Gender-Based
Credit Constraints and Firm
Performance in Cameroon

Tabi Atemnkeng Johannes
and
Ndam Romanus Adze

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Bringing Rigour and Evidence to Economic Policy Making in Africa

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By

Tabi Atemnkeng Johannes
University of Buea, Cameroon
and
Ndam Romanus Adze
University of Douala, Cameroon

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Abstract

This paper revisits the empirical literature on gender and access to formal finance by enterprises and examines the effect of financial constraints on firm performance in Cameroon. Existing literature on the importance of gender of the firm's owner as a determinant of the firm's access to finance is clouded with mixed findings. Based on the objective measure of access to finance variable where firms are constrained if they applied and were refused, including those that did not apply because they expected to be refused. The analysis finds evidence that female-owned firms are less likely to be credit-constrained once sample selection bias is accounted for. Furthermore, unobservable heterogeneity does not explain gender difference in access to finance while using a two stage least squares regression, no significant gender gap in firm performance between male- and female-owned companies was found, though financial constraint render firms to be less efficient.

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Key words: Lending Discrimination, Entrepreneurship, Gender, Performance, Cameroon

Acknowledgements

1. Introduction

Entrepreneurial activities by women have attracted a considerable amount of interest among policy makers and researchers. The existing empirical evidence specifically suggests that lack of access to financing is one of the most important constraints to firm growth and efficiency (Beck and Demirgüç-Kunt, 2006; Nkurunziza, 2010; Stein et al, 2010; Tabi and Fomba, 2013). But access to credit and therefore firm creation and growth of women-owned firms is constrained by, among others, distortions in the financial markets, especially high collateral requirements and poorly designed and enforced property rights (ILO, 2011). Female entrepreneurs still have limited access to credit in Cameroon. The Cameroon Households Survey demonstrated that female entrepreneurs are mostly affected by lack of business or production loan. Precisely, the weak production financing access of female entrepreneurs in Cameroon decreased from 4% in 2001 to 3.4% in 2011. In contrast, male entrepreneurs' access to production financing increased from 12% in 2001 to 14% in 2011 (Kame et al, 2016). This financial constraint encountered by female entrepreneurs can be explained by the shallowness of financial system (IMF, 2013; 2014) and could therefore have far reaching implications to macroeconomic outcomes and economic development. Female entrepreneurs access to credit matters as an instrument for development as it enhances economic efficiency and improves macroeconomic outcomes in several ways (Berik et al, 2008; Damiano and Mwakubo, 2014). There is a need for governments to revisit microeconomic (the so called second-generation) reforms needed to stimulate private sector development by improving the business environment and investment climate to facilitate firm entry, growth and survival. These reforms are particularly important given that benefits from trade liberalization come primarily from new firms and new products (Fafchamps et al, 2011). Entrepreneurship is a determining factor on the growth of nations. There has been a growing awareness since the early 1970s that small and medium size enterprises (SMEs) are important for economic growth. The societal significance of the entrepreneurial process is the creation of job- and wealth-creating organizations, primarily enacted through creation of organizations (Tabi and Fomba, 2013). Thus, keeping out female entrepreneurship from the mainstream economy may have far reaching consequences.

It has been hypothesized that observed gender differences in entrepreneurial performance may stem from discrimination against female entrepreneurs in accessing finance. Gender discrimination in credit markets is defined as the economically

unjustified awarding of inferior credit conditions to female borrowers (Becker, 1971; Phelps, 1972; Arrow, 1973). As earlier indicated, lack of credit is one of the principal impediments faced by female entrepreneurs in Cameroon. In many cases, distortions and discrimination in the credit market restrict women's options for decent job creation, and entrepreneurship remains low (Government of Cameroon, 2009).

This paper studies gender and access to formal finance by firms in Cameroon and relates to existing studies on gender gap in access to credit and performance. The literature on gender and access to formal finance and on whether gender of the entrepreneur affects performance of the enterprise both yield mixed results. While these two strands of literature are voluminous, there are reasons why further research can provide new insights. Specifically, the research questions and hypotheses formulated here are to answer the following questions: 1) Are female-owned firms more financially constrained than male-owned firms: 2) Is there a performance gap between male- and female-owned companies and, if so, does credit constraint matter? To answer these questions, we use the World Bank Enterprise data and unlike existing research on gender and access to formal finance, we test alternative explanations using a panel dimension of the dataset that allows us to explore the role of observed and unobserved individual heterogeneity in explaining the difference in access to finance observed among female- and male-owned firms.

The results contradict existing studies on the evidence of gender discrimination in access to formal credit in favour of male-owned firms and corroborate other studies (for example Fowowe, 2017) that shed light on the views that firms that are credit-constrained perform poorly than firms which are not credit-constrained. The results lend support to the view that financing is very important for firm performance and from the efficiency point of view, firms may be less efficient when subjected to financial scarcity. But we argue that unobserved individual firm heterogeneity may be driving access to credit and the performance gap. The latter result relates to some studies that report on a field experiment providing random grants to microenterprise owners where female microenterprise owners had returns to capital that were dramatically lower than male entrepreneurs, and in many instances zero or even negative (de Mel et al, 2009; Banerjee et al, 2010, and Karlan and Zinman, 2010; and Fafchamps et al, 2011) contrary to expectations that women would experience larger increases in income because women are generally seen as being more credit-constrained in low income countries and should grow rapidly when given additional capital.

The rest of the paper proceeds as follows: The next section presents a review of the literature. Section 3 contains a description of the dataset. The conceptual and empirical modelling framework is devoted to section 4 while discussion of descriptive statistics and econometric results is done in section 5, while section 6 concludes.

2. Literature review

This paper relates to a growing literature on the gender gap in access to credit which signifies discrimination. Discrimination arises when terms of transactions are influenced by personal characteristics of the participants that are not relevant to the transaction (Blanchflower, Levine and Zimmerman, 2003). This narrow definition corresponds to the intuition of a double-standard lending practice and is close in spirit to Becker's definition of "taste-based" discrimination (Becker, 1971). In the classical model of discrimination by Becker (1971), discrimination arises due to the taste-based preferences of the lender, who is willing to pay a price in order not to be associated with certain groups of borrowers. Becker also notes that such discrimination tends to vanish with competition among lenders as they are no longer able to bear the cost of the non-economically motivated choices. The alternative statistical model of discrimination suggests that as long as borrowers' demographic characteristics are correlated with their creditworthiness, lenders may use the former as a proxy for the risk factor associated with loans. This is the case when lenders cannot observe the risk factors or do not collect relevant information due to the cost involved (Phelps, 1972; Arrow, 1973). Importantly, the economic effects of the two types of discrimination need not be the same; statistical discrimination of minorities, for example, may be consistent with profit maximization by lenders while Becker-type discrimination is not.

There is some empirical evidence on gender discrimination in formal and traditional financial markets. A strand of literature finds no discrimination in access to finance; that is, women are as likely to access credit compared to their male counterparts (Bruhn, 2009; Cavalluzzo and Cavalluzzo, 1998; Blanchflower et al, 2003; Storey, 2004; Cavalluzzo and Wolken, 2005; Zimmerman and Scott, 2006). This suggests that gender differences in use of credit might be explained by differences in the demand for external financing (Buvinic and Berger, 1990; Aguilera-Alfred, Baydas, and Meyer 1994; Baydas, Meyer, and Aguilera-Alfred, 1994; Coleman, 2000, 2002; Carter and Shaw, 2006). Further evidence from Asia and Africa finds that women entrepreneurs are more likely than men to rely on internal or expensive informal financing when formal funding is unavailable (Rose, 1992; Richardson, Howarth and Finnegan, 2004). Importantly, these studies do not find explicit discrimination against female borrowers.

