Gender Bias in Access to Finance, Occupational Choice, and Business Performance

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Abstract
We analyze, in a model of occupational choice in the labour market and discrimination in the capital market, the relationship between the gender of the owner and of the top manager of a firm, access to finance, and this firm's performance. Occupational choice serves as the link from the capital market to the labour market. The model predicts that if the lenders discriminate against female entrepreneurs, then the conditional average of entrepreneurial skill of female business owners and female top managers is higher than that of their male counterparts. We find empirical evidence in support of our model using firm-level data from the 2009 wave of the Business Environment and Enterprise Performance Survey (BEEPS) for twenty six emerging economies in Eastern Europe and Central Asia. Specifically, we find evidence of discrimination of women in the capital market. Furthermore, we find a positive effect of the female gender of a business owner and of a business top manager on business performance, after controlling for various factors, including possible constraints on access to external finance. The positive effect of a female top manager is mitigated if the firm is owned by a female, suggesting decreasing return to skill, or if it operates in certain industries where female leadership may be of special value, which could be an additional factor in the occupational choice.

Keywords: discrimination, finance, gender, occupational choice, small and medium enterprises
JEL classification numbers: J16, J24, G20, L25

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Introduction

The analysis of the effect of the gender of business owner or its senior manager on business performance has been a growing field in the economic literature. A number of explanations of the difference in performance, such as gender discrimination in the labour and capital markets (e.g., Sabarwal and Terrell, 2008; Muravyev et al., 2009), differing degree of risk aversion of females and males (Jianakoplos and Bernasek, 2007), or their preferences for competitive behaviour (Gneezy et al. 2003, Croson and Gneezy, 2009), have been proposed in the literature; however, the empirical studies have yielded rather mixed results.

In this paper, we contribute to the literature by approaching the issue from a different angle: we look at the implications of discrimination of female borrowers in the capital market for the occupational choice and the resulting skill distribution in the skilled labour market.

We construct a theoretical model, along the lines of Coate and Tennyson (1992), according to which discrimination of female entrepreneurs in the capital market results in the higher, on average, entrepreneurial skill of female business owners and female top managers than that of the male owners and managers. Therefore, the model predicts that, ceteris paribus, businesses owned and/or managed by women should perform better than businesses owned and/or managed by men.

In the empirical part of the paper, using a firm-level dataset, we test the following hypotheses. First, we test whether female business owners are subjected to discrimination as borrowers in the capital market; in particular, we test whether women are more likely than men to face prohibitively high interest rates and the size of the collateral, and whether such restricted access to finance is viewed more by women than by men as an obstacle to business. Second, we test whether there is a positive effect of the female gender of a company's owner and/or top manager on that company's performance, as measured by sales, profit and profits per unit of sales.

Previous Empirical and Theoretical Literature

The evidence of the effect of an owner's gender on business performance reported in the empirical literature is rather mixed. Sabarwal and Terrell (2008) provide a comprehensive summary of such work, where firms' performance is measured in terms of sales and profits. In particular, a number of studies found that female ownership has a significantly negative impact on sales (see, inter alia, Chagnati and Parsuraman, 1996, Loscocco and Robinson, 1991,
Coleman, 2007, and Sabarwal and Terrell, 2008) and on profits (Robb and Wolken, 2002, and Bosma et al., 2004). At the same time, other studies, such as Watson (2002), Bardasi and Getahun (2008), and Kepler and Shane (2007), find no effect of the owner's gender on the firm's performance. Furthermore, Coleman (2007) finds that women-owned firms have significantly higher annual sales growth than firms owned by men. In a number of studies this issue has been analysed from a different perspective, namely, by looking at the differential access to finance by gender of owner/borrower in the capital market. Brush (1992), Carter and Cannon (1992), and Carter (2000) find that raising funds is more difficult for female entrepreneurs. Muravyev et al. (2009) report similar findings based on the Business Environment and Enterprise Performance Survey (BEEPS) for 2002-2005. However, as Sabarwal and Terrell (2008) point out, “it is not clear whether it is due to discrimination on the part of the banking sector or the result of other factors,” such as, potentially, institutional factors and social norms (Aidis et al., 2007). Our study contributes to this literature by studying the effect of gender bias in lending to entrepreneurs on the occupational choice, and, in particular, by investigating the possibility of spillovers of the gender discrimination in the capital market into the (conditional) distribution of skill in the labour market.

Discrimination, and in particular discrimination in the labour market has been studied extensively in economic theory, beginning with the seminal work by Becker (1971) and Arrow (1973). The distinction is drawn between the preference discrimination, whereby employers, for example, have preferences favouring one group of agents over another, and the statistical discrimination, whereby the "testing error" committed by employers is higher for one group compared to the other (Phelps, 1972). Furthermore, the two types of discrimination can be endogenously linked: as Coate and Loury (1993) show, when the quality, or skill, of a potential employee is determined by this individual's rational choice of a costly action, such as investment in human capital, the difference in quality between the groups, as perceived by the discriminating employer when information is asymmetric, may become self-fulfilling. The link between the preference discrimination and the statistical discrimination can also emerge across different markets. As demonstrated by Coate and Tennyson (1992), preference discrimination in the labour market can spill-over to the capital market where it induces statistical discrimination. This, in turn, affects the occupational choice of individuals belonging to the discriminated group and results in an inefficient allocation of physical and human resources. Blanchflower et al.
analyzed and found discrimination of black business owners in the small business loan market in the United States. However, the reverse channel, that is, distortion of the occupational choice generated by preference discrimination in the capital market has not received attention in the literature, to our best knowledge.

