination against female entrepreneurs. Firms that are managed by females have 5.4 percent lower probability of receiving a loan, and pay 0.6 percent higher interest rates. Disaggregation of the sample by country groups suggests that these results are driven by firms in the least financially developed countries of the region. As long as differences in the financial development imply different degrees of competition in financial markets, our results are perfectly consistent with Becker's view on discrimination: competition among providers of capital should reduce the scope for their discriminatory behavior.

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Table 1: Definition of variables and their descriptive statistics.

Variable	Definition	μ	σ	N
$Need$	1 if the firm needed a loan, else 0	0.61	0.49	5,022
$Loan$	1 if the firm got a loan in 2002-2005, else 0	0.33	0.47	5,022
$Interest$	interest rate charged, %	12.46	6.34	1,606
$Term$	loan maturity in months	34.06	28.42	1,624
$ForCurrency$	1 if the loan is in foreign currency, else 0	0.16	0.37	1,729
$Collateral$	1 if collateral is required, else 0	0.82	0.39	1,729
$Female$	1 if the manager is female, else 0	0.27	0.44	5,022
$Single$	1 if the firm consists of a single establishment, else 0	0.83	0.37	5,017
$Concentr$	% of sales from the main business activity	0.96	0.10	5,022
$Competition$	1 if the firm faces four or more competitors in 2002, else 0	0.78	0.41	4,769
$CapUtil$	% of capacity utilization in 2002	0.83	0.19	4,904
$Profit$	1 if firm was profitable in 2003, else 0	0.89	0.31	4,856
Age	age of the firm in 2002	8.75	7.71	5,017
Age^2	age squared divided by 100	1.36	2.31	5,017
$Communism$	1 if the firm was established in the Soviet period, else 0	0.13	0.33	5,022
$log(Labor)$	logarithm of the number of employees	2.10	1.33	4,975
$City$	1 if the firm is in a capital or large city (more than 1 mln), else 0	0.30	0.46	5,022
$Subsidy$	1 if the firm received subsidies	0.05	0.22	5,022
$RepSales$	% of sales reported	0.89	0.18	4,824
$RepLabor$	% of workforce reported	0.91	0.17	4,840

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

Table 2: Descriptive statistics by gender.

	Male			Female		
	μ	σ	N	μ	σ	N
Panel A: *Financial variables*						
$Need$	0.62	0.48	3683	0.58	0.49	1339
$Loan$	0.35	0.48	3683	0.25	0.44	1339
$Interest$	12.18	6.28	1278	13.54	6.47	328
$Term$	34.15	28.36	1285	33.69	28.65	339
$ForCurrency$	0.16	0.37	1369	0.14	0.35	360
$Collateral$	0.82	0.38	1369	0.81	0.40	360
Panel B: *Real variables*						
$Single$	0.82	0.38	3680	0.88	0.33	1337
$Concentr$	0.96	0.10	3683	0.97	0.09	1339
$Competition$	0.79	0.40	3500	0.75	0.43	1269
$Capacity$	0.83	0.19	3610	0.85	0.18	1294
$Profit$	0.90	0.30	3568	0.88	0.33	1288
Age	9.16	7.89	3680	7.61	7.09	1337
Age^2	1.46	2.40	3680	1.08	2.01	1337
$log(Labor)$	2.25	1.36	3646	1.70	1.16	1329

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

Table 3: Descriptive statistics by regions: Financial variables.

	Male			Female		
	μ	σ	N	μ	σ	N
Panel A: *Old EU*						
Need	0.49	0.50	992	0.38	0.49	366
Loan	0.34	0.47	992	0.20	0.40	366
Interest	6.67	2.62	335	6.75	2.88	69
Term	49.62	32.54	322	53.31	34.12	71
ForCurrency	0.01	0.09	356	0.01	0.11	76
Collateral	0.75	0.44	356	0.74	0.44	76
Panel B: *New EU*						
Need	0.66	0.47	830	0.57	0.50	348
Loan	0.37	0.48	830	0.24	0.43	348
Interest	10.65	4.59	295	10.50	4.60	80
Term	34.74	28.28	299	36.91	30.69	80
ForCurrency	0.13	0.34	320	0.13	0.34	85
Collateral	0.80	0.40	320	0.74	0.44	85
Panel C: *South-Eastern Europe (SEE)*						
Need	0.71	0.45	627	0.66	0.47	176
Loan	0.43	0.49	627	0.34	0.48	176
Interest	12.51	5.89	271	14.34	6.15	57
Term	34.14	28.10	271	28.42	25.47	62
ForCurrency	0.31	0.46	283	0.21	0.41	63
Collateral	0.90	0.30	283	0.90	0.30	63
Panel D: *Former Soviet Union (CIS)*						
Need	0.67	0.47	1234	0.71	0.46	449
Loan	0.31	0.46	1234	0.28	0.45	449
Interest	18.04	4.82	377	19.00	3.77	122
Term	21.03	15.72	393	23.19	17.48	126
ForCurrency	0.22	0.42	410	0.19	0.39	136
Collateral	0.86	0.35	410	0.84	0.37	136

