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Does Corruption Discourage More Female Entrepreneurs from Applying for Credit?

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Abstract

There is evidence of a gender gap in access to finance. In this paper, we test the hypothesis that corruption discourages more female than male entrepreneurs from applying for credit. We use data on access to credit and corruption at the firm level for a large dataset of firms from 68 countries worldwide. We demonstrate that female entrepreneurs are more discouraged by corruption to ask for credit than male borrowers. We find evidence for two explanations for the gendered impact of corruption on borrower discouragement: women have less experience in management than men and as such can have less experience to deal with corruption, and gender inequality in society enhances the discouragement of female borrowers. Thus, our findings provide evidence that corruption enhances the gender gap in access to finance, enhancing gender inequality in participation in economic activity.

JEL Codes: D73, G21, J16.

Keywords: gender, access to credit, borrower discouragement, corruption.

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1. Introduction

Access to finance is critical to firm growth (Beck and Demirgüç-Kunt, 2006; Oliveira and Fortunato, 2006). However, evidence has demonstrated that women entrepreneurs suffer from lower access to finance than male entrepreneurs (Aristei and Gallo, 2016; Asiedu et al., 2012; IFC, 2011). This lower access to finance reduces the opportunities of women entrepreneurs to grow their businesses, thereby affecting their contributions to the economy such as job creation, poverty reduction, and economic growth, and hampers their income, constituting an impediment to gender equality.

Several explanations have been proposed to explain this gender gap in access to finance. The gap might be due to supply-side discrimination such that female-managed firms are less likely to obtain credit than those managed by men (Muravyev et al., 2009). The gap can also result from the demand-side: women entrepreneurs can self-refrain from applying for a credit because they anticipate rejection from the bank (Moro et al., 2017; Ongena and Popov, 2016). The demand-side mechanism raises questions on what shapes the perceptions of women entrepreneurs to expect higher rates of loan rejection. The objective of this paper is to investigate whether corruption has a different impact on borrower discouragement for men and women. We test the hypothesis that corruption discourages more female borrowers than male borrowers and therefore that a greater degree of corruption results in a higher gender gap in access to finance. This hypothesis is based on the results in the literature on behavior differences between men and women. In the presence of greater corruption, women would apply less for credit than men because women are more risk averse (Byrnes et al., 1999; Croson and Gneezy, 2009) and tend to be more honest (Grosch and Rau, 2017; Muehlheusser et al., 2015) than men and have less experience in managing corrupt practices than men (Rheinby and Chene, 2016; Swamy et al., 2001).

To investigate this hypothesis, we use the Enterprise Surveys data on access to credit and corruption at the firm level on a large dataset of firms from 68 countries. Each country participates in the survey once during the research period 2011–2018. We first examine whether corruption exerts a different influence on borrower discouragement for male and female entrepreneurs. We further test two explanations for why corruption can have a gendered impact on borrower discouragement. First, we consider the possible impact of experience: the higher impact of corruption on discouraging female borrowers might be due to their having less experience in managing corruption than men. Second, we investigate the influence of

culture in terms of gender equality. Lower gender equality can enhance the differences in behavior between men and women and as such can increase the differences in terms of reaction in borrower discouragement to the degree of corruption.

We perform ordinary least squares (OLS) and logit regressions to examine the gendered impact of corruption on discouraged borrowers. To manage potential endogeneity, we perform a two-stage least squares regression using instrumental variables. We additionally perform a set of OLS regressions to investigate the relevance of the explanations for this gendered impact. Finally, we apply random effects regression for a smaller sample on which we have panel data to confirm the results.

Our primary finding is that female entrepreneurs are more discouraged than male in the presence of high corruption. Further, we find evidence for the two tested explanations of this higher discouragement. First, women have less experience in management than men, which can affect their experience in managing corruption. Second, lower gender equality favors higher discouragement for female entrepreneurs than for male entrepreneurs.

Our contribution to the literature is twofold. First, we contribute to the nascent strand of literature on the influence of institutions on the gender gap in access to finance. Galli et al. (2018) and Wellalage et al. (2019) have investigated the influence of corruption on the gender gap in access to finance. Using data for 11 European countries, Galli et al. (2018) find no impact of corruption on the gender gap, while Wellalage et al. (2019) show that corruption reduces the gender gap in a dataset from five South Asia countries. By analyzing a large dataset of 19,366 firms from 68 countries, and so by not restricting to a single geographical area, our work provides a much broader investigation of the gendered impact of corruption on borrower discouragement. Moreover, our results focus only on discouragement and thus complement the ones obtained by Wellalage et al. (2019) on access to credit. Our framework allows us to investigate the different channels through which corruption can differentially affect the borrower behavior of men and women. Our analysis is thus not limited to testing the existence of the gendered impact of corruption but also considers in depth the underlying mechanisms. Through this analysis, our work contributes to a better understanding of the gender gap in access to finance.

Second, we contribute to the literature on the effects of corruption. These effects have been widely studied, and the evidence demonstrates that corruption affects growth, productivity, and foreign direct investment (Mauro, 1995; Méon and Weill, 2010; Wei and Shleifer, 2000) at the macroeconomic level and bank lending decisions (Fungáčová et al., 2015)

at the microeconomic level. Our work presents a new perspective of the impact of corruption by showing its detrimental effects on gender equality in economic life.

The paper is structured as follows: Section 2 presents the literature review, Section 3 develops the hypotheses, Section 4 describes the data and econometric methodology, Section 5 reports the results, and Section 6 concludes the paper.

2. Literature review

2.1 Discouraged borrowers

Credit rationing and discouragement are supply and demand dysfunctions that affect credit markets; although the former has been studied in detail for more than 40 years, the latter has been more recently studied because of Kon and Storey (2003), the first to propose the discouraged borrowers' theory. They define discouraged borrowers as good borrowers who do not apply for loans because they think they will be rejected. Their model is based on three characteristics: the cost of the loan application, the imperfect screening of applicants by banks, and the difference between the lending rates of banks and other money lenders. They show that the level of discouragement increases with the first two characteristics and decreases with the last characteristic. Additionally, they predict that although discouragement decreases with information asymmetry, this relationship may not be linear.

Subsequently, several empirical studies have uncovered the determinants of discouraged borrowers. First, evidence has been provided that entrepreneur characteristics such as gender, experience, and level of education affect the probability of discouragement (Chakravarty and Xiang, 2009; Fraser, 2014; Gama et al., 2017). Second, support has been provided for the influence of firm characteristics on discouragement, with the role of firm age, firm size, creditworthiness, and ownership structure (Brown et al., 2011; Chakravarty and Xiang, 2013; Cole, 2016; Ferrando and Mulier, 2015; Freel et al., 2012; Han et al., 2009; Mac an Bhaird et al., 2016; Xiang et al., 2015). Third, elements that alleviate asymmetric information such as a lending relationship (Chakravarty and Xiang, 2009, 2013; Chakravarty and Yilmazer, 2009; Freel et al., 2012) or distance between lenders and borrowers (Gama et al., 2017) have been demonstrated to play a role in reducing the probability of discouraged borrowers.