Others document that women-owned firms are disadvantaged. For example, women are less likely to get financing from formal and informal financial institutions or are charged higher interest rate than men (Klapper and Parker, 2010; Muravyev,

et al, 2009; Aidis et al, 2007; Brush, et al, 2004; Cavalluzzo et al, 2002). Looking at informal or traditional financial markets, the following studies could be cited. Alesina, Lotti, and Mistrulli (2013) used a unique and large dataset on loan contracts between banks and micro firms in Italy and found that women pay higher interest rates despite the fact that they exhibit a lightly better credit history. Women are kept being more credit-constrained than men by micro finance institutions - MFIs (Berger, Hasan and Zhou, 2009; Fletschner, 2009). Built on a unique database from Brazilian microfinance institutions over an 11-year period, Agier and Szafarz (2013) detected no discriminatory practice in the approval rate but uncovered a gender gap in loan size. They concluded that glass ceiling effect was greater for female borrowers than for male borrowers. These results suggest discrimination against female entrepreneurs, and such discrimination is found to be higher in the least financially developed countries in the region.

Recently, more results on the gender gap in access to credit have been published but still with mixed conclusions (Bardasi, Sabarwal, and Terrell, 2011; Aterido, Beck, and Iacovone, 2013; Hansen and Rand, 2011; Hallward-Driemeier and Gajigo, 2013; Asiedu et al, 2013). However, differences may have occurred due to definitions of financing constraints used. No evidence of gender discrimination in credit in Sub-Saharan Africa including Eastern Europe and Central Asia and Latin America was found (Bardasi, Sabarwal, and Terrell, 2011; Aterido, Beck, and Iacovone, 2013) though the latter examined how the gender of the firm's owner affects the firm's use of financial services. Hallward-Driemeier and Gajigo (2013) provide only anecdotal evidence on gender gap in access to credit. In addition, WDR (2011) documents that female entrepreneurs in Africa are as likely to access credit compared to their male counterparts, indicating that Sub-Saharan Africa credit markets may be different in terms of gender discrimination. Aterido, Beck, and Iacovone (2013) find the existence of an unconditional gender gap in Sub-Saharan Africa. However, when key observable characteristics of the enterprises or individuals are considered, the gender gap disappears. In the case of enterprises, they explain their finding with differences in key characteristics and a potential selection bias. In the case of individuals, the lower use of formal financial services by women can be explained by gender gaps in other dimensions related to the use of financial services, such as their lower level of income and education, and by their household and employment status.

Redefining "constrainedness" by excluding firms that currently have a bank loan, overdraft facilities, or financed recent investments using formal loans which reduces the share of constrained firms, Hansen and Rand (2011) examined gender credit constraint gap by decomposing the difference in the probability of being credit constrained, by using a generalized Blinder-Oaxaca decomposition and indicated that the credit gap is mostly due to differences in the unexplained component than observable characteristics, with female firms less likely to be credit constrained compared to their male-counterparts. This result is contrary to the conclusions reached in Muravyev et al (2009) and Asiedu et al (2013). In Central and Eastern European (and a few Western European and Asian) countries, Muravyev et al (2009)

find credit discrimination against women at lower levels of financial development. However, due to missing information in the dataset, the analysis in Muravyev et al (2009) does not take into account the fact that firms not applying for formal bank loans are not necessarily financially constrained. Female owners may be less likely to apply and get formal credit without being more constrained if they are, for example, more likely to operate smaller businesses or in sectors with an innate lower demand for external financing or if female entrepreneurs are more likely to have access to non-bank credit than their male counterparts. Asiedu et al (2013) confirm that female-owned firms in Sub-Saharan Africa are more likely to be financially constrained than male-owned firms but found no evidence of discrimination in the other developing regions. However, their definition of credit-constrained status for firms was done using perceptions data based on answers to the survey question such as "to what degree is access to finance an obstacle to the current operations of this establishment?"

Finally, Ongena and Popov (2016) established a causal link from gender bias to credit access by extracting an exogenous measure of gender bias from survey responses by descendants of U.S. immigrants on questions about the role of women in society. They find that in high gender-bias countries, firms owned by females have lower access to bank credit than otherwise similar firms owned by males. This phenomenon is fully explained by the fact that in high gender-bias countries, female entrepreneurs are more likely to opt out of the formal credit granting process, largely because they believe that their loan application will be denied. In contrast, there are no statistical differences between female- and male-owned firms in loan rejection rates or in the terms of granted loans, such as rates or collateral required by the bank.

The second related strand of literature relates to credit market and firm performance. Observed differences in entrepreneurial performance by gender may be due to discrimination against female entrepreneurs in accessing finance (Bardasi, Sabarwal, and Terrell, 2011). There is broad agreement among researchers that in both industrialized and developing countries, women entrepreneurs earn less income than male entrepreneurs. In general, women and men-owned enterprises differ in terms of size. Evidence from the U.S. suggests that, on average, men-owned businesses are twice as large as women-owned businesses in terms of both sales and assets (Coleman, 2007). On average, employer-firms owned by women generate only 78% of the profits generated by comparable male-owned businesses (Robb and Wolken, 2002). Also, women generate less sales turnover relative to men, even in the same industry (Loscocco and Robinson, 1991; Chagnati and Parasuraman, 1996). It should be acknowledged that the evidence on inferior women entrepreneurial performance is not unanimous. It is true that some studies have found similar survival and growth rates for male- and female-owned businesses (Kalleberg and Leicht, 1991; Westhead and Cowling, 1995; Storey 2004), but these studies are the exception rather than the rule.

In developing countries, randomized controlled trials (RCT) studies conducted in Sri Lanka, India, the Philippines and Ghana have cast doubt on the ability of capital alone to grow female-operated microenterprises. The papers reported that female

microenterprise owners had returns to capital that were dramatically lower than male entrepreneurs—in many instances zero or even negative (de Mel et al, 2009; Banerjee et al, 2010, Karlan and Zinman, 2010; and Fafchamps et al, 2011). Their expectations were that women would experience larger increases in income because women are generally seen as being more credit-constrained than men in low income countries and should therefore grow rapidly when given additional capital. Nevertheless, the current state of the literature does not clearly reveal whether gender performance gap in entrepreneurship is primarily attributable to credit-constraint or voluntary choices by women entrepreneurs or unobserved individual heterogeneity.

There is ample evidence that when women are fully involved in entrepreneurship, there are significant macroeconomic gains (Kame et al, 2016). Productivity differentials among companies owned by men and by women have been found to be mainly the result of differences in access to productive inputs (Muravyev et al, 2009). A reduction of this productivity gap through equal access to productive resources yields considerable output gains (Revenga and Shetty, 2012). This implies that with equal credit access, the firm performance gap may be attributed not to available financial resources but to other factors. Just like legal and cultural norms have a big impact on the chance of women getting equal (or any) access to financial services, one of the major problems of female-owned enterprises is that of management and governance, which is generally attributed to education, training and socio-cultural influences.

It has been observed that economic behaviours and entrepreneurial spirits are largely influenced by cultural values since coordination and management styles are dictated by social interest. According to Brush et al (2004), most research suggests that cultural barriers, especially the desire to avoid the "glass ceiling", positively influence women to become business owners. However, these cultural barriers may also be an impediment to achieving entrepreneurial goals. If women are not taken as seriously, then it becomes more challenging for them to gain social and financial capital necessary for their business ventures despite their human capital levels and solid strategic plans. Ongena and Popov (2016) also find that female-owned firms do not underperform male-owned firms in terms of sales growth, even when not obtaining credit or when based in high gender-bias countries, alleviating concerns that results are driven by statistical discrimination. The findings suggest that culture may limit credit access of firms owned by females through a mechanism of self-selection out of the credit granting process. Once the credit application is made, similar approval rates and loan terms suggest that female-owned firms are assessed to be identical to male-owned firms, and this assessment is correct because their credit worthiness also turns out to be statistically similar (Ongena and Popov, 2016).

Fowowe (2017) brought in some new light to the literature on finance firm performance by examining how access to finance and other constraints affect firm performance, which relates to several studies, but his central focus differs slightly from previous ones where the effects of financing constraints rather than access to finance on the performance of firms is investigated.

