

Does gender matter for firms' access to credit? Evidence from international data

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Abstract

This paper investigates the existence of gender differentials in firms' access to finance. Based on firm-level data for 28 transitional European countries, we show how estimated gender gaps in credit demand and financial constraints significantly depend on the way in which female participation in firm ownership and management is measured. Furthermore, we find that differences in credit denial probability are not explained by the observed firm characteristics considered, but are due instead to unexplained factors, thus providing support to the hypothesis of gender-based discrimination in access to credit against women-led businesses.

Keywords: credit constraints; loan demand; gender discrimination; decomposition methods

JEL Classification: G21; J16; O16; C34

1. Introduction

A broad and still growing literature has focused on gender-based discrimination in firms' access to finance, which limits growth and profitability of women-led firms and represents an obstacle for their investing opportunities (World Bank, 2011).

Alternative explanations have been proposed to motivate these gender differentials. Observed gaps can be the result of supply-side discrimination by financial intermediaries (Cavalluzzo et al. 2002), who treat loan applications coming from male- and female-led firms, with otherwise similar characteristics and creditworthiness, differently. This unequal treatment may be the result of a taste-based discrimination (Becker, 1957), not explained by economic motivations, but related instead to lenders' preferences and cultural beliefs about gender (Muravyev et al., 2009). On the other hand, the lower diffusion of female-led firms makes information on their quality insufficient and costly to collect for lenders, who may be thus induced to perceive them as riskier than their male counterparts. These adverse selection effects make credit access difficult for creditworthy female borrowers and lead to a self-reinforcing Arrowian statistical discrimination mechanism (Bellucci et al., 2010). Most empirical studies do not distinguish between these two motives and adopt instead a broad definition (Blanchflower et al., 2003), according to which evidence of discrimination is found whenever gender differences remain statistically significant even after controlling for a wide range of observable characteristics, reflecting firm's economic fundamentals, solvency and creditworthiness.

Gender gaps in credit access may also stem from demand-side factors related to differences in characteristics and preferences for credit use between male- and female-led firms, which could affect their actual loan application behaviour (Drakos and Giannakopoulos, 2011). Gender differences in credit demand may thus reflect different external financing needs, but also diverse lending conditions and perceptions on approval probability that lead to application discouragement.

Results from empirical studies are not yet definitive and there is not a general agreement upon the existence of significant gender gaps in credit access. Brown et al. (2011) suggest that such mixed evidence may depend on country-specific market and institutional factors, which may affect firms' credit demand and rationing. Hansen and Rand (2014a, b) have also shown that dissimilarities in estimated gender gaps crucially depend on the way researchers measure credit constraints. As discussed in Presbitero et al. (2014), a further critical aspect relates to the definition

of firm's gender structure. Due to the limited availability of information on the gender composition of the firm, empirical studies have in fact adopted a wide range of indicators, capturing different degrees of female involvement in firm's ownership and management (Aterido et al., 2013), making it difficult to compare findings and draw unequivocal conclusions on the existence of gender-based discrimination in credit access.

This paper contributes to the empirical analysis of gender discrimination in financial access for firms in European transitional countries. Using direct financial constraints indicators and controlling for endogenous sample selectivity, we investigate gender differences in credit rationing probability and evaluate to what extent the heterogeneity in empirical findings obtained for these countries is due to the way in which firm's gender is defined. Differently from previous studies, exploiting the detailed information on firm's gender structure provided in the latest release of the EBRD-World Bank *Business Environment and Enterprise Performance Survey* (BEEPS), we consider alternative gender definitions and propose a restrictive measure of female presence, identifying firms in which women play a key role in both ownership and management. Furthermore, we explicitly assess the role of banking system characteristics and financial and institutional factors on loan application behaviour and credit rationing. We also provide a methodological contribution to the existing literature by proposing a generalised decomposition technique for probit models with endogenous selectivity. This framework allows assessing the role of observable and unobservable factors in determining gender differentials in credit demand and rationing and to obtain indication on the existence of gender-based discrimination.

2. Data

We use the 2012 BEEPS survey and focus on 12970 manufacturing and service firms in 17 Central and Eastern European countries (CEECs) and 11 countries belonging to the Commonwealth of Independent States (CIS).¹

¹ The CEECs group includes Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Kosovo, Latvia, Lithuania, Macedonia, Montenegro, Poland, Romania, Serbia, Slovak Republic and Slovenia; the CIS group includes: Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyz Republic, Moldova, Russian Federation, Tajikistan, Ukraine and Uzbekistan. Since Russian firms represent more than the 30% of the entire sample, we have decided to analyse Russia separately from the other CIS countries.

We define a binary indicator of credit demand (A) equal to one for those firms which applied for a loan during the last fiscal year and zero otherwise.² Conditional on credit demand, we identify rationed firms using a dummy (R) that equals one for firms whose application was rejected. This direct measure of credit rationing allows avoiding interpretation problems of indirect indicators inferred from balance-sheet data and potential misperceptions issues related to self-assessed indicators of credit as an obstacle for firm growth (Hansen and Rand, 2014a).

