Female unemployment and the procedure that a woman has to go through to start a business: microfinance policy thresholds

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Abstract

This study examines how the starting of business by females can be promoted by assessing critical levels of microfinance institutions (MFIs) penetration that policy makers must endeavour to maintain and/or attain in order for female unemployment not to represent a constraint in the doing of business. A constraint in doing business is understood in terms of the procedure that a woman has to go through in order to start a business. The focus of the study is on 44 countries in Sub-Saharan Africa (SSA) for the period 2004-2018, while the empirical evidence is based on interactive quantile regressions. The following findings are established. The validity of tested hypotheses is exclusively apparent in the lowest and highest quantiles of the conditional distribution of the procedure women have to go through to start a business. MFI penetration levels needed to reverse the unfavorable incidence of female unemployment in doing business are provided. These are minimum MFIs penetration thresholds that are required in order for female unemployment not to negatively affect the procedure that a woman should go through to start a business. The study complements the extant literature by assessing critical microfinance penetration levels that are needed to promote female doing of business, contingent on existing levels of female doing of business.

1. Introduction

The present study, which is focused on assessing nexuses between female unemployment, microfinance institutions (MFIs) and the procedure a woman has to go through to start a business in sub-Saharan Africa (SSA), is worthwhile from both scholarly and policy perspectives. Accordingly, the study aims to provide critical levels of MFIs penetration that should be reached in order for the positive incidence of female unemployment on the procedure that a woman has to go through to start a business to be dampened. In other words, the objective of the study is to provide minimum MFIs penetration thresholds that are required in order for female unemployment not to positively affect the procedure that a woman should go through to start a business. The scholarly motivation for the study is fourfold, notably: (i) the representation of women in socio-economic circles which has been documented to be low in SSA; (ii) the overwhelming policy syndrome of exclusive economic development in SSA; (iii) the relevance of MFIs in promoting inclusive economic and human developments and (iv) gaps in the attendant literature focusing on doing business and gender economic inclusion. The underlying four motivational elements are expanded in what follows in the same chronology.

First, there is a longstanding policy concern of engaging more women in social, economic and political activities in SSA, especially as it pertains to reaching the 2030 targets of the United Nations' sustainable development goals (SDGs). In essence, SDG5, which focuses on gender inclusion, clearly articulates the relevance of involving more women in politico-economic and social activities in view of promoting the involvement of women in the formulation and implementation of policies designed to promote equitable and sustainable development. To put this point into perspective, it is relevant to put some statistics on the concern of gender exclusion. As documented in the attendant scholarly and policy literature (World Bank, 2018; Asongu *et al*., 2021a, b), the loss in terms of gross domestic product (GDP) that is associated with the non-involvement of women in economic activities is about 160 trillion USD annually. The motivation of the present research fundamentally rests on how such women can be more economically-involved by assessing critical levels of MFIs penetration that policy makers must endeavour to maintain in order for female unemployment not to represent a constraint in the doing of business in terms of the procedure that a woman has to go through in order to start a business. The study is also partly motivated by post-2015 sustainable development literature, which is consistent with the fact that, unless concerns surrounding inequality such as gender exclusion are addressed; most countries in SSA are unlikely to achieve most poverty- and inequality-related SDGs (Tchamyou, 2019, 2020).

Second, in the light of recent literature on the achievement of SDGs targets by countries in SSA, Bicaba *et al*. (2017) have concluded that poverty and inequality-oriented targets related to SDGs cannot be achieved in the sub-region unless bold initiatives are taken to address the underpinning issues of poverty and inequality that prevented most countries in the sub-region from achieving the millennium development goals (MDGs) poverty target prior to 2015. It follows that in the light of the attendant literature, just as the underlying poverty and inequality related MDGs could not be achieved, it is also unlikely that the attendant SDGs would be achieved by the year 2030 in the sub-region.