This paper makes the following contributions to the two strands of literature presented here. First, most of the extant literature used alternative modelling: gender gap in the use of financial services or access to credit taking into account selectivity bias or running model with sample selection (Muravyev et al, 2009; Bardasi, Sabarwal, and Terrell, 2011; Aterido, Beck, and Iacovone, 2013) while others directly run a model of the determinants of firms' financing constraints with the gender of the firm's owner as a factor of firms' financing constraints (Muravyev et al, 2009; Hansen and Rand, 2011; Hallward-Driemeier and Gajigo 2013; Asiedu et al, 2013) but with differing definitions of financially constrained firms. The other possibility is to point to a self-selection of female entrepreneurs out of the loan application process, which involved a classification of firms into constrained and unconstrained and then running separate regressions (see for example, Alesina, Lotti, and Mistrulli, 2013; and Ongena and Popov, 2016). Little or no study has explored the role of unobservable heterogeneity and therefore unlike ours was unable to relate access to credit to unobservable heterogeneity which can explain the difference in access to finance. In this paper, we test this alternative explanation using a panel identity of the dataset that allows us to explore the role of observed and unobserved individual heterogeneity in explaining the difference in access to finance observed among female and male-owned firms.

Secondly, we determined the effect of credit constraint or discrimination on gender-gap in firm performance relating to Fowowe (2017) where gender gap is observed from the coefficient of the dummy variable for female ownership (Bardasi, Sabarwal, and Terrell, 2011; Ongena and Popov, 2016). We argue that the difference in performance between female- and male-owned firms can be related to discrimination in access to credit, with access to credit being one channel while unobserved heterogeneity is another one through which gender bias can depress the performance of female entrepreneurship.

3. Empirical strategies

The methods of analysis in this study involve a model of gender discrimination in access to formal credit and a model of credit constraint and differentials between male and female entrepreneurial performance. In this sense, we identify credit constrained firms following the definitions of Bigsten et al (2003) and Byiers et al (2010), including Hansen and Rand (2011).

We identify firms that are constrained due to failures/imperfections in capital markets as being discriminated in the credit market. Thus, firms are defined as "unconstrained" in the credit market if they state that they do not wish to obtain external funds (i.e. no credit demand) or that they were able to obtain a loan. Those that applied and were refused, including those that did not apply because they do not want to incur transactions costs if they suspect they will not obtain any loans, are considered "constrained". This latter category comes from some of the firms that provided the following responses for not applying: Application procedures for loans or lines of credit are complex; collateral requirements are too high; size of loan and maturity are insufficient; did not think it would be approved; and interest rates not favourable. However, this latter group, according to Bigsten et al (2003), is more problematic because it suggests that they are not willing to pay current prices, so that they can hardly be considered rationed. Nevertheless, they could be facing the increasing part of the supply curve due to monitoring cost, making credit too expensive for them. In this case, they are indeed suffering the consequences of market imperfections. Since we aim to focus more on rationed groups at given interest rates, we include the group reporting high interest rates as the reason for not applying, as belonging to the "unconstrained, no credit demand" group' (Bigsten et al, 2003). As noted in Bigsten et al (2003), defining credit constraint brings in the notion of potential "loan rationing", i.e. firms are identified whether they would have liked a loan but could not get one (type II rationing). Here, cases of "size rationing" (type I rationing) cannot be accounted for in which firms borrow less than desired or firms that are facing higher interest rate costs due to monitoring costs imposed following the credit market informational asymmetries. Precisely, a strict definition of credit constraints is used (Bigsten et al, 2003).

Modelling gender and access to credit

The first research question is whether male and female borrowers have equal chances of getting funds, holding loan terms and all observable characteristics equal. Based on

the discrimination theory, discrimination in the financial market may emerge either because of imperfect information about the borrowers' quality that leads to statistical discrimination (Phelps, 1972; Arrow, 1973), or because of distaste or prejudice that leads to taste-based discrimination (Becker, 1971). Both types of discrimination imply that if gender discrimination exists in the lending market, borrowers of a particular gender have to pay more favourable terms than the other particular gender, ceteris paribus. In other words, the chances of funding success may be different for male and female borrowers if they offer the same loan terms and have the same observable personal characteristics. However, imperfect information about the borrowers' quality may stem from unobserved ability innate in the gender of ownership structure.

We run an ordinary least squares regression corroborating the methodology of Asiedu et al (2013), though with some modification. We differ in that the latter's definition of credit constraint is based on perception data where financing constraints was measured from the answers to survey question such as: "to what degree is access to finance an obstacle to the current operations of this establishment?" where five possible answers are: not an obstacle, minor obstacle, moderate obstacle, major obstacle, and very severe obstacle. With several features of the data such as the categorical nature of their dependent variable, they made two substantial contributions to the literature. First, this was the first study to investigate whether female-owned firms are more credit constrained than male-owned firms. Second, the study extends the empirical literature by examining whether firms in Sub-Saharan African countries face more credit constraints than in other regions, and whether women-owned firms in SSA are more credit constrained than male-owned firms. In this paper, we run pooled ordinary least squares regression taking into account unobserved heterogeneity which can explain differences in access to credit, while easily correcting for heteroskedasticity in Stata by using the robust option. Our definition of credit constraint differs from that of Asiedu et al (2013), considering that credit constraint studies may be subject to selection bias since not all enterprises have credit demand. Here, firms are classified into the different categories of constrained and not constrained, with such variable representing the dependent variable and our equation takes the following form:

$$z_i = \alpha + x'_{1it}\beta_1 + x'_{2i}\beta_2 + \lambda\,female_i + \mu_{it} \tag{1}$$

Where, z_i is a binary variable which equals 1 if firm i faces credit constraint or 0 when unconstrained, and μ_{it} is the error term while x'_{1it} and x'_{2i} are vectors of time-variant and time-invariant characteristics, respectively. In this model, it is assumed that female ownership changes over time as suggested by the data, and can be merged into x'_{1it} although some of this change may be due to sampling error. A potential limitation of this methodology is that there may be an omitted variable bias; that is, access to credit may depend on unobserved heterogeneity. For example, firms in a location are likely to benefit from certain economies which are not easily observed. It

has been argued that preference gaps can also arise in industry selection, and when comparing the performance of male and female entrepreneurs at the macro-level, it becomes imperative to take into account their relative sectoral concentrations since female entrepreneurs are disproportionately concentrated in the small scale sector, which might explain existing gender gaps in entrepreneurial performance, at least in part (Bardasi, Sabarwal, and Terrell, 2011). Women may also be clustered in a narrow range of low investment and low profit activities for the local market. Lastly, spatial heterogeneities among locations, such as the uneven distribution of immobile resources, supply of transport infrastructure, and large markets may also create a variety of comparative advantages.

Most important in the equation are dummies describing the gender of firm ownership. In terms of the debate as to whether or not female-owned firms are credit constrained, the interpretation of the effects of these dummy variables is of paramount importance. The nature of data enables us to pose the question in the following form: if we include a wide range of variables which control for the heterogeneity of firms in the sample, is it still true that access to credit is related to the gender of ownership? Another econometric issue in addition to our controls for the heterogeneity of the firms is a selectivity problem posed for those obtaining the credit. To address these two econometric issues, we follow an approach that allows for both unobserved heterogeneity and selectivity.

To control for unobservable differences in access to credit, consider the following equation that modifies Equation 1 assuming that the unobserved fixed effect is embedded in $x_{2i}^{'}$ which becomes θ_i :

$$z_{it} = W`_{it} \beta + \theta_i + \delta_t + \varepsilon_{it} \tag{2}$$

In Equation 2, $W`$ is a vector of time-varying covariates including the dummy for female ownership and $\theta_i$ is a vector of time-invariant covariates, $\delta_t$ are time dummies and $\varepsilon_{it}$ is a random error term that is assumed to be independent of $W`$. The complication is the addition of the unobserved variable θ_i, which is assumed to be correlated with the dummy for female ownership, and hence with the observed regressors, $W`$. However, panel data helps to solve the problem of unobserved heterogeneity if it is assumed that $\theta_i$ is time-invariant and so $\varepsilon_{it}$ is uncorrelated with $W`$ and θ_i is correlated with $W`$.

