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Formal Credit Markets and Entrepreneurial Discrimination in a Developing Economy: A New Evidence from Nigeria

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ABSTRACT

The objective of this study is to ascertain if women entrepreneurs face discrimination in accessing formal credit in a developing economy using Nigerian data. Adopting direct measures of credit constraint, this study could not find any statistically significant discrimination against women in formal credit regardless of the firm size. This is evident by the non-significance of the gender coefficient in the probit estimations at different firm sizes as well as no statistically significant difference found in the Fairlie decomposition of the credit constraint by gender. The results show that medium size firms are significantly less likely to suffer credit constraint compared to smaller firms, while on the other hand, wood and furniture, and textile enterprises have significantly higher probability of being credit constrained. However, even though our results show there is no significant gender discrimination in the formal credit markets, access to formal credit by small and medium enterprises in Nigeria still remain very low at an average of about 29%. Thus, monetary authorities should support credit expansion policies for medium and small enterprises. Again, direct government involvement by the use of intervention funds targeted at small and medium enterprises would make impact. This is among the first studies in Nigeria to find no statistically significant difference or discrimination by gender using Fairlie decomposition of credit constraint.

ملخص

تهدف هذه الدراسة لمعرفة ما إذا كانت رائدات الأعمال يواجهن تمييزًا في الحصول على ائتمان رسمي في اقتصاد نام، وذلك باستخدام البيانات النيجيرية. اعتمادا على القياس المباشر لقيود الائتمان، لم تسجل هذه الدراسة أي تمييز ذي دلالة إحصائية ضد المرأة في ما يتعلق بالوصول إلى

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الائتمان الرسمي بغض النظر عن حجم الشركة. ولتأكيد ذلك، فإن عامل النوع لا يشكل أهمية بارزة في ما يتعلق بتقديرات الأرباح على مستوى الشركات بمختلف أحجامها، وبالإضافة لذلك، حسب تحليل "فيرلاي"، لم تُسجَل أية فروق ذات دلالة إحصائية في ما يخص قيود الائتمان حسب الجنس. تُظهر النتائج أن الشركات متوسطة الحجم تعاني بشكل أقل من قيود الائتمان مقارنة بالشركات الأصغر. ومن ناحية أخرى، تعد احتمالية الخضوع للقيود الائتمانية أكبر بالنسبة لشركات الخشب والأثاث والمنسوجات . وعلى الرغم من أن نتائجنا تظهر عدم وجود تمييز كبير بين الجنسين في أسواق الائتمان الرسمية، إلا أن الوصول إلى الائتمان الرسمي من قبل الشركات الصغيرة والمتوسطة في نيجيريا لا يزال منخفضًا للغاية بمتوسط 29%. وبالتالي، ينبغي للسلطات النقدية أن تدعم سياسات التوسع الائتماني للمؤسسات المتوسطة والصغيرة. ومن شأن المشاركة المباشرة للدولة عن طريق تمويل المشاريع الصغيرة والمتوسطة أن تحدث تغييرا بارزا في هذا الصدد. وتعد هذه الدراسة من بين الدراسات الأولى في نيجيريا التي لم تجد أي فرق أو تمييز حسب الجنس باستخدام تقنية تحليل "فيرلاي" لقيود الائتمان.

ABSTRAITE

L'objectif de cette étude est de vérifier si les femmes entrepreneurs sont victimes de discrimination dans l'accès au crédit formel dans une économie en développement en utilisant des données nigérianes. En adoptant des mesures directes de la contrainte de crédit, cette étude n'a pas pu trouver de discrimination statistiquement significative à l'encontre des femmes dans le crédit formel, quelle que soit la taille de l'entreprise.Ceci est évident par la non-significativité du coefficient de genre dans les estimations probit à différentes tailles d'entreprise ainsi que par l'absence de différence statistiquement significative dans la décomposition de Fairlie de la contrainte de crédit par genre.Les résultats montrent que les entreprises de taille moyenne sont significativement moins susceptibles de souffrir de contraintes de crédit que les entreprises plus petites, tandis que, d'autre part, les entreprises de bois et de meubles et les entreprises textiles ont une probabilité significativement plus élevée d'être soumises à des contraintes de crédit. Cependant, même si nos résultats montrent qu'il n'y a pas de discrimination significative entre les sexes sur les marchés du crédit formel, l'accès au crédit formel par les petites et moyennes entreprises au Nigéria reste très faible, avec une moyenne d'environ 29%. Les autorités monétaires devraient donc soutenir les politiques d'expansion du crédit pour les petites et moyennes entreprises. Là encore, l'implication directe du gouvernement par l'utilisation de fonds d'intervention ciblés sur les petites et moyennes entreprises aurait un impact. Cette étude est l'une des premières au Nigeria à ne pas trouver de différence statistiquement significative ou de discrimination en fonction du sexe en utilisant la décomposition de Fairlie de la contrainte de crédit.

Keywords: Entrepreneurs, gender, discrimination, credit, constraint, probit, decomposition.

JEL Classification: G21, O16, O17

1. Introduction and Motivation

The role of women entrepreneurs in national development has become widely recognized in many parts of the world not only in developing countries but also in the developed world (Malmstrom & Wincent, 2018). The rate at which women now contribute to economic development through their participation in small and medium-scale enterprises is quite unprecedented despite several barriers to the full optimization of their economic potential (Chaudhuri, Sasidharan and Raj, 2020). For example, one of the recent reports published by the Global Partnership for Financial Inclusion (GPFI) (2011), highlights that in developed countries, women are starting businesses at a faster rate than men, and are making significant contributions to job creation and economic growth. According to the report, women-owned firms are growing at more than twice the rate of all other firms owned by men (23 percent and 9 percent respectively per annum) in the United States for nearly three decades. Also in Canada, the report shows that women own about 47 percent of small enterprises and accounted for about 70 percent of new business start-ups in 2004.

