DBN Development Bank of Nigeria RC 1215724

...*Financing Sustainable Growth*

WORKING PAPER SERIES

234, 2025

BANKING CONCENTRATION AND WOMEN'S ENTREPRENEURSHIP IN DEVELOPING COUNTRIES

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Abstract

The purpose of the present study is to assess how bank concentration affects female entrepreneurship in 70 developing countries using data for the period 2000 to 2019. The empirical evidence is based on OLS Fixed Effects and the Generalized Method of Moments (GMM) regression. Three main female entrepreneurship outcome variables are employed, notably: women's entrepreneurial activity rate; women business leaders and the number of jobs created by businesses run by women. Two main moderating variables are employed, namely: education and access to credit. It follows that the analysis is tailored towards assessing the direct impact of bank concentration on the female entrepreneurship outcomes as well as the indirect effect pertaining to how the education and credit access moderating variables influence the effect of bank concentration on female entrepreneurship. The results provided below are established. Bank concentration broadly reduces female entrepreneurship. The negative effect is robust to the inclusion of additional control variables, an alternative estimation technique and a different measurement of bank concentration. Within interactive regressions' purview, the unconditional effect of bank concentration reduces female entrepreneurship while education and credit access further complement bank concentration to reduce female entrepreneurship. This evidence of negative synergies is explained, and policy recommendations are provided.

1.Introduction

The purpose of the current research is to assess how the concentration of banks impacts the entrepreneurship of women in developing countries. The motivational elements underpinning the purpose of the study are numerous. For instance, Women's empowerment has garnered increased scientific focus in the last few decades as a way to improve economic status, mobility, health, and women's participation in decision-making (Afrin *et al.*, 2008; Sundström *et al.*, 2017; Asongu *et al.*, 2024). Furthermore, the sustainable development agenda recognizes that women's empowerment and gender inequality are important factors in increasing women's opportunities and reducing the gender gap. The authors identified three types of women's empowerment: political, social and economic. The study concentrates on economic empowerment in the research within the specific remit of women's entrepreneurship.

Numerous scholars have demonstrated in the literature that women are more inclined to favor measures that help other women, such healthcare and education, when they are given politico-economic power. As maintained by Tchamyou et al. (2023), Kamaluddeen (2019), Asongu et al. (2024), and other sources, women who have access to savings accounts, bank accounts, and other financial institutions actually have greater authority over their earnings and can pay for both personal and productive needs. Additionally, adolescents have greater control over how they choose to spend their time, be it working, playing, earning money, or learning (Aker et al., 2016; Asongu & Odhiambo, 2018; Chant, 2016). When it comes to choosing a career, getting married, or using contraception, they might have more freedom in their lives (Asongu & Odhiambo, 2023; Aker *et al.*, 2016). They might also be in a better position to choose where and how to work (Field *et al.*, 2016), which could boost their income and productivity and help them escape poverty (Jack *et al.*, 2016).

Even with all of the advantages that women's empowerment can offer, developing nations continue to lag behind. Women actually participate less in politico-economic activities (Nchofoung et al., 2023). According to Asongu et al. (2024), the majority of studies that have been done in the literature to date have ignored any potential relationships between bank concentration and women's empowerment. Whereas Asongu et al. (2024) have focused on the nexus between bank concentration and female political empowerment, The current investigation is tailored towards assessing the linkage between bank concentration and gender economic inclusion within the specific remit of female entrepreneurship. Moreover, the size of the sample in this study, which includes up to 80 developing nations, enables the study to depart from Asongu et al. (2024) on a multitude of fronts. (i) As previously highlighted, the first distinguishing feature is a focus on economic empowerment within the specific remit of female entrepreneurship contrary

to political empowerment. (ii) Instead of using information sharing offices (i.e., public credit bureaus and private credit registries) as moderators of the bank concentration channel, the present study uses education and credit availability as moderators.

This study is positioned differently than the existing literature on contemporary entrepreneurship, which has concentrated on the connections among innovation, business constraints, relevant technologies, and entrepreneurship for overall sustainability and reduction of income inequality (Régnier, 2023; Bouanza et al., 2024); technological change and the significance of frugal innovations for entrepreneurial development (Khadria & Mishra, 2023); Chinese entrepreneurship and technologies during global challenges (Shi, 2023); development of frugal innovations that are seen as highly innovative from the viewpoint of sustainable entrepreneurship (Rao & Liefner, 2023) and connections between ICT and business opportunities (Fuamba et al., 2023). The paper's other sections are organized as follows: A concise overview of the literature is given in Section 2. In Section 3, the data and technique are disclosed. The results are presented and analyzed in Section 4, and the study is concluded in Section 5.

2. Theoretical Underpinnings and Literature Review

2.1 Theoretical Underpinning

The investigated linkage between bank concentration and female entrepreneurship can be supported theoretically by four essential theoretical pillars: (i) the financial inclusion theory; (ii) the job search theory; (iii) the theory of Substantive Representation of Women (SRW) and (iv) the Creative Capital Theory (CCT). On the theoretical premise of the financial inclusion theory, it is noteworthy that the theoretical literature on the linkage between financial inclusion and gender empowerment is largely consistent with the importance providing financial access in order to enable the female gender to realize that maximum of its potentials (Nchofoung et al., 2014a, 2024b; Asongu et al., 2024). It is also worthwhile to note that Nchofoung et al. (2024a) have used the theory of financial inclusion beneficiary to establish the relationship between financial inclusion and women's empowerment. The theory is pertinent to the current study because, according to the theory of financial inclusion, gender access to finance creates opportunities with which to fund and achieve inclusive development outcomes, including gender economic inclusion within the remit of entrepreneurial activities. In what follows, more perspectives of the theory are provided.

First, the fundamental theoretical framework for this inquiry is the financial inclusion beneficiary (Asongu et al., 2024). In this sense, financial services should be seen as a public benefit, and the public goods theory of financial inclusion holds that people's use of attendant services and access to them shouldn't be restricted. Therefore, the existing financial institutions ought to make use of extant structures to improve financial access to the population (Ozili, 2020). All people, regardless of age, gender, or ethnicity, have access to and are free to use the attendant services since they are a public good (Nchofoung et al., 2014a). Credit availability is used as a moderating variable because market power or bank concentration limits access to credit which is essential in female entrepreneurship (Bennardo et al., 2015; Karapetyan & Stacescu, 2014; Boateng et al., 2018). Another moderator that is used in the present study is education and thus the importance of the 'job search theory' in providing a theoretical basis for such an inclusion.