For the ownership dummy, the causal effect on access to credit is then measured by the association between changes in access to credit and changes from female to male ownership or the reverse. The fixed effects panel approach enables the determination of causation under weaker assumptions than those of cross-section analysis. It is assumed that θ_i consists of an observable and an unobservable component, as follows:

$$\theta_i = O_i \eta + U_i \tag{3}$$

where O_i is a vector of time invariant observables (in our model these will be controls for firm location and sector of activity or industry) and U_i the time invariant "unobservable" component – which is referred to as the individual specific effect representing the unobserved individual heterogeneity. Estimating equation (2) using fixed effects techniques, the within or fixed effect estimator model is obtained by subtraction of the time-averaged model of equation (2) given as $\overline{z}_{it} = \overline{W}^{`}_{it}\beta + \theta_i + \overline{\varepsilon}_{it}$ from the original model in what follows:

$$z_{it} - \overline{z}_i = +(W_{it} - \overline{W}_i)^`\beta + (\varepsilon_{it} - \overline{\varepsilon}_i), \tag{4}$$

which then eliminates the fixed effect θ_i, along with time-invariant regressors since $z_{it} - \overline{z}_i = 0$ if $z_{it} = z_i$ for all t.

Lastly, the definition of credit constraint as mentioned earlier poses a selectivity problem for those obtaining the credit. The problem of sample selection arises because some entrepreneurs may have chosen not to apply for credit in anticipation of their applications being rejected or of them being offered unfavourable contractual conditions due to discrimination. In the survey, there may be a population that does not apply for credit because it does not need external financing. Further, data also reveals that there is also a population that needs a loan but did not apply, for a number of reasons. For these two populations, we do not observe the probability of obtaining a loan. Therefore, clearly the observed sample that applies for loans is a self-selected, non-random sub-sample of the total population, and for obtaining the true relationship between entrepreneurial gender and probability of obtaining credit we need to correct for this selection.

Given that our dataset are not large (heterogeneous) enough to estimate a complex model such as the multinomial logit selection model that corrects for selection by maximum-likelihood estimation as applied in Bardasi, Sabarwal and Terrell (2011), we follow the approach of Bigsten et al (2003) and Muravyev et al (2009) to estimate a more standard – and less data demanding – Heckprobit model a la Heckman. In the econometric analysis, the outcome equation is the probability of having the loan application rejected by the bank and the selection equation is the likelihood to demand for a loan (if the firm has a demand for external finance i.e., need a loan but not applying and needing a loan and applying). This leads us to two binary regressions of the form:

$$Y_i = W^{'}_{it}\beta + \hat{\theta}_i + \varepsilon_{it} \tag{5}$$

$$D_i = W^{'}_{it}\beta + \phi I + v_{it} \tag{6}$$

Equation 5 represents the outcome equation while Equation 6 is the selection equation. Y is a binary variable indicating loan rejection for applicants while D is equals 1 if the firm has a demand for external finance; that is, need a loan but not applying and needing a loan and applying) and 0 otherwise. The other variables are as defined earlier while I is a vector of instruments representing the variable that identifies the selection equation. We use as instruments two variables that are likely to be correlated with the need for formal credit, but not with the probability of obtaining it or its supply. The first variable is the percentage of annual material inputs or services purchased on credit or paid after delivery; this is likely to be negatively related to the firm's probability of seeking formal credit. The second is the percentage of working capital financed through retained earnings (a proxy for retained earnings and firm preferences for financing). The full model, comprising the main Equation 5 and the selection Equation 6 also assumes the joint normality of the two error terms, ε_{it}, v_{it} and non-zero correlation ρ between them. When ρ ≠ 0, i.e. there is correlation between error terms of outcome and participation in the credit market equation, the standard Probit model will produce biased results. The Heckprobit procedure is instead intended to correct for selection bias and to provide consistent, asymptotically efficient estimates for all the parameters in the model.

Turning to the factors determining the demand for and supply of credit as captured in W, the choice of the variables is based on whether firms want to expand their activities either by investing or by increasing the working capital, taking into account the cost of alternative sources of funds, including internal sources. Equation 5 will reflect the possibility of constraints operating on this demand. Here, female is a dummy variable indicating female-owned firms with men-owned the omitted variable); X are other key controls such as firm characteristics that affect a firm's access to credit, notably age and firm size, ownership, the legal status of the firm, and other easily observable characteristics. We classify firms as small, medium, and large if the number of employees is between five and 19, 20 and 99, and 100 or more, respectively. The categories of a firm's legal status are sole proprietorship, publicly traded, privately traded and partnership. Other factors include whether the firm keeps accounts, alternative financial sources proxy to percentage of working capital financed by trade credit, geographical dummy and 1-digit SIC industry classification. Evidence of discrimination would exist if the coefficient on gender or female ownership is significantly greater than zero.

The factors W included in the various equations are selected based on the standard models of investment and credit market imperfections presented in Bigsten et al (2003). Accordingly, controlling for risk attitudes, firms will invest if the expected return exceeds the cost of using funds for investment. In an economy without either credit market imperfections, or adjustment costs, only unanticipated changes to the condition faced by the firm in the economy should matter for net investment. If financial markets function according to perfect market assumptions, then the firm's average cost per unit of capital is equal to the capitalization rate of a pure equity stream and the firm's value is independent of its capital structure (Modigliani

and Miller, 1958). Consequently, the firm is indifferent to the source of investment finance: equity finance, debt finance, or self-finance. Therefore, if financial markets are perfect, the choice of the sources of finance does not influence the firm's investment decisions. On the contrary, the returns to investment, the cost of external funds, and the opportunity cost of using internal or other sources of funds are likely to be different and matter for investment demand and, by implication for the demand and supply of credit. The demand for credit will therefore be modelled as a function of firm-specific variables affecting the differences between the returns on capital to the firm and the cost of capital to the firm. Thus, considering the model of returns to capital by profit rates, proxied by efficiency, we control for changes in these returns by introducing time and sectoral dummies. The cost of capital to the firm includes the opportunity cost of alternative sources, but also factors that affect the cost of external funds in the presence of market imperfections, including collateral requirements or transaction costs in applying for loans. We model the opportunity cost by the availability of alternative sources of funds, including informal credit or access to overdraft financing.

In modelling the factors that determine the supply of credit, it is likely that banks in trying to allocate credit to firms will use the same information set used by firms to decide on whether to request for funds. We propose to assume that banks use sector-specific predictions of profitability for each firm based on sector, time, ownership, legal status and other easily observable characteristics. We further assume that banks have access to information on the current formal debt position and on the capital of the firm, which they can use to assess its current net worth and ability to provide collateral for loans.

We include in both the demand and supply equations a wide range of variables to control for the heterogeneity of firms in the sample. These include its legal status, ownership, structure, firm age and whether it keeps accounts. These controls can be interpreted as proxies for transaction costs in applying for loans, so they will affect the demand for credit and as proxies for enforcement and monitoring costs which will influence the supply of credit. We also include sectoral and time dummies as controls. Finally, dummies describing the size of the firm are entered. We also consider the export status of a firm, as a firm aiming to maximize its value must carry out investments that expand its market sphere such that it finds it necessary to request for external finance, while banks too will satisfy such demand by finding the venture as a less risky project.

Modelling credit constraint and gender-gap in firm performance

In this section, we investigate if female and male-owned firms are equally efficient or perform differently when constrained from bank finance. Thus, we examine whether there are any systematic gender differences in the impact of financial constraint on firm performance. Firm performance is measured by efficiency or labour productivity

defined by value added or (sales minus intermediate goods) per worker; intermediate inputs include costs for raw materials, solid and liquid fuel, electricity and water. This is consistent with previous studies (Bird and Sapp, 2004; Bardasi, Sabarwal, and Terrell, 2011; Tabi and Fomba, 2013). The log function of value added per worker is regressed on credit constraint/rationing rather than on different measures of access to formal credit. This helps capture the efficiency argument of judging the direction of entrepreneurial finance. For example, firms that are financially constrained would perform better if provided with finance. But this was not the case with randomized controlled trial studies conducted in Sri Lanka, India, the Philippines and Ghana (de Mel et al, 2009; Banerjee et al, 2010; Karlan and Zinman, 2010; and Fafchamps et al, 2011). Women-owned firms generally seen as being more credit-constrained experienced larger increases in income when they were given equal amounts of grants as men. This study is then important for equity and efficiency reasons. For example, if women are just as good entrepreneurs as men, they should have equal access if they are just as good as men, but (rationed) credit not allocated to some good female entrepreneurs and is allocated to some bad male entrepreneurs is a misallocation of resources. The question that arises is how much can gender gap in firm performance be attributed to differences in access to credit or discrimination?