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

Table 4: Descriptive statistics by regions: Enterprise characteristics.

	Male			Female		
	μ	σ	N	μ	σ	N
Panel A: *Old EU*						
Single	0.87	0.34	990	0.90	0.29	366
Concentr	0.98	0.07	992	0.99	0.05	366
Competition	0.82	0.38	965	0.80	0.40	354
Capacity	0.86	0.15	967	0.88	0.15	349
Profit	0.88	0.32	963	0.90	0.31	357
Age	12.82	9.54	992	9.90	8.90	365
log(Labor)	1.90	1.35	987	1.38	1.06	364
Panel B: *New EU*						
Single	0.80	0.40	830	0.86	0.35	348
Concentr	0.95	0.11	830	0.97	0.08	348
Competition	0.89	0.31	791	0.88	0.33	321
Capacity	0.83	0.18	815	0.86	0.16	332
$Profit_i$	0.90	0.30	819	0.85	0.36	336
Age	9.30	6.66	828	8.66	6.99	347
log(Labor)	2.12	1.35	815	1.65	1.14	344
Panel C: *South-Eastern Europe (SEE)*						
Single	0.69	0.46	627	0.79	0.41	176
Concentr	0.95	0.11	627	0.96	0.10	176
Competition	0.80	0.40	590	0.76	0.43	161
Capacity	0.83	0.20	616	0.85	0.18	173
Profit	0.88	0.33	600	0.85	0.36	168
Age	8.67	6.61	627	6.76	4.61	176
log(Labor)	2.38	1.38	615	1.94	1.35	174
Panel D: *Former Soviet Union (CIS)*						
Single	0.86	0.35	1233	0.90	0.30	447
Concentr	0.95	0.11	1234	0.95	0.11	449
Competition	0.70	0.46	1154	0.62	0.49	433
Capacity	0.79	0.22	1212	0.81	0.21	440
Profit	0.91	0.28	1186	0.89	0.31	427
Age	6.37	6.47	1233	5.28	5.35	449
log(Labor)	2.54	1.30	1229	1.91	1.11	447

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

Table 5: Determinants of financial constraints.

	Likelihood of getting a loan	Interest Rate
	(1)	(2)
$Female$	-0.054***	0.593**
	(0.021)	(0.255)
$Single$	-0.047**	0.392
	(0.023)	(0.245)
$Concentr$	-0.080	-1.555*
	(0.079)	(0.890)
$Competition$	-0.036*	-0.165
	(0.020)	(0.245)
$Capacity$	0.037	-0.596
	(0.045)	(0.555)
$Profit$	0.107***	-0.277
	(0.029)	(0.332)
Age	0.004	-0.060
	(0.004)	(0.044)
Age^2	-0.015	0.135
	(0.012)	(0.134)
$log(Labor)$	0.061***	-0.080
	(0.010)	(0.081)
$Term$		-0.008**
		(0.003)
$ForCurrency$		-2.375***
		(0.364)
$Collateral$		0.343
		(0.284)
N	4,312	1398
χ^2	317.41***	-
R^2	-	0.687
ρ	-0.80***	-

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

Table 6: Likelihood of obtaining a loan by region.