One could argue that currently gender discrimination can hardly take place in the labour market because of the existing legislation and scrutiny of hiring and other personnel procedures, whereas similar monitoring of private lenders in the capital market is virtually non-existent. There are a number of studies on the extent to which female-owned business face discrimination in the credit markets. Coleman (2000) argues that businesses managed by women are less attractive to the banks because they are small and considered to be riskier ventures: the banks prefer to finance larger projects that are already established, a point that works in favour of men. Because of this adverse selection, the average quality of the businesses run by women is lower, leading to a self-reinforcing discrimination mechanism (Scalera and Zazzaro, 2001). Robb and Wolken (2002), using the data for the United States, demonstrate that when the characteristics of the firm and its owner are taken into account, women have equal access to credit. While there is little evidence of systematic gender discrimination by banks, the studies that have compared matched pairs of male and female owned businesses of identical age, size, and sector report the presence of residual funding differences (Verheul and Thurik, 2001, and Brush et al., 2002). A survey of 2,000 Dutch entrepreneurs in Verheul and Thurik (2001), for example, found that most differences in the use of starting capital by male and female entrepreneurs were explained by "indirect" effects (size, age, sector); however, some residual, "direct" gender effects survived.

Riding and Swift (1990) compared the experience of men and women entrepreneurs in their relationship with financial institutions over a given period. They show that financial conditions are less favourable to women, but that businesses managed by women are both younger and smaller than those run by men and have slower economic growth; similar findings are reported in Fairlie and Robb (2008). Banking conditions would therefore be the result of rational banking behaviour when faced with riskier ventures. It also seems that women experience greater difficulty in providing collateral. In terms of collateral and personal savings women, who are more likely to work part-time and earn less than men, are therefore less likely to accumulate enough resources (Marlow and Patton, 2005). For these reasons, the lack of personal funds puts women at a disadvantage when starting up business: their personal financial input is limited and
cannot be used as collateral to strengthen the loan relationship. In addition, female entrepreneurs tend to lag behind men in work experience before starting a business, which is crucial for accumulating both financial and human capital and for building a network. Buttner and Rosen (1988) conclude that gender stereotypes are still at play in banking relationship with women asked to provide higher collateral with stricter credit limits (Bellucci et al., 2010) and higher interest rates (Coleman, 2000).

Other studies have found that structural disparities cannot account for all the gender differences in financing patterns. First, women are usually less satisfied than men with the relationship they have with their bank (Buttner and Rosen, 1988). Second, as argued by Carter et al. (2007), the relationship of trust, an important aspect of any bank loan connection, differs between men and women. Banks will require women to give a proof of their knowledge of how to start up a business and of its various implications. Men, on the other hand, are only asked to show a proof of their social stability, by being married, for example. Fay and Williams (1993) carried out an experiment by mailing to the lending managers of major banks constructed scenarios of loan applications, where the “applicants” differed in the level of schooling or gender and asking whether or not the loan would be approved. They show that among non school-leavers, women were less likely than men to obtain a loan. For people with completed further education, the chances were the same but education played a more significant role for women. They conclude that the feeling women have of being discriminated against when asking for start-up capital is well-grounded, but that such discrimination is probably unconscious, cultural and consequently more firmly entrenched.

In our model, described in the next section, we assume the existence of such preference discrimination against women in the credit market, and in the empirical part further on we investigate whether the data support this assumption.

**Theoretical Model**

In this section we develop a simple theoretical model of occupational choice in the presence of discrimination in the capital market. The model is similar to the Coate and Tennyson (1992) model of discrimination in the labour market. If the availability of a loan for starting up a business is part of the occupational choice decision, discrimination results in the distortion of the occupational choice. Assuming that the occupational choice is linked to the distribution of skill,
the resulting distribution of skill conditional on the choice of occupation will be different for men and women, even if the unconditional distribution of skill is the same.

Consider an economy populated by two visibly distinctive groups of agents, say, two genders. An agent chooses either to be employed or to become an entrepreneur (a business owner). To become an entrepreneur an agent must borrow in the credit market. In the labour market there are two types of job, skilled (managerial level) and unskilled (regular employees). Each agent is capable of doing the unskilled job, but only high-skilled agents can do the skilled job. The fraction of skilled agents is the same in the two groups. Each worker is paid their (constant) marginal product of labour. We assume that all workers are correctly assigned to jobs according to their skill. The main result will still hold if there is imperfect information in the labour market, so that a skilled (unskilled) worker is assigned to a skilled (unskilled) job with some probability less than one, given that this probability is not too small.