2.2 Gender, corruption, and access to finance

2.2.1 Gender and access to finance

The literature has confirmed differences between female-owned and male-owned firms in access to credit. These differences are explained by three main factors: structural dissimilarities, supply-side discrimination, and demand-side risk aversion (Carter and Shaw, 2006).

Specifically, a strand of research has demonstrated that gender is not a factor in female entrepreneurs' difficulties in access to finance but that the structural differences between female-owned and male-owned firms are. Compared with male-owned firms, female-owned firms are usually younger and smaller (Coleman, 2000), have a narrower range of collateral (Fabowale et al., 1995) and fewer and shorter lending relationships (Cole and Mehran, 2018), and operate in industries which require less capital such as retail sales, trade, or services (Cole and Mehran, 2018; Robb and Wolken, 2002; Stefani and Vacca, 2013). These characteristics are reasons why female-owned firms are less likely to apply for credit or are considered riskier by lenders than men are.

On the supply side, evidence has revealed that women entrepreneurs are discriminated against in the credit market. Women are less likely to obtain a bank loan and more likely to pay higher interest rates than men (Alesina et al., 2013; Aristei and Gallo, 2016). In a similar fashion, Cavalluzzo et al. (2002) reveal that firms owned by women receive a higher rate of rejection as the lender market concentration increased. Bellucci et al. (2010) also find that female entrepreneurs are more likely to be required to show collateral and experience stricter credit limits than male entrepreneurs.

On the demand side, the difference in the use of external finance between female and male-led firms can be explained by female entrepreneurs' perceptions. Female entrepreneurs are less confident than male entrepreneurs and anticipate that they will be more likely to be turned down than men would be, resulting in women's lower rate of application. Treichel and Scott (2006) find that loan applications from women-owned firms are less likely to be rejected than those of men-owned firms and that the terms of approved loans are not significantly between women and men. However, women's belief that they might be discriminated against in the lending process constrains them from applying for loans. Likewise, Ongena and Popov (2016) and Moro et al. (2017) propose the same conclusion. Using a different approach, Naegels et al. (2018) explore how individual entrepreneurs' perceptions of normative and cognitive institutions drive financing behaviors. They find that female entrepreneurs in Tanzania apply for credit less than their male counterparts and mainly rely on alternative

sources to finance their firms' operations because of the fear of loan rejection. Carter and Shaw (2006) also reveal that because female entrepreneurs perceive that their chance to obtain the full loan amount is less than that of men, female entrepreneurs are also inclined to request a smaller loan than is necessary.

Finally, De Andrés et al. (2020) study the gender gap in access to credit on both demand and supply sides. On the demand side, they show that female entrepreneurs are less likely to apply for a loan than males, in accordance with the previously cited studies. On the supply side, they find that women-led firms experience a tougher credit access in the founding year but this gender gap disappears over the subsequent years. Moreover, as women-led firms are less likely to default than male-led firms, they conclude that women suffer, through tougher standards to credit access, of an implicit discrimination from creditors.

2.2.2 Gender and corruption

The first strand of studies tended to show that women have a tendency to be more honest (Capraro, 2018; Grosch and Rau, 2017; Muehlheusser et al., 2015), more risk averse (Byrnes et al., 1999; Croson and Gneezy, 2009) than men and lack experience in managing corrupt practices (Rheinby and Chene, 2016; Swamy et al., 2001). In line with this view, many studies have confirmed that women condone less corrupt behaviors than men. Dollar et al. (2001) state that the presence of women in government reduces the level of corruption because women may be more ethical and more concerned with the common good than men. Swamy et al. (2001) find that women tolerate less corruption and are less involved in corruption than men. Torgler and Valev (2010) also confirm that women condemn corrupt behaviors more than men. In addition to the studies based on survey data, Rivas (2013) applies an experimental method and finds that women are less corrupt than men.

A second strand of works however moderates the view that women are less inclined to engage in corruption than men, by stressing the influence of the cultural and institutional contexts. The evidence has tended to show no significant difference between women and men when corruption is considered normal behavior in society, and that women are less inclined to be corrupt than men because women are more pragmatic regarding the realities of detection and punishment. Alatas et al. (2009) find different attitudes toward corruption in four investigated countries. Although women in Australia are less condoning of corruption than men, attitudes toward corruption are not significantly different between women and men in India, Indonesia, and Singapore. Hence, they conclude that these attitudes are culture specific. Using an experimental method, Schulze and Frank (2003) reveal that the effect of gender on

corruption is influenced by the institutional context. In the absence of the risk of detection and punishment, no difference is found in the corrupt behaviors between women and men. Nevertheless, women are significantly less willing to accept bribes when there is the risk of detection and punishment. These findings have been confirmed in several subsequent works. The significant effect of women's participation in government to reduce corruption disappears when institutional features such as rule of law, freedom of the press, and democratic elections are controlled (Sung, 2003). This result supports the view that the relationship between gender and corruption is mainly based on its context, and a "fairer system" plays a more important role in reducing corruption than gender does. Breen et al. (2017) also find that women in the business field are less likely to pay bribes than men but only in democracies because the risk of detection and punishment is greater.

In summary, two strands of literature have investigated the effect of gender on corruption. The first strand confirms that women are less inclined to engage in corruption than men, and the second finds no difference between women and men in attitudes toward corruption if corruption is not stigmatized. Several reasons can be found to explain this link: women are more honest in condoning corrupt behaviors and more risk averse than men. Hence, because risks may be a part of participating in corrupt activities, women are more likely to avoid them than men. Additionally, women are less experienced in corrupt transactions than men, limiting their access to these behaviors. Furthermore, the link between gender and corruption varies by cultural and institutional contexts.

2.2.3 Gender, corruption, and access to finance

According to our review of the literature, two studies have investigated whether corruption has a different impact on men and women in access to finance.

Galli et al. (2018) use data for 11 European countries from the European Central Bank-Survey on the Access to Finance of Enterprises during the period 2009–2014. They expected that women-owned firms would refrain less from applying for credit when corruption was low than when it was high. Measuring the corruption perception by country-level indices, and controlling for firm characteristics and country features, they find that women-led firms are more reluctant to apply for bank credit than men-led firms. However, this result is not affected by a country's level of corruption. Therefore, their expectation is not proved.

Wellalage et al. (2019) question whether corruption worsens gender equality in access to credit. They work on Enterprise Surveys data collected by the World Bank in 2014 for five countries in South Asia that limit women's rights. They measure corruption by the percentage

of sales paid to “get things done” at the firm level, allowing them to capture the experience of corruption. They find evidence that gender differences exist in credit access. Surprisingly, women benefit more from corruption than men. When women-owned firms pay bribes, they experience less credit constraints than men-owned firms. An explanation for the result is that women-owned firms experience more difficulties in credit access than men-owned firms. Therefore, women engage in corruption to avoid the discrimination against them.