Concerns about students entering the workforce after graduation are largely based on the predicted pay and/or wage that the related work would provide them with a means of subsistence so that they can be capable of maintaining a life, according to the second strand, or "job search theory" (McMahon, 1987; Asongu, 2024). To put it simply, the expected utility depends on comparing the quality of life during one's time in school to the standard of living after graduating and finding employment. According to the corresponding theory, students' expectations about their expected salaries may cause them to become self-employed through

entrepreneurial endeavors or find employment in private or public organizations that pay what they expect or find appropriate. It is also important to stress that the anticipated advantages align with knowledge from the body of existing research on the topic (Asongu, 2024). Moreover, it seems intuitive that if students are given financial access tools like credit availability, the expected benefits regarding employment and quality of life can increase.

In the light of the above, the second theoretical underpinning is in line with the present study because the purpose of education is to eventually get employed, either in the public sector or private sector, especially by means of entrepreneurial activities that are tailored to promote women economically. It follows that educated people can better be informed on how to circumvent constraints associated with limited financial access owing to high banking concentration. It is relevant to note that Asongu (2024) has recently employed financial access and education in the interactive regressions in order to fight female unemployment. Hence, beyond the discussed theoretical justification, there is also an empirical justification for the inclusion of the two sets of moderators.

Third, according to relevant research, the Creative Capital Theory (CCT) is based on the idea that a valuable and innovative workforce—comprising citizens involved in economic spheres—plays a key role in a country's political and economic growth (Lopes et al., 2011; Zogo et al., 2025). When applied to this study's context, it becomes clear that bank concentration influences access to credit which is necessary for creative capital relevant for female entrepreneurship as conceived in the present study. Hence, the CCT aligns with the theory of women's substantive economic representation (SRW) in the perspective that capital from financial institutions that is constrained by bank concentration can enable more women to be represented among the population of entrepreneurs (i.e., women being substantively represented among entrepreneurs), in line with attendant literature on SRW (Kodila-Tedika & Asongu, 2018; Zogo et al., 2025).

Although the CCT has faced criticism in some academic circles; arguing that economic development from a specific working class needs innovation rather than just creativity (Lopes & Cunha, 2009; Storper & Scott, 2009; Amabile, 2018), considering this study, bank concentration which limits competition in the banking industry can affect women's access to credit and by extension, women's ability to realize their innovative and creative potentials within the framework of entrepreneurship. The CCT aligns with the context of this study in view of the SRW in entrepreneurial circles.

2.2 Literature Review on the Effects of Financial Access on Women Entrepreneurship

Two primary strands can be used to discuss the related literature, especially as it pertains to the positive and negative effects of financial access and women entrepreneurship. These sections are developed according to the same sequence that was emphasized.

The first part focuses on how financial education affects the performance of women micro-entrepreneurs' businesses and its investigated by Tumba et al. (2022). The study employs a survey research design to collect information from 247 female business owners in six states in northeastern Nigeria. The findings indicate that financial education, cash forecasting, and bookkeeping, as proxies for financial literacy, have a noteworthy influence on the performance of the business of female entrepreneurs. Furthermore, they show that the two factors that have the biggest and least impact on the variation in the business performance of female micro-entrepreneurs are bookkeeping practices and financial knowledge, respectively. This volatility is least affected by cash forecasting. This implies that financial knowledge is essential to the success of female micro-entrepreneurs.

Anselme (2022) focuses on how women's entrepreneurial development and access to capital, technical expertise, and financial literacy affect women's empowerment. In order to achieve the intended replies, standardized questionnaires were emailed to 950 women-owned SMEs as part of the sample. Their research indicated a statistically significant positive correlation between financial literacy, women's empowerment, and the sustainability of their business.

Principal Component Analysis (PCA) and cross-sectional data methods are used by Esmaeilpour and Karami (2023) to investigate the effect of financial inclusion through FinTech on women's financial empowerment with a sample of 113 nations. Their findings demonstrate that, in nations with low levels of gender discrimination, there is a positive and significant association between women's financial empowerment and financial inclusion through FinTech. Nonetheless, in nations where there is widespread gender prejudice, this effect is minimal. Gender disparity constitutes a barrier, preventing women from achieving financial independence.

By emphasizing the growth of female entrepreneurs, particularly in developing countries, Yingjun et al. (2021) add to the accumulation of existing material. According to their study, the growth of small and medium-sized businesses (SMEs), particularly those run by women in Bangladesh, is significantly influenced by two factors: ease of business creation and access to outside funding. The current credit status must therefore be extended in order to boost female-owned SMEs.

With 144 nations, Hasan et al. (2023) use a cross-sectional approach to assess the effect of digital financial literacy on women's financial inclusion. Higher digital financial literacy among female entrepreneurs is associated with a higher likelihood of using formal banking channels, according to the study's probabilistic regression results. Rui and Qian (2022) utilizing multi-sourced data from the Chinese Family Panel Studies with manually combined provincial and industrial data from 2014, investigate the impact of industrial regulation on the relationship between financial literacy and creativity as well as the relationship between financial literacy and entrepreneurial activities. It is evident from their empirical findings that financial literacy has a substantial positive impact on both the performance and engagement of entrepreneurs. Furthermore, it has been observed that the benefits of financial literacy on entrepreneurial involvement and performance are favorably moderated by industrial regulation. This suggests that financial literacy is a more significant factor in fostering entrepreneurship in industries with strict regulations.

In Ethiopia, Abraham and Meketaw (2023) investigate the connection between women's economic empowerment and financial inclusion. Their results, which were obtained by using instrumental variable and endogenous switching regression techniques, demonstrate that women's economic empowerment in Ethiopia is positive and statistically significantly impacted by financial inclusion, suggesting that increased access to financial services improves women's economic outcomes.