Dependent Variable: *Loan*				
	Old EU	New EU	SEE	CIS
	(1)	(2)	(3)	(4)
$Female$	-0.061	-0.029	0.013	-0.087**
	(0.039)	(0.044)	(0.049)	(0.034)
$Single$	-0.013	-0.084*	-0.007	-0.083*
	(0.046)	(0.049)	(0.044)	(0.043)
$Concentr$	-0.004	-0.276	-0.069	0.014
	(0.184)	(0.173)	(0.182)	(0.125)
$Competition$	-0.049	-0.136***	0.007	-0.016
	(0.030)	(0.050)	(0.047)	(0.031)
$Capacity$	0.291***	0.015	-0.114	0.017
	(0.091)	(0.101)	(0.110)	(0.068)
$Profit$	0.021	0.151**	0.170***	0.114**
	(0.041)	(0.067)	(0.063)	(0.053)
Age	0.005	-0.004	0.001	0.009
	(0.005)	(0.008)	(0.009)	(0.007)
Age^2	-0.015	0.017	0.010	-0.034
	(0.017)	(0.028)	(0.032)	(0.026)
$log(Labor)$	0.023	0.103***	0.054*	0.054***
	(0.016)	(0.023)	(0.032)	(0.017)
N	1,206	1,003	661	1,442
χ^2	61.94***	70.71***	48.12***	86.40***
ρ	-0.79*	-0.77***	-0.91	-0.91***

Note: The table reports marginal effects after probit estimation. Regressions include constant, *City*, *Communism*, industry and country dummy variables. Asymptotic 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 interest rates by region.

Dependent Variable: *Interest*				
	Old EU	New EU	SEE	CIS
	(1)	(2)	(3)	(4)
Female	0.526*	-0.194	0.831	0.918**
	(0.295)	(0.541)	(0.891)	(0.419)
Term	-0.005*	-0.007	-0.016	-0.018*
	(0.003)	(0.009)	(0.011)	(0.010)
ForCurrency	0.667	-0.075	-4.224***	-2.107***
	(3.033)	(0.729)	(0.765)	(0.480)
Collateral	-0.083	-0.975*	0.778	1.437**
	(0.296)	(0.545)	(1.229)	(0.592)
Single	-0.442	-0.251	0.942	0.885*
	(0.310)	(0.464)	(0.605)	(0.462)
Concentr	-0.438	-1.398	-4.498*	-0.955
	(1.460)	(1.704)	(2.296)	(1.443)
Competition	-0.073	-0.354	0.235	-0.027
	(0.270)	(0.642)	(0.800)	(0.410)
Capacity	-2.523***	1.111	1.081	-1.371*
	(0.719)	(1.352)	(1.748)	(0.792)
Profit	0.241	-0.635	-1.270	0.057
	(0.345)	(0.655)	(1.143)	(0.645)
Age	-0.073	-0.102	0.006	-0.050
	(0.047)	(0.094)	(0.132)	(0.093)
Age^2	0.212	0.352	-0.244	-0.025
	(0.139)	(0.295)	(0.476)	(0.339)
log(Labor)	-0.212***	-0.454***	0.082	0.253
	(0.080)	(0.156)	(0.270)	(0.174)
N	344	325	280	449
R^2	0.528	0.485	0.425	0.363

Note: Every equation includes constant, *City*, *Communism*, industry and country dummy variables. Asymptotic robust standard errors are reported in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

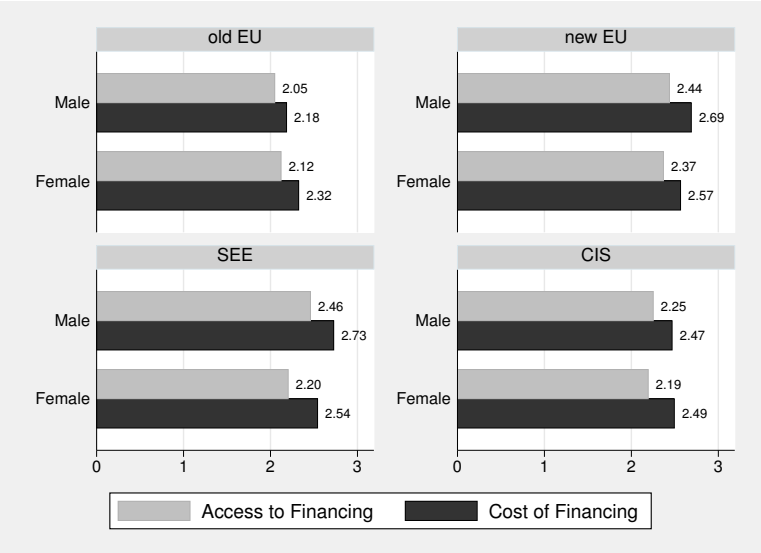

Figure 1: Subjective evaluation of financial constraints by managers (1 - no obstacle, 4 - major obstacle).