3. Hypotheses development

Our literature review has shown that women-led firms are less likely to have access to credit than men-led firms because of the structural differences between these two types of firms and the discrimination of lenders against women-led firms; additionally, women-led firms are discouraged from entering the credit market because they perceive a higher probability of rejection than men-led firms. Therefore, women-led firms are more likely to become discouraged borrowers than men-led firms.

Additionally, despite dramatic changes, women continue to have the main role in childcare and homemaking (Bianchi et al., 2006). This role influences women’s self-concepts, affecting their behaviors: they prefer to act honestly than dishonestly when teaching their children values (Eagly and Wood, 2016). Hence, women may be less involved in corruption than men. In addition, the behavior of women is influenced by social constructs (Eagly and Wood, 2016). For example, women will be more condemned and punished than men if they engage in corrupt activities (Esarey and Chirillo, 2013), because these behaviors are perceived as inconsistent with women’s roles. It prevents women from engaging in corrupt practices as well. More importantly, corruption is a hidden agreement not protected by legislation. Hence, participating in these agreements, women experience risks of being detected, punished, or not receiving the expected results. Since women are more risk averse than men (Byrnes et al., 1999; Croson and Gneezy, 2009), they less involve in corruption to avoid taking these risks. Based on these arguments, we expect that corruption enhances the discouragement of women entrepreneurs in access to credit, and we propose hypothesis 1 (H1):

H1: Perceiving high corruption discourages women entrepreneurs from applying for credit.

If the first hypothesis is confirmed, we can then question which channels explain the discouragement of female entrepreneurs when perceiving high corruption. To answer this question, we test hypotheses 2 and 3 (H2, H3).

First, corruption is a hidden agreement based on trust and reciprocity. Because women have generally joined business and politics later than men, women have less experience, making it more difficult for women to access the “bribe-sharing old boy networks” (Rheinby and Chene, 2016; Rivas, 2013; Swamy et al., 2001). Barnes and Beaulieu (2019) and Goetz (2007) have also revealed that women are marginalized from access to important networks; therefore, they have less experience in managing corruption than men.¹ When women accumulate an amount of knowledge and experience equal to that of men, there may be no difference between women and men in corrupt behaviors. On the basis of these arguments, we infer that experience is an explanation for gender differences in applying for credit when perceiving high corruption, and we expect that the more years of experience female entrepreneurs have, the more confidence they have to overcome constraints due to corruption to access credit. Our expectation is presented in H2.

H2: Women entrepreneurs’ experience mitigates the probability of them being discouraged from credit application when they perceive high corruption.

Second, the social role theory of Eagly and Wood (2016) predicts that when the roles of women change such that women have more opportunities to access the fields now dominated by men, gender differences should decrease. In line with that theory, we expect that higher gender equality reduces the difference between women and men in terms their reaction to corruption, namely, in terms of discouragement. Moreover, in a society with high gender equality, women may experience less pressure from corruption than those in a society with low gender equality; thus, the former may experience less fear when applying for credit than the latter. Based on these inferences, we propose H3.

H3: Gender equality reduces the probability that women entrepreneurs are discouraged from credit application when they perceive high corruption.

4. Data and methodology

4.1 Data

¹ Rivas (2013, p.2) predicts that “it may be just a matter of time until women get involved in corrupt activities.”

We use the Enterprise Surveys (ES) data from the World Bank. The survey has been conducted since the 1990s to offer an expansive array of economic data including access to finance, and corruption. More than 90% of the questions objectively determine the characteristics of a country's business environment, and the remaining questions show the respondents' opinions on obstacles to their firms' operation. This dataset contains rich information at the firm level, allowing us to deeply investigate our concerns. We collect data from middle-income and high-income countries surveyed from 2011 to 2018. In low-income countries, low-end financial institutions and specialized lenders but not banks seem particularly suited to ease firms' access to finance (Beck et al., 2013). Because our study focuses on bank lending, we exclude low-income countries to avoid biases. In addition, because of missing values and avoiding problems of extremely unequal cluster sizes (Spamann, 2019), we exclude countries with fewer than 4 discouraged borrowers. Finally, our dataset includes 68 countries. Each country participates in the survey once during the period 2011–2018, and the survey can last from 1 to 3 years in one country. Appendix A2 displays the list of countries.

4.2 Methodology

Our key hypothesis (H1) predicts that firms managed by women are more discouraged when they perceive high corruption.

The dependent variable is *discouraged*, which is a dummy variable equal to one if the firm did not apply for credit not because they had sufficient capital but because they consider that application procedures are complex, interest rates are unfavorable, collateral requirements are excessive, loan size and maturity are insufficient, or the application would be rejected. It is equal to zero if the firm applied for a loan. This measure of discouragement has been applied in many studies (Chakravarty and Xiang, 2009, 2013; Galli et al., 2017; Gama et al., 2017; Statnik and Vu, 2020).

The first key explanatory variable is *gender*, which is a dummy variable equal to one if top managers are female and to zero otherwise. It allows us to investigate the effect of gender on firms' financing decisions.

The second key explanatory variable is *corruption*, which is measured through the perception of corruption at the firm level. It is a dummy variable equal to one if firms perceive corruption as a major or very severe obstacle and to zero if firms perceive no obstacle or a minor or moderate obstacle. The advantage of this measurement is that we could observe the perception of corruption for each firm and its effect on firm managers, resulting in their credit access decisions.

Our aim is to investigate H1 (i.e., women-led firms are more discouraged than man-led firms when the former perceives high corruption). To achieve this objective, we include an interaction between *gender* and *corruption*, which is the third key explanatory variable. If H1 is confirmed, we should observe a significantly positive coefficient for this interaction term. This finding would mean that higher corruption discourages more women-led firms than men-led firms from applying for credit.

In line with the literature on borrower discouragement, we also include a set of control variables: experience of top managers (*experience*); firm characteristics such as financial services used by firms (*AI1*, *AI2*), their locations (*city1m*, *maincity*), firm age (*age*), firm size (*size*), ownership (*ffirm*), export activities (*diexport*), trade credit (*tradecr*), research and development (*innovation*), information transparency (*certificate*, *exteraudit*), credit worthiness (*creditline*), and access to finance (*access*). All these variables are defined in Appendix A1.

To explore the hypothesis H1 that women-led firms are more discouraged when they perceive high corruption, we estimate the following model:

$$\begin{aligned} discouraged_i = & \alpha + \beta_1 gender_i + \beta_2 corruption_i + \beta_3 gender_i \times corruption_i \\ & + \sigma B_i + Year\ dummies + Sector\ dummies + Country\ dummies + \varepsilon_i \end{aligned} \quad (1)$$

where i is the firm and B is the set of firm-level control variables. We also control for the country, sector, and year as fixed effects to eliminate time-invariant factors. These fixed effects also control for country-specific, sector-specific, and year-specific effects, which may bias the estimates. We alternately perform regressions with the OLS model and the logit model to check the robustness of our findings. The model clusters standard errors by country.