In developing economies women are currently participating actively in economic activities through ownership of business ventures, and through this means have contributed immensely to economic growth and poverty reduction. For example, a survey of 1228 women business owners in Middle East and North Africa (MENA) region found that women are running well-established businesses that are generating revenue well over $100,000 per annum comparable to women-owned firms in the United States generating similar amounts. In Indonesian, 2007 data showed that women-owned businesses grew at 8 per cent per annum, while men-owned businesses shrank 0.3 per cent per annum. In 2008, women-owned businesses grew on annual basis by 2.3 per cent in Thailand, while the male counterparts grew only by 0.3 per cent; in Malaysia, 2008 data show that women-owned enterprises grew by about 10 percent compared to about 7 percent growth of male-owned enterprises (GPFI, 2011).

In the last two decades, Nigerian economy has seen increasing participation of female entrepreneurs operating at the small and medium enterprise (SME) level. For example, a survey carried out by Small and medium Enterprises Development Agency of Nigeria (SMEDAN) in 2010, shows that the total number of enterprises in Nigeria stood at 17,284,671 (micro-17,261,753, small- 21,264 and medium-1,654). The total number of persons employed by the Micro, Small and Medium Enterprises (MSME) sector as at December, 2010 stood at 32,414,884. Of this number, the female entrepreneurs account for 42.1 percent in the ownership structure of microenterprises, and 13.6 percent of the ownership structure in small and medium enterprises. The SMEDAN survey shows that MSMEs contribution to the Nation's gross domestic product in nominal terms stood at 46.5 percent as at the period under review. The Survey highlighted that access to finance is one of the priority areas of assistance to MSMEs in Nigeria. Over the course of time evidence shows that the opportunity to access financial benefits by men and women, has the general tendency to favour men. For instance, 'The Global Findex', which is a comprehensive database used in measuring people's behavior with respect to saving, borrowing, and risk management in 148 countries, revealed the disparity in men against women's possession of bank accounts. The same data base disclosed that women are 20% less likely than men to have a bank account in a formal financial institution (Ezike, 2015). A study in Kenya which was funded by the World Bank showed that in Kenya where women constituted about 40% of small holder farmers, they only have access to less than 1% of available credits (Ellis et al. 2007). Also, Narain (2007) reports that in Bangladesh where women accounts for 27% of bank deposits, they could only access only 1.8% of total credits. When it comes to bank account ownership among female and male entrepreneurs in developing countries, 43% of female enterprise owners have bank account, while their male counterparts accounts for about 52% of bank account ownership. When Nigerian statistics is brought to lime light, it was observed that women constitute a greater percentage of the 80% unbanked population in the country. Therefore, since access to finance is often cited as one of the major factors impeding the growth of women-owned businesses in developing countries, one of the critical questions in the existing literature is the issue of whether or not there is discrimination against women entrepreneurs in the formal credit market especially in the developing world and the extent women are discriminated. Furthermore, gender and credit access literature in Nigeria did not expressly address the issues of

credit constraint/discrimination against women at the SME level. For instance, Nwaru and Onuoha (2010) investigated the mean technical efficiency of the male/female farmers who have access to credit or not, while Garba (2011) study the risk attitude of female entrepreneurs. Again, this study also departs from Nwosu and Orji (2016 and 2017) that were specifically focussed on the impact of credit access on firm performance. None of these studies investigated if there is gender discrimination in formal credit market in Nigeria or not and there is no robust approach adopted by most of these studies in defining access to credit except that they asked an entrepreneur if he/she has access to credit or not.

Specifically, this study contributes to the ongoing empirical debate on access to credit in two ways: First, the study investigates if women entrepreneurs are discriminated in the formal credit markets in Nigeria. Second, the study determines the extent to which enterprise characteristics explain gender credit gap in Nigeria. The rest of the paper is structured as follows: Section 2 provides an overview of the literature, while section 3 presents an overview of the methodological framework. The result and discussions are presented and analysed in section 4, while section 5 ends the paper with policy recommendations and conclusions.

2. Literature Review

Globally, there has been an increase in the debate on female entrepreneurship in various countries around the world over the past two decades. As a result, academic literature has seen a lot of arguments on female entrepreneurship and credit markets (Carter et al., 2007). Welter (2006), in a study, equally argues that in emerging and transition economies, women entrepreneurs have become a growing force that should not be neglected in academic discourse. Accordingly, their impact include the process of wider social transformation their contribution extends beyond the economic sphere to other areas of development. A report prepared by United Nations Industrial Development Organization (2008) on Africa also recognizes that women entrepreneurs have been very committed to economic activities in Africa. This finding is also reflected in various studies suggesting that women represent most businesses in the informal sector and also own or manage around a third of all businesses in the formal sector in many developed and developing countries. (World Bank, 2007; Bardasi et al., 2007 and Aderemi et al., 2008).

Despite these, the reality of many economies' situation is very different since women entrepreneurs continue to find themselves in a position where they constantly struggle with issues relating to gender (Nichter and Goldmark, 2009). Gender is a social construction of sex in which men and women are attributed features based on the notions of femininity and masculinity (Oakley, 1972). For example, in his analysis of gender and citizenship, Lister (2003) describes man as an active, rational, impartial, independent, and strong individual while women are seen as passive, emotional, dependent, irrational and focused on domestic concerns. This analysis may not be completely acceptable in today's business world because if women could develop their potential fully in the labor market, the gross domestic product would increase, and growth would be stimulated (Elborgh-Woytek et al., 2013). However, Minniti et al., (2005) equally argues that women-led businesses still represent a small percentage of men-led businesses, although less pronounced in low- and middle-income countries, where women's participation in entrepreneurial activities is greater, due to the difficulties encountered in accessing work.

In recent decades, one of the major problems that inhibit SMEs' growth (especially women-owned businesses) and sustainability in emerging market countries has been identified to be credit constraint (Improve access to finance for the property of women in India, 2014). The development and survival of businesses are largely dependent on the availability of access to a wide range of financial services. Indeed, since SMEs are unable to access equity markets, they rely heavily on bank credit as their main source of finance (Kremp and Sevestre, 2013; Vermoesen et al., 2013; Caglayan and Xu, 2016).