All skilled workers possess entrepreneurial skills, measured by the probability \( p \) of success of a potential undertaking. Thus, each skilled worker is characterized by probability \( p \) of entrepreneurial success, drawn from a (continuous) distribution, assumed to be the same for all skilled workers, i.e. gender groups do not differ in their entrepreneurial abilities. For all unskilled workers \( p=0 \). An agent’s entrepreneurial skill is their private information. For each agent an investment of capital \( K \) in a project results in a gross return of \( R \) with probability \( p \) and \( 0 \) with probability \( 1-p \), and the entire amount of investment must be borrowed from a competitive credit market. The lenders observe the gender group and know the distribution of the probability of success.

The workers are risk-neutral, and therefore, taking the interest rate, \( r \), and the wage rate, \( w \), as given, a worker with probability of entrepreneurial success \( p \) chooses to become an entrepreneur if, and only if, the expected return on the investment project is greater than the wage, \( p[R-(1+r)K] \geq w \). All workers with \( p<p^* \), where

\[
p^*(r, w) = \frac{w}{R-(1+r)K}
\]

enter paid employment. The workers curve (curve WC in Fig. 1) that traces out the cut-off probability \( p^*(r, w) \) is increasing and convex in \( r \), and it is higher for the higher values of \( w \), so that more people join paid employment, the higher the interest rate and the higher the wage.\(^3\)

\(^3\) The proof is straightforward and is similar to the one in Coate and Tennyson (1992).
A non-discriminating lender breaks even when lending to a borrower with wage $w$ if

$$E[p|p \geq p^*(r, w)](1 + r)K = (1 + \rho)K$$

where $\rho$ is the risk-free interest rate. This condition defines a downward sloping lenders curve $p^*(r, w)$. The equilibrium in the credit market is defined as the interest rate pair, $(r^*_F, r^*_M)$, such that the lenders make zero profit from lending to each group, that is,

$$E[p|p \geq p^*(r^*_F, w)] = 1 + \rho.$$ 

However, if the lenders discriminate against women, they will require from them a higher expected return. Thus, the lenders' behaviour is described by two curves, $(1 + r^*_M)E[p|p \geq p^*(r^*_M, w)] = 1 + \rho_M$ (curve $LC_M$ in Fig. 1) and $(1 + r^*_F)E[p|p \geq p^*(r^*_F, w)] = 1 + \rho_F$ (curve $LC_F$ in Fig. 1), with $\rho_F > \rho_M$.

One can see that, given $\rho_F > \rho_M$, the $LC_M$ curve lies above the $LC_F$, and in equilibrium the interest rate charged to female borrowers is higher than that charged to male borrowers. Thus, the firms owned by females face higher cost of capital. Furthermore, the probability of success of the marginal female borrower is higher than that of the marginal male borrower. That is, on average, female entrepreneurs are more successful than male entrepreneurs. Moreover, recall that the skilled agents with $p < p^*(r^*_{F,M}, w)$ are assigned to managerial jobs. If $p$ reflects the entrepreneurial abilities of a skilled worker, then the (conditional) average entrepreneurial skill of females assigned to managerial jobs is higher than that of males, and the (conditional) average entrepreneurial skill of female owners is higher than that of male owners:

$$p^*(r_F) > p^*(r_M) \Rightarrow E[p|p \leq p^*(r_F^* M)] > E[p|p \leq p^*(r_M^*)].$$

Assuming that the owner's and the manager's entrepreneurial skill are among the factors enhancing the firm's performance, we would then expect that, ceteris paribus, firms with female managers perform better than firms with male managers. Similarly, female-owned firms are expected to perform better than male-owned firms, after the effect of the discrimination in the capital markets (reflected, for instance, in higher interest rate or in harder access to finance) is taken into account. Our empirical analysis described in the next section appears consistent with the model predictions.
Empirical Strategy and Data

Hypotheses

The following three predictions of our theoretical model lend themselves to empirical testing.

Hypothesis 1: Female business owners are faced with higher interest rates, compared to male owners. More generally, women tend to face more difficulties, compared to men, with access to finance, such as a higher collateral requirement.

Hypothesis 2a: Female top managers have, on average, higher entrepreneurial skills than male top managers.

Hypothesis 2b: Female business owners have, on average, higher entrepreneurial skills than male business owners.

Because entrepreneurial skill is difficult to measure directly, we can instead look at some measures of business performance, such as sales or profits. If, after controlling for the usual factors of business performance, the remaining unobserved heterogeneity is due to the entrepreneurial skill of the owner or of the top manager, then the difference in performance of businesses owned or run by men and those owned or run by women can be, at least partly, attributed to the difference in the (conditional) average entrepreneurial skill between men and women.