We consider alternative definitions of gender, starting from two indicators commonly used in empirical studies. We firstly define a variable identifying female owned firms (FOF) as those in which there is at least one woman among the owners; this indicator is not particularly informative, as it does not accurately capture the intensity of female participation in ownership (Asiedu et al., 2013). Our second measure identifies female-managed firms (FMF) and equals one when the top manager is a woman. Combining these two indicators, we identify firms in which the highest management person is a woman and there is also some female presence among the owners (FMF&FOF). The 2012 BEEPS has introduced an additional question (not available for Russia) on the share of the firm owned by women, which allows defining a more restrictive measure of female ownership (FOF1) equal to one if women own at least 50% of the firm. Combining this variable with the FMF dummy, we propose a more precise indicator of firm's gender structure (FMF&FOF1) that identifies firms in which women play a key role in both managerial decisions and ownership.

Table 1 shows that female-led firms have a lower demand for credit, irrespective of the gender indicator considered (with the exception of FOF). Gender differences in financing constraints, conditional on loan demand, significantly vary according to both the definition of gender and the countries considered. In CIS and Russia, women-managed firms have a higher probability of being constrained, whereas no gender gaps emerge in CEECs. In CEECs and CIS considered together, the share of rationed firms equals 13% for those in which women are the majority of owners and is much higher than the corresponding share (8.5%) for the other firms. Similarly, firms in which women play a key role in both ownership and management have a significantly higher rejection probability (14.9%).

² According to this definition of credit demand, both firms that do not need a loan and those discouraged from applying (due to unfavourable terms and conditions of credit or anticipated denial) are included in the group of "non-demanding" firms (i.e. those with $A=0$). Here, we do not analyse the determinants of credit discouragement, since we are mainly interested in the evaluation of actual credit rationing by lenders, controlling for self-selection of borrowers. At the same time, differently from Muravyev et al. (2009), we do not pool discouraged and rejected firms together (building a single binary variable equal to one for both rationed and discouraged firms). As pointed out by Presbitero et al. (2014), this would in fact lead to overestimate actual denial rates and may distort the estimation of gender effects if male- and female-led firms have different degrees of risk aversion and attitudes towards credit demand.

Table 1 – Differences in loan demand and rejection rates by gender

| | | CEECs and CIS (N = 9003) | | CEECs (N = 4955) | | CIS (N = 4048) | | Russia (N = 3960) | |
|----------|-------|-----------------------------|-----------------------|---------------------|-----------------------|--------------------|----------------------|----------------------|-----------------------|
| | | Apply (N = 2144) | Rejected (N = 194) | Apply (N = 1310) | Rejected (N = 115) | Apply (N = 834) | Rejected (N = 79) | Apply (N = 912) | Rejected (N = 287) |
| FOF | 0 | 0.2314 | 0.0889 | 0.2581 | 0.0876 | 0.1996 | 0.0909 | 0.2447 | 0.2591 |
| | 1 | 0.2511 | 0.0933 | 0.2762 | 0.0881 | 0.2190 | 0.1017 | 0.1934 | 0.3220 |
| | Diff. | 0.0197* | 0.0043 | 0.0181 | 0.0004 | 0.0194 | 0.0108 | -0.0513 | 0.0629 |
| FMF | 0 | 0.2459 | 0.0875 | 0.2782 | 0.0875 | 0.2069 | 0.0874 | 0.2443 | 0.2526 |
| | 1 | 0.2069 | 0.1048 | 0.2105 | 0.0892 | 0.2023 | 0.1258 | 0.1711 | 0.4013 |
| | Diff. | -0.0390*** | 0.0174 | -0.0677*** | 0.0017 | -0.0046 | 0.0384* | -0.0732* | 0.1487* |
| FMF&FOF | 0 | 0.2459 | 0.0859 | 0.2757 | 0.0852 | 0.2097 | 0.0871 | 0.2451 | 0.2712 |
| | 1 | 0.1985 | 0.1195 | 0.2075 | 0.1053 | 0.1871 | 0.1393 | 0.1461 | 0.3019 |
| | Diff. | -0.0474*** | 0.0336* | -0.0682*** | 0.0201 | -0.0225 | 0.0523** | -0.0990*** | 0.0307 |
| FOF1 | 0 | 0.2450 | 0.0852 | 0.2726 | 0.0844 | 0.2109 | 0.0864 | | |
| | 1 | 0.1972 | 0.1299 | 0.2141 | 0.1141 | 0.1774 | 0.1524 | | |
| | Diff. | -0.0478*** | 0.0447** | -0.0585*** | 0.0297* | -0.0336** | 0.0660** | | |
| FMF&FOF1 | 0 | 0.2457 | 0.0851 | 0.2738 | 0.0835 | 0.2109 | 0.0875 | | |
| | 1 | 0.1789 | 0.1492 | 0.1870 | 0.1386 | 0.1695 | 0.1625 | | |
| | Diff. | -0.0668*** | 0.0641*** | -0.0868*** | 0.0551* | -0.0414** | 0.0750** | | |

Notes: rejection rates are computed on the subsample of firms having applied for a loan during the last fiscal year.