Therefore, the issue of gender and access to credit is considered crucial by scholars, researchers and policy makers. This is because SMEs dominate the business landscape in Africa and are the main engines of employment, growth, and innovation (Berger & Udell, 2006; Kirschenmann, 2016 and Cole & Sokolyk, 2016).

Interestingly, there is a large volume of literature on various forms of credit constraint and gender discrimination. However, what we have learnt from existing literature on access to credit is that there is no clear conclusion on discrimination against women in the formal credit markets. Strands of literature have emerged on the subject with each strand taking a particular position on gender discrimination in access to credit. For

instance, studies like Riding and Swift (1990), Kondo (2003), De Mel, McKenzie, and Woodruff (2009), Bardasi, Terrell, and Sabarwal (2011) find no evidence of discrimination against women entrepreneurs in credit markets. On the other hand, the empirical works of Bellucci, Borisov and Zazzaro (2010), Malapit (2012), Fletscher and Kenny (2011), Hansen and Rand (2014a) and Hashimzade and Rodionova (2013) find evidence of gender credit constraint and discrimination against women in access to formal credits.

Furthermore, some other studies have shown that women entrepreneurs tend to refrain from making loan applications since their feeling of being less secure could lead them to be more skeptical about their ability to obtain financing. Thus, women entrepreneurs seem to be more risk-averse than their male counterparts (Neeley and Van Auken 2010; Yordanova and Alexandrova-Boshnakova, 2011, Carter, Mwaura, Ram, Trehan and Jones, 2015; Ongena and Popov, 2016; Malmstrom, Johansson and Wincent, 2017; Chaudhuri, Sasidharan and Raj, 2020; Poczter and Shapsis, 2018)

Thus, the mixed results in the literature suggest that the argument of whether or not there is discrimination against women entrepreneurs in formal credit markets especially in developing countries where discrimination against women is huge still remains an empirical issue.

In terms of our contribution in this study, it is pertinent to note that most recent studies such as Hansen and Rand (2014a) that use Sub-Saharan African dataset find that different approaches to measuring credit constraint give different results on the extent women are discriminated in the formal credit market. Though in this study we followed one of the approaches used by Hansen and Rand in defining credit constraint, our sample is carefully chosen in order to minimize the risk of endogeneity and reverse causality as we explained in the methodology. Hansen and Rand's cross country study has the advantage of using a large sample in the estimations but was silent on how endogeneity issues were treated in the regression. If the risk of endogeneity is high, large sample size may not give robust estimates. We also extended our analysis beyond manufacturing firms and included firms in different sectors captured in the survey. Again, this gave us sample size advantage to be able to estimate the different variants of the model specifications as well as capturing small and medium enterprises better.

Also, in their methodology, Hansen and Rand used a generalised Oaxaca–Blinder decomposition and traditional logit model in their analysis but we adopted Fairlie (1999 and 2003), which is more appropriate for decomposing binary outcomes. The Oaxaca (1973) decomposition technique cannot be used directly for binary outcomes and also if the coefficients come from probit and logit models. The Fairlie (1999 and 2003), decomposition is more suitable for a nonlinear equation. Hansen and Rand (2014b) focused on mainly on manufacturing firms but our study included entrepreneurs in other sectors like food, hotels and retail services. Our data set is more country specific, richer and more current. While Hansen and Rand (2014b) used data from 2006-2007 survey, ours is 2010 enterprise survey.

Furthermore, as earlier stated, gender and credit access literature in Nigeria did not expressly address the issues of credit constraint/discrimination against women at the SME level. For instance, Nwaru and Onuoha (2010) investigated the mean technical efficiency of the male/female farmers who have access to credit or not, while Garba (2011) study the risk attitude of female entrepreneurs. Again, this study also departs from Nwosu and Orji (2016) that was specifically focussed on the impact of credit access on firm performance. None of these studies investigated if there is gender discrimination in formal credit market in Nigeria or not and there is no robust approach adopted by these studies in defining access to credit except that they asked an entrepreneur if he/she has access to credit or not. Furthermore, the dataset used by these studies is very small as data collection was just limited to one small area that may not represent the characteristics of the Nigerian lending market. Our work therefore differs from previous studies in Nigeria because we use a nationally representative dataset and make innovative definition of credit constraint in order to reduce possible endogeneity issues. Also most of the earlier studies in Nigeria did not account for firm size nor controlled for informality in their discussion of credit discrimination against female entrepreneurs. Accounting for firm size would help to understand if the scale of operation gives women entrepreneurs any advantage in the credit market. Informal credit has been used to measure opportunity cost of capital (Hansen and Rand, 2014b) or how availability of alternative sources of fund could affect formal credit constraint. These are some of the critical gaps this research is designed to address.

3. Methodology and Data

3.1 Theoretical Framework

Analysis of discrimination in credit markets has been a complex and subtle issue in microeconometric literature. Baydas, Meyer, and Aguilera-Alfred (1992) in their pioneering work on discrimination in credit markets argue that analysis of internal self-selection and external credit rationing would help to determine if the distribution of borrowers and the amount borrowed differ among different categories of loan applicants. According to them, simple discrimination occurs if one class of customers obtains more or less loans than another. They refer to internal self-selection as when a group of potential loan applicants self-select themselves and decide to not even apply for a loan. One reason is true self-selection that occurs when potential applicants do not apply for formal credits because they do not have a true demand for external finance although some of them may report a "need" for credit when asked. The second reason, according to them, may be due to induced self-selection where potential applicants do not apply for loans because they perceive they will be rejected.