Data

We test the predictions of the theoretical model using a sample of firm-level data on about 7,700 enterprises in 26 countries in Eastern Europe and Central Asia (ECA)\textsuperscript{4} from the 2009 wave of the BEEPS. This dataset contains information on such firm-specific characteristics as sales, material and labour costs, fixed assets, the gender of the firm's owner and of the senior manager, and the tenure (in years) of the senior manager in the given specialisation. Although BEEPS data has four waves (1999, 2002, 2005, and 2009, with a panel component of 2002 - 2009), we used only the most current, 2009 wave, as it was the first wave to provide information on the gender of the

\textsuperscript{4} The dataset includes Albania, Belarus, Georgia, Tajikistan, Ukraine, Uzbekistan, Russia, Poland, Romania, Serbia, Kazakhstan, Moldova, Bosnia and Herzegovina, Azerbaijan, Macedonia, Armenia, Kyrgyz Republic, Mongolia, Estonia, Kosovo, Czech Republic, Hungary, Latvia, Lithuania, Slovak Republic, Slovenia, Bulgaria, Croatia, and Montenegro. We drop Turkey, the only non-post Soviet country in the dataset, from the sample as the socio-economic and cultural environment in Turkey may differ significantly from that in the countries in the post-Soviet space.
top manager. A note of caution has to be made about the quality of the data on the fixed assets, or the capital stock ($K$), and cost of materials ($M$), for which observations are missing in about a half of the sample. We went around this problem by imputing both $K$ and $M$ by the corresponding country-industry averages. However, our main results are robust to inclusion of all input variables into the estimated equations.

Summary statistics for the whole sample and for the sub-samples by the gender of the owner and that of the senior manager are presented in Table 1.

{Place Table 1 about here.}

**Results**

**Access to Finance, Size of Collateral, and Interest Rates**

For Hypothesis 1 we used the difference-in-means test and a linear regression for the variables representing access to external finance. Our results generally confirm the discrimination in the capital market hypothesis proposed in the theoretical part.

The dataset includes a number of questions on the access to external finance. In particular, on the question about the reason for not applying for a loan the available choices were “Interest rate is too high” and “Collateral is too high”. We estimated the difference in the mean response by the gender of the business owner; the results are presented in Table 2. For the first response, chosen by 8.8 percent of all respondents, the difference in the mean by the owner’s gender is only 0.3 percent and not significant at the 0.1 level. For the second response the difference is 0.7 percent and is statistically significant at the 0.05 level; however, only 2.78 percent of all respondents chose this answer.

Another question was about the access to finance as an obstacle to business, where the available choices were “not an obstacle”, “moderate”, “major” and “very severe obstacle”. We assigned the values from 1 to 4 to these responses, respectively, and estimated the mean response separately for the firms owned by females and males. The results suggest that female owners are more likely to view access to finance as an obstacle to doing business; the difference between two groups is 0.04, statistically significant at the 0.05 level.

Female business owners have to put up, on average, a 4.6 percent larger collateral to obtain a loan, compared to male owners. However, the difference-in-means test shows that it is not significant at the 0.1 level.

We also estimated a linear regression at the firm level, where for the dependent variable we used the level of interest rate and the size of the collateral,

$$Y = X\beta + FO\gamma + \varepsilon.$$  

Here $FO=1$ if the owner is female and zero otherwise, and $X$ is a matrix of other regressors, where, following Muravyev et al. (2009), we included correction for selection on whether or not the firm needs a loan, the profit of the firm, capacity utilization, firm’s age, and competition.
faced by the firm, as well as the industry and country fixed effects, and \( \varepsilon \) is the random error. The estimated coefficient on the female owner variable was positive but only marginally significant coefficient. When we corrected for the sample selection of the firms that did, in fact, require a loan, using Heckman’s procedure, with country and industry fixed effects along with profits and sales growth in the selection equation, the result became even less significant.

In this analysis we did not take advantage of the panel nature of the 2002 - 2009 BEEPS dataset, for which the female owner variable is available, although the cross-section component is slightly restricted there to only those firms which survived from at least 2005. The next step of the analysis would be to exploit the time dimension of the issue and also to address potential endogeneity issues by using lagged values, building on the results of Muravyev et al. (2009).

**Gender Effect on Business Performance: OLS and TSLS Estimation**

Hypotheses 2a and 2b are tested using the estimation of the production function, following Sabarwal and Terrell (2008), where the dependent variable is the logarithm of sales and the independent variables include fixed assets, materials, employment (all in logarithms), as well as the gender of the owner, the gender of the senior manager, and the interaction between these two. We estimate a Cobb-Douglas production function with pooled firm-level:

\[
\log Y = \beta^K \log K + \beta^L \log L + \beta^M \log M + \gamma^O FO + \gamma^M FM + \delta (FO \times FM) + X \lambda + Z \mu + \varepsilon
\]

where \( K \) is the capital stock (at replacement value); \( L \) is employment (the number of full-time permanent employees) and \( M \) is the intermediate material input, \( FM=1 \) if the senior manager of the firm is female and zero otherwise, \( X \) are various controls, including the access to finance responses and the tenure of the senior manager in his or her sector (the number of years in the particular field of specialization), as a proxy for the acquired skill via on-the-job learning, and \( Z \) is a set of industry and country-level fixed effects. According to Hypotheses 2a and 2b, we expect the coefficients on \( FO \) and \( FM \) in the regression to be positive. The results of the OLS estimation with heteroskedasticity-robust standard errors for log(Sales) are presented in Table 3.