***, ** and * denote significance of the test for the difference between two proportions at the 1, 5 and 10% levels, respectively

To properly evaluate gender discrimination and mitigate as much as possible omitted variable bias, we control for a large set of characteristics related to firm’s riskiness and credit worthiness.³ We relate credit demand and constraints to firm size and age, as measures of informational opacity, and to its ownership and legal status. We capture financial transparency using dummies for having financial statements certified by external auditors and for having received public subsidies. Additional indicators of riskiness relate to firm’s export activity and concentration of production. We include a dummy for firm’s use of bank loans as the main source of funding for its working capital needs; this variable provides a measure of firm’s financial strength and might be also considered as a proxy of informational transparency, as it identifies firms that frequently recur to external financing. We further account for top manager’s experience and include the number of competitors and a dummy for firms located in large cities. Finally, we include industry and country fixed effects. Table S1 in the Supplementary Appendix provides complete variable definitions.

3. Econometric methods

According to our definition, rationed firms are observed only if they have applied for a loan. This may cause an endogenous selection bias since firms that are more likely to have an application

³ Unfortunately, as in all previous empirical studies based on BEEPS data, the unavailability of information on credit rating and past repayment behaviour of the firm does not allow us to directly capturing actual firm’s credit worthiness.

rejected may also be more likely to refrain from applying. We thus consider a probit model with sample selection to deal with this non-random selectivity issue and jointly model credit demand and rationing probabilities. Formally:

$$\begin{aligned} A_i &= 1(\mathbf{z}'_i \boldsymbol{\alpha} + u_i > 0) \\ R_i &= 1(\mathbf{x}'_i \boldsymbol{\beta} + \varepsilon_i > 0) \end{aligned} \quad (1)$$

where R_i is observed only when $A_i = 1$ and u_i and ε_i have standard bivariate normal distribution with correlation ρ . Selectivity operates through error correlation: when $\rho \neq 0$, a univariate probit for R_i leads to inconsistent estimates. Model (1) can be consistently estimated by maximising the corresponding log-likelihood function:

$$\log L(\boldsymbol{\alpha}, \boldsymbol{\beta}, \rho) = \sum_{R_i=1, A_i=1} \Phi_2(\mathbf{x}'_i \boldsymbol{\beta}, \mathbf{z}'_i \boldsymbol{\alpha}, \rho) + \sum_{R_i=0, A_i=1} \Phi_2(-\mathbf{x}'_i \boldsymbol{\beta}, \mathbf{z}'_i \boldsymbol{\alpha}, -\rho) + \sum_{A_i=0} \Phi(\mathbf{z}'_i \boldsymbol{\alpha}) \quad (2)$$

where $\Phi(\cdot)$ and $\Phi_2(\cdot)$ denote univariate and bivariate standard normal CDFs, respectively. To improve model identification we include indicators of business and tax obstacles only in the application equation, assuming that firm's perceptions on business environment affect its loan demand behaviour, but they do not influence banks' granting decision.

To disentangle the role of observable and unobservable factors on credit demand and rationing, we extend the Blinder–Oaxaca decomposition proposed by Bauer and Sinning (2008) to probit models with endogenous selection. Estimating model (1) separately for female (f) and male (m) firms, the estimated gender gap in loan application probability ($P(A_i = 1 | \mathbf{z}_i) = \Phi(\mathbf{z}'_i \boldsymbol{\alpha})$) can be decomposed as:

$$\hat{\Delta}^A = \left[\frac{1}{N_f} \sum_{i=1}^{N_f} \Phi(\mathbf{z}'_{if} \hat{\boldsymbol{\alpha}}_f) - \frac{1}{N_m} \sum_{i=1}^{N_m} \Phi(\mathbf{z}'_{im} \hat{\boldsymbol{\alpha}}_f) \right] + \left[\frac{1}{N_m} \sum_{i=1}^{N_m} \Phi(\mathbf{z}'_{im} \hat{\boldsymbol{\alpha}}_f) - \frac{1}{N_m} \sum_{i=1}^{N_m} \Phi(\mathbf{z}'_{im} \hat{\boldsymbol{\alpha}}_m) \right] \quad (3)$$

Similarly, we decompose the estimated gender gap in rejection probability conditional on loan demand ($P(R_i = 1 | A_i = 1, \mathbf{x}_i, \mathbf{z}_i) = \Phi_2(\mathbf{x}'_i \boldsymbol{\beta}, \mathbf{z}'_i \boldsymbol{\alpha}, \rho) / \Phi(\mathbf{z}'_i \boldsymbol{\alpha})$) as:

$$\begin{aligned} \hat{\Delta}^{R|A} &= \left[\frac{1}{N_f} \sum_{i=1}^{N_f} \frac{\Phi_2(\mathbf{x}'_{if} \hat{\boldsymbol{\beta}}_f, \mathbf{z}'_{if} \hat{\boldsymbol{\alpha}}_f, \hat{\rho}_f)}{\Phi(\mathbf{z}'_{if} \hat{\boldsymbol{\alpha}}_f)} - \frac{1}{N_m} \sum_{i=1}^{N_m} \frac{\Phi_2(\mathbf{x}'_{im} \hat{\boldsymbol{\beta}}_f, \mathbf{z}'_{im} \hat{\boldsymbol{\alpha}}_f, \hat{\rho}_f)}{\Phi(\mathbf{z}'_{im} \hat{\boldsymbol{\alpha}}_f)} \right] \\ &+ \left[\frac{1}{N_m} \sum_{i=1}^{N_m} \frac{\Phi_2(\mathbf{x}'_{im} \hat{\boldsymbol{\beta}}_f, \mathbf{z}'_{im} \hat{\boldsymbol{\alpha}}_f, \hat{\rho}_f)}{\Phi(\mathbf{z}'_{im} \hat{\boldsymbol{\alpha}}_f)} - \frac{1}{N_m} \sum_{i=1}^{N_m} \frac{\Phi_2(\mathbf{x}'_{im} \hat{\boldsymbol{\beta}}_m, \mathbf{z}'_{im} \hat{\boldsymbol{\alpha}}_m, \hat{\rho}_m)}{\Phi(\mathbf{z}'_{im} \hat{\boldsymbol{\alpha}}_m)} \right] \end{aligned} \quad (4)$$