Furthermore, to examine whether the gendered impact of corruption on discouragement is stronger in highly corrupt environment, we split the sample into two groups of countries at the median value of the “control for corruption” indicator issued by the World Bank. This indicator “captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as ‘capture’ of the state by elites and private interests.” Its values range from -2.5 to 2.5, and a higher value means a lower level of corruption. As a result, we have two groups: high- and low-corruption countries. Next, we test H1 by applying equation (1) to two groups.

Table 1 shows the summary statistics for the whole sample and also the means for all variables for female- and male-managed firms. Both types of firms have significant differences in many aspects, and female-managed firms perceive less corruption than male-managed firms:

28% and 36% of female-managed firms and male-managed firms, respectively consider corruption as a major or very severe obstacle. Additionally, female entrepreneurs have less experience than their male counterparts. Firms led by women are also significantly smaller, younger, less frequently use financial services, invest less in R&D activities, and are owned more by domestic owners. Finally, male-managed firms report more obstacles in access to finance than female-managed firms: 26% and 24% of male- and female-managed firms mention access to finance as a major or very severe obstacle.

5. Results

5.1 Main estimations

We test the hypothesis that the perception of high corruption discourages more women than men to apply for credit. Table 2 reports the estimations: OLS is in column 1 and the logit model is in column 2. We observe that the interaction *corruption*×*gender* is significantly positive in both estimations; thus, female entrepreneurs are more discouraged than male entrepreneurs when they perceive high corruption.

The effect is economically significant. The marginal effect of the interaction term with the logit model and the coefficient of the interaction term with the OLS model in column 1 of Table 2 show that the probability of discouraged borrowers increases 4% if female entrepreneurs perceive that corruption is a major or severe obstacle to their firm's operation.

We furthermore investigate whether the effect varies with the level of corruption of the country. To achieve this objective, we split the sample into two groups and redo the OLS estimation for each group in column 3 for high-corruption countries and in column 4 for low-corruption countries. The interaction *corruption*×*gender* is significantly positive in high corruption countries but not significant in low-corruption countries. The probability of discouraged borrowers in higher corruption countries increases by 8% if female entrepreneurs perceive high corruption.

Thus, our findings support H1: perceiving high corruption discourages women entrepreneurs from applying for credit. In addition, this effect is stronger in a highly corrupt environment.

The difference in the behavior of women and men is one of the channels to explain this result. Although living in the same environment, women may act differently from men due to

risk tolerance, conservatism, overconfidence, competition, and societal stereotypes (Byrnes et al., 1999; Charness and Gneezy, 2012; Croson and Gneezy, 2009; Eagly and Wood, 2016; Eckel and Grossman, 2002; Palvia et al., 2015). Therefore, in line with Audretsch et al. (2020), we infer that the gendered impact of corruption on discouragement is caused by the fact that women respond differently from men to corruption due to women's honesty and risk aversion. In detail, involving more in domestic activities, women can be influenced to act with honesty to teach their children the appropriate values (Eagly and Wood, 2016). Hence, in a more corrupt environment that can affect financing operations, women can be less willing than men to apply for a loan. The greater risk aversion of women than men (Croson and Gneezy, 2009) can also lead women to reduce their loan applications in the presence of corruption. Both factors then increase the number of discouraged female borrowers because they perceive high corruption.

5.2 Addressing the endogeneity bias

Although we control for characteristics of entrepreneurs and firms, and for time-invariant unobservable country, sector, and year characteristics to mitigate the probability of endogeneity, our main finding can be misleading because of omitted variables or errors in measuring variables.

Corruption is a complex notion, and it is difficult to measure. The first measurements for corruption emerged in the 1990s (Heinrich and Hodess, 2011), and researchers continue to search for accurate methods to capture corruption. Therefore, measuring corruption with errors can be a source of endogeneity. Moreover, inaccurate estimations may occur because of omitted variables. For example, burdens of loan policies may affect corruption and discouraged borrowers, but these policies have not been controlled in the model. To mitigate these biases, we use the locality–sector average of corruption by referring to Fisman and Svensson (2007) and Qi and Ongena (2019). For each firm, this instrumental variable measures the mean of the “corruption variable” of all firms in the same locality and sector, excluding the firm. As Fisman and Svensson (2007) explain, the locality–sector average of corruption is determined by inherent characteristics of the locality–sector, for example, underlying technologies, rent-extraction talent, and inclinations of bureaucrats, which are exogenous to the firm. Hence, this instrumental variable can alleviate biases due to endogeneity.

Since *corruption* is a potential endogenous variable, its interaction with gender is an endogenous regressor as well. Following Wooldridge (2010, p. 235), we generate an instrumental variable for this interaction by using the product of the *locality–sector average of corruption* and *gender*.

We apply the two-stage least squares method (2SLS) to run the regressions. The correlations between *corruption*, *corruption* $\times$ *gender*, and the two instrumental variables are 0.46 and 0.62, respectively. The first stage regressions in Table 3 confirm that instruments are highly significant at 1% level to explain the endogenous variables for which they are a substitute. More important, all tests in Table 4 confirm that the instruments are relevant. Specifically, F-statistics in the first stage summary statistics are much higher than 10. Besides, Shea's partial R-square reveals that after control for all exogenous variables, the instrumental variables explain 6% for corruption and 18% for the interaction. Thus, instrumental variables play a fairly significant role in explaining the endogenous variables. Finally, the Cragg-Donald Wald F statistic is 535.961. It is much higher than Stock-Yogo critical values (7.03) to test for the validity of the instrumental variables (Stock and Yogo, 2005). Hence, we reject the hypothesis that instrumental variables are weak and use them as a substitute for the endogenous variables.

Table 3 reports the results with the instrumental variables. We confirm our finding that female entrepreneurs are more discouraged from applying for loans than male entrepreneurs are when the former perceive high corruption. This result proves that the gendered impact of corruption on discouraged borrowers is a causal effect rather than a simple correlation.

5.3 Testing the explanations

An explanation for our key finding may be that women behave differently from men to corruption because they are more honest and risk averse; however, both reasons are difficult to measure and then check, and they are not unique explanations. The available data allow us to test other explanations. Two channels can explain the gendered impact of corruption on discouraged borrowers. First, women entrepreneurs can be reluctant to apply for credit because they have less experience in managing corruption than men do, which hampers women from accessing credit when corruption is high. Second, gender inequality can increase the gender gap in credit demand in the presence of corruption.