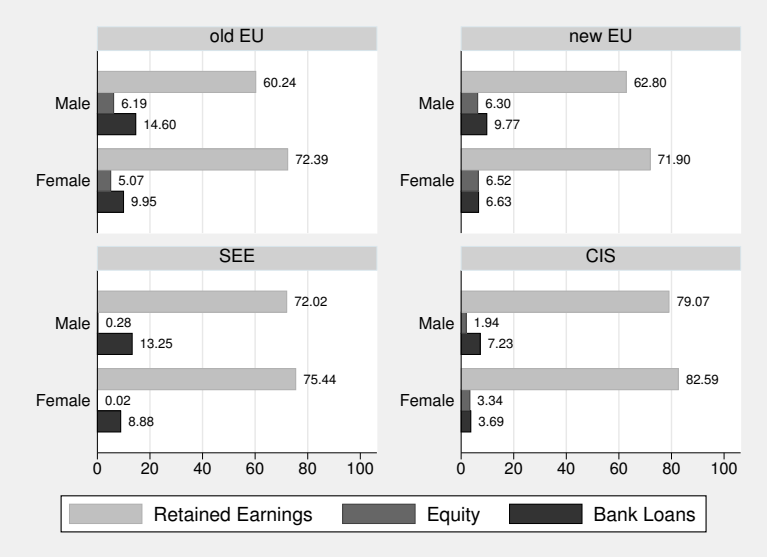

Figure 2: Percentage of new fixed investment financed from different sources.

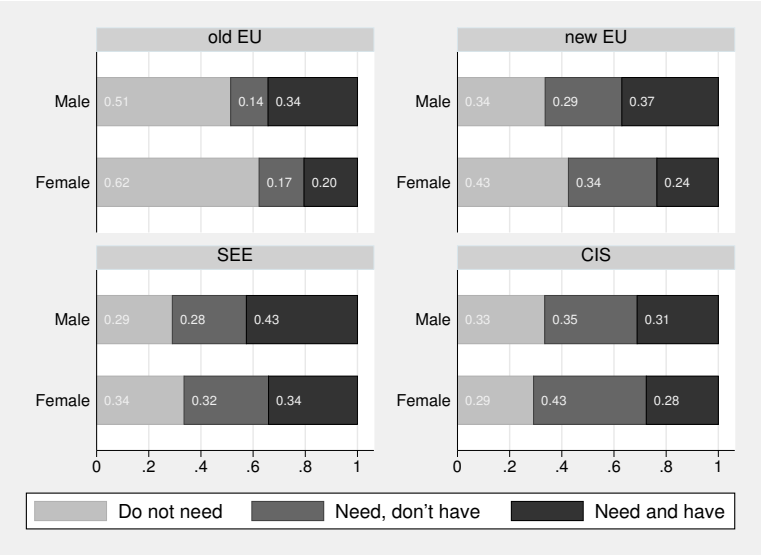

Figure 3: Demand for and approval of loans.

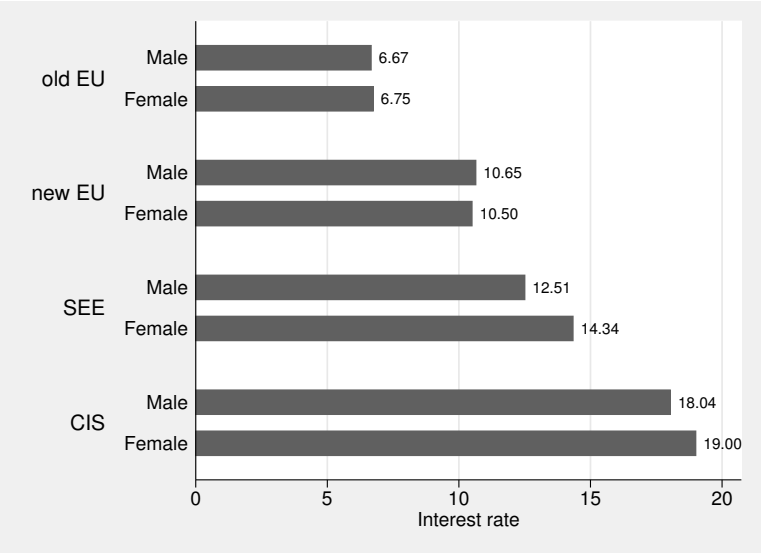

Figure 4: Average interest rates by subsamples.