The first terms in both decompositions measure the fraction of average gaps in loan demand and rejection probabilities due to differences in observable characteristics (*characteristics effect* or *explained*

part). The second terms represent instead the part due to differences in estimated coefficients and related to unobservable factors (*coefficients effect* or *unexplained part*). In equation (4), this component provides an estimate of the gap in financing constraints not explained by differences in observable characteristics, which can be interpreted as a measure of gender discrimination.

4. Results

Estimation results for different country groups and gender definitions are presented in Tables 2 and 3. We firstly notice that all cross-equation error correlations are negative and statistically significant, confirming the necessity of accounting for endogenous selectivity to properly analyse credit rationing. We find that small and young businesses, as well those lacking external certification, with a less diversified production, operating in less competitive markets and having not received public incentives, are more likely to be denied credit. These firms also have a lower application probability, due to their lower external financing needs, but also because they may be discouraged from applying for additional credit fearing rejection. As expected, firms relying on external financing for their working capital needs have a higher loan demand, conditional on application, are less likely to be denied credit. Business and tax obstacles variables significantly affect loan demand behaviour, providing support to the validity of our identification strategy. Female participation in ownership and management is negatively related to credit demand, while it is associated with a higher rejection probability. As in Presbitero et al (2014), significant gender differences in financing constraints emerge when more precise definitions of female involvement are used, with FOF1 and FMF&FOF1 being significant at the 5% level in both CEECs and CIS.

Estimated gender differences in loan application probability (Table 4) highlight that women-led firms have a significantly lower demand for credit, particularly in CEECs and Russia and to a much lesser extent in CIS, confirming the relevance of demand-side factors in affecting firms' credit access. These differences in credit use by women-led firms could be due to lower external financing needs, but they could also be the result of a higher risk aversion and/or of a stronger anticipation of rejection, which discourage demand. Decomposition analysis shows that characteristics effects are significant and explain a relatively large fraction of the estimated gap: differences in observable features between male- and female-led firms significantly contribute to determine their different loan demand behaviour.