Furthermore, Baydas, et.al (1992) put forward that self-selection based on the belief that loan applications will be rejected may reflect a correct assessment because these applicants do not possess the attributes (income, collateral, etc.) required by lenders. These attributes therefore, signify barriers to access to formal credit markets for some potential applicants. Alternatively, these potential applicants may have incorrectly concluded that their applications would have been rejected when in fact they would have been approved. They argue that while internal self-selection cannot be easily quantified, it is more likely to explain the behaviour of many women, small farmers, micro entrepreneurs and poor people who rely heavily on the informal sector for their financial services. Therefore, our definition of credit constraint is guided by this framework.

a. Defining Credit Constraint and sample of analysis

To properly identify the number of credit constrained firms, we adopt and modify the approach used by Hansen and Rand (2014a,b) which is an extension of the works by Bigsten et al. (2003) and Bentzen, Byiers, Rand and Tarp (2011). Hansen and Rand recognised the potential selection bias problem inherent in credit constraint studies since not all firms have

external demand for credit and they suggest that modifying the way credit constraint is defined could help to solve selection bias problem. This approach is innovative and we slightly modified it as follows: we identified (i) firms with demand for external finance, and (ii) conditional on such credit demand established the characteristics of credit constrained firms. In this subsample, a firm is categorised as credit constrained if (1) it applied and was denied credit or (2) did not apply for credit due to reasons such as "application procedures too complex", "collateral requirements unattainable", or "possible loan size and maturity insufficient" (non-applicants) following from the definition given by Baydas et.al (1992). From this definition we get rid of firms responding "interest rates too high" or "did not believe it would be approved" and "insufficient Profitability" as reasons for not applying for credit. The reason for dropping these firms is that they do not appear to have a viable business plan and hence do not show true entrepreneurial characteristic of risk taking. Also, we classified firms that financed their previous acquisition of fixed assets by borrowing from formal credit markets as credit unconstrained. Hence, an indicator variable which takes the value 1, if the firm is credit constrained and 0 otherwise was constructed based on full rejection and half rejection of loan applications.

In sum, credit constraint exists when it is not flexible for firms or individuals to access credit especially in the formal financial markets. This may be due to a number of reasons. First, the applicant may not get up to the amount of credit applied for. Second, the collateral requirements may be a constraint since most small and medium enterprises do not have the right collateral to borrow regardless of the viability of their business proposal. Finally, credit constraint may exist if an enterprise did not submit application for a loan because the rejection rate has been high based on the past experience. This is a kind of self-selection bias which the market has already created (Nwosu and Orji 2016). Hence, credit constrained firms are firms that experience any of the above conditions when they try to access credit. Credit selection bias occurs when a firm did not apply for credit by erroneously concluding that its application will be rejected because the credit-seeking firm sees itself as not possessing the attributes required by the lender (Baydas et al., 1992). These attributes, however, are among those which reflect barriers to access to formal credit markets for some potential applicants.

Furthermore, in defining whether a firm is credit constrained or not our sample of analysis is restricted to only on firms that already have a business and, in the current period, applied for credit or did not apply for the reasons listed above. We excluded those firms that already have existing line of credit such as overdraft, loans and financed their purchase of fixed assets with formal credit in the previous periods. By so doing, our final sample size reduces to 1590 firms of which 1,330 firms are owned by male entrepreneurs and 260 of them owned by women entrepreneurs. Without these modifications, the total sample size would have been 2,994 based on the dataset. We believe that the estimation subsample we have chosen helped to minimize the possible endogeneity and reverse causality of some of the explanatory variables. Endogeneity would have been very serious in our probit estimations because variables such as the firm age, manager's years of experience and education of the owner would have had serious reverse causality with a firm's access to credit if we had included firms that already have line of credit in the sample. That being said, the estimations presented below are better to be used for the newly (i.e. in the current period) credit constrained/unconstrained firms, and not for those already receiving a credit at the time of the survey. For the latter, the results should be interpreted with some caution.

3.2 Model Specifications

3.2.1 Ascertaining gender credit constraint

In order to ascertain if women are more credit constrained than men in the formal credit markets, we specified the following probit model of credit constraint which we estimated by different firm sizes. The variable female which takes the value 1 if the entrepreneur is a female and 0 otherwise is the variable of interest in our probit estimation.

$$\begin{aligned}\text{Contraint} &= \beta_0 + \beta_1\text{experience} + \beta_2\text{educ\_sec} + \beta_3\text{finan\_statement} + \beta_4\text{children} < 10\\ &+ \beta_5\text{status} + \beta_6\text{female} + \beta_7\text{age\_dummy} + \beta_8\text{OwnerCEO} + \beta_9\text{Informal} + \beta_{10}\text{food}\\ &+ \beta_{11}\text{wood\_furniture} + \beta_{12}\text{non\_metallic} + \beta_{13}\text{metals\_othermanuf} + \beta_{14}\text{retail} + \beta_{15}\text{hotels}\\ &+ \beta_{16}\text{Zonal\_dummy} + \mu \qquad (11)\end{aligned}$$

Variable definitions are given in table A4 in the appendix to the work. We used the total weight per size in each state (weight_size) in the estimations because it more appropriately accounts for over or under representation of firms of different categories in each state and thus makes the data nationally representative. The probit model is justified because it is used

to model binary or dichotomous outcome variables. In the probit model, the inverse standard normal distribution of the probability is modelled as a linear combination of the predictors.

3.2.2 Explaining Gender Credit Gap: Nonlinear Decompositions

If gender gap exists, further decomposition of it into explained and unexplained components would give more insight into what causes gender gap in credit access. In order to accomplish this, we employ the methods of decomposing inequality into contributing factors. The core idea is to explain the distribution of the outcome variable in equation (1.1) by a set of factors that vary systematically with firm characteristics (the covariates). We thus adopted the extended decomposition technique proposed by Fairlie (2003) which is more appropriate for decomposing binary outcomes. The Oaxaca (1973) decomposition technique cannot be used directly for binary outcomes and also if the coefficients come from probit and logit models. The method to perform such nonlinear decompositions was first described by Fairlie (1999) and the discussion was extended in Fairlie (2003). Following Fairlie (1999 and 2003), the decomposition for a nonlinear equation such as $Y = F(X\hat{\beta})$, can be specified as:

$$\bar{Y}^{W} - \bar{Y}^{M} = \left[\sum_{i=1}^{W} \frac{F(X_i^{W}\hat{\beta}^{M})}{N^{W}} - \sum_{i=1}^{N^{M}} \frac{F(X_i^{M}\hat{\beta}^{M})}{N^{M}}\right] + \left[\sum_{i=1}^{N^{W}} \frac{F(X_i^{W}\hat{\beta}^{W})}{N^{W}} - \sum_{i=1}^{N^{W}} \frac{F(X_i^{W}\hat{\beta}^{M})}{N^{W}}\right] \quad 1.2$$

where N_j is the sample size for group j. To calculate the decomposition, define $\bar{Y}^{j}$ as the average probability of being credit constrained for group *j* and *F* as the cumulative distribution function from the standard normal distribution. In the above decomposition W represents women entrepreneurs and M represents men entrepreneurs. Again, following Fairlie (2003), in equation (1.2) the first term in brackets represents the part of the gender credit gap that is due to group differences in distributions of *X (covariates)*, and the second term represents the part due to differences in the group processes determining levels of *Y*. The second term also captures the portion of the gender credit gap due to group differences in unobserved endowments. We estimated the decompositions using the Stata command 'fairlie'.

3.2.3 The Data

The data for the proposed study were sourced from the World Bank Investment Climate Survey in Nigeria in 2010. The data collection consisted of a series of structured, face to face interviews with key senior managers/owners of a sample of 3,157 establishments (including large enterprises which we did not include in our analysis because of no representation of women-owned firms at that level across 26 states (Adamawa, Akwa Ibom, Bayelsa, Benue, Borno, Delta, Ebonyi, Edo, Ekiti, Gombe, Imo, Jigawa, Katsina, Kebbi, Kogi, Kwara, Nasarawa, Niger, Ondo, Osun, Oyo, Plateau, Rivers, Taraba, Yobe, Zamfara) representing most sectors of activity and firm sizes. The data is thus nationally representative and the survey was drawn from all geopolitical zones. The data covers large, medium and small scale enterprises with about 422 firms owned by women enterpreneurs either as sole owner or as the majority shareholder. The survey instrument has information explaining why firms did not apply for credit - one being that the firm has "no need for a loan – establishment has sufficient capital." The instrument also asked questions such as whether the establishment has an overdraft facility, the proportion of financing from different sources which include formal and informal sources, whether the establishment currently has a line of credit or loan from a financial institution, collateral requirements, whether the establishment applied for loans or lines of credit, and other firm characteristics. We included firms in different industries instead of limiting our sample to few manufacturing firms as Hansen and Rand (2014b) did in their study. The advantage of doing this is that most women entrepreneurs in the micro/small establishment do not engage in manufacturing activities. Therefore, concentrating only on the manufacturing firms may not allow us to have a clearer picture of the extent of credit discrimination against women entrepreneurs generally. Second, we have more observations to work with by accounting for firms in different industries. Specifically, the sample was drawn from manufacturing sectors, construction, retail and wholesale services, hotels and restaurant, transport, storage, and communications, and computer and related activities.

The stratified sampling method was adopted in the data collection. Under stratified random sampling, unweighted estimates are biased unless sample sizes are proportional to the size of each stratum. The three weights integrated in the dataset to account for bias are the total weight per stratum in each State (variable weight_reg), the total weight per size

in each State (variable weight_size) and the single weight per stratum in each state (variable weight_est). We chose the total weight per size in each state since this would normalize variations in sample in each state.

4. Results and Discussion

4.1. Descriptive Statistics

Comparing the mean of the variables by gender as shown in table A1, we see that female-owned firms have significantly higher average of level of education above secondary, have higher average of being in sole proprietorship businesses and hence higher average of being their own CEOs. Women entrepreneurs on the average use more informal credit compared to men. The average of firms in garments and textile are mostly owned by women entrepreneurs.

4.2. Estimates of Credit Constraint

Table 1 reports the probit model of credit constraint and the corresponding marginal effects. The results are arranged by micro and medium enterprises and the combination of both. The dependent variable takes the value 1 for credit constrained and 0 otherwise. The results show no statistically significant difference in access to formal credit in Nigeria by gender regardless of the firm size. This suggests no evidence of discrimination against women using the direct measure of credit constraint. This result is contrary to the findings by Hansen and Rand (2014b) for manufacturing firms in Sub-Saharan African countries using the same enterprise dataset. In Hansen and Rand (2014b), there is statistically significant gender effect in their results across all firm sizes and according to Hansen and Rand (2014a:89) "In most cases, a statistically significant pure gender effect, shows that the mean gap is in all likelihood caused by some form of favouritism vis-à-vis female-owned firms" (see Hansen and Rand (2014a) pages 89 and 90). However, in our result gender has no statistical significance across all firm sizes.

The results show that the effect of age on the probability that a firm will be credit constrained is statistically significant and firms with ageing owners are 13 to 15.6 percentage points more likely to be credit constrained. On the other hand, firms with experienced managers are significantly less likely to be credit constrained, other things being equal. Even though the marginal effect of years of experience is small (ranging between 0.5 to 0.7%) but it is statistically significant for all firm sizes. This suggests that experienced managers can manage the firm's financial

and credit policies better than inexperienced ones. Experienced managers are more likely to understand application procedures better and thus their loan applications are less likely to be rejected.

Firms whose top owner is also CEO are 10.4 percent points more likely to be credit constrained and this is statistically significant only at the 10% level of significance when medium and micro enterprises are combined into one sample. This may be related to risk-averse policies the owner may adopt because most entrepreneurs are quite skeptical of taking bank loans in Nigeria. As the descriptive statistics show, the owner CEOs are more common among sole proprietorship businesses and significant number of these firms is owned by women. The probit estimates further show that firms that have good financial records have significantly less probability of being credit constrained and this may be as low as 27.3 percentage points for medium sized firms. The results also suggest that firms that patronise the informal market face significant credit constraint in the formal credit markets. This may be attributed to the fact that those firms are not able to present good collateral requirements in the formal credit markets. As a result, such firms find it more convenient and easier to borrow from the informal sources and thus reduce the stress and rigor involved in accessing formal credits.