The first explanation is related to experience: the greater discouragement of women to apply for credit in the presence of greater corruption is due to women having less experience than men. We have shown that female managers have less experience than male managers do. To investigate the hypothesis H2, we redo the estimations by considering the experience of the managers, with the variable *experience* defined as the number of years of experience in the sector for top managers (Table 5). First, we add *experience*, *experience* $\times$ *gender*, *experience* $\times$ *corruption*, and *experience* $\times$ *corruption* $\times$ *gender* in column (1). The interaction

term *experience*×*corruption*×*gender* provides information on how experience affects the financing behavior of female entrepreneurs in the presence of corruption. We observe a significant and positive coefficient for *corruption*×*gender* and a significantly negative coefficient for *experience*×*corruption*×*gender*. In other words, the greater experience of women entrepreneurs mitigates the probability that they are discouraged from credit application when perceiving high corruption.

Second, we split the sample at the median value of female entrepreneurs' years of experience and perform regressions on each subsample. This alternative approach allows us to investigate the influence of experience by mitigating multicollinearity resulting from a triple interaction term. Rather than examining the triple interaction term *experience*×*corruption*×*gender*, we compare the results for *corruption*×*gender* between both subsamples. The estimations are presented in column 2 for short-experience entrepreneurs and in column 3 for long-experience entrepreneurs. *corruption*×*gender* is significantly positive for short-experience entrepreneurs but not significant for long-experience entrepreneurs. This result corroborates the finding obtained with the triple interaction term that greater experience mitigates the discouragement of female borrowers in the presence of corruption.

Thus, these findings support H2 and provide evidence that the explanation for this key finding is that the greater discouragement of women to apply for credit in the presence of greater corruption is due to their having less experience than men.

The second explanation explains the influence of culture: gender equality can play a role in the gendered effect of corruption on the discouragement of borrowers. We examine the relevance of this explanation by considering the variable *gendergap* in the estimations. This variable is the Global Gender Gap Index from the World Economic Forum. This index examines the gap between men and women in access to resources and opportunities in a country by composing 14 different indicators. Its value ranges from 0 to 1, where 1 indicates equality and 0 is inequality. Table 6 displays the estimations.

We start by including *gendergap*, *gendergap*×*gender*, *gendergap*×*corruption*, and *gendergap*×*corruption*×*gender* in column (1). The interaction term *gendergap*×*corruption*×*gender* provides information on the influence of culture on the behavior of female entrepreneurs when perceiving corruption. In addition to the significant and positive coefficient for *corruption*×*gender*, we observe a significantly negative coefficient for *gendergap*×*corruption*×*gender*. This finding means that greater gender equality mitigates the discouraging impact of corruption on women when applying for a loan.

Next, we split the sample into two groups based on the median of the *gendergap* variable (i.e. low gender equality, high gender equality) and perform regressions on each subsample in columns (2) and (3) to check whether we obtain the same finding. We observe that *corruption*×*gender* is significantly positive for the subsample of countries with low gender equality but not significant for the subsample of countries with high gender equality. These results confirm the mitigating role of gender equality on the discouragement of female borrowers in the presence of corruption.

Hence, we have demonstrated support for H3, namely, gender equality reduces the probability that female entrepreneurs relative to male entrepreneurs are discouraged from applying for credit when they perceive more corruption.

We explain this result by following the social role theory of Eagly and Wood (2016). In countries that practice gender equality, women and men have equal opportunities to access resources, and one of these opportunities is access to credit sources. Women are less likely to be rejected than men because of their gender. Therefore, there is no significant difference between women and men in their loan applications. Moreover, gender equality seems to play an important role in mitigating corruption. Hence, in a society with higher gender equality, women may experience less pressure from corruption and thereby be less discouraged from applying for credit.

5.4 Robustness checks

We perform additional tests to check the robustness of our results by applying other measurements for the dependent variable and corruption, and by applying the estimation on panel data at a smaller sample size.

5.4.1 Applying other measures for the dependent variable

We check the relevance of the results obtained through two stricter measures for discouraged borrowers. In the main model, discouraged borrowers are defined as non-applicants who did not apply for credit because of complex application procedures, unfavorable interest rates, excessive collateral requirements, insufficient loan size and maturity, or fear of being rejected. Following Statnik and Vu (2020), we now apply a stricter approach and consider that only the last reason, fear of being rejected, indicates discouragement. We then use the variable *fear*, with a value of one if firms did not apply for a loan because of fear they would be rejected and zero if they did not apply for other reasons. When using this variable in the model, our results could be affected by sample selection bias due to excluding all applicants.

To overcome this issue, we use a Heckman selection model. The selection equation includes the same explaining variables as the main model in equation (1) and uses the variable *noapp*, defined as a dummy variable equal to one for non-applicants and zero for applicants.² The regression equation is observed only if *noapp* is equal to one. It includes the same explaining variables as the main model from equation (1) and adds Heckman's lambda.

The sign and the significance of *corruption*×*gender* in columns 1 to 3 of Table 7 are the same as those of the main findings. These results again confirm that female entrepreneurs are less likely to apply for credit when they perceive high corruption than their male counterparts are, and this effect is stronger in a high-corruption environment than in a low-corruption environment.

Another definition of “discouraged borrowers” can be obtained by considering firms that have a line of credit from a financial institution and did not apply for loans not because they have sufficient capital but because application procedures are complex, interest rates are unfavorable, collateral requirements are excessive, loan size and maturity are insufficient, or they do not think the application would be approved. When a firm has a line of credit from a financial institution, this element can prove its creditworthiness in the eyes of that institution. Therefore, we classify firms with lines of credit as good borrowers and use the measurement of discouraged borrowers as outlined. The dependent variable is given a value of one if the firm is considered to be a discouraged borrower and a value of zero if it applies for loans. The results in columns 4 to 6 in Table 7 are consistent with the main results and confirm our expectations.

By applying other measurements for the dependent variable, we are confident that our findings are not driven by how we capture discouraged borrowers.

5.4.2 Applying other measures for corruption

We use two alternative measures of corruption. In the main model, we consider *corruption* to be defined as a dummy variable equal to one if firms perceive corruption as a major or very severe obstacle and zero for a perception of no obstacle or a minor or moderate obstacle. We first use *corruption2*, which is a dummy variable equal to one if firms perceive corruption as a moderate, major, or very severe obstacle and zero for a perception of no obstacle or a minor obstacle. We then consider *corruption3*, which captures corruption at five different levels from one to five, where one is no obstacle and five is a very severe obstacle.

² As explained by Kai and Prabhala (2007, p. 45), “Strictly speaking, exclusion restrictions are not necessary in the Heckman selection model because the model is identified by non-linearity”. Hence, we use the same set of variables in our selection equation and regression equation.

We perform regressions with both these measures of corruption in Table 8. Our results confirm that corruption constrains more female than male managers from applying for loans and that this effect is stronger in a highly corrupt environment. Hence, the definition of the corruption variables does not affect our results.