Table 2 – Determinants of loan demand and credit constraints

| | CEECs and CIS | | | | Russia | | | |
|---------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| | (1) | | (2) | | (3) | | (4) | |
| | Apply | Rejected | Apply | Rejected | Apply | Rejected | Apply | Rejected |
| Age | 0.031 (0.027) | -0.228*** (0.063) | 0.032 (0.027) | -0.223*** (0.061) | -0.003 (0.027) | -0.053 (0.040) | -0.007 (0.027) | -0.049 (0.040) |
| Large Firm | 0.270*** (0.044) | -0.548*** (0.124) | 0.266*** (0.044) | -0.545*** (0.123) | 0.324*** (0.104) | -0.428*** (0.135) | 0.310*** (0.104) | -0.416*** (0.132) |
| Non-listed shareholding | 0.166* (0.095) | -0.359** (0.141) | 0.163* (0.095) | -0.357** (0.1398) | 0.106 (0.310) | -0.777* (0.464) | 0.122 (0.314) | -0.788* (0.467) |
| Listed shareholding | 0.436*** (0.151) | -0.416** (0.196) | 0.431*** (0.151) | -0.401** (0.196) | 0.081 (0.309) | -0.748* (0.424) | 0.090 (0.312) | -0.755* (0.424) |
| Sole Proprietorship | 0.069 (0.112) | -0.297* (0.167) | 0.069 (0.112) | -0.311* (0.167) | 0.158 (0.309) | -5.487*** (1.280) | 0.194 (0.316) | -5.527*** (1.296) |
| Foreign owned | -0.212*** (0.072) | 0.306** (0.143) | -0.217*** (0.072) | 0.299** (0.143) | -0.160 (0.099) | 0.575* (0.308) | -0.148 (0.100) | 0.563* (0.310) |
| State owned | -0.153 (0.172) | 0.587** (0.247) | -0.149 (0.173) | 0.565** (0.249) | -0.541 (0.362) | -3.425*** (0.912) | -0.527 (0.361) | -3.461*** (0.910) |
| Privatized Firm | -0.074 (0.051) | -0.148 (0.138) | -0.074 (0.051) | -0.135 (0.134) | 0.114 (0.102) | -0.089 (0.128) | 0.131 (0.104) | -0.099 (0.126) |
| Top Manager Experience | 0.048** (0.020) | 0.027 (0.042) | 0.047** (0.020) | 0.029 (0.041) | 0.018 (0.053) | 0.053 (0.058) | 0.016 (0.052) | 0.054 (0.058) |
| Product Concentration | -0.002*** (0.001) | 0.002** (0.001) | -0.002*** (0.001) | 0.002** (0.001) | -0.004*** (0.001) | 0.002** (0.001) | -0.004*** (0.001) | 0.002** (0.001) |
| Number of Competitors | 0.060*** (0.021) | -0.080** (0.037) | 0.060*** (0.021) | -0.077** (0.037) | 0.102*** (0.038) | -0.042 (0.045) | 0.101*** (0.038) | -0.043 (0.044) |
| Subsidized Firm | 0.410*** (0.052) | -0.541*** (0.088) | 0.410*** (0.052) | -0.535*** (0.088) | 0.392*** (0.086) | -0.531*** (0.155) | 0.401*** (0.088) | -0.538*** (0.155) |
| Audited Firm | 0.289*** (0.038) | -0.341*** (0.064) | 0.287*** (0.038) | -0.337*** (0.066) | 0.332*** (0.034) | -0.497*** (0.067) | 0.330*** (0.034) | -0.494*** (0.066) |
| Exporter | 0.135** (0.055) | -0.035 (0.091) | 0.131** (0.054) | -0.023 (0.091) | 0.025 (0.120) | 0.023 (0.173) | 0.020 (0.118) | 0.028 (0.172) |
| Large City | -0.049 (0.041) | 0.018 (0.074) | -0.046 (0.041) | 0.009 (0.075) | 0.044 (0.040) | 0.079 (0.054) | 0.042 (0.039) | 0.079 (0.053) |
| Working capital financing | 1.008*** (0.053) | -0.990*** (0.093) | 1.008*** (0.053) | -0.996*** (0.092) | 1.254*** (0.078) | -1.227*** (0.098) | 1.248*** (0.076) | -1.223*** (0.097) |
| Business Obstacles | 0.059** (0.023) | | 0.058** (0.023) | | 0.131*** (0.022) | | 0.127*** (0.023) | |
| Tax Obstacles | 0.063*** (0.016) | | 0.064*** (0.016) | | 0.083*** (0.017) | | 0.084*** (0.017) | |
| FOF | -0.001 (0.033) | 0.099 (0.065) | | | -0.001 (0.028) | 0.018 (0.073) | | |
| FMF | | | -0.095** (0.044) | 0.161* (0.085) | | | -0.188*** (0.060) | 0.147* (0.083) |
| Intercept | -1.555*** (0.187) | 1.331*** (0.429) | -1.528*** (0.185) | 1.302*** (0.429) | -0.767** (0.346) | 1.036** (0.451) | -0.736** (0.344) | 1.023** (0.450) |
| ρ | -0.850*** (0.094) | | -0.850*** (0.093) | | -0.846*** (0.089) | | -0.850*** (0.086) | |
| Country fixed-effects | Yes | Yes | Yes | Yes | - | - | - | - |
| Sector fixed-effects | Yes |
| N | 9003 | | 9003 | | 3960 | | 3960 | |
| Log Likelihood | -4836.91 | | -4834.79 | | -2505.36 | | -2500.65 | |

Notes: Robust standard errors, clustered on industry sectors within each country, are reported in parentheses below the estimates. ***, ** and * denote significance at the 1, 5 and 10% levels, respectively.

Table 3 – Determinants of loan demand and credit constraints: alternative gender indicators