Firstly, we assumed that credit discrimination relates to firm performance differentials caused by pure fact of gender or other identities. To explain the gender performance gap in the Cameroon formal business world, we observed the coefficient; γ_1 of female-owned firms overall. Thus, we estimate the following model:

$$\Pi_i = \gamma_0 + \gamma_1 C_i + \gamma_2 (C_i * female) + \sum_{j=3}^{n} \gamma_j H_i + \mu_i \qquad (7)$$

Where Π represents the mentioned variable of interest measuring firm performance, C_i is a binary variable that equals 1 if firm i faces financial constraint, 0 otherwise; H_i is a vector of controls for firm characteristics including firm size, firm age, export status, etc. μ_i captures the unobserved firm attributes and any other unknown factor that may also affect performance. We included an interaction term representing gender of the entrepreneur with access to finance constraint. In particular, one might argue that exporters and foreign-owned firms both have higher know-how (and thus are more productive).

However, an issue with estimating Equation 7 is that credit rationing or access to finance constraint, C_i may be endogenous. The probability of being rationed is likely to be determined by the extent of credit risk of a firm and other firm attributes as captured by H, and the supply side of the credit market. The strategy to tackle these endogeneity issues is to identify exogenous restrictions on the local supply of financial services. These restrictions are expected to directly influence firms' ability to obtain financing and, therefore, the probability of rationing. In contrast, we do not expect these restrictions to directly affect a firms' performance. The literature

suggests as instruments variables related to financial development and the financial environment (Guiso et al, 2004; Herrera and Minetti, 2007; and Wang, 2016). While financial development determines the degree of access to credit, an effective legal system protects the creditors' rights and thus either relaxes or restricts a firms' external financing (for details, see Wang, 2016). The literature makes use of the following measures: 'strength of legal rights index' and 'depth of credit information index'. The first instrument measures the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders, which directly indicates the degree of contract enforceability in a country. The 'depth of credit information index' is a proxy that measures rules affecting 'the scope, accessibility, and quality of credit information'.

In this study, similar indicators that measure quality and efficiency of courts and the degree of financial development in Cameroon as provided by the data are used. We constructed two indexes where one identifies financial deepening at the local level while the other is a legal index which describes the courts system and how it affects business. Firstly, based on the IMF (2013) report, access to financial services, for example financial inclusiveness as measured by the number of bank branches per capita in the CEMAC region is limited, and falls behind other regions in Sub-Saharan Africa. Micro finance institutions (MFIs) help reach the unbanked population. The savings and lending behaviours of households and SMEs reflect the importance of informal and micro finance institutions. Microfinance institutions are particularly prevalent in Cameroon where they help boost financial inclusiveness (IMF, 2013) and thus indicative of a low level of financial development. Thus, our index of financial depth is constructed based on how firms finance their working capital and or asset purchases. Access to finance is a big obstacle for firms that do not apply for loans, and such firms will finance their working capital and asset purchases from non-bank sources (i.e., retained earnings, owners' contribution or issued new equity shares, trade credit and or informal sources including moneylenders, friends and relatives). This is indicative of low financial inclusiveness or development. While the financing of working capital and or asset purchase from bank sources (i.e., microfinance institutions, credit cooperatives, credit unions, private commercial banks and or state-owned banks or government agency may express a high level of financial inclusiveness. Thus, dividing the proportion of the firm's working capital that was financed through banking sources by the proportion financed from non-bank sources provides a ratio which proxies financial deepening or inclusiveness. The second index measures the efficiency of the legal system in Cameroon and is based on the following question: 'The court system is fair, impartial and uncorrupted'. They range from one to four, coded as strongly disagree, tend to disagree, tend to agree and strongly agree with higher scores indicating better enforcement of the law and so reinforces confidence that the legal system will uphold contract and property rights in business disputes. This is expected to affect external financing and thus indirectly influencing financial constraint.

However, to avoid biased coefficients and inference problems associated with endogeneity given the nature of the dependent variable used in this model, an

estimation procedure is suggested in the literature. A two-stage Probit least squares (2SPLS) approach (Amemiya, 1978; Alvarez and Glasgow, 1999) is implemented here. The reduced form of the binary variable (constraint equation) is estimated using a Probit model. The parameter from this reduced form equation is then used to generate a predicted value for the endogenous variable which is then substituted for the suspect endogenous variable. Equation 8 is then re-estimated using the predicted values from the reduced form equation. However, according to Greene (2003) and Alvarez and Glasgow (1999), the major drawback of 2SPLS is that the standard errors produced are biased and their correction is difficult. This implies that statistical inference would not be legitimate. One solution is to use the consistent 2SPLS parameter estimates along with bootstrapped standard errors. Bootstrapping is a statistical technique where the sampling distributions for the parameter estimates of interest are simulated through an iterative process (Mooney and Duval, 1993; Mooney, 1996). The advantage of bootstrapping is that it allows for the creation of confidence intervals for statistics where sampling distributions are unknown or, in the case the 2SPLS, are difficult to estimate.

4. Presentation of data

Firm level data were collected on 1 June 2009 to 15 October 2009 and between July 2016 and November 2016 as part of the Enterprise Survey, an initiative of the World Bank with the objective of gaining an understanding of what firms experience in the private sector. The Enterprise Surveys, through interviews with firms in the manufacturing and services sectors, capture business perceptions on the biggest obstacles to enterprise growth and the relative importance of various constraints to increasing employment and productivity, etc.

The sample covers registered small, medium and large-size manufacturing firms and data were collected using random stratified sampling. Breaking down by industry, a total of 363 firms were surveyed in 2009, of which 117 are manufacturing firms, 132 are retail firms and 114 are services firms. In 2016, 361 firms were interviewed of which 120 are manufacturing firms, 115 are retail firms and 126 are services. A panel (balance) of about 114 firms was surveyed both in 2006 and 2009.

As discussed in greater detail in the sampling manual, stratified random sampling was preferred over simple random sampling in the Indicator Surveys. Three levels of stratification were used: firm sector, firm size, and geographic region. Industry stratification was designed as follows: the universe was stratified into one manufacturing industry, one services industry (retail) and one services residual sector as defined in the sampling manual. Size stratification was defined following the standardized definition used for the Enterprise Surveys: small (5 to 19 employees), medium (20 to 99 employees), and large (more than 99 employees). For stratification purposes, the number of employees was defined based on reported permanent fulltime workers. Regional stratification was defined in terms of the geographic regions, with the largest commercial presence in the capital and cities with over one million inhabitants. For example, the survey was conducted on firms located in the major industrial regions in Cameroon which consist of Littoral (Douala), Centre (Yaoundé), West (Bafousam), which represents approximately 92% of the total number of firms in the country.

In this study, we consider a female-owned firm as a sole proprietor or main shareholder in a company based on the following definitions. Owners of the firm are either all women or majority are women as opposed to all or majority being men or equally divided between men and women conditional on the largest owner or main shareholder being female.

Table 1 shows the basic breakdown of firms by industry or sector, size and region. Consistent with the general distribution of firms in Cameroon, most of the firms in the sample are from the Centre (Yaounde) and Littoral region (Douala) representing over 80% of both the total number of firms surveyed in 2009 and 2016, respectively, in Cameroon. As shown in the table, most of the large firms (one employees and over) are situated in the Littoral and Centre regions though generally most firms are small firms. Lastly, most firms are in retail services while manufacturing firms are mostly located in Douala, the major industrial zone except for the 2009 survey where more manufacturing companies were in Yaounde.