The research carried out by Iram et al. (2023) aims to ascertain the degree to which financial awareness mediates the gap between behavioral biases and financial literacy in female entrepreneurs. Utilizing AMOS 21, structural equation modeling was used to examine a random sample of 346 Pakistani women business owners. Financial literacy has been proven to have no correlation with mental accounting bias, but it does have a strong direct influence on lowering anchoring and herding prejudices. Financial literacy significantly decreases mental accounting and herding tendency for financially conscientious women, according to the moderation analysis, which also indicated intriguing indirect effects. The association between financial literacy and anchoring bias is however not adversely accelerated by financial mindfulness.

The effects of digital financial inclusion on women entrepreneurs are investigated by Yang et al. (2022) utilizing a nationwide sample made up of matched data from a nationally representative survey and a digital financial inclusion index. The findings demonstrate how digital financial inclusion strongly encourages women to pursue entrepreneurial endeavors. They discovered that digital financial inclusion can reduce the financial barriers faced by women and help them obtain business information to lessen information gaps.

Gang et al. (2022) examine how the gender distribution of informal economic activity is impacted by new funding choices. They discover compelling empirical evidence maintaining the relevance of financial access in boosting the doing of business in India's unorganized sector firms by utilizing nationwide data on unorganized (informal) enterprises collected by India's National Sample Survey Office in 2010/11 and 2015/16.

As highlighted earlier, the second strand on negative effects is sparse. In this strand, using the mediating variable of perceived entrepreneurial behavioral control, Nguyen (2020) examines the direct and indirect effects of personal and environmental factors on entrepreneurial intention. Using structural equation modeling analysis, the researchers found that students perceived environmental factors are significantly correlated with their perceived entrepreneurial behavioral control, serving as a mediator between the environmental factors and entrepreneurial intention. The sample consisted of 635 students from 11 universities in Vietnam. The author claims that without entrepreneurial behavioral control, financial availability alone is not enough to impact entrepreneurial ambition.

As recently shown from a systematic review on female entrepreneurship by Deng et al. (2025), according to Simarasl et al. (2022), there is a strong emphasis that access to resources such as networks, mentorship, and funding is essential for female entrepreneurs to overcome challenges and achieve business growth. Furthermore, other studies have concentrated on social cognitive aspects, including confidence, resilience, and perceived support from family and friends, as essential elements contributing to women's entrepreneurial success and decision-making (Shetty et al., 2023). In order to address attendant obstacles, in view of Angulo-Guerrero et al. (2023), feminist empiricists advocate for enhancing women's skills, education, and managerial experience. Rugina and Ahl (2023) is also of the viewpoint that the fluid and energetic characteristics of masculinity and femininity, which influence individual behaviors and result in different life experiences for men and women should be taken into account. Deng et al. (2023) posit that the family's role in offering emotional support, practical help, and financial aid is essential for female entrepreneurship while in line with Welsh et al. (2021), in situations where family backing is strong, women are generally better prepared to tackle challenges in entrepreneurship. Furthermore, Dewitt et al. (2023) posits that more egalitarian family arrangements, where responsibilities are shared, create a more supportive atmosphere for women to engage in entrepreneurial pursuits. Nonetheless, these contemporary studies have failed to address the problem statement considered in this study as stated in the introduction, especially with a robust methodological framework that is tailored to address most dimensions of endogeneity as clarified in the methodology section.

In the light of the above, two main testable hypotheses are examined in the empirical analysis section:

Hypothesis 1: bank concentration reduces women's entrepreneurship.

Hypothesis 2: education and credit moderate the negative effect of bank concentration on women's entrepreneurship.

In the section that follows, the study examines whether the above testable hypotheses withstand empirical scrutiny. Hypothesis 1 is examined using linear additive models while Hypothesis 2 is assessed within the framework of interactive regressions.

3. Data and Empirical Strategy

3.1 Description of the Data

Imbalanced panel data is used for a sample of seventy developing nations from 2000 to 2019 in this analysis. The accessibility of data informed the selection of the study period and sample size. Accordingly, the extant Global Entrepreneurship Monitor (GEM) data is available for the 70 countries at the time of the study and thus potential bias may not be apparent because the available data at the time of the study is used for the research. The descriptive statistics for each variable utilized in this investigation are shown in Table A1. The nations under investigation are listed in Appendix Table A3.

3.1.1 Dependent Variable

The dependent variable is women's entrepreneurship. It is measured here by three indicators: (i) women's entrepreneurial activity rate (F/H) which is the share of women-owned businesses or businesses led by women; (ii) women business leaders (F%T) which refers to the increasing number and influence of women in leadership positions, particularly in the realm of business and (iii) the number of jobs created by businesses run by women. The data come from the following sources: Global Entrepreneurship Monitor (GEM, 2020) and Mastercard Index of Women Entrepreneurs (MIWE, 2020).

Compared to male entrepreneurs, it is less common to find female entrepreneurs. As recently documented by Minniti et al. (2005) and Llussá (2009a), the rate of entrepreneurship is significantly lower among women than men. Accordingly, the survival of modern market economies depends on entrepreneurship, which creates creative companies that stimulate competition and maintain economic expansion (De Vita *et al.*, 2014). It is therefore important to know what factors may be at the root of these inequalities.

3.1.2 Independent Variables

As the main explanatory factor, banking concentration is employed, collected by the total assets owned by a nation's five biggest banks (C5) and its three biggest banks (C3). The data comes from the Global Financial Development Database (GFDD, 2020). As shown Appendix Table A4, two moderators are employed, namely: (i) education which is measured as the amount of public

expenditure in education and (ii) credit supply which refers the amount credit provided by banks in the country.

Banking concentration refers to two distinct realities. A distinction is made between geographical concentration and concentration in terms of activity (Beitone, 2013). Geographic concentration is the agglomeration of banks in a given location (Salop, 1979). This type of concentration obeys a particular discipline, spatial economics, whose precursors are Daspremont (1979) and Salop (1979). However, industrial concentration is unanimously defined as a market structure in which the bulk of production is controlled by a small number of banks.