5.4.3 Using panel data

Unobserved effects at firm level can be sources of endogeneity. To mitigate the endogeneity issue, we therefore redo our estimations by using panel data. We have observations from 26 countries where the Enterprise Surveys were conducted for the same firm in two different periods from 2012 to 2019. The dependent variable (*discouraged*) can receive a missing value in either one period or both because firms had sufficient capital and they did not apply for loans, so they are not discouraged borrowers. Therefore, we keep only firms for which the dependent variable is not a missing value for both periods. By doing so, we have a panel data of 334 observations in 22 countries. The list of countries is displayed in Appendix A.3

Using the panel data, we test our original model. We perform the random effects model because the two key independent variables, *corruption* and *gender*, have little changes over time. Moreover, the Hausman test for choosing between fixed effects and randoms effect also confirm that random effects is the preferred model.³

The interaction between *corruption* and *gender* in Table 9 is positive and highly significant. These estimations then provide additional support to our key finding that female entrepreneurs are more likely to be discouraged when they perceive high level of corruption.

6. Conclusion

This paper examines whether corruption discourages more female borrowers than male borrowers and thus contributes to increasing the gender gap in access to finance. To achieve this objective, we perform a cross-country investigation on a large dataset of firms.

Our key finding is that female borrowers are more discouraged by corruption to ask for credit than male borrowers. It supports the view that corruption increases the gender gap in access to finance and thus enhances gender inequality in participation in economic activity.

³ The fixed effects model provides the same conclusions.

We furthermore find evidence for two explanations for the gendered impact of corruption on borrower discouragement. First, women have less experience in management than men do and thus less such experience in managing corruption. This can enhance women's aversion to managing corrupt practices. Second, the degree of gender equality influences the gendered impact of corruption with greater discouragement for women associated with less gender equality.

Our work therefore provides new evidence that advances the understanding of what shapes the gender gap in access to finance. The institutional framework through the degree of corruption affects this gender gap, influencing the equal participation of women and men in economic activity. Our conclusion thus supports implementing policies against corruption that reduce the gender gap in access to finance.

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Table 1
Descriptive statistics of variables

This table summaries statistics of variables used in the models. The last column shows the significance of a two-sample t-test of a difference in means of variables between female and male entrepreneurs with equal variances. Definition of variables are provided in the Appendix A1. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

Variable	Obs	Mean	Std. Dev.	Min	Max	Female		Male		T-test
						Mean	Std.dev.	Mean	Std.dev.	
discouraged	19366	0.52	0.50	0	1	0.53	0.49	0.51	0.50	
corruption	19366	0.34	0.47	0	1	0.28	0.45	0.36	0.48	***
corruption1	16616	0.83	4.64	0	100	1.08	5.83	0.78	4.38	***
corruption2	19366	0.52	0.50	0	1	0.43	0.50	0.53	0.50	***
corruption3	19366	1.70	1.47	0	4	1.45	1.44	1.75	1.47	***
gender	19366	0.16	0.36	0	1					
experience	19366	17.94	10.79	1	70	16.85	10.03	18.15	10.92	***
AI1	19366	0.90	0.30	0	1	0.88	0.33	0.90	0.30	***
AI2	19366	0.46	0.50	0	1	0.43	0.50	0.47	0.50	***
city1m	19366	0.40	0.49	0	1	0.39	0.49	0.41	0.49	*
maincity	19366	0.48	0.50	0	1	0.47	0.50	0.49	0.50	
age	19366	18.40	14.70	0	190	17.35	13.18	18.60	14.95	***
size	19366	1.78	0.77	1	3	1.69	0.76	1.80	0.77	***
ffirm	19366	0.04	0.19	0	1	0.03	0.17	0.04	0.19	***
diexport	19366	7.29	21.34	0	100	8.22	22.87	7.12	21.04	***
tradecr	19366	45.11	35.49	0	100	45.53	37.04	45.03	35.20	
innovation	19366	0.22	0.41	0	1	0.20	0.40	0.22	0.41	***
certificate	19366	0.27	0.44	0	1	0.23	0.42	0.28	0.45	***
exteraudit	19366	0.55	0.50	0	1	0.45	0.50	0.57	0.49	***
creditline	19366	0.50	0.50	0	1	0.48	0.50	0.50	0.50	**
access	19366	0.25	0.44	0	1	0.24	0.43	0.26	0.44	*
gendergap	14118	0.67	0.04	0.51	0.79					

Table 2
Main estimations

This table presents the results of regressions examining the gendered impact of corruption on discouraged borrowers. Columns (1) and (2) test the effects for the whole data using OLS and logit models; columns (3) and (4) split the sample into 2 groups (high vs low corruption countries). Definitions of variables are provided in the Appendix A1. Robust standard errors in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	<i>Dependent variable = discouraged</i>			
	Whole data-OLS	Whole data-Logit	High-corruption	Low-corruption
	(1)	(2)	(3)	(4)
corruption	-0.010 (0.016)	-0.074 (0.114)	-0.031** (0.014)	0.047*** (0.014)
gender	-0.004 (0.011)	-0.036 (0.071)	-0.008 (0.014)	0.006 (0.013)
corruption × gender	0.043* (0.023)	0.315** (0.150)	0.078*** (0.022)	-0.050 (0.031)
experience	-0.001*** (0.000)	-0.008*** (0.003)	-0.001*** (0.000)	-0.001 (0.000)
AI1	-0.003 (0.020)	-0.085 (0.131)	0.000 (0.025)	-0.016 (0.015)
AI2	-0.069*** (0.011)	-0.434*** (0.068)	-0.063*** (0.011)	-0.078*** (0.025)
age	-0.000 (0.000)	-0.000 (0.002)	0.000 (0.000)	-0.000 (0.000)
size	-0.036*** (0.009)	-0.244*** (0.053)	-0.037*** (0.013)	-0.040*** (0.009)
ffirm	0.009 (0.016)	0.059 (0.109)	0.015 (0.019)	0.001 (0.028)
diexport	-0.000 (0.000)	-0.002* (0.001)	-0.000 (0.000)	-0.000 (0.000)
tradecr	-0.001** (0.000)	-0.005*** (0.002)	-0.001 (0.000)	-0.001*** (0.000)
innovation	-0.033** (0.012)	-0.248*** (0.089)	-0.029* (0.015)	-0.038* (0.020)
certificate	-0.022*** (0.006)	-0.176*** (0.046)	-0.014** (0.007)	-0.030** (0.011)
exteraudit	-0.059*** (0.015)	-0.422*** (0.110)	-0.068*** (0.021)	-0.042** (0.015)
creditline	-0.414*** (0.066)	-2.199*** (0.272)	-0.391*** (0.085)	-0.472*** (0.034)
access	0.019* (0.011)	0.117 (0.074)	0.007 (0.013)	0.046*** (0.012)
city1m	-0.014 (0.011)	-0.064 (0.069)	-0.015 (0.012)	-0.010 (0.027)
maincity	0.002 (0.013)	0.004 (0.096)	-0.011 (0.015)	0.027* (0.016)
constant	1.027*** (0.058)	3.433*** (0.336)	1.036*** (0.060)	0.809*** (0.060)
Sector FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Country FE	Yes	Yes	Yes	Yes
R ²	0.440		0.414	0.468
N	19,366	19,366	13,916	5,450