Table 1:   Number of firms by size and region

Survey data for 2009					
Region	No. of workers	Manufacturing	Retail	Other Services	Grand total
	Small (<20)	20	42	24	86
Centre	Medium (20-99)	30	28	20	78
	Large (Over 100)	25	5	21	51
Centre Total		75	75	65	215
	Small (<20)	10	20	7	37
Littoral	Medium (20-99)	8	23	18	49
	Large (Over 100)	12	1	8	21
Littoral Total		30	44	33	107
	Small (<20)	7	8	6	21
West	Medium (20-99)	1	9	8	18
	Large (Over 100)	3	0	3	6
West Total		11	17	17	45
Grand Total					366
Survey (Fresh and Panel Combined) data for 2016					
Region	No. of workers	Manufacturing	Retail	Other Services	Grand total
	Small (<20)	21	55	25	101
Centre	Medium (20-99)	15	6	14	35
	Large (Over 100)	6	2	5	13
Centre Total		42	63	44	149
	Small (<20)	19	43	22	84
Littoral	Medium (20-99)	8	4	12	24
	Large (Over 100)	21	2	12	35
Littoral Total		48	49	46	143
	Small (<20)	26	2	30	58
West	Medium (20-99)	3	1	4	8
	Large (Over 100)	1	0	2	3
West Total		30	3	36	69
Grand Total					361

continued next page

Table 1 Continued

Survey data (pooled panel)					
Region	No. of workers	Manufacturing	Retail	Other Services	Grand total
	Small (<20)	10	34	9	53
Centre	Medium (20-99)	7	14	11	32
	Large (Over 100)	5	1	6	12
Centre Total		22	49	49	97
Littoral	Small (<20)	9	29	5	43
	Medium (20-99)	3	14	15	32
	Large (Over 100)	11	1	9	21
Littoral Total		19	28	19	96
West	Small (<20)	10	3	7	20
	Medium (20-99)	0	1	9	10
	Large (Over 100)	3	0	3	6
West Total		12	4	19	36
Grand Total					228

Source: Authors' estimates based on 2009 and 2016 Cameroon World Bank Enterprise Survey Samples

5. Empirical results

Descriptive statistics

Table 2 gives an overview of the descriptive statistics used in the analysis. Panel A of Table 2 illustrates some general attributes of male- versus female-owned firms. Note that female entrepreneurs account for about 22% of the firms in the sample. The share of entrepreneurs who are women is also lower in other developing and high income countries (Verheul and Thurik, 2006; Bardasi, Sabarwal, and Terrell, 2011) and the prevalence of female-owned enterprises varies across Africa and is alarmingly low[1] (UNECA, 2017). On average, there is no difference between male and female-owned enterprises in terms of performance or labour efficiency, age, size and sector of activity. UNECA (2017) finds that female-owned enterprises are, on average, less productive than their male counterparts but after controlling for sector, size and location of enterprises the gap narrows down and closes in Angola, Cameroon and Mali.

Although more male-owned firms operate in the manufacturing sector and have a greater number of permanent workforce than female-owned firms, relatively more females are involved in petty trade activity or small businesses. Generally, firms operate in the following sub-sectors: textiles and garments, retail and wholesale trade, hotels, chemical and pharmaceuticals, construction, transport and other manufacturing activities.

Panel B depicts the gap as concerns ownership and firm legal status. Most female entrepreneurs are sole proprietor firms while a greater percentage of male-owned firms are run by foreigners and as shareholding companies with non-traded shares or shares traded privately. Male and female-owned firms are equally run by domestic shareholders with shares traded in the stock market.

Panel C gives an overview of some of the firms' involvement in credit markets, the tendency of being financially constrained and other characteristics such as reasons for not applying for loans. Firms' involvement in credit markets and other characteristics show mild performance for female-owned firms. First, in Panel C1, we notice that the two groups of firms are financially inclusive or have bank accounts and both male and female-owned firms equally have access to overdraft facilities.

Table 2:   Firm characteristics and access to credit/participation in financial markets variables by gender of firm ownership: tests of difference in means

Variables	Male (Mean)	Female (Mean)	t Statistic
Panel A: General descriptive			
Value added[a]	2,090	687	1.21
Permanent employees	70	31	1.68***
Efficiency or labour productivity	13.76	13.89	-0.335
Firm age (years)	19	20	-1.19
Manufacturing	0.35	0.27	1.89***
Services	0.32	0.34	-0.421
Retail	0.33	0.39	-1.43
Small-sized firms	0.45	0.53	-1.56
Medium-sized firms	0.33	0.31	0.502
Large firms	0.22	0.16	1.35
Proportion of entrepreneurs (% of all)	77.9	22.1	100
Panel B: Firm ownership and or legal status			
Solo firm	0.64	0.79	-3.59*
Partnership	0.09	0.06	1.26
Publicly traded	0.11	0.07	1.36
Private or non-traded	0.12	0.05	2.53**
Others	0.045	0.032	0.732
% of firms owned by private domestic individuals and companies or organizations	82.9	87.6	-1.53
% of firms owned by private foreign individuals and companies or organizations	10.2	4.1	2.62*
% of other ownership	5.4	8.2	-1.40
Panel C1: Credit market participation and credit constraints of firms			
% with bank account	0.87	0.82	1.43
Collateral as a % of loan	5.4	2.2	0.429
Has overdraft?	0.51	0.53	-0.512
Rate of interest on overdraft	16.2	12.2	2.56***
Rate of interest on loan	14.5	11.1	2.02***
Did not need and did not apply for a loan	0.27	0.29	-0.678
Applied and denied or did not received	0.38	0.40	-0.175
Applied and received	0.62	0.60	0.175
Needed but did not apply	0.36	0.42	-1.22
Needed and applied	0.36	0.28	1.88***
No credit demand	0.27	0.29	-0.679
Demand, but rejected [b]	0.19	0.13	1.29
Panel C2: Why did the firms not apply for loans?			
No need for a loan - establishment has sufficient capital	0.421	0.411	0.402
Application procedures are complex	0.086	0.088	-0.065
Interest rates are not favourable	0.135	0.235	-2.42***
Collateral requirements are too high	0.191	0.117	1.70***
Size of loan and maturity are insufficient	0.018	0.019	-0.074
Did not think it would be approved	0.049	0.009	0.074
Other	0.098	0.117	-0.554

Table 2 Continued			
Variables	Male (Mean)	Female (Mean)	t Statistic
Panel D1: Source of finance for working capital, last fiscal year (% of total)			
Internal funds/retained earnings	63	71.3	-2.69***
Borrowed from banks (private and state-owned)	13	11.5	0.731
Borrowed from non-bank financial institutions	5	3.7	0.913
Purchases on credit from suppliers and advances from customers	12.7	7.5	2.56***
Borrowed from informal sources (moneylenders, family, friends, relatives, etc)	6.3	6	0.216
Panel D2: Source of finance for purchased assets, last fiscal year (% of total)			
Internal funds/retained earnings	63.7	74.2	-2.19***
Borrowed from banks (private and state-owned)	12.5	6.2	1.97***
Borrowed from non-bank financial institutions	4.7	4.8	-0.058
Purchases on credit from suppliers and advances from customers	9.1	5.1	1.55
Borrowed from informal sources (moneylenders, family, friends, relatives, etc.)	3.7	6	-1.27
Issue of new shares	5.7	2.5	1.68***
Observations	550	156	

Note: * Significant at the 1% level; ** Significant at the 5% level; *** Significant at the 10% level.
[a] In 'millions' of CFA Franc; [b] includes firms that needed a loan but did not apply for various reasons and suggested that loans would not be granted.

While the value of collateral as a percentage of loan is typically higher for male-owned firms, female entrepreneurs are charged lower interest rates for loan applications and overdraft facilities. The reason might stem from the fact that the value of loan requested by female-owned firms is smaller, and the number of female firms in the overall sample is also small. While financial inclusion is positive in terms of prevalence of bank accounts, referring to the most recent line of credit or loan, there are no clear indications of mild and favourable conditions for female-owned firms. However, more male than female-owned firms needed loan and applied for the loan. The issue of credit constraint is further investigated by looking at the main reason why firms did not apply for loans and how they finance working capital and purchased their assets.

In Panel C2, some reasons are advanced as to why firms did not apply for a loan in the past year, and most of them are female-owned firms. Most male and female-owned firms reported that they did not apply because they did not need one. This qualifies them to be financially unconstrained. But some firms gave reasons that make them to be classified as being financially constrained. This involved those that reported not applying because they found the collateral and interest rates to be high. More female-owned firms complained of high interest rates while significantly more

male-owned firms indicated the collateral requirement as a hindrance. Other reasons which deter firms from applying for loans, such as not being sure to be granted, and the issue of size or maturity being a problem were equally advanced by both groups of firms. Notwithstanding the large share of female-owned firms not applying for loans, access to finance remains the biggest obstacle in their operation. This finding can easily be corroborated by the fact that most female-owned firms in the sample finance their working capital and asset purchases through retained earnings.