Although both types of concentration are important, banking concentration in terms of activity is analyzed for two principal reasons. The first reason is theoretical and is based on the fact that, to the best of knowledge, the theoretical debate on the effect of the geographical concentration of banks is not sufficiently established (Asongu et al., 2024). However, the effects of bank concentration in terms of activity have been the subject of an unresolved theoretical debate that is constantly being revisited (e.g., Harvard School vs. Chicago School). The second justification for choosing concentration in terms of activity is empirical. Empirical studies generally find contradictory effects from bank concentration (e.g., Deidda, 2005; Asongu et al., 2024). The challenge is therefore to provide new empirical evidence to fuel the debate on the effects of bank concentration in terms of activity.

3.1.3 Control Variables

To substantiate the relationship between banking concentration and women's entrepreneurship and to avoid variable omission bias, the present study is tailored to account for a selection of current controls that have been demonstrated to be crucial for women's entrepreneurship (Hechavaria et al., 2019; Giménez & Calabro, 2018; Ghouse et al., 2017; Pallaress et al., 2015). Five determinants are introduced: electricity, financial development, natural resources, urbanization and per capita income. The choice of these determinants is further substantiated in what follows.

Electricity enables women entrepreneurs to use machines and power tools to automate tasks, increasing their efficiency and productivity (World Bank, 2019). This allows them to produce more goods and services in less time, resulting in an increase in their income streams. Other studies, such as that by Liussa (2009), highlighted the role of financial development on women's entrepreneurship. They showed that financial development affects particular demographic groupings in a distinct way in terms of their propensity to create new businesses. In addition, a

developed financial system offers women entrepreneurs better access to credit, loans and other sources of financing to launch and grow their companies (World Bank, 2021). This enables them to overcome one of the main obstacles to female entrepreneurship which is the lack of capital.

Third, natural resources are introduced, which through rents can have effects on women's entrepreneurship. According to a World Bank study in 2019, in developing countries, 43% of women entrepreneurs said that lack of access to markets was a major barrier to their growth, partly due to the concentration of men in the extractive sector.

Fourth, another important determinant is urbanization. According to World Bank (2021), urban areas offer a greater concentration of potential customers, facilitating market access for female entrepreneurs. They can therefore sell their products and services more easily and to a larger number of people. Fifth, on the premise of per capita income, another strand of the literature looks at the effects of economic growth on women's entrepreneurship. Indeed, high-growth enterprises, often referred to as "gazelles", are equated to the success of entrepreneurs and celebrated as fundamental to boosting economies, and women's entrepreneurship is a driver for socio-economic development (Hechavaria et al, 2019).

3.2 Empirical Strategy

The objective of this paper is to study the effect of bank concentration on women's entrepreneurship. The study therefore builds on the work of Asongu et al. (2025) and begin by specifying a panel model below, estimated by pooled Ordinary Least Squares (OLS-FE) :

$$WET_{it} = \alpha + \beta_1 BC_{it} + \beta_2 X_{it} + \mu_i + v_t + \varepsilon_{it} \qquad (1)$$

Where WET_{it} represents women entrepreneurs, BC_{it} is the bank concentration, X_{it} is the vector of control variables, μ_i is the country fixed effect, v_t is the fixed effects time and ε_{it} is the error term. It is relevant to note that the choice of variables has been discussed in the previous section. Although this approach is relevant to the study, it is nevertheless the subject of a major criticism often raised in the literature due to its lack of robustness to concerns about reverse causality (Asongu et al., 2024). To overcome this, a dynamic panel model is specified.

$$WET_{it} = \alpha + \beta_1 WET_{it-1} + \beta_2 BC_{it} + \beta_3 X_{it} + \mu_i + v_t + \varepsilon_{it} \qquad (2)$$

Given that the lagged dependent variable in the model places the model within the framework of the dynamic panel model, using OLS-FE to estimate Equation (1) may result in inefficient estimates (see Nickell, 1981). Furthermore, the use of standard estimators such as OLS and fixed effects would lead to biased results, as they do not take into account endogeneity problems that arise from several sources such as reverse causality, measurement error and omitted variables (Tchamyou, 2020).

A common approach in the literature to correct for these problems is the use of the Generalized Moments of Method (GMM) (see, for example, the work of Wen et al. (2022) and Blundell and Bond (1998). One benefit of the GMM is that it uses internal instruments to treat the endogeneity of all the explanatory factors. In addition, the GMM deals with endogeneity arising from reverse causality and produces valid instruments (Tchamyou et al., 2019).

It is relevant to emphasis that the choice of the OLS-FE empirical strategy is to account for the unobserved heterogeneity dimension of endogeneity while the adopted GMM approach is meant to account for the simultaneity as well as the unobserved heterogeneity dimensions of endogeneity. Furthermore, the methodological approach is tailored to account for the variable omission bias dimension on endogeneity by employing additional control variables as well as the measurement error concern of endogeneity by employing alternative variables of interest.

4. Empirical Results

4.1 Baseline Results

The baseline values calculated using pooled OLS are summarized in Table 1. Table 1 highlights the results of the effect of bank concentration on women's entrepreneurship without the control variables. Overall, it is found that bank concentration has a negative and significant effect on women's entrepreneurship.

Column (1) of Table 2 presents the results of bank concentration on the number of jobs created by female-led firms. According to the results, the coefficient related to the number of jobs created by female-led firms is negative and statistically significant at the 1% level, suggesting that bank concentration reduces the number of jobs created by female-led firms. Next, in Column (2), the study analyses the effect of bank concentration on the female entrepreneurial activity rate (F/M). As before, the study finds a negative and statistically significant effect at the 1% level, suggesting that bank concentration reduces the entrepreneurial activity rate of women (F/H). The same result is obtained in column (3) between bank concentration and the number of women entrepreneurs (F%T). One explanation for these findings is that bank concentration or market power reduces competition, which limits the supply of credit by increasing interest rates (Bain, 1951; Mason, 1957; Boateng et al., 2018; Asongu & Odhiambo, 2019). Thus, large banks tend to favour lending to large companies and men, leaving women entrepreneurs with limited financing options (Demirgüç-Kunt & Klapper, 2012; Asongu et al., 2020). In addition, women entrepreneurs often pay higher interest rates and additional fees on loans, reducing their profit margins and limiting their capacity to make investments and expand their companies (Leitch et al., 2018).