We also estimated the model with logarithm of profits and with the logarithm of profits per unit of sales as the dependent variable (in the latter specification the logarithm of sales was used instead of the logarithms of inputs in the right-hand side). The results were similar but somewhat weaker. The problem with the equations for log(Profits) and log(Profits/Sales) is that they suffer from a selection issue, as only the firms with strictly positive profits will be included in the sample. Therefore, we concentrate on the results from the equation for the log(Sales).

{Place Table 3 about here.}

In agreement with earlier findings for the same geopolitical region (Sabarwal and Terrell, 2008), without controlling for the access to external finance we find that, on average, firms
owned or managed by females have lower sales, although the significance is not robust (Table 3, columns 1, 2, 4, and 5). However, when we introduce the interaction between the female owner and the female senior manager, $FO \times FM$, both the female owner and the female senior manager have positive and significant at the 0.01 level effect on sales, whereas the coefficient on the interaction variable is negative and significant at the 0.01 level (columns 3 and 6). The results remain robust in all specifications for $FM$ and $FO \times FM$, and in almost all specification for $FO$, both in significance and sign when we add controls for inputs and controls for the access to external finance. If the positive effect of the female owner and of the female manager is due to their higher entrepreneurial skill, as the theoretical model predicts, the negative coefficient on the interaction variable suggests some sort of decreasing returns to skill; an alternative explanation is the positive effect of complementarity between female and male styles of leadership in running business.

In the industries with preferred female leadership we expect to see a lesser effect of skill difference because of the additional factor of selection, or self-selection into the job. To account for this effect we introduce a dummy variable, $IFM=1$ for those industries where female leadership and management may be preferred by owners of both genders (such as food, garments, hospitality, and other services). We expect the coefficient on the interaction variable, $IFM \times FM$, to be negative, and this is confirmed by the results presented in column 11 of Table 3.

We also explore the possible effect of the Soviet legacy in gender equality by introducing a dummy variable, $SovTen=1$ if the senior manager has started at this job before 1992 (before the collapse of the Soviet bloc). It can be argued that females hired under the Soviet regime were more likely to be treated equally to men and hence their occupational choice would less likely to have been distorted. However, we did not find any significant effect of this variable nor of the interaction between this variable and the gender dummies in the regression, and including these variables have not altered our main results.

We must note that the OLS estimation procedure can suffer from the potential endogeneity in the input mix chosen by the firm (see, e.g., Commander and Svejnar, 2011) and thus may need instrumenting. Since material inputs is a noisier variable than capital and labour inputs, we exclude the material inputs and instrument the other two inputs, following Commander and Svejnar (2011). Instrumental variables include the share of workers with higher education, firm age, and the interaction of the firm's location (city) and firm age. We also instrument two qualitative variables describing the access to finance (“Interest rate is too high” and “Collateral too high” cited as obstacles to obtaining a loan) with their averages across all firms except for the given firm, by country, industry and firm size. All these instruments have passed the validity test. The results of the TSLS estimation for the sales equation are presented in Table 3, column 12; heteroskedasticity-corrected standard errors were used. The table shows that the TSLS estimates are comparable to the OLS estimates in signs, magnitudes and significance.

Finally, we estimated the model for two separate subsamples, small and medium enterprises (250 or less employees, according to the EU classification, 5462 observations) and large firms (over 250 employees, 470 observations). The results are available from the authors upon request.
For the SME sub-sample the results are virtually the same as for the entire sample, whereas for the large firms the results are substantially weaker: all the coefficients on the gender variables are insignificant, except for the significant positive coefficient on $IFM \times FM$. This could be explained by different investment strategies of large firms or by the relatively small number of firms in this category that are managed by females (about 10 percent of the sub-sample). The TSLS results for the SMEs sample are very similar, with a minor exception of the effect of the female top manager now having a lower significance.

Overall, the evidence of the effect of the female gender of business owner on business performance, as measured by sales and profits, is somewhat mixed. However, the results for the positive effect of the female gender of senior manager on business performance are robust to the regression specification and consistent with the predictions of the theoretical model.

Gender Effect on Business Performance: PSM/ATT Estimation

To address the potential endogeneity and to assess further the robustness of our empirical results, we estimate the average treatment-on-treated (ATT) effect of the gender of the top manager using the propensity score matching (PSM) technique, where the firms with female (male) top manager are the treated (control) group. The technique is described, for example, in Rosenbaum and Rubin (1983, 1985), Becker and Ichino (2002), Caliendo and Kopeinig (2008), Heckman et al. (1997) and Lechner (2001). Sabarwal and Terrell (2008) apply the PSM technique to the 2002 and 2005 waves of the BEEPS data to estimate the ATT effect of female ownership of a firm on the total factor productivity. To ensure a better comparability we use, first, the whole sample and, second, a sub-sample of small and medium enterprises, and estimate the effect separately for the male-owned and female-owned firms.