Panel D depicts the preceding statement and shows that firm's access to formal sector borrowing to finance working or investment capital is relatively low for female entrepreneurs. Female-owned firms mostly resort to internal funds and informal borrowings. This may also reflect the fact that legal and cultural norms reduce the chances of women getting equal (or any) access to formal financial services, with the resultant effect of few female-owned firms in SMEs. Lastly, trade credit plays a big role in financing working capital for male- than female-owned firms.

Gender and firm access to credit

We now turn to the empirical relationship between the gender of the owner and access to credit by firms, precisely the probability of obtaining formal credit and its relationship to the sex of the entrepreneur. The sex of the entrepreneur could affect both the demand for and supply of credit on the part of the banking institution as indicated by the coefficient of the gender dummy. Female entrepreneurs may be less likely to apply for loans than male entrepreneurs (if, for example, they are more risk averse).

They may also be less likely than male entrepreneurs to obtain loans if, for example, there are cultural barriers in terms of discrimination, or women's firms are supposedly considered to be less creditworthy.

We now discuss the results of modelling Equations 5 and 6. Table 3 presents the results of the demand or access to credit by firms and its supply by formal banks. Three models on access to credit by the gender of firm ownership are presented. The first, column [1], is a Probit model for the pooled sample. The limitation of the Probit model is that it does not allow us to use fixed effects estimations to control for the unobserved individual heterogeneity or possible bias due to omitted variables. Secondly, the Probit regression results may also suffer from sample selection bias, and the problems commonly identified in the literature on discrimination against minority entrepreneurs (e.g. female-owned firms by financial institutions). Selectivity will arise as only firms with a demand for credit will be in the market for a loan. The results of column [2] of Table 3 takes into account unobserved heterogeneity after running a fixed effect logit model. Thus, the dependent variable in both columns is a dummy variable which equals 1 if firms applied for loan and were refused, including those that did not apply because they expected to be refused or discouraged from applying, and 0 if the loan application was approved or the entrepreneur did not wish to obtain external funds. Lastly, the problem of sample selection which arises because some entrepreneurs may have chosen not to apply for credit in anticipation of their

applications being rejected due to discrimination is resolved in column [3] that deals with the issue of sample selection. In these last two columns, the dependent variables in the regression reported are the outcome or binary variable which equals 1 if a loan application was rejected and 0 if it was approved and selection equation takes a value of 1 for selection in the main outcome equation and zero for requesting a loan.

Table 3:   Access to credit constraint and gender of firm ownership

Variables	Logit column (1)	Fixed Effect Logit column (2)	Heckprobit Column 3	
			outcome	selection
Female-owned firm	-0.361 (0.251)	-0.203 (0.314)	-0.379** (0.205)	-0.115 (0.189)
Age of firm	-0.003 (0.007)	0.007 (0.010)	-0.009 (0.006)	-0.001 (0.005)
Small sized firms	0.893** (0.312)	1.38*** (0.439)	0.778** (0.252)	0.550** (0.241)
Medium sized firms	0.660** (0.283)	0.816** (0.468)	0.480* (0.244)	0.374* (0.228)
Solo firm	0.645 (0.442)		0.664* (0.348)	0.204 (0.340)
Partnership	0.201 (0.516)		0.150 (0.394)	0.525 (0.407)
Shareholding company with shares traded in the stock market	0.064 (0.647)		0.006 (0.505)	0.483 (0.397)
Shareholding company with non-traded shares or shares traded privately	0.291 (0.498)		0.384 (0.380)	0.363 (0.377)
% of firms owned by private domestic individuals and companies or organizations	0.009** (0.005)		-0.0001 (0.004)	0.006** (0.003)
% of firms owned by private foreign individuals and companies or organizations	0.003 (0.006)		-0.003 (0.005)	0.001 (0.004)
Has a bank account	0.208 (0.303)		0.072 (0.254)	0.323 (0.213)
Make use of external auditors	-0.565** (0.197)	-0.559* (0.289)	-0.684*** (0.173)	-0.021 (0.163)
Export status	0.003 0.005)		0.006 (0.004)	0.006 (0.004)
Year_2009	1.19*** (0.237)		1.15*** (0.203)	0.745*** (0.168)
Industry dummies	Yes		Yes	Yes

Table 3 Continued

Variables	Logit column (1)	Fixed Effect Logit column (2)	Heckprobit Column 3	
			outcome	selection
Location dummies	Yes		Yes	Yes
Constant	-2.29*** (0.736)	-20.26 (2.62)***	-1.19*** (0.643)	-0.291 (0.562)
Selection equation instruments				
% of inputs paid for after delivery				-0.001 (0.002)
% of working capital financed by retained earnings				-0.013*** (0.002)
Athrho			1.25*** (0.244)	
Rho			0.85 (0.067)	
Wald test (indep. Equs) (rho = 0): chi²(1)			54.4*** (Pr.=0.00)	
Number of observations	561	323	444	
Censored number of observations		132	149	
Uncensored number of observations			295	
Log pseudo-likelihood	-321.95			
Wald chi²	78.99		99.77	
LR Joint significance		χ² (4) =19.70**		

Note: * Significant at the 1% level; ** Significant at the 5% level; *** Significant at the 10% level. Robust standard errors are reported in parentheses. The dependent variable in the regression reported in columns 1 and 2 is a binary variable which equals 1 if firms applied for loan and were refused including those that did not apply because they expected to be refused or discouraged from applying, and 0 if either his or her loan application was approved or the entrepreneur do not wish to obtain external funds. It is missing in case the firm has no external demand for fund. The dependent variables in the regression reported in column 3: outcome or binary variable which equals 1 if a loan application was rejected and 0 if it was approved and selection equation takes a value of 1 for selection in the main outcome equation and zero for requesting a loan.

Looking at the overall fit of the model and sample selection hypothesis, the significance level of the coefficient of the athrho and the Wald test of independent equations concur to suggest that the null hypothesis of no correlation between error terms of main (loan rejection) and selection (loan request) equation is rejected. In other words, any estimate of the determinants of the probability to successfully get a loan without controlling for sample selection bias would turn biased results.

The coefficient on the variable, female-owned firm, which is of major interest in this paper, is negative and statistically (and economically) significant at the 5% level in column 3. The negative sign is maintained as in column 1 and even column 2 when unobserved heterogeneity is taken into account, though statistically insignificant. This contradicts the conjecture that female-owned firms in the formal sector of Cameroon

are more likely to be financially constrained than male-owned firms. The result also contradicts the findings of Asiedu et al (2013) for manufacturing firms in Sub-Saharan African countries and Muravyev et al (2009) in Central and Eastern European (and a few Western European and Asian) countries where credit discrimination against women at lower levels of financial development was noted.

The effects of the firm's legal status, such as sole proprietorship, small- and medium-sized firms are more financially constrained with respect to large firms.

Alternatively, one may consider selection into the set of firms reporting a need for bank credit. The setup here, for the access to credit part, is an estimation model a la Heckman, where the outcome equation is the probability of having the loan application rejected by the bank and the selection equation is the likelihood to demand for a loan. The main equation then differentiates between successful loan applicants, and firms with unmet credit needs (discouraged and unsuccessful borrowers). Pertaining to the selectivity model, one of the instruments chosen for the selection equations have the expected sign and is statistically significant, indicating that firms that resort to internal finance are less likely to request for loan. Thus, our results show statistically significant difference in access to formal credit in Cameroon by gender, with female-owned firms having more advantage. This suggests evidence of discrimination against men using the direct measure of credit constraint.

Access to finance constraint and gender-gap in firm performance

Table 4 presents the estimates for the overall sample for both men-owned and women-owned firms and assesses the effects of access to finance constraints on the performance gaps between male- and female-owned businesses in Cameroon. Access to credit constraint takes a value of 1 when the firm as defined in section 3 is considered credit-constrained and 0 otherwise while the other covariates are firm size, ownership structure and legal status, firm age and exports status including (Fowowe, 2017) constraints of the business environment, which accounts for characteristics that might represent obstacles to firms' operation; such are regulation, corruption, crime, electricity, transportation tax rate, and the competition from informal sectors. In particular, one might argue that exporters and foreign-owned firms both have higher know-how and thus are more productive. We measure performance gaps between male- and female-owned firms in terms of efficiency (value added per worker).