| | CEECs | | | | CIS | | | |
|---------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| | (1) | | (2) | | (3) | | (4) | |
| | Apply | Rejected | Apply | Rejected | Apply | Rejected | Apply | Rejected |
| Age | 0.074** (0.034) | -0.221*** (0.064) | 0.072** (0.034) | -0.217*** (0.065) | -0.019 (0.045) | -0.237* (0.129) | -0.019 (0.045) | -0.224* (0.128) |
| Large Firm | 0.238*** (0.064) | -0.374*** (0.119) | 0.237*** (0.063) | -0.371** (0.119) | 0.308*** (0.061) | -1.057*** (0.322) | 0.309*** (0.062) | -1.050*** (0.325) |
| Non-listed shareholding | 0.124 (0.137) | -0.276 (0.168) | 0.127 (0.136) | -0.272 (0.166) | 0.225** (0.111) | -0.259 (0.247) | 0.2252** (0.111) | -0.290 (0.263) |
| Listed shareholding | 0.196 (0.237) | -0.291 (0.330) | 0.187 (0.239) | -0.265 (0.331) | 0.649*** (0.168) | -0.261 (0.365) | 0.647*** (0.167) | -0.283 (0.370) |
| Sole Proprietorship | -0.002 (0.161) | -0.469* (0.259) | 0.010 (0.160) | -0.487* (0.261) | 0.153 (0.135) | 0.115 (0.274) | 0.151 (0.135) | 0.090 (0.284) |
| Foreign owned | -0.233*** (0.088) | 0.416*** (0.141) | -0.239*** (0.088) | 0.427*** (0.141) | -0.149 (0.126) | -6.350*** (2.099) | -0.150 (0.126) | -6.184*** (2.158) |
| State owned | 0.276 (0.293) | 0.224 (0.391) | 0.286 (0.292) | 0.212 (0.390) | -0.253 (0.194) | 0.875** (0.398) | -0.252 (0.195) | 0.877** (0.396) |
| Privatized Firm | -0.107 (0.078) | 0.022 (0.158) | -0.104 (0.078) | 0.011 (0.156) | -0.030 (0.070) | -0.313 (0.241) | -0.030 (0.070) | -0.301 (0.240) |
| Top Manager Experience | 0.054* (0.029) | 0.044 (0.054) | 0.054* (0.029) | 0.043 (0.054) | 0.043 (0.023) | 0.020 (0.081) | 0.043 (0.029) | 0.016 (0.079) |
| Product Concentration | -0.002** (0.001) | 0.002 (0.001) | -0.002** (0.001) | 0.001 (0.001) | -0.003** (0.001) | 0.004 (0.003) | -0.003** (0.001) | 0.004* (0.003) |
| Number of Competitors | 0.072** (0.028) | -0.089** (0.043) | 0.071** (0.028) | -0.088** (0.043) | 0.045 (0.031) | -0.067 (0.075) | 0.045 (0.031) | -0.067 (0.074) |
| Subsidized Firm | 0.484*** (0.057) | -0.593*** (0.084) | 0.484*** (0.057) | -0.593*** (0.084) | 0.084 (0.119) | -0.417 (0.299) | 0.084 (0.119) | -0.412 (0.299) |
| Audited Firm | 0.228*** (0.046) | -0.253*** (0.073) | 0.224*** (0.046) | -0.250*** (0.073) | 0.371*** (0.063) | -0.491*** (0.128) | 0.371*** (0.063) | -0.493*** (0.127) |
| Exporter | 0.168*** (0.064) | -0.163* (0.091) | 0.168*** (0.064) | -0.165* (0.091) | 0.079 (0.100) | 0.340 (0.243) | 0.079 (0.100) | 0.337 (0.245) |
| Large City | -0.015 (0.056) | -0.047 (0.095) | -0.013 (0.056) | -0.051 (0.095) | -0.085 (0.061) | 0.089 (0.138) | -0.084 (0.061) | 0.097 (0.140) |
| Working capital financing | 0.893*** (0.063) | -0.891*** (0.084) | 0.895*** (0.063) | -0.899*** (0.084) | 1.243*** (0.092) | -1.262*** (0.269) | 1.244*** (0.092) | -1.271*** (0.268) |
| Business Obstacles | 0.031* (0.018) | | 0.030* (0.018) | | 0.099** (0.043) | | 0.100** (0.042) | |
| Tax Obstacles | 0.072*** (0.019) | | 0.072*** (0.019) | | 0.048* (0.029) | | 0.048* (0.029) | |
| FOF1 | -0.148*** (0.056) | 0.217** (0.091) | | | -0.056 (0.076) | 0.342** (0.156) | | |
| FMF&FOF1 | | | -0.223*** (0.066) | 0.364*** (0.118) | | | -0.056 (0.080) | 0.359** (0.170) |
| Intercept | -1.630*** (0.231) | 1.586*** (0.371) | -1.620*** (0.230) | 1.583*** (0.372) | -0.923*** (0.235) | -0.293 (0.811) | -0.926*** (0.234) | -0.227 (0.818) |
| ρ | | -0.935*** (0.063) | | -0.936*** (0.063) | | -0.637* (0.325) | | -0.647* (0.332) |
| Country fixed-effects | Yes |
| Sector fixed-effects | Yes |
| N | 4955 | | 4955 | | 4048 | | 4048 | |
| Log Likelihood | -2801.64 | | -2798.41 | | -1983.67 | | -1983.81 | |

Notes: Robust standard errors, clustered on industry sectors within each country, are reported in parentheses below the estimates.