In our model specification the estimated ATT effect shows the percentage difference in sales between the firms with female senior manager and those with male senior manager. In the probit equation male and female senior managers are matched on such characteristics as industry, country, labour and capital inputs, instrumented (by averages) constraints on access to finance, and the manager's tenure in his or her area of specialization. The results of the probit equation are presented in Table 4.

The common support condition, requiring the distributions of the observable characteristics to overlap sufficiently for male and female senior managers, which is necessary for implementing PSM, is almost fully satisfied in our sample, as shown in Table 4, with just one observation out

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5 We use the psmatch2 command in STATA10 (see, e.g., Kaiser and Malchow-Møller (2011) for the description of the procedure) with kernel matching (Epanechnikov kernel with bandwidth of 0.06) and one-to-one matching (single nearest neighbour with replacement). The two methods produced very similar results.
of 3023 outside the support in the equation for the male-owned firms and all observations within the support in the equation for the female-owned firms.

Table 5 presents a comparison of the ATT effect obtained from PSM to that from the OLS and the TSLS regressions for the SMEs. The results of the PSM estimation are consistent with our linear regression results. In particular, the ATT effect obtained using kernel matching in the subsample of the male-owned firms is 32 percent and is significant at the 0.1 level (the estimated effect is 44 percent when using one-to-one matching, and in the untreated sample the effect is 77 percent). The linear regressions give a robust positive and significant effect between 20 and 48 percent, depending on the specification. The TSLS regression with capital and labour inputs, as well as the access to finance constraints, for the SME sub-sample gives an effect of 41 percent, but only marginally significant, while for the full sample the estimated effect is 61 percent, significant at the 0.1 level. We also perform PSM on the sample of female-owned firms. The estimated ATT effect is negative (−14 percent for the SME sub-samples and −16 percent for all firms) but statistically insignificant. This, again, agrees with the least squares results indicating a weaker gender effect when both the owner and the senior manager are women.

{Place Table 5 about here.}

Conclusion

According to The Fawcett Society, “companies with more women on their boards were found to outperform their rivals with a 42 percent higher return in sales, 66 percent higher return on invested capital and 53 percent higher return on equity.”\(^6\) Does this suggest that women are more successful in business than men? Or is the reason for this difference in that women must have business skills superior to that of men in order to achieve the same level in business hierarchy? In this paper we explore some theoretical and empirical issues concerning the difference in business performance of the firms owned and/or managed by males and females.

We present a theoretical model where gender bias in the capital market leads to a distorted occupational choice. The model is based on the assumption that lenders discriminate against female entrepreneurs. Unequal access to finance leads to different distributions of entrepreneurial skill for men and women conditional on the occupational choice of owning a business or entering a paid (skilled) employment. In the pool of potential entrepreneurs the marginal female borrower has higher skill than the marginal male borrower, and, therefore, the conditional average entrepreneurial skill of female entrepreneurs (business owners) is higher, and the average entrepreneurial skill of female high-skilled employees (managers) is higher, than that of their male counterparts.

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Our empirical findings support these model predictions. We find evidence in the data of discrimination of female entrepreneurs in the capital market. After controlling for the usual factors that determine business performance, including access to finance (captured by prohibitively high interest rates and the size of the collateral), the firms with female owners and/or female top managers perform better than the firms with male owners and/or male top managers. We estimate the effect using the ordinary least squares and the two-stage least squares with instrumental variables, as well as the propensity score matching technique. When controlling for the negative effect of the restricted access to finance, the effects of a female owner and of female senior manager are positive and significant. If the owner's or the manager's entrepreneurial skill is responsible for unobserved heterogeneity in firms' performance, this suggests that female business owners and senior managers tend to have, on average, higher entrepreneurial skills than their male counterparts, as predicted by our theoretical analysis.

References


Fig. 1. Equilibrium in the capital market and occupational choice.
Table 1. Summary statistics.
1.a. Sample means and standard deviations

<table>
<thead>
<tr>
<th>Var</th>
<th>All firms</th>
<th>Female Owner</th>
<th>Male Owner</th>
<th>Female Top Manager</th>
<th>Male Top Manager</th>
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<td>Mean</td>
<td>SD</td>
<td>N</td>
<td>Mean</td>
</tr>
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<td>2.56E+07</td>
<td>9.49E+08</td>
<td>2926</td>
<td>4.12E+07</td>
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<tr>
<td>Materials (US)</td>
<td>7542</td>
<td>4.86E+07</td>
<td>1.58E+08</td>
<td>3115</td>
<td>3.50E+07</td>
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<td>Capital (US)</td>
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<td>1.08E+09</td>
<td>4.37E+09</td>
<td>2954</td>
<td>2.48E+09</td>
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<td>Employment</td>
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<td>9.892</td>
<td>4021</td>
<td>16.811</td>
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<td>FO-9941</td>
<td>1.004</td>
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<td>FM-10139</td>
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<td>0.402</td>
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<td>FO x FM-9928</td>
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<td>IFM-10152</td>
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<td>0.468</td>
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<tr>
<td>FM x IFM-10152</td>
<td>0.495</td>
<td>0.499</td>
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<tr>
<td>FO x FM x IFM-9941</td>
<td>0.226</td>
<td>0.418</td>
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<td>Int_Rate_high-9999</td>
<td>0.094</td>
<td>0.292</td>
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<td>Collat_High-9999</td>
<td>0.031</td>
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### 1.b. Sample correlation coefficients