The performance gap between female and male entrepreneurs has been of increasing interest in the literature on female entrepreneurship, with opposing perspectives on the subject. The analysis in this paper makes a substantial contribution to the literature in that the 'constraint driven gap' perspective which argues that there are substantial gender-specific barriers to entrepreneurship that constrain the performance of female entrepreneurs may coincide with the issue that credit rationing or financial constraint is endogenous.

Table 4:   Credit constraints and performance gaps between male- and female-owned firms (regression coefficient of female-owned dummy)

	Ordinary least-squares column (1)	First stage Probit for credit constraint column (2)	2SLS with bootstrapped errors column (3)
Access to finance constraint	0.429 (0.432)		-1.09* (0.655)
Female-owned firm	0.906** (0.559)	-0.231 (0.152)	0.462 (0.624)
Female-owned dummy*finance constraint	-0.882 (0.855)		-0.289 (0.740)
Industry dummies	Yes	Yes	Yes
Location dummies	Yes	Yes	Yes
Year_2009	2.02*** (0.452)	0.640*** (0.144)	3.07*** (0.676)
Age of firm	0.020 (0.021)	-0.002 (0.004)	0.016 (0.019)
Small sized firms	0.374 (0.674)	0.585*** (0.191)	1.03 (0.788)
Medium sized firms	0.198 (0.628)	0.443** (0.185)	0.640 (0.746)
Solo firm	0.1.18 (0.988)	0.479* (0283)	2.26* (1.21)
Partnership	-0.120 (1.19)	0.270 (0.327)	0.488 (1.16)
Shareholding company with shares traded in the stock market	1.16 (0.130)	0.210 (0.273)	1.95 (1.34)
Shareholding company with non-traded shares or shares traded privately	0.013 (1.16)	0.299 (0.316)	0.774 (1.18)
% of firms owned by private domestic individuals and companies or organisations	0.009 (0.008)	0.001 (0.003)	0.006 (0.009)
% of firms owned by private foreign individuals and companies or organisations	0.013 (0.011)	0.005* (0.002)	0.012 (0.013)
Has a bank account	0.844 (0.564)	0.236 (0.188)	1.23* (0.708)
Make use of external auditors	0.153 (0.416)	-0.376 (0.129)	-0.212 (0.449)
Export status	0.002 (0.008)		0.004 (0.009)
Top manager's experience in years	0.008 (0.022)		0.012 (0.024)

Table 4 Continued

	Ordinary least-squares column (1)	First stage Probit for credit constraint column (2)	2SLS with bootstrapped errors column (3)
Constraints to business environment variables			
Courts	2.97*** (0.934)		3.17* (1.28)
Electricity	-0.877 (0.782)		-0.926 (0.820)
Constant	10.88*** (1.61)	-1.54*** (0.454)	8.56*** (1.98)
Legal index		0.008 (0.061)	
Financial Development		-0.011* (0.006)	
Number of observations	496	530	468
R^2/ Pseudo R^2	0.134	0.145	0.14.1
Wald chi^2		82.67	79.1

Note: Robust standard errors are in parentheses.*, **, and *** represent the level of significance at 10%, 5% and 1%, respectively. Industry dummies are manufacturing, retail trade and service as reference while location dummies include Douala, Bafoussam and Yaounde as reference category.

In general, female entrepreneurs fare better than their male counterparts in terms of this measure of performance, based on OLS regressions as presented in column 1 of Table 4 observed on the coefficients of the dummy for female ownership. This is contrary to Bardasi, Sabarwal, and Terrell (2011), where evidence of female underperformance was detected. However, once the issue of endogeneity is considered as noted in column 3, the coefficients of the dummy for female ownership turns out insignificant. The result for Cameroonbecomes similar to that of Bardasi, Sabarwal, and Terrell (2011) when they controlled for country and sector of activity of firms, where the average female-owned firm was significantly less efficient in Eastern Europe and Central Asia, and Latin America but not necessarily in Sub-Saharan Africa where there is no significant difference in either value added or total factor productivity.

However, the sign of the coefficient on finance constraint changed from positive to negative and significant, being an indication that inadequate finance is a serious constraint on the performance of firms. This result corroborates other studies (Dinh et al, 2012; Ayyagari et al, 2008; Fowowe, 2017) and show that inadequate financing is a serious constraint that firms face, which may adversely affect their performance. The results support the view that financing is a crucial problem for firm growth, and justifies that other considerations are made. Further, results show that sole proprietorship for businesses and firms with financial inclusion, such as having bank accounts, and the legal system promote performance.

Generally, the conclusion is that credit is important but more so for female-owned firms on efficiency grounds and thus increasing credit access for credit-constrained firms improves the efficiency of female- rather than male-owned firms. This lends support to the view that financing is very important for female-owned firms, and

justifies the many measures and initiatives being put in place to make more finance available to them.

Lastly, column 2 of Table 4 presents maximum likelihood estimation results showing the relationship between firm characteristics and financial constraint. The instrumental variables have the expected sign, though only financial development is statistically significant. One channel through which financial development is beneficial is through improved access to finance, leading to higher and more efficient investment. By facilitating better credit access, it allows constrained firms to obtain vital funds with which capital investment plans can be undertaken. Thus, it makes firms to be less likely to be financially constrained. A good legal system will equally promote financial access.

6. Conclusion and policy implication

This paper aims to contribute to the literature on the relationship between the gender of owners of business ventures and their access to bank financing. First, using direct measures of credit constraint, it investigates whether female-owned firms are more credit constrained than male-owned firms. Secondly, it determines the relationship between access to finance constraint and gender gap in firm performance as measured by efficiency (value added per worker). In measuring access to credit by firms, we defined as "unconstrained" in the credit market if they state that they do not wish to obtain external funds (i.e. no credit demand) or that they were able to obtain a loan. Those that applied and were refused, including those that did not apply because they do not want to incur transactions costs if they suspect they will not obtain any loans, are considered "constrained". The study is one of the few in this area, and it differs from others in that we control for both selectivity and unobserved heterogeneity across firms.

The results show a statistically significant discrimination against men in formal credit markets as female-owned firms are less likely to be financially constrained after controlling the evidence of sample selection bias. The instrumental variables used in the selection equation — the percentage of annual material inputs or services purchased on credit or paid after delivery, and the percentage of working capital financed through retained earnings have the expected signs, though only the latter is statistically significant.

As concerns the gender performance gap, there is no significant difference in value added per worker between female ownership participation and male-owned firms in Cameroon once we control for the endogeneity of credit constraint using a two-stage least square or instrumental variable regression. Understanding the effects of gender credit constraint gap is of central policy importance as many donor-funded credit programmes in Sub-Saharan Africa target female entrepreneurs. Furthermore, the paper shows that inadequate financing is a serious constraint that firms face, which may adversely affect their performance. Access to finance constraint exerts a significant negative effect on firm productivity and there are indications that when female-owned firms face credit constraint, performance is affected, although the coefficient on the interaction term – female dummy and access to finance constraint is insignificant.

The results obtained, however, have strong policy implications. The literature considers entrepreneurship as an essential role in fostering economic growth and indicates that huge potential gains could be achieved by promoting female

entrepreneurial activity across the globe. It also highlights an important role of access to external financing for the creation and subsequent performance of business ventures. The study provides that in the absence of gender discrimination in access to credit, there is a need to overcome credit constraints by directing more external finance to female-owned firms. This presents an important challenge to governments and financial institutions in African countries. Concrete efforts need to be undertaken to overcome constraints in obtaining finance and boost access to financial services among female businesses, because male businesses benefit more than female entrepreneurs when there is financial scarcity. The conclusion is that credit is important, but more so for female-owned firms. Thus, financial institutions should target women for them to invest in their firms.

Notes

1. Among formal enterprises across selected countries, female ownership ranges from 4% in Egypt and 31% in Cameroon. Among informal enterprises, prevalence rates are higher with 15% in Egypt and 34% in Cameroon. Finally, among micro-enterprises across selected countries, Cape Verde is closest to gender parity while DR Congo and Zimbabwe report 25% of all formal microenterprises owned by women. In Burkina Faso, Kenya and Cameroon, prevalence rates range between 12% and 17%.

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