***, ** and * denote significance at the 1, 5 and 10% levels, respectively.

Table 4 – Blinder-Oaxaca decomposition of gender differences in credit access

| | | (1) CEECs and CIS | | (2) CEECs | | (3) CIS | | (4) Russia | |
|----------|------------------|------------------------|-----------------------|------------------------|----------------------|------------------------|-----------------------|------------------------|----------------------|
| | | Apply | Rejected | Apply | Rejected | Apply | Rejected | Apply | Rejected |
| | | FOF | Estimated gap | 0.0196 (0.0141) | 0.0045 (0.0134) | 0.0182 (0.0145) | 0.0006 (0.0163) | 0.0188 (0.0152) | 0.0107 (0.0205) |
| | Explained part | 0.0161 (0.0105) | -0.0081 (0.0036) | 0.0173 (0.0137) | -0.0104 (0.0060) | 0.0139 (0.0082) | -0.0054 (0.0060) | -0.0148 (0.0303) | -0.0043 (0.0204) |
| | Unexplained part | 0.0035 (0.0089) | 0.0126 (0.0130) | 0.0009 (0.0129) | 0.0110 (0.0168) | 0.0048 (0.0127) | 0.0161 (0.0196) | -0.0368 (0.0214) | 0.0680 (0.0951) |
| FMF | Estimated gap | -0.0389*** (0.0136) | 0.0177 (0.0184) | -0.0672*** (0.0170) | 0.0021 (0.0178) | -0.0056 (0.0268) | 0.0380* (0.0220) | -0.0728*** (0.0287) | 0.1519** (0.0682) |
| | Explained part | -0.0151*** (0.0054) | 0.0012 (0.0049) | -0.0160** (0.0066) | -0.0074 (0.0049) | -0.0189** (0.0091) | 0.0089 (0.0072) | -0.0364** (0.0151) | 0.0273 (0.0225) |
| | Unexplained part | -0.0238** (0.0118) | 0.0165 (0.0185) | -0.0512*** (0.0172) | 0.0095 (0.0185) | 0.0133 (0.0241) | 0.0291* (0.0173) | -0.0364** (0.0176) | 0.1246** (0.0623) |
| FMF&FOF | Estimated gap | -0.0472*** (0.0168) | 0.0336* (0.0201) | -0.0678*** (0.0150) | 0.0206 (0.0200) | -0.0226 (0.0223) | 0.0516** (0.0254) | -0.0996*** (0.0172) | 0.0286 (0.0388) |
| | Explained part | -0.0179*** (0.0069) | 0.0025 (0.0048) | -0.0180** (0.0079) | -0.0045 (0.0067) | -0.0206* (0.0110) | 0.0021 (0.0073) | -0.0431** (0.0212) | 0.0397 (0.0106) |
| | Unexplained part | -0.0293** (0.0146) | 0.0313* (0.0190) | -0.0498*** (0.0144) | 0.0251 (0.0185) | -0.0020 (0.0190) | 0.0495** (0.0251) | -0.0565** (0.0242) | -0.0112 (0.0432) |
| FOF1 | Estimated gap | -0.0479*** (0.0164) | 0.0454** (0.0210) | -0.0587*** (0.0173) | 0.0298* (0.0180) | -0.0334** (0.0168) | 0.0653** (0.0315) | | |
| | Explained part | -0.0203*** (0.0062) | 0.0054 (0.0050) | -0.0169** (0.0075) | -0.0003 (0.0040) | -0.0240*** (0.0078) | 0.0171 (0.0095) | | |
| | Unexplained part | -0.0275** (0.0137) | 0.0400** (0.0203) | -0.0418*** (0.0164) | 0.0301* (0.0181) | -0.0094 (0.0160) | 0.0483* (0.0292) | | |
| FMF&FOF1 | Estimated gap | -0.0670*** (0.0162) | 0.0645*** (0.0243) | -0.0869*** (0.0172) | 0.0544** (0.0272) | -0.0408** (0.0205) | 0.0734*** (0.0187) | | |
| | Explained part | -0.0249*** (0.0063) | 0.0062 (0.0058) | -0.0244** (0.0096) | -0.0036 (0.0074) | -0.0276** (0.0121) | 0.0115 (0.0097) | | |
| | Unexplained part | -0.0420*** (0.0136) | 0.0582** (0.0244) | -0.0625*** (0.0139) | 0.0579** (0.0280) | -0.0132 (0.0187) | 0.0619** (0.0245) | | |

Notes: Estimated average gender gaps and decompositions are based on estimates of model (1) reported in Tables 2 and 3 and on unreported estimates available from the authors. Bootstrapped (500 replications) standard errors are reported in parentheses below the estimates. ***, ** and * denote significance at the 1, 5 and 10% levels, respectively.

Estimated gender gaps in credit rejection probability are statistically significant in CIS countries and Russia when female management indicators are considered. Russian female-managed firms have a 15.2% higher probability of being denied credit than their male counterparts; this gap is not explained by differences in observed characteristics and is entirely due to unobservable factors. The magnitude and statistical significance of the estimated gaps increase as more precise indicators of female involvement in firm's ownership and management are used. For CEECs and CIS considered together the average gap against female-owned businesses identified by the FOF1 indicator is equal to 4.54%, and only 0.54% is explained by differences in observed characteristics. However, this aggregate result disguises the heterogeneity in estimated gender gaps between country groups: in CIS countries firms in which the majority of owners are women have a significantly higher rationing probability (6.53%), whereas the estimated gender gap is much lower (2.98%) and only marginally significant in CEECs. In this latter group, gender differences in credit access may be affected to a larger extent by the lower demand for credit of female-owned businesses than by supply-side discrimination. Estimated gender

gap is even higher for firms in which women have a key role both in ownership and management: it equals 6.45% for the entire sample and reaches 7.34% for CIS countries, while the unexplained part amounts to 5.82 and 6.19%, respectively. Coherently with previous empirical findings (Hansen and Rand, 2014b; Presbitero et al., 2014), characteristics effects are small and statistically insignificant suggesting that, based purely on the observed firm characteristics considered, there should be no gender differences in loan rejection probabilities. This evidence must be interpreted cautiously as, due to the cross-sectional nature of the data and to the lack of direct information on firm's credit history, our empirical specification may not be able to perfectly control for firm's riskiness and creditworthiness. Taking into account these limitations, our results point out the existence of unexplained factors that significantly affect gender differences in credit access and support the hypothesis of a certain degree of discrimination against women-led businesses by financial institutions.