Overall, if the owner has at least secondary education, the probability of facing credit constraint in the formal credit market reduces by about 6 percent on the average. Again, this is weakly significant at the 10% level of significance for the combined sample. Educated owners are better able to gather and utilise credit information than none educated owners. As a result, higher levels of education of the firm owner decreases the likelihood of credit constraint since this enhances the ability to comply with application procedures as well as to understand the structure of the financial market. Zonal factors and industry characteristics are also significant in explaining credit constraint. Entrepreneurs in garments and wood industry face significant credit constraint compared to the construction industry in Nigeria. The summary statistics shows that average of women-owned firms is significantly larger in garments and textile than male-owned firms.

When the significant variables were interacted with gender in the regression (the results not reported here), we did not find any statistically significant coefficient. This again suggests that there is no evidence of gender credit discrimination even after controlling for interaction of

variables. The dummy variable included in all firms indicates that medium-sized firms are significantly less credit constrained in the formal credit markets compared to micro/small firms.

Table A1: Test of Significance of Difference in Means of the Variables by Male and Female and firm size

Variable	Micro/Medium (Male-Female)		Micro/Small (Male-Female)		Medium (Male-Female)	
Constraint1_1	-0.0142	(-0.41)	0.00940	(0.25)	-0.0990	(-1.08)
Experience	1.469***	(6.59)	1.431**	(2.92)	1.545	(1.47)
Educ_sec	-0.0459*	(-2.00)	-0.0414	(-1.55)	-0.0990*	(-2.15)
Status	-0.0714***	(-3.50)	-0.0497**	(-2.57)	-0.0661	(-1.17)
age-dummy	0.189***	(6.59)	0.130***	(4.21)	0.235***	(3.91)
ownerCEO	-0.103***	(-4.34)	-0.0519*	(-2.35)	-0.147*	(-2.33)
Employees	2.841***	(3.68)	0.0774	(0.30)	1.070	(0.56)
Children<10	0.0659*	(2.40)	0.0819**	(2.67)	0.0176	(0.29)
output_worker	0.196***	(3.44)	0.164*	(2.50)	0.170	(1.48)
capital_worker	0.159*	(2.17)	0.0904	(1.13)	0.467**	(2.61)
acquiredland	0.0162	(0.65)	0.0112	(0.40)	0.0270	(0.48)
fixed_asset	0.0438	(1.51)	0.00813	(0.25)	0.0582	(0.96)
Informal	-0.0338*	(-1.97)	-0.0341	(-1.64)	-0.00270	(-0.09)
Finan_Statement	0.0612*	(2.19)	0.00907	(0.28)	0.102*	(2.15)
food	0.0174	(1.17)	0.0113	(0.82)	-0.00642	(-0.15)
garments_textile	-0.0772***	(-5.52)	-0.0698***	(-4.24)	-.0968***	(-3.55)
wood_furniture	0.109***	(5.31)	0.153***	(6.27)	-0.0128	(-0.34)
non_metallic	0.0236	(1.53)	0.0271	(1.48)	0.0276	(0.94)
metals_othermanuf	0.171***	(7.83)	0.196***	(7.72)	0.114**	(2.60)
retail	-0.0331	(-1.55)	-0.0424	(-1.72)	0.0200	(0.45)
Hotels	-0.165***	(-6.84)	-0.200***	(-7.74)	-0.0840	(-1.44)
Construction_others	-0.0457**	(-2.93)	-0.0749***	(-4.70)	0.0386	(0.95)
N	2618		1844		774	

Source: Authors' computations

t statistics in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

3.3. Fairlie Nonlinear Decompositions

In order to ensure the robustness of our probit estimates of no gender bias in credit access among entrepreneurs in small and medium enterprises in Nigeria. We carried the Fairlie type decomposition of the small gaps observed in the regression to ascertain if a particular component is statistically significant. This is reported in Table A3 in the appendix. The decomposition results are shown for micro/small enterprises, medium enterprises and for combination of both. In the decompositions, positive difference means that women are more favoured while negative difference shows they are less favoured. Again, the differences are not statistically different from zero. This reinforces our finding that women are not discriminated in access to formal credit in Nigeria using the direct measure of credit constraint.

However, decomposition of the explained components for all firms shows that age of the owner, region and industry type have statistically significant endowment effect. However, the reported coefficients are the marginal effects. Where the explained component is positive, the characteristics with negative coefficients increase credit constraint for women and where the explained component is negative, the characteristics with positive coefficients tend to reduce credit gap to the advantage of women entrepreneurs.

Therefore the results in table A3 show that age of the owner tend to significantly increase credit gap against women in the formal credit markets for micro enterprises and decreases it in medium enterprises. However, type of industry and keeping proper financial records tend to favour women credit access at medium enterprise level. These findings suggest that even though we do not find overall significant bias in credit access by women in the formal credit market, differences in specific endowments or characteristics of men and women owned enterprises could account for most of the discrimination against women in the formal credit markets.

5. Conclusions and Policy Recommendations

The main object of this study is to ascertain if women entrepreneurs are discriminated in access to formal credit in Nigeria. Using direct measures of credit constraint, this study could not find any statistically significant discrimination against women in formal credit regardless of the firm size.

This is evident by the non-significance of the gender coefficient in the probit estimations at different firm sizes as well as no statistically significant difference found in the Fairlie decomposition of the credit constraint by gender. These findings therefore differ from the findings of other studies that use cross country Sub-Saharan African enterprise data (see for example Hansen and Rand, 2014b among others) to analyse gender credit discrimination. These findings are also consistent with the general belief that the Nigerian formal financial institutions (especially commercial banks) do not have any gender-targeted credit policy. However, even if our results show there is no significant gender discrimination in the formal credit markets, access to formal credit by small and medium enterprises in Nigeria still remain very low at an average of 29 percent (as shown in our descriptive analysis in appendix table A2). Hence, the objective of any credit policy in Nigeria should be to expand access to formal credit through education of entrepreneurs on how to access credit as well as targeting credit policy for geopolitical zones in Nigeria that are more credit constrained. Since micro/small firms are more credit constrained in the formal credit markets compared to medium firms, government credit intervention in SMEs should give priority to small and micro enterprises. Most of the small and micro enterprises are owned by women. Women play vital roles in the economy and there is need to support them so that they can continue to play active part in the development trajectory of the nation. Neglecting women entrepreneurs at the SME level will be detrimental to the growth of the economy and it will also affect the creation of jobs at that level.