Several control variables are introduced into the estimates. The coefficient of female entrepreneurship remains statistically significant and is not affected by the inclusion of these control variables in the regression. Access to electricity has a positive and significant effect on women's entrepreneurship. Access to electricity increases production through the use of machinery and power tools (Gamette et al., 2024). It is important to note the positive effect of financial development on women's entrepreneurship. This result can be explained by the fact that financial development makes it possible to offer a range of financial products tailored to the specific needs of women entrepreneurs, such as microcredit, tontines and credit guarantees (IFC, 2019). This better meets their needs and enables them to manage their finances more effectively. Finally, a positive effect of urbanization on women's entrepreneurship is noted. This is due to the fact that urbanization can offer better access to markets, business opportunities, infrastructure and services, as well as foster networks and empower women.

Table 1: Bank concentration and women entrepreneurship (OLS-FE)

	Number of jobs created by businesses run by women		Women Entrepreneurial activity Rate (F/M)		Women Leaders	Business
C3	-0.663* (0.368)	-0.0676*** (0.0349)	-0.144*** (0.0150)	-0.0360** (0.0147)	-0.092*** (0.0247)	-0.954** (0.425)
Electricity		0.188*** (0.0536)		0.156*** (0.0243)		0.782 (0.648)
Financial dev		0.0920** (0.0376)		0.0826*** (0.0188)		1.141** (0.540)
Natural ressources		-0.161** (0.0725)		-0.0257 (0.0374)		0.257 (0.961)
Urbanisation		0.962*** (0.162)		0.522*** (0.0735)		3.651* (1.938)
Economic growth		-0.0392 (0.0922)		-0.0697 (0.0465)		-1.052 (1.277)
Constant	119.1*** (24.89)	13.71* (7.786)	79.82*** (1.026)	33.35*** (3.616)	82.03*** (1.714)	42.9*** (9.25)
Observations	943	826	1,154	1114	1,072	909
R-squared	0.369	0.191	0.770	0.271	0.136	0.315
Countries	66	55	64	64	68	66
Fisher	106.23***	92.01***	131.75***	77.82***	83.31***	93.50***

Standard errors in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$. C3 : The total assets held by the three largest banks in a country. Financial dev: financial development.

4.2 Robustness Checks

Sensitivity analyses is performed along multiple dimensions, including the employment of additional control variables, different subsamples, and alternative estimating methodologies, in order to verify the robustness of the primary findings. Overall, it is found that the requirements produce results that are comparable to those in Table 1 in all robustness checks.

4.2.1 Robustness to Additional Control Variables

Thus far, a statistically significant and adverse relationship between bank concentration and women entrepreneurship has been established. It is not possible to completely rule out the idea that this negative link is partly caused by unobserved country factors, though. In order to address this potential issue and guarantee the stability of the calculations, the study accounts for other factors such as democracy and corruption that may have an impact on women entrepreneurs. The results of this exercise are reported in Table 2. By introducing these additional control variables into the model, it is established that bank concentration has a negative and significant effect on women's entrepreneurship.

Table 2: Estimations with additional controls.

Variables	Number of jobs created by businesses run by women	Women Entrepreneurial Activity Rate (F/M)	Women Business Leaders
C3	-0.0571**	-0.883*	-0.0470***
	(0.0233)	(0.456)	(0.0161)
Electricity	0.154***	0.971	0.151***
	(0.0377)	(0.686)	(0.0256)
Financial dev	0.0933***	1.223**	0.0982***
	(0.0303)	(0.587)	(0.0207)
Natural Ressources	-0.0688	-0.190	0.0226
	(0.0549)	(1.011)	(0.0388)
Urbanisation	0.657***	3.000	0.492***
	(0.123)	(2.054)	(0.0768)
Economic growth	-0.0525	-1.388	-0.0812
	(0.0737)	(1.426)	(0.0514)
Democraty	-0.378***	-1.102	-0.0724
	(0.110)	(2.128)	(0.0739)
Corruption	-0.855	-29.23**	-0.134
	(0.582)	(11.68)	(0.396)
Constant	29.08***	33.3***	37.46***
	(5.991)	(5.134)	(3.796)
Observations	957	853	1039
R-squared	0.155	0.025	0.275
Number of id	55	62	60
Fisher	71.23***	155.4***	170.24***

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1   C3 : The total assets held by the three largest banks in a country. Financial dev: financial development.

4.2.4 Robustness to the Alternative Measure of Bank Concentration

Different bank concentration metric to estimate the model are used. The study makes use of the total assets owned by a nation's five biggest banks (C5). Table 3 shows that bank concentration (C5) has a negative and significant effect on women's entrepreneurship.

Table 3: banking concentration (C5) and women's entrepreneurship

Variables	Number of jobs created by businesses run by women	Women Entrepreneurial Activity Rate (F/M)	Women Business Leaders
C5	-0.0287**	-1.241**	-0.0345**
	(0.0254)	(0.578)	(0.0188)
Electricity	0.182***	-0.807	0.182***
	(0.0425)	(0.868)	(0.0297)
Financial dev	0.0850***	1.360**	0.0802***
	(0.0325)	(0.659)	(0.0212)
Natural ressource	-0.0353	-0.0647	-0.0423
	(0.0629)	(1.171)	(0.0424)
Urbanisation	0.847***	-3.605	0.432***
	(0.139)	(2.381)	(0.0829)
Economic growth	-0.00150	-1.175	-0.0141
	(0.0792)	(1.501)	(0.0528)
Constant	16.01**	35.0***	30.85***
	(6.772)	(11.1)	(4.066)
Observations	1032	963	927
R-squared	0.151	0.017	0.216
Number of id	59	62	60
Fisher	93.50***	71.12***	158.24***

Standard errors in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$. C5 : The total assets held by the five largest banks in a country. Financial dev: financial developpement.