Table 3
Instrumental variable results

This table presents the instrumental variable results. Columns (1), (2) and (3) report the results from the second-stage and first-stage estimates for the whole data. Columns (4), (5) and (6) report the results for the group of high corruption countries, and columns (7), (8) and (9) report the results for the group of low corruption countries. Controls: *gender, experience, A11, A12, city1m, maincity, age, size, ffirm, diexport, tradecr, innovation, certificate, exeraudit, creditline, access* for the first stage regressions and exclude *gender* for the second stage regressions. Definitions of variables are provided in the Appendix A1. Robust standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	<i>Dependent variables</i>								
	<i>Discouraged corruption interaction</i>			<i>Discouraged corruption interaction</i>			<i>Discouraged corruption interaction</i>		
	High corruption			Low corruption					
	Second stage	First stage		Second stage	First stage		Second stage	First stage	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
corruption	-0.025 (0.107)			-0.072 (0.097)			0.256** (0.103)		
gender	-0.020 (0.019)			-0.025 (0.020)			-0.006 (0.024)		
corruption × gender	0.092* (0.053)			0.129*** (0.049)			-0.020 (0.073)		
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Locality-sector average of corruption		0.538*** (0.152)	-0.045** (0.017)		0.594*** (0.170)	-0.036** (0.019)		0.307*** (0.081)	-0.075*** (0.016)
Locality-sector average of corruption × gender		-0.018 (0.042)	0.787*** (0.055)		-0.038 (0.046)	0.778*** (0.071)		0.040 (0.055)	0.813*** (0.066)
Countr FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.442	0.252	0.418	0.414	0.263	0.420	0.442	0.234	0.422
N	18,885	18,885	18,885	13,602	13,602	13,602	5,283	5,283	5,283

Table 4
Weak instrument tests

These tables present the results of weak instrument tests for two endogenous variables *corruption* and the interaction between *corruption* and *gender*. Two instrumental variables are *locality-sector average of corruption* and *locality-sector average of corruption* $\times$ *gender*.

First-stage regression summary statistics

Variable	R-sq.	Adjusted R-sq.	Partial R-sq.	Robust F(4,53)	Prob > F
corruption	0.2521	0.2466	0.0545	13.5192	0.0000
corruption $\times$ gender	0.4182	0.4139	0.1648	113.476	0.0000

(F statistics adjusted for 68 clusters in country)

Shea's partial R-squared

Variable	Shea's Partial R-sq.	Shea's Adj. Partial R-sq.
corruption	0.0605	0.0535
corruption $\times$ gender	0.1831	0.1769

Minimum eigenvalue statistic = 535.961

Critical Values	# of endogenous regressors:	2
Ho: Instruments are weak	# of excluded instruments:	2

	5%	10%	20%	30%
2SLS relative bias	(Not available)			
	10%	15%	20%	25%
2SLS Size of nominal 5% Wald test	7.03	4.58	3.95	3.63
LIML Size of nominal 5% Wald test	7.03	4.58	3.95	3.63

Table 5
Interaction of gender, corruption, and experience of the top managers

This table presents the results of regressions examining the impact of the interaction of *Gender*, *Corruption* and *Experience* on discouraged borrowers. Column (1) tests this interaction for the whole data; columns (2) and (3) split the sample into 2 groups at the median value of *experience*. Controls: *AI1*, *AI2*, *city1m*, *maincity*, *age*, *size*, *ffirm*, *diexport*, *tradecr*, *innovation*, *certificate*, *exteraudit*, *creditline*, *access*. Definitions of variables are provided in the Appendix A1. Robust standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Dependent variable = <i>discouraged</i>		
		Short experience	Long experience
	(1)	(2)	(3)
corruption	-0.025 (0.029)	-0.014 (0.020)	-0.008 (0.016)
gender	-0.029 (0.025)	0.003 (0.017)	-0.013 (0.016)
experience	-0.001** (0.001)	0.002 (0.002)	-0.001 (0.001)
corruption × gender	0.144*** (0.036)	0.082*** (0.025)	0.012 (0.028)
experience × gender	0.002 (0.001)		
experience × corruption	0.001 (0.001)		
experience × corruption × gender	-0.006*** (0.002)		
Controls	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
R ²	0.440	0.404	0.452
N	19,366	9,801	9,565

Table 6
Interaction of gender, corruption, and gender equality

This table presents the results of regressions examining the impact of the interaction of *Gender*, *Corruption* and *Gendergap* on discouraged borrowers. Column (1) tests this interaction for the whole data; columns (2) and (3) split the sample into 2 groups at the median value of *gendergap*. Controls: *AI1*, *AI2*, *city1m*, *maincity*, *age*, *size*, *ffirm*, *diexport*, *tradecr*, *innovation*, *certificate*, *exteraudit*, *creditline*, *access*. Definitions of variables are provided in the Appendix A1. Robust standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Dependent variable = <i>discouraged</i>		
	(1)	Inequality (2)	Equality (3)
corruption	-0.166 (0.298)	-0.034* (0.018)	0.008 (0.011)
gender	-0.196 (0.245)	-0.009 (0.012)	-0.002 (0.013)
gendergap	-0.983 (0.792)		
corruption × gender	0.746** (0.333)	0.079** (0.028)	0.019 (0.026)
gendergap × gender	0.293 (0.372)		
gendergap × corruption	0.261 (0.427)		
gendergap × corruption × gender	-1.070** (0.494)		
Controls	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Country FE		Yes	Yes
R ²	0.380	0.352	0.468
N	14,118	7,119	12,247