To assess the role of country-level financial and institutional factors, we relate loan demand and rationing to indicators of banking sector structure, credit information sharing, creditors' rights, and macroeconomic and financial development. Results (Table 5) support the robustness of our empirical findings on gender gaps, as measured by the most stringent indicator of female involvement, and the related Blinder-Oaxaca decompositions. Moreover, we find evidence on the significant impact of market and institutional factors on firms' credit access. In this respect, it is worth remarking that loan rejection probability significantly increases as the concentration and fragility of the banking system rise and as the quality of credit deteriorates; conversely, credit rationing to firms is less likely in countries with stronger legal protection of creditor rights and better information sharing institutions.⁴

⁴ Complete results are reported in Table S3 of the Supplementary Appendix. We have also considered an extended specification, which includes a full set of interaction terms between the FMF&FOF1 indicator and country-level variables. From this extended specification, we obtain the profiles of estimated gender differences in conditional credit rejection probability with respect to country-level variables, presented in Figure S1 in the Supplementary Appendix. These profiles show that gender gaps in credit rationing do not significantly vary with most of the country specific credit market and institutional variables. However, estimated differences in credit access against women-led businesses significantly increase as the quality of credit in the country (proxied by the share of non-performing loans) worsens, while they decrease as the degree of protection of borrowers and lenders rights rises. These findings provide valuable insights on the relationship between gender discrimination and institutional factors that deserve further attention in future research.

Table 5 – The role of institutional and credit market factors on loan demand and credit constraints

| | (1) CEECs and CIS | | (2) CEECs | | (3) CIS | |
|--|------------------------|-----------------------|------------------------|----------------------|-----------------------|-----------------------|
| | Apply | Rejected | Apply | Rejected | Apply | Rejected |
| Panel A. Parameter estimates | | | | | | |
| FMF&FOF1 | -0.146*** (0.054) | 0.355*** (0.102) | -0.210*** (0.072) | 0.324*** (0.103) | -0.076 (0.082) | 0.434* (0.222) |
| <i>Institutional and credit market factors:</i> | | | | | | |
| Private credit to GDP | -0.003** (0.001) | 0.011*** (0.003) | 0.001 (0.003) | 0.015** (0.006) | -0.140*** (0.035) | 0.244*** (0.087) |
| Bank concentration | -0.002 (0.001) | 0.006*** (0.002) | -0.006*** (0.002) | 0.011*** (0.003) | -0.067*** (0.018) | 0.114** (0.045) |
| Non-performing loans | -0.012*** (0.004) | 0.026*** (0.008) | 0.007 (0.007) | 0.022 (0.015) | -0.151*** (0.032) | 0.278*** (0.081) |
| Bank Z-score | -0.010*** (0.002) | 0.008** (0.004) | -0.010*** (0.002) | 0.013*** (0.003) | -0.337*** (0.086) | 0.549*** (0.213) |
| Legal rights strength | 0.017** (0.008) | -0.026* (0.015) | 0.007 (0.014) | -0.019 (0.019) | 0.192*** (0.046) | -0.286** (0.119) |
| Credit information depth | 0.093*** (0.020) | -0.071* (0.040) | 0.121*** (0.030) | -0.050 (0.053) | 1.334*** (0.304) | -2.265*** (0.762) |
| GDP per capita | 0.065*** (0.009) | -0.054*** (0.018) | 0.059*** (0.012) | -0.085*** (0.017) | -1.057*** (0.304) | 2.065*** (0.684) |
| Panel B. Generalised Blinder-Oaxaca decomposition | | | | | | |
| Estimated Gap | -0.0692*** (0.0155) | 0.0661*** (0.0241) | -0.0852*** (0.0187) | 0.0547** (0.0233) | -0.0470** (0.0234) | 0.0812*** (0.0262) |
| Explained part | -0.0288*** (0.0091) | 0.0122 (0.0095) | -0.0225** (0.0108) | -0.0027 (0.0048) | -0.0334** (0.0148) | 0.0111 (0.0086) |
| Unexplained part | -0.0404*** (0.0127) | 0.0539** (0.0245) | -0.0627*** (0.0145) | 0.0549** (0.0265) | -0.0136 (0.0209) | 0.0701** (0.0307) |

Notes: Panel A reports the estimated coefficients for the FMF&FOF1 indicator and the country-level variables only; all the other variables from models (2) and (4) of Table 3 are included in the regressions, but coefficients are not reported for brevity. All regressions include sector and country-group fixed-effects are Complete results are presented in Table S3 of the Supplementary Appendix. Country-level data on institutional characteristics refer to 2013 and are missing for Kosovo and Uzbekistan. Definitions, data sources and descriptive statistics of credit market and institutional variables are reported in Tables S1 and S2 of the Supplementary Appendix. Robust standard errors, clustered on industry sectors within each country, are reported in parentheses below the estimates. Panel B shows the corresponding estimated average gender gaps and decompositions results; bootstrapped (500 replications) standard errors are reported in parentheses below the estimates.

***, ** and * denote significance at the 1, 5 and 10% levels, respectively.

5. Conclusions

This paper provides empirical evidence on gender differences in credit access for firms in European transition economies. Overall, our findings point out that female-led firms have a lower credit demand, but are more likely to be financially constrained than their male counterparts. Gender gaps significantly vary according to the definition of female participation: when more precise measures are considered, women-led firms have a significantly higher probability to face credit rejection.

Decomposition results show that differences in credit rationing probability against female firms are mainly due to unexplained factors. Gender gaps in financing constraints are not explained by differences in the observed characteristics included in our empirical model, but can be interpreted as related to gender-based discrimination in credit markets.

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