4.2.6 Robustness with Alternative Estimation Strategy

Even while the prior findings support the theory that bank concentration is generally linked to lower levels of female entrepreneurship, it is still worthwhile to investigate the validity of these earlier findings using a different approach. Thus, the study extends the robustness assessments by employing the system Generalized Method of Moments (GMM) proposed by Blundell and Bond (1998), especially as it pertains to the unobserved heterogeneity and simultaneity or reverse causality (Tchamyou et al., 2019). The choice of this method is justified by the fact that it resolves some potential endogeneity problems. Specifically, the GMM system estimator uses an optimal weighting matrix that minimizes the asymptotic variance of the estimator. The first, variable

differences are needed to eliminate country-specific effects and any endogeneity bias resulting from the correlation of these fixed effects with explanatory variables.

In line with the GMM results, the coefficients linked to the various measures of women's entrepreneurship are statistically significant and negative. Consequently, the findings are reliable to the use of alternative estimation strategies.

Table 4 : Bank concentration (C3) and women entrepreneurship (GMMS)

VARIABLES	Number of jobs created by businesses run by women	Women Entrepreneurial Activity Rate (F/M)	Women Business Leaders
C3	-0.0556*	-0.0136**	-0.0979***
	(0.0327)	(0.0216)	(0.0214)
Electricity	0.0154**	0.00429	0.0500*
	(0.0244)	(0.0209)	(0.0298)
Financial dev	0.125***	0.0530*	0.138***
	(0.0279)	(0.0278)	(0.0331)
Urbanisation	-0.275**	-0.0653	-0.464**
	(0.125)	(0.0583)	(0.183)
Natural ressources	-0.0178	-0.0121	-0.0284
	(0.0387)	(0.0642)	(0.0268)
Economic growth	0.0433**	0.0313**	0.0671*
	(0.0194)	(0.0248)	(0.0368)
L. Women Business Leaders	0.516***		
	(0.0301)		
L. Women Entrepreneurial Activity Rate (F/M)		0.964***	
		(0.0395)	
L. Number of jobs created by businesses run by women			0.138**
			(0.0675)
Constant	32.00***	0.611	79.13***
	(4.404)	(3.209)	(3.231)
Observations	1,061	983	797
Number of countrys	63	59	65
Instruments	23	21	25
Hansen OIR	0.696	0.361	0.430
Sargan	0.0058	0.000	0.000
AR1	0.00199	0.00486	0.00512
AR2	0.335	0.308	0.105

H excluding group	(0.633)	(0.656)	(0.289)
Dif(null, H=exogenous)	(0.577)	(0.415)	(0.380)
Fisher	166.15***	1105.38***	403.46***

Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1. C3 : The total assets held by the three largest banks in a country. Financial dev: financial developpement.

4.3 Analysis of Moderators

In Section 2 on the theoretical underpinnings, two moderators were highlighted (education and credit supply) that interact with bank concentration to affect women's entrepreneurship. The work of Ongo and Song (2022) is used to test these channels empirically. Tables 5 and 6 display the outcomes of this activity. The effects of the variables C3*education and C3*credit supply are looked and it is apparent that they are negatively significant and underline the mediating role. In other words, bank concentration has a negative effect on women's entrepreneurship (i.e., confirmation of Hypothesis 1) while education and credit supply cannot mitigate the underlying negative effect (i.e., rejection of Hypothesis 2). The fact that the unconditional effects of bank concentration reduce female entrepreneurship and that education and credit access complement bank concentration to further reduce the female entrepreneurship is evidence of negative synergies. It is important to clarify that in this analysis of moderators, bank concentration is the channel or mediator while education and credit are the moderators. The negative interaction effects are traceable to the ineffectiveness of the moderators, especially as it pertains to poor education and limited access to credit owing to information asymmetry that motivate credit rationing.

Table 5: Result including the education moderator

Variables	Number of jobs created by businesses run by women	Women Entrepreneurial Activity Rate (F/M)	Women Business Leaders
C3	-0.140***	-0.0830**	-0.0593***
	(0.0228)	(0.0387)	(0.0170)
Education	-0.128**	-0.155*	-0.0633**
	(0.0542)	(0.0932)	(0.0393)
C3*Education	-0.00399***	-0.00647***	-0.00406***
	(0.000741)	(0.00125)	(0.000515)

Variables			
Electricity	0.136***	0.164***	0.00504
	(0.0276)	(0.0473)	(0.0199)
Financial Dev	0.0187	0.0626***	-0.0124
	(0.0115)	(0.0218)	(0.00812)
Natural ressource	-0.0203	-0.0626	-0.0288
	(0.0411)	(0.0688)	(0.0278)
Urbanisation	0.419***	0.526***	0.196***
	(0.0923)	(0.167)	(0.0663)
Economic growth	-0.110**	0.0821	-0.0359
	(0.0543)	(0.0915)	(0.0398)
Constant	47.65***	36.02***	63.82***
	(4.389)	(7.904)	(3.224)
Observations	944	958	973
R-squared	0.291	0.299	0.369
Number of id	79	74	71
Fisher	944***	858***	773***

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. C3 : The total assets held by the three largest banks in a country. Financial dev: financial development.

Table 6 : Result taking into account the credit offer moderator

Variables	Number of jobs created by businesses run by women	Women Entrepreneurial Activity Rate (F/M)	Women Business Leaders
C3	-0.0413*	-0.0273**	-0.0511***
	(0.0249)	(0.0163)	(0.0188)
Credit supply	-0.153**	-0.302***	-0.0677*
	(0.0750)	(0.109)	(0.0610)
C3*Credit supply	-0.00658*	-0.00194**	-0.00413***
	(0.000595)	(0.000910)	(0.000140)
Electricity	0.176***	0.190***	0.0117
	(0.0264)	(0.0382)	(0.0200)
Financial Dev	-0.0466	-0.118*	-0.0155
	(0.0408)	(0.0656)	(0.0304)
Natural ressource	-0.0299	-0.131**	-0.0475*
	(0.0391)	(0.0541)	(0.0280)
Urbanisation	0.585***	0.808***	0.322***
	(0.0768)	(0.121)	(0.0577)

Economic growth	-0.108**	0.0380	-0.0520
	(0.0532)	(0.0748)	(0.0412)
Constant	35.47***	25.57***	59.59***
	(4.044)	(6.165)	(3.121)
Observations	1034	957	948
R-squared	0.258	0.160	0.127
Number of id	60	55	62
Fisher	1034***	957***	848***

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. C3 : The total assets held by the three largest banks in a country. Financial dev: financial development.