Also, small and medium enterprises should be encouraged to keep good financial records of their transactions since this enhances a firm's ability to access formal credits. Lenders would prefer firms that keep good financial records since such records could help to ascertain the stream of income that flows into the firm and hence help to calculate the firm's credit repayment ability. We found that keeping good financial records decreases credit constraint by about 10 % and as high as 27% for medium enterprises.

Although it is difficult for government to direct formal financial institutions to disburse credit to firms in a deregulated financial system, however direct government involvement by the use of intervention funds targeted to small and medium enterprise would make impact.

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APPENDICES

Table A2: Summary Statistics of the Variables by Gender and Firm Size

Variable	Micro and Medium			Micro Enterprises			Medium Enterprises		
	male	female	Total	male	female	Total	male	female	Total
Constraint1_1	0.711	0.725	0.714	0.729	0.720	0.728	0.660	0.759	0.669
experience	12.21	10.74	12.02	12.16	10.73	11.95	12.30	10.76	12.17
Educ_sec	0.801	0.847	0.807	0.783	0.825	0.790	0.840	0.939	0.849
status	0.846	0.918	0.856	0.896	0.945	0.903	0.737	0.803	0.743
age dummy	0.462	0.274	0.438	0.360	0.230	0.341	0.689	0.455	0.669
OwnerCEO	0.773	0.876	0.787	0.861	0.912	0.868	0.581	0.727	0.593
employees	16.05	13.21	15.68	9.194	9.117	9.183	31.25	30.18	31.16
children<10	0.675	0.609	0.666	0.684	0.602	0.672	0.654	0.636	0.652
output_per worker	13.67	13.47	13.64	13.58	13.42	13.56	13.85	13.68	13.83
capital_per worker	10.15	9.993	10.13	10.14	10.05	10.13	10.19	9.723	10.13
acquired land	0.243	0.226	0.241	0.237	0.226	0.236	0.254	0.227	0.252
purchased F/Asset	0.526	0.482	0.520	0.457	0.449	0.456	0.679	0.621	0.674
Informal	0.093	0.126	0.097	0.108	0.142	0.113	0.0579	0.0606	0.058
Finan_Statement	0.644	0.582	0.636	0.553	0.544	0.552	0.845	0.742	0.836
Food	0.073	0.0559	0.071	0.0478	0.0365	0.0461	0.130	0.136	0.130
garments_textile	0.052	0.129	0.062	0.0580	0.128	0.0683	0.0395	0.136	0.0478
wood_furniture	0.162	0.0529	0.148	0.193	0.0401	0.170	0.0932	0.106	0.0943
non_metallic	0.0794	0.0559	0.076	0.0892	0.0620	0.0851	0.0579	0.0303	0.0556
metals_othermanuf	0.197	0.0265	0.175	0.222	0.0255	0.193	0.144	0.0303	0.134
retail	0.158	0.191	0.162	0.166	0.208	0.172	0.141	0.121	0.140
Hotels	0.205	0.371	0.227	0.172	0.372	0.202	0.280	0.364	0.287
Construction_others	0.072	0.118	0.078	0.0529	0.128	0.0640	0.114	0.0758	0.111
Observations	2618			1844			774		

Source: Authors' computations

Table 1: Probit Estimates of Determinants of Credit Constraint and their Marginal Effects

	Prob2_all	Marg2_all	Prob2_micro	Marg2_micro	Prob2_medium	Marg2_medium
constraint1_1						
Gender(fem=1) (d)	0.0635	0.0173	0.0561	0.0146	0.258	0.0835
	(0.658)	(0.652)	(0.717)	(0.712)	(0.426)	(0.390)
age45+ (d)	0.522***	0.135***	0.539***	0.131***	0.439**	0.156**
	(0.000)	(0.000)	(0.001)	(0.000)	(0.029)	(0.031)
experience	-0.0182**	-0.0506**	-0.0181*	-0.00481*	-0.0218*	-0.00753*
	(0.032)	(0.033)	(0.057)	(0.058)	(0.073)	(0.075)
status (d)	0.184	0.0540	0.152	0.0425	0.305	0.110
	(0.346)	(0.372)	(0.508)	(0.529)	(0.153)	(0.167)
ownerCEO (d)	0.279*	0.0837	0.302	0.0886	0.219	0.0764
	(0.084)	(0.105)	(0.120)	(0.151)	(0.240)	(0.246)
children<10 (d)	0.0678	0.0190	0.0409	0.0109	0.495**	0.176**
	(0.570)	(0.574)	(0.756)	(0.758)	(0.014)	(0.015)
informal_credit (d)	0.371**	0.0916**	0.382**	0.0897**	0.175	0.0579
	(0.033)	(0.014)	(0.041)	(0.018)	(0.544)	(0.526)
fin_statement (d)	-0.362***	-0.0968***	-0.356***	-0.0919***	-1.041***	-0.273***
	(0.002)	(0.002)	(0.004)	(0.003)	(0.000)	(0.000)
educ_sec (d)	-0.243*	-0.0630*	-0.241	-0.0597	-0.0212	-0.00731
	(0.092)	(0.074)	(0.125)	(0.103)	(0.933)	(0.933)
North-central	-0.538***	-0.170***	-0.484**	-0.146**	-1.253***	-0.469***
	(0.003)	(0.006)	(0.015)	(0.026)	(0.000)	(0.000)
North-east	-0.826***	-0.278***	-0.821***	-0.268***	-0.661*	-0.251*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.052)	(0.060)
North-west	-0.365	-0.110	-0.370	-0.108	-0.310	-0.113
	(0.100)	(0.126)	(0.126)	(0.157)	(0.351)	(0.369)
South-east	-0.395	-0.124	-0.462*	-0.144	0.476	0.143
	(0.103)	(0.139)	(0.084)	(0.122)	(0.267)	(0.186)
South-south	0.0283	0.00780	0.0902	0.0234	-0.219	-0.0765
	(0.897)	(0.897)	(0.721)	(0.715)	(0.371)	(0.375)
food (d)	-0.150	-0.0437	-0.227	-0.0655	0.0446	0.0153
	(0.661)	(0.677)	(0.592)	(0.620)	(0.890)	(0.889)
garments_textile (d)	1.519***	0.214***	1.728***	0.210***	0.910*	0.230***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.085)	(0.006)
wood_furniture (d)	0.379	0.0937*	0.331	0.0791	0.739*	0.209**
	(0.108)	(0.070)	(0.213)	(0.167)	(0.073)	(0.018)
non_metallic (d)	0.0858	0.0231	0.0656	0.0170	-0.191	-0.0688
	(0.762)	(0.754)	(0.835)	(0.830)	(0.612)	(0.624)
metals_othermanuf (d)	0.0222	0.00613	0.0192	0.00508	-0.115	-0.0404
	(0.929)	(0.929)	(0.946)	(0.946)	(0.729)	(0.734)
retail (d)	-0.512**	-0.161**	-0.594**	-0.184**	0.118	0.0397
	(0.025)	(0.042)	(0.021)	(0.040)	(0.718)	(0.711)
hotels (d)	-0.0189	-0.00526	-0.0724	-0.0196	0.368	0.120
	(0.928)	(0.929)	(0.762)	(0.766)	(0.224)	(0.193)
size (medium=1)	-0.341**	-0.0944***				
	(0.012)	(0.008)				
Observations	1301	1301	988	988	313	313
Pseudo R^2	0.148	0.148	0.156	0.156	0.160	0.160
chi2	167.7	167.7	131.4	131.4	64.28	64.28
P_corr						