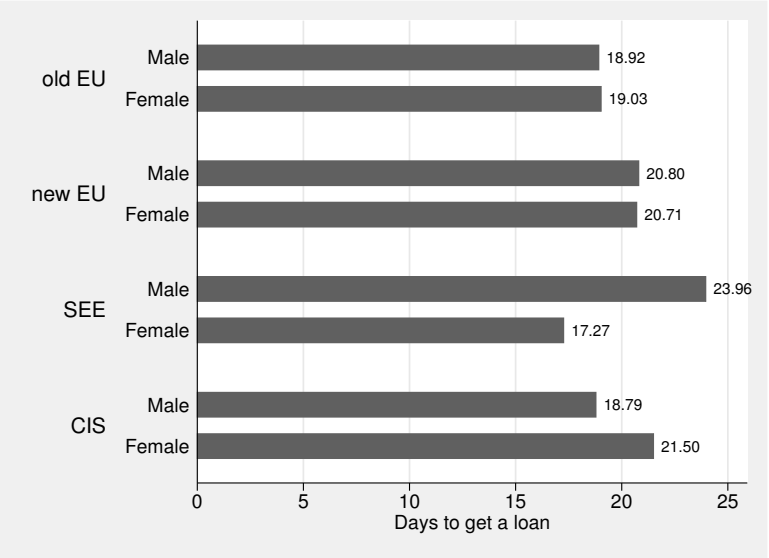

Figure 5: Average days required to obtain bank's decision on loan application.

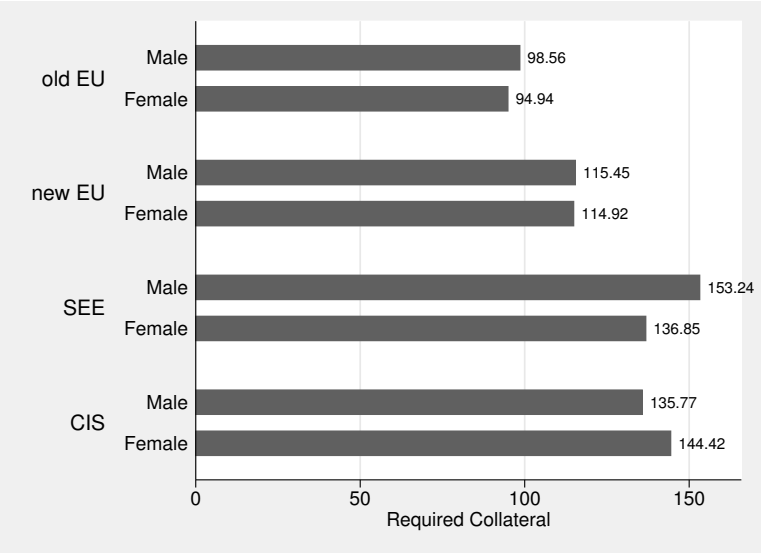

Figure 6: Average collateral size as percentage of the value of loans by subsamples.

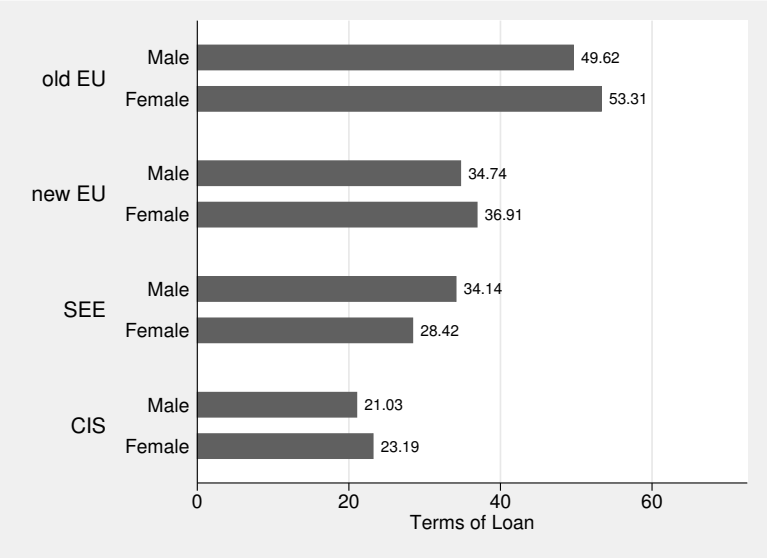

Figure 7: Average terms of loans in months by subsamples.