4.4 Discussion of Results

The findings are consistent with the theoretical literature on the detrimental effects of bank concentration on female entrepreneurship that is located in Section 2 (Karapetyan & Stacescu, 2014; Bennardo et al., 2015; Boateng et al., 2018). However, the perspective that the financial access does not effectively moderate bank concentration to positively influence female entrepreneurship is not consistent with the theoretical literature on the relevance of financial inclusion in female inclusive development outcomes (Nchofoung et al., 2014a, 2024b; Asongu et al., 2024). Moreover, in relation to the job search theory, the findings are not consistent with the relevance of education in effectively moderating bank concentration to positively influence female economic participation. Hence, the established negative synergies are not in line with the perspective of research on the importance of literacy for job prospects (Babajide et al., 2021; Quagrainie, 2024; Dvouletý, 2024), especially as it pertains to female employment (Asongu et al., 2023; Kouladoum, 2023).

As maintained by Asongu (2024), the overall findings about how education affects female entrepreneurship do not align with a body of literature on the role that education plays in reducing female unemployment. These include Kamau (2021), who has demonstrated how education helps women find work, which in turn helps them become financially and economically independent; Choi et al. (2019) on the role that literacy plays in the workforce; and Adejumo et al. (2021) on the role that human capital plays in long-term employment opportunities. On the other hand, the position of Achuo et al. (2023) regarding educated people's inability to find employment due to mismatches in the labor market between employers' desired skill sets and what graduates offer, ceteris paribus, explains why the expected linkage in relation from education does not withstand

empirical scrutiny. According to certain scholars (Stijepi, 2021; Shi & Wang, 2022), there is an inherent mismatch between the type of education and management system, particularly in light of the fact that light technical education offers more employment chances than general education (Iqbal et al., 2020; Forster et al., 2016).

5. Conclusion and Implications

The objective of the current research has been to assess how bank concentration affects female entrepreneurship in 70 developing countries using data for the period 2000 to 2019. The empirical evidence is based on OLS Fixed Effects and the Generalized Method of Moments (GMM) regression. Three main female entrepreneurship outcome variables are employed, notably: women's entrepreneurial activity rate; women business leaders and the number of jobs created by businesses run by women. Two main moderating variables are employed, namely: education and access to credit. It follows that the analysis is tailored towards assessing the direct effect of bank concentration on the female entrepreneurship outcomes as well as the indirect effect pertaining to how the education and credit access moderating variables influence the effect of bank concentration on female entrepreneurship. The following findings are established. Bank concentration broadly reduces female entrepreneurship. The negative effect is robust to the inclusion of additional control variables, an alternative estimation technique and a different measurement of bank concentration. Within the remit of interactive regressions, the unconditional effect of bank concentration reduces female entrepreneurship while education and credit access further complement bank concentration to reduce female entrepreneurship. Policy implications are discussed in what follows.

The first policy implication relates to reducing bank concentration or market power in order to enable female entrepreneurs have more access to credit that is worthwhile for present and future economic operations. Consistent with Chaffai and Coccorese (2023), given that competition in the banking sector is thought to be advantageous for lowering bank concentration or market power and enhancing overall economic performance, it is critical to support lowering the switching costs that banks impose on their clients without keeping them locked in by enforcing large explicit costs or strengthening relationships. In this regard, switching costs could serve as a benchmark for regulators as they carry out their mandate to control bank behavior and curtail their market dominance, which ensures significant rents. Making information easier to access for consumers who want to switch can lead to lower switching costs (in terms of loan redemption conditions, loan redemption fees, takeover pricing and conditions of competitors, *inter alia*) or lowering the "bureaucratic" obstacles to moving banks (facilitating, for instance, account number portability). Moreover, there are other crucial elements that contribute to competition, such as promoting new entrants, which calls for the removal of any significant barriers and the vigorous pursuit of deregulation, as well as the endorsement of any measure that boosts bank productivity, the benefits of which could then be distributed to clients in the form of more affordable rates and improved services.

The second policy implication which relates to quality education is important, especially financial literacy which is essential in providing women with the financial knowledge needed to leverage on education in order to improve their entrepreneurial prospects. Such education should be tailored to *inter alia*, motivate and encourage females to start saving money as soon as they can. It is also worthwhile within the same remit to introduce them to various tactics, such as budgeting, automating savings, and goal-setting for savings. Moreover, financial literacy also entails, learning and using techniques for managing and paying off debts, creating budgets, and other financial management task.

The third policy implication focuses on addressing potential constraints in credit assess related to information asymmetry, especially as it relates to reducing adverse selection and moral hazard that are blocking the provision of loans by financial institutions to the relevant economic activities surrounding female entrepreneurship. The establishment and consolidation of entities that exchange information, such as public credit registries and private credit bureaus, are steps in the suggested direction. While it could take a while for information sharing offices to be established, in the medium and long terms, these offices contribute to reducing borrowing-related issues such as adverse selection on the part of financial institutions (i.e., before female entrepreneurs are offered credit) and moral hazard on the part of female entrepreneurs (i.e., to avoid credit risk once female entrepreneurs have had access to credit).

There are some limits to this study which can offer opportunities for future research, notably: (i) assessing more channels for boosting female entrepreneurship; (ii) putting emphasis on other areas of the United Nations Sustainable Development Goals (SDGs); (iii) considering the informal sector in which female entrepreneurs operate and (iv) engaging country-specific studies. Accordingly, this work certainly offers an opportunity for future investigations, particularly in view of understanding other channels or mechanisms by which female entrepreneurship can be promoted. This is based on the limitation that female entrepreneurship cannot be exclusively understood within the remit of the present study from the considered mechanisms and policy instruments. Governance, information technology and doing business conditions can be considered as some of these potential future research avenues. Furthermore, considering investigated linkages established in this study as well as the recommended future research directions within the remit of other United Nations SDGs is worthwhile. Another limitation of this study is that female entrepreneurship as understood in this study is formal and thus, future studies should complement this study by considering the informal entrepreneurship of women using qualitative

studies. Last but not the least, the findings in this study are panel-oriented and thus, country-specific studies are still worthwhile to robustly motivated policy implications that are country-specific. Furthermore, the limitation of the exclusive quantitative focus of the present study can be addressed in future studies by engaging case examples or qualitative narratives to supplement the quantitative data and enhance contextual relevance. The suggested qualitative research should consider the quality and nature of considered variables instead of incorporating them are uniform moderators.