<table>
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<tr>
<th></th>
<th>Sales</th>
<th>Tenure</th>
<th>FO</th>
<th>FM</th>
<th>IFM</th>
<th>FM x IFM</th>
<th>FO x FM x FM</th>
<th>Collat_High (mean)</th>
<th>Int_Rate_high (mean)</th>
<th>K</th>
<th>L</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>log(Sales)</td>
<td>1</td>
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<td>Tenure</td>
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<td>-0.056</td>
<td>0.071</td>
<td>0.156</td>
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<tr>
<td>FM x IFM</td>
<td>-0.122</td>
<td>-0.079</td>
<td>0.106</td>
<td>0.203</td>
<td>0.658</td>
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<tr>
<td>FO x FM x FM</td>
<td>-0.106</td>
<td>0.015</td>
<td>0.657</td>
<td>0.435</td>
<td>0.366</td>
<td>0.545</td>
<td>1</td>
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</tr>
<tr>
<td>Collat_High (mean)</td>
<td>-0.129</td>
<td>-0.012</td>
<td>0.014</td>
<td>0.039</td>
<td>-0.036</td>
<td>0.026</td>
<td>0.024</td>
<td>1</td>
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<tr>
<td>Int_Rate_high (mean)</td>
<td>-0.222</td>
<td>-0.038</td>
<td>0.003</td>
<td>0.044</td>
<td>0.009</td>
<td>0.069</td>
<td>0.029</td>
<td>0.012</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>log(K)</td>
<td>0.206</td>
<td>0.091</td>
<td>0.152</td>
<td>0.122</td>
<td>0.429</td>
<td>0.217</td>
<td>0.323</td>
<td>-0.060</td>
<td>-0.074</td>
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<tr>
<td>log(L)</td>
<td>0.670</td>
<td>0.059</td>
<td>0.028</td>
<td>-0.123</td>
<td>-0.180</td>
<td>-0.138</td>
<td>-0.079</td>
<td>-0.108</td>
<td>-0.181</td>
<td>-0.009</td>
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<tr>
<td>log(M)</td>
<td>0.346</td>
<td>0.098</td>
<td>-0.048</td>
<td>-0.026</td>
<td>0.248</td>
<td>0.066</td>
<td>0.054</td>
<td>-0.065</td>
<td>-0.095</td>
<td>0.836</td>
<td>0.07</td>
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</table>
Table 2. Differences in means measuring access to finance.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Female Owner</th>
<th>Male Owner</th>
<th>t-stat</th>
<th>p-value</th>
<th>N obs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest rate too high</td>
<td>.0964</td>
<td>.0928</td>
<td>-0.6047</td>
<td>0.2727</td>
<td>10033</td>
</tr>
<tr>
<td>Collateral too high</td>
<td>.0355</td>
<td>.0271</td>
<td>-2.4054</td>
<td>0.0081</td>
<td>10033</td>
</tr>
<tr>
<td>Access to finance as an obstacle</td>
<td>2.7640</td>
<td>2.7240</td>
<td>-1.8194</td>
<td>0.0345</td>
<td>5180</td>
</tr>
<tr>
<td>Collateral as % of loan value</td>
<td>137.7953</td>
<td>132.6266</td>
<td>-0.7334</td>
<td>0.2317</td>
<td>3196</td>
</tr>
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</table>
Table 3. Summary of the OLS and TSLS regressions, all firms.