Table 7
Other measurements for discouraged borrowers

This table presents the results of regressions examining the gendered impact of corruption on discouraged borrowers by using other measurements for discouraged borrowers. Column (1) applies Heckman selection model to test the effect for the whole data. Columns (2) and (3) apply the same method and test on two separate groups (high vs low corruption countries). Columns (4), (5) and (6) apply OLS and measure discouraged borrowers by a stricter way. Column (4) tests the effect for the whole data; columns (5) and (6) split the sample into 2 groups (high vs low corruption countries). Controls: *experience*, *AI1*, *AI2*, *city1m*, *maincity*, *age*, *size*, *ffirm*, *diexport*, *tradedcr*, *innovation*, *certificate*, *exteraudit*, *creditline*, *access* for the regressions in columns (1) to (3); and without *creditline* for the regressions in columns (4) to (6). Definitions of variables are provided in the Appendix A1. Robust standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Dependent variable = <i>fear</i>			Dependent variable = <i>discouraged1</i>		
		High corruption	Low corruption		High corruption	Low corruption
	(1)	(2)	(3)	(4)	(5)	(6)
corruption	-0.007*** (0.002)	-0.012*** (0.003)	0.011** (0.005)	-0.011 (0.024)	-0.026 (0.030)	0.022 (0.013)
gender	-0.006* (0.003)	-0.005 (0.004)	-0.006 (0.006)	-0.028** (0.013)	-0.019 (0.015)	-0.038** (0.017)
corruption × gender	0.014** (0.006)	0.019*** (0.007)	-0.004 (0.012)	0.053** (0.026)	0.065** (0.031)	0.015 (0.033)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Lambda	0.029** (0.013)	0.042*** (0.016)	0.001 (0.026)			
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
R ²				0.308	0.356	0.126
N Censored	9,355	5,989	3,366			
N Uncensored	29,737	22,817	6,920			
N	39,092	28,806	10,286	11,618	7,816	3,802

Table 8
Other measurements for corruption

This table presents the results of regressions examining the gendered impact of corruption on discouraged borrowers by using other measurements for corruption. Columns (1) and (4) test the effect for the whole data; columns (2), (3), (5) and (6) split the sample into 2 groups (high vs low corruption countries). Controls: *experience*, *A11*, *A12*, *city1m*, *maincity*, *age*, *size*, *ffirm*, *diexport*, *tradecr*, *innovation*, *certificate*, *exeraudit*, *creditline*, *access*. Definitions of variables are provided in the Appendix A1. Robust standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	(1)	Dependent variable = <i>discouraged</i>				
		High-corruption	Low-corruption	High-corruption	Low-corruption	
		(2)	(3)	(4)	(5)	(6)
corruption2	-0.005 (0.010)	-0.014 (0.012)	0.012 (0.015)			
gender	-0.006 (0.014)	-0.009 (0.018)	-0.005 (0.016)	-0.013 (0.014)	-0.021 (0.017)	0.000 (0.017)
corruption2 × gender	0.034** (0.016)	0.053*** (0.019)	-0.007 (0.025)			
corruption3				-0.002 (0.004)	-0.009** (0.004)	0.011** (0.005)
corruption3 × gender				0.015** (0.007)	0.023*** (0.007)	-0.006 (0.010)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.440	0.414	0.466	0.440	0.414	0.467
N	19,366	13,916	5,450	19,366	13,916	5,450

Table 9
Robustness check by using panel data

This table presents the results of regressions examining the gendered impact of corruption on discouraged borrowers by using panel data. Controls: *experience*, *A11*, *A12*, *city1m*, *maincity*, *age*, *size*, *ffirm*, *diexport*, *tradecr*, *innovation*, *certificate*, *exteraudit*, *creditline*, *access*. Definitions of variables are provided in the Appendix A1. Robust standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	<i>Dependent variable = Discouraged</i>
	panel data
corruption	-0.112** (0.052)
gender	-0.101 (0.068)
corruption × gender	0.261*** (0.093)
Controls	Yes
Sector FE	Yes
Year FE	Yes
Country FE	Yes
N	334
N of groups	167

Appendix A1

Definitions of variables

Name	Definition	Source
DEPENDENT VARIABLES		
discouraged	Dummy =1 for discouraged borrowers and 0 for applicants	ES
discouraged1	Dummy=1 for discouraged borrowers who have credit lines and 0 for applicants	ES
fear	Dummy=1 for non-applicants who did not think their application be approved and 0 for other non-applicants	ES
INDEPENDENT VARIABLES		
<i>Corruption</i>		
corruption	Dummy =1 if corruption is major obstacle or very severe obstacle and 0 otherwise	ES
corruption1	Percentage of sales paid as informal payment	ES
corruption2	Dummy =1 if corruption is moderate, major obstacle or very severe obstacle and 0 for otherwise	ES
corruption3	Degree of corruption affecting to a firm's operation	ES
<i>Entrepreneur characteristics</i>		
gender	Dummy=1 if top managers are female and 0 otherwise	ES
experience	Number of years of experience in the sector for top managers	ES
<i>Firm characteristics</i>		
AI1	Dummy =1 if firms have a checking or savings account and 0 for otherwise	ES
AI2	Dummy =1 if firms have an overdraft facility and 0 for otherwise	ES
city1m	Dummy = 1 if firm located in city with population over 1 million	ES
maincity	Dummy = 1 if firm located in main business city	ES
age	Firm age measured by number of year establishment operates	ES
size	Firm size measured by number of employees: small (5-19), medium (20-99) and large (>100)	ES
ffirm	Dummy =1 if percentage of firm owned by foreigners is greater than 50% and 0 for otherwise	ES
diexport	Direct export as a percentage of sale	ES
tradecr	Proportion of total annual purchases of material inputs purchased on credit	ES
innovation	Dummy =1 if firms spent on formal research and development activities and 0 for otherwise	ES
certificate	Dummy =1 if firm got internationally recognized quality certification	ES
exteraudit	Dummy =1 if firms' annual financial statements are checked and certified by an external auditor	ES
creditline	Dummy = 1 if firms have a line of credit or loan from a financial institution	ES
<i>Firms perception about the operating environment</i>		
access	Dummy =1 if access to finance is major obstacle and very severe obstacle and 0 for otherwise	ES
<i>Country level variables</i>		
gendergap	Gender gap Index	WEF

Appendix A2

List of countries in the sample

Countries in the sample	
Albania	Lesotho
Argentina	Macedonia, FYR
Armenia	Malaysia
Azerbaijan	Mauritania
Belarus	Moldova
Bolivia	Mongolia
Bosnia and Herzegovina	Montenegro
Bulgaria	Morocco
Cambodia	Myanmar
Cameroon	Namibia
China	Nicaragua
Colombia	Nigeria
Côte d'Ivoire	Pakistan
Croatia	Papua New Guinea
Czech Republic	Paraguay
Djibouti	Peru
Dominican Republic	Philippines
Ecuador	Romania
Egypt	Russia
El Salvador	Serbia
Georgia	Slovakia
Ghana	Solomon Islands
Greece	Sudan
Guatemala	Swaziland
Honduras	Thailand
Hungary	Timor-Leste
India	Tunisia
Indonesia	Turkey
Israel	Ukraine
Jordan	Uruguay
Kazakhstan	Uzbekistan
Kosovo	Vietnam
Laos	Yemen
Lebanon	Zambia

Appendix A3

List of countries in the panel data

Countries in the panel data

Albania
Armenia
Azerbaijan
Belarus
Bosnia and Herzegovina
Bulgaria
Croatia
Czech republic
Egypt
Georgia
Kosovo
Lebanon
Mongolia
Montenegro
Morocco
Myanmar
Romania
Russia
Serbia
Turkey
Ukraine
Uzbekistan