Source: Authors computations

Marginal effects; *p*-values in parentheses (d) for discrete change of dummy variables (except experience) from 0 to 1 * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

* (d) indicates dummy variable

*construction is the base category industry dummy.

*constant term omitted because of reported marginal effects

*South-west is the base category zonal dummy.

*weight used in the estimation is proportional to size.

Table A3: Fairlie Nonlinear Decomposition of Gender Credit Constraint

Variable	micro	medium	both
Model:			
Pr(Y!=0G=0,women)	0.772	0.657	0.762
Pr(Y!=0G=1, men)	0.726	0.760	0.728
Difference	0.046	-0.103	0.033
Total explained	0.057	-0.021	0.052
Explained by:			
age dummy	.018**	.0394*	.0203**
experience	-0.005	-0.003	-0.004
status	-0.006	-0.003	-0.007
ownerCEO	-0.003	-0.006	-0.004
children10	-0.0001	0.005	-0.0002
informal	0.006	-0.001	0.005
financial_statement	0.004	-.0125*	0.003
educ_sec	0.004	0.0015	0.005
region	.0331***	-0.011	.0302***
industry	0.004	-.0343*	0.004

Source: Authors' computations

Table A4: Definitions of Variables of the Models We estimated

Variable	Definition and motivation
constraint11	**Constraint1_1** is the credit constraint variable which takes the value 1 if the firm is credit constrained and 0, otherwise.
experience	years of experience of the firm manager (CEO): firms with experienced managers are more likely to understand the procedures for applying and securing a loan from a formal institution than firms with less experienced managers. As a result, such firms are less likely to be credit constrained.
Edu_sec	education level of the owner (0 is no education, 1 primary, 2 secondary, 3 technical, and 4 tertiary education): We expect that managers with at least secondary education and above better understand the strategies and techniques for securing loans from formal credit institutions and also when and where to apply compared to less educated owners or managers.
Finan_statement	Financial Statement: Firms that have good financial statements enjoy some form of goodwill that enables them to have access to finance relatively more easily than firms that have poor financial statements. Consequently, such firms are less likely to be credit constrained. We also expect that formal credit institutions will be more inclined to grant loans and credit facilities to firms with good financial positions as reflected in their financial statement.

Status	This is an indicator variable showing the type of business ownership. We recoded as 1 if the firm is sole proprietorship and 0 otherwise. Financial firms are not well disposed to lend to single-owner firms than they are to partnerships and incorporated firms. The believe that in one man business the death of the owner may change the structure of the firm or even bring it to an end could affect the chances of such enterprises obtaining credit.
female	1 if the sole owner or majority shareholder is a female and 0 if male.
ownerCEO	1 if the owner is the chief executive officer and 0 otherwise: This is the case with many firms in the dataset. The owner or majority shareholder is not different from the chief executive officer. When the owner is the chief executive officer, risk-taking is minimal and the demand for external finance will be low.
children<10	owner has children under age 10: As a control, Children under 10 years of age is there to take account of the demographic structure of the household of the firm owner.
Age dummy	age category of the owner. The effect of age on the chances of a firm being credit constrained could be negative or positive. For example, when formal lenders become apprehensive of aging business owners, it can increase the probability of being credit constrained. Also, we introduce this to account for the effect of demographics on the probability of being credit constrained.
Informal	1 if the firm has used informal credit and 0 otherwise. Firms that have access informal credit are less likely to take the pains and troubles of applying for formal loans or credit. This is usually common with small or micro enterprises.
Industry	group dummy for the type of industry (food, garments/textile, wood/furniture, retail, construction, etc): we hypothesize that the type of industry the firm is engaged in may affect the probability of being credit constrained. Formal lenders like industries with regular cash inflows or turnover over industries with non-regular inflows.
Zonal dummy	"North_central =1", "North_east =2", “North_west =3", "South_east =4", "South_south =5", "South_west =0". The zonal dummy accounts for the regional distribution of the firms and their owners across the nation. Here we use South West as the base category for the zonal dummy.

Source: Authors’ compilation

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