<table>
<thead>
<tr>
<th>1</th>
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<th>4</th>
<th>5</th>
<th>6</th>
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<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>log K</td>
<td>-0.073*** (0.000)</td>
<td>-0.076*** (0.000)</td>
<td>-0.071*** (0.000)</td>
<td>-0.071*** (0.000)</td>
<td>-0.071*** (0.000)</td>
<td>-0.06*** (0.000)</td>
<td>-0.076*** (0.000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>log M</td>
<td>0.187*** (0.000)</td>
<td>0.192*** (0.000)</td>
<td>0.187*** (0.000)</td>
<td>0.186*** (0.000)</td>
<td>0.186*** (0.000)</td>
<td>0.18*** (0.000)</td>
<td>0.212*** (0.000)</td>
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<td></td>
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</tr>
<tr>
<td>log L</td>
<td>1.053*** (0.000)</td>
<td>1.052*** (0.000)</td>
<td>1.047*** (0.000)</td>
<td>1.041*** (0.000)</td>
<td>1.038*** (0.000)</td>
<td>1.035*** (0.000)</td>
<td>0.980*** (0.000)</td>
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</tr>
<tr>
<td>FO</td>
<td>-0.026 (0.591)</td>
<td>0.389*** (0.000)</td>
<td>-0.059* (0.099)</td>
<td>-0.006 (0.872)</td>
<td>0.383*** (0.000)</td>
<td>0.383*** (0.000)</td>
<td>-0.004 (0.913)</td>
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<td></td>
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<tr>
<td>FM</td>
<td>-0.504*** (0.000)</td>
<td>0.569*** (0.000)</td>
<td>-0.051 (0.218)</td>
<td>0.202* (0.015)</td>
<td>0.568*** (0.000)</td>
<td>0.559*** (0.000)</td>
<td>0.209* (0.012)</td>
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<tr>
<td>FO x FM</td>
<td>-1.542*** (0.000)</td>
<td>-0.314*** (0.001)</td>
<td>-1.513*** (0.000)</td>
<td>-1.495*** (0.000)</td>
<td>-0.321*** (0.001)</td>
<td>-0.319*** (0.001)</td>
<td>-0.321*** (0.001)</td>
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<tr>
<td>'Interest rate too high'</td>
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<td>IFM x FM</td>
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<tr>
<td>N</td>
<td>7086</td>
<td>7208</td>
<td>7072</td>
<td>6106</td>
<td>6128</td>
<td>6094</td>
<td>6988</td>
<td>6988</td>
<td>6033</td>
<td>6033</td>
<td>5932</td>
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<tr>
<td>R-sq.</td>
<td>0.321</td>
<td>0.330</td>
<td>0.340</td>
<td>0.733</td>
<td>0.734</td>
<td>0.733</td>
<td>0.352</td>
<td>0.358</td>
<td>0.734</td>
<td>0.734</td>
<td>0.734</td>
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<tr>
<td>Chi-sq. (p-value)</td>
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<td></td>
</tr>
</tbody>
</table>

Note: \( Y = \log (\text{Sales } \$US) \), p-values in parentheses; country and industry-level dummies included.

* significant at 0.1 level, ** significant at 0.05 level, *** significant at 0.01 level
**Table 4.** PSM (probit) estimation with kernel matching.

<table>
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<tr>
<th></th>
<th>Y = FM</th>
<th>SME</th>
<th>All firms</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Male owner</td>
<td>Female owner</td>
<td>Male owner</td>
</tr>
<tr>
<td>log K</td>
<td>-.006 (0.809)</td>
<td>-.001 (0.922)</td>
<td>-.023 (0.313)</td>
</tr>
<tr>
<td>log L</td>
<td>.109*** (0.004)</td>
<td>-.279*** (0.000)</td>
<td>.125*** (0.000)</td>
</tr>
<tr>
<td>Tenure</td>
<td>-.019*** (0.000)</td>
<td>-.002 (0.591)</td>
<td>-.015*** (0.001)</td>
</tr>
<tr>
<td>‘Interest rate too high’</td>
<td>.189 (0.583)</td>
<td>.193 (0.477)</td>
<td>.19 (0.527)</td>
</tr>
<tr>
<td>‘Collateral too high’</td>
<td>.923 (0.119)</td>
<td>.522 (0.201)</td>
<td>1.096*** (0.011)</td>
</tr>
<tr>
<td>LR</td>
<td>119.04</td>
<td>448.23</td>
<td>133.67</td>
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<tr>
<td>Pr &gt; χ²</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>N</td>
<td>2781</td>
<td>2107</td>
<td>3023</td>
</tr>
<tr>
<td>Pseudo R²</td>
<td>0.094</td>
<td>0.155</td>
<td>0.094</td>
</tr>
</tbody>
</table>

Note: p-values in parentheses; country and industry-level dummies included.
* significant at 0.1 level, ** significant at 0.05 level, *** significant at 0.01 level
<table>
<thead>
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<th>Sample</th>
<th>N</th>
<th>Female TM (Treated)</th>
<th>Male TM (Control)</th>
<th>Diff</th>
<th>SE</th>
<th>OLS</th>
<th>TSLS</th>
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<tr>
<td>Unmatched, Male owner, SME</td>
<td>2781</td>
<td>14.162</td>
<td>13.391</td>
<td>0.77***</td>
<td>0.171</td>
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<tr>
<td>ATT, Male owner, SME</td>
<td>2781</td>
<td>14.162</td>
<td>13.843</td>
<td>0.32*</td>
<td>0.183</td>
<td>0.19**</td>
<td>0.23**</td>
</tr>
<tr>
<td>ATT, Female owner, SME</td>
<td>2107</td>
<td>12.651</td>
<td>12.796</td>
<td>-0.14</td>
<td>0.114</td>
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<td>-0.32***</td>
</tr>
<tr>
<td>ATT, Male owner, all firms</td>
<td>3023</td>
<td>14.533</td>
<td>14.153</td>
<td>0.38***</td>
<td>0.184</td>
<td>0.22***</td>
<td>0.27***</td>
</tr>
<tr>
<td>ATT, Female owner, all firms</td>
<td>2.05</td>
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<td>12.961</td>
<td>-0.16</td>
<td>0.117</td>
<td>-0.32***</td>
<td>-0.35***</td>
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</tbody>
</table>

Note: Dependent variable: log(Sales); country- and industry- level dummies included. ATT effects computed from PSM estimation with kernel matching. * significant at 0.1 level, ** significant at 0.05 level, *** significant at 0.01 level