Appendices

Table A1 : Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Number of jobs creat	1109	74.199	113.957	15.438	3827
Women Entrepreneu	1348	69.132	17.793	25.625	100
Women Business Lea	1216	75.411	21.986	0	100
C3	1249	67.743	20.392	17.047	100
C5	1026	79.539	16.662	31.855	100
C3*education	1073	1639.05	1563.268	0	7760.271
C3*credit supply	1159	2026.499	1766.936	0	11585.611
Education	1243	64.781	29.209	6.197	141.364
Credit supply	1297	7.023	8.542	-25.958	86.826
Corruption	1315	-.449	.683	-1.672	1.718
Urbanisation	1320	2.798	1.947	-2.869	19.612
Natural resource	1313	8.698	10.93	0	58.92
Economic growth	1298	2.711	3.806	-15.891	27.831
Financial Dev	1214	31.612	22.159	2.215	115.856
Democracy	1236	7.842	2.726	1	12
Electricity	1320	68.475	33.886	1.252	100

C3 : The total assets held by the three largest banks in a country. C5 : The total assets held by the five largest banks in a country. Financial dev: financial development. Number of jobs creat : Number of jobs created by businesses run by women. Women Entrepreneu: Women Entrepreneurial Activity Rate (F/M). Women Business Lea: Women Business Leaders.

Table A2 : Correlation matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1) Number of jobs created	1.000															
(2) Women Entrepreneurial Act	-0.240	1.000														
(3) Women Business Lea	-0.035	-0.215	1.000													
(4) C3	-0.102	-0.081	0.019	1.000												
(5) C5	-0.163	-0.101	-0.055	0.846	1.000											
(6) C3*education	0.149	0.137	0.203	0.156	0.136	1.000										
(7) C3*credit supply	-0.062	-0.041	0.160	0.448	0.305	0.084	1.000									
(8) education	0.232	0.041	0.166	-0.066	-0.055	0.783	0.141	1.000								
(9) Credit supply	0.018	-0.041	0.021	-0.069	-0.073	-0.044	-0.080	-0.087	1.000							
(10) Corruption	-0.004	0.340	-0.041	0.079	0.024	0.211	0.071	0.120	-0.067	1.000						
(11) Urbanization	0.008	-0.116	0.159	-0.000	0.024	-0.262	0.117	-0.174	-0.053	-0.093	1.000					
(12) Natural resources	0.029	-0.086	0.207	0.026	0.061	-0.069	0.129	0.130	-0.011	-0.092	0.441	1.000				

(13) Economic growth	-0.101	0.029	-0.035	0.027	-0.086	0.036	-0.070	-0.053	0.018	0.038	-0.156	-0.137	1.000			
(14) Financial Dev	0.114	-0.001	0.155	0.101	-0.005	0.031	0.908	0.178	-0.103	0.027	0.088	0.134	-0.069	1.000		
(15) Democracy	0.042	-0.047	-0.081	0.064	0.087	-0.158	0.179	-0.151	-0.027	0.044	0.123	0.095	-0.046	0.159	1.000	
(16) Electricity	0.169	-0.023	0.179	-0.204	-0.204	0.705	0.053	0.881	-0.113	0.051	-0.193	0.100	-0.006	0.148	-0.180	1.000

C3 : The total assets held by the three largest banks in a country. C5 : The total assets held by the five largest banks in a country. Financial dev: financial development. Number of jobs creat : Number of jobs created by businesses run by women. Women Entrepreneurial act: Women Entrepreneurial Activity Rate (F/M). Women Business Lea   :Women Business Leaders

Table A3 : List of countries in the study

South Africa	Cameroon	Mauritania	Romania
Albania	Benin	Mexico	Rwanda
Argentina	Burundi	Mongolia	Senegal
Armenia	Cambodia	Mongolia	Seychelles
Belize	Colombia	Montenegro	Tajikistan
Botswana	Ivory Coast	Mozambique	Tanzania
Brazil	Djibouti	Nepal	Chad
Burina Faso	Tunisia	Jamaica	Nicaragua
Cape Verde	Estonia	Oman	Tunisia
Chile	Ecuador	Nigeria	Togo
China	Egypt	Niger	
Ethiopia	Eswatini	Uganda	
Georgia	Iran	Pakistan	
Ghana	Iraq	Paraguay	
Guatemala	Kuwait	Peru	
India	Lesotho	Philippines	
Indonesia	Madagascar	Qatar	
Morocco	Afghanistan	Costa Rica	
Kenya	Mongolia	Guatemala	
Moldova	Bangladesh	Kazakhstan	

Table A4 : Definition of variables

Variables	Definitions	Data sources
Bank concentration (C3)	the total assets held by a country's three largest banks.	GFDD (2020)
Bank concentration (C5)	the total assets held by a country's five largest banks.	GFDD (2020)
Women entrepreneurship	-Women's entrepreneurial activity rate (F/H) -Women business leaders (F%T) -Number of jobs created by businesses run by women	GEM (2020) NIWE(2020)
Natural Ressources	Measured by the benefits derived from natural resources in relation to GDP.	WDI (2021)
Democracy	Measured by the democracy index. It provides an indication of the constraints on the executive.	Polity IV (2020)
Electricity	Measured by access to electricity for a given population	WDI (2021)
Corruption	Measured by the level of corruption.	ICRG (2020)
Economic growth	Measured by the growth rate of GDP per capita. It captures a country's level of economic activity.	WDI (2021)
Urbanisation	Measured by the proportion of the total population living in urban areas compared to the rural population.	WDI (2021)
Financial development	Captured by the ratio of credit granted to the private sector to GDP.	WDI (2021)
Education	Measured by public expenditure on education.	WDI (2021)
Credit supply	measured by credit to the economy by banks	COBAC report (2020)

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