The underlying concerns related to the achievement of global targets are also motivated by growing poverty and inequality trends in Africa in general and SSA in particular. According to the extant literature (Asongu & Nwachukwu, 2016; Tchamyou, 2020), the sub-region is host to the highest number of poor people in the world, not least because, as recently documented by Nwani and Osuji (2020), SSA outpaced Asia to become the sub-region with the highest number of poor people living in the world. These concerns are compounded by female economic exclusion, which has been established to be most apparent in SSA, owing to, *inter alia*, restricted opportunities for employment and the doing of business (Awel & Yitbarek, 2022; Ngono, 2021; Kim, 2022).

Third, one of the documented channels through which to get more women involved in economic activities is funding from MFIs (Tchamyou *et al*., 2019a; Ngono, 2021; Abdulqadir & Asongu, 2022). Moreover, both the policy and scholarly literature are consistent on the importance of financial access from banks and MFIs in the achievement of most poverty- and inequality-related SDGs (Tchamyou, 2019; UNCDF, 2022). The positioning of the present study is also premised on an identified gap in the extant literature.

Fourth, the contemporary literature motivating the positioning of this study can be documented in two main streams, notably: the doing business and gender inclusion literature. On the one hand, the extant gender inclusion literature has for the most part, been oriented towards, *inter alia*, nexuses between information technology and the social responsibility of corporations in their business practices, especially as it pertains to involving more women in economic activities (Uduji *et al*., 2019; Uduji & Okolo-Obasi, 2018, 2019, 2020); enhancement in the involvement of women in educational activities (Elu, 2018; Asongu *et al*., 2019); nexuses between mobile money innovations, MFIs and female entrepreneurship (Ngono, 2021); the effect of mobile money on enhancing access to finance by females for both household and entrepreneurial opportunities (Kim, 2022); the nexus between environmental sustainability and

the political involvement of more women (Achuo *et al.*, 2022); the linkage between political involvement and gender inclusion (Bezinna *et al.*, 2021) and nexuses between technology, opportunities from mobile phones and access to funding opportunities by females (Osabuohien & Karakara, 2018; Asongu & Odhiambo, 2018a; Mndolwa & Alhassan, 2020).

On the other hand, extant studies on doing business have largely focused on *inter alia*: the importance of the drive towards knowledge-based economies in African business development (Tchamyou, 2017), issues surrounding the doing of business in Africa (Asongu & Odhiambo, 2019), the incidence of doing business on knowledge-based African economies (Asongu & Tchamyou, 2016), tailoring of strategies designed to leverage on forces that are parallel to doing business prospects in Africa (Eskor, 2017), strategic insights for boosting sustainable entrepreneurship in the continent (Kolo, 2017), the importance of doing business in tackling issues linked to youth unemployment (Chigunta, 2017), non-farming doing business dynamics in SSA (Nagler & Naudé, 2017), how the doing of business can be promoted by means of financial institutions in economies that are characterized by a substantial presence of the informal economic sector (Adom, 2017), perspectives from an emerging economy on the relevance of consolidating technologies that are tailored towards promoting the doing of business (Amankwah-Amoah, 2018), the imperative of revisiting institutions in view of formulating and implementing better policies designed to boost economic growth (Eshun, 2018), the dynamic of taking advantage of systems of collaboration in view of boosting the doing of business in a sustainable manner (Juma *et al.*, 2017) and avoidable female unemployment thresholds in the nexus between MFIs and female entrepreneurship (Asongu & Odhiambo, 2023).

Considering the extant literature motivating the present research, the study that is closest to the present research in the extant attendant literature is Ngono (2021), which has investigated how female self-employment can be promoted through linkages, such as *inter alia*, MFIs, mobile money prospects and financial institutions. The underlying study has focused on 48 countries in SSA using data from 2004 to 2018 and an empirical strategy is based on the generalized method of moments (GMM). According to the findings of Ngono (2021), female self-employment is not significantly influenced by banking services, while alternative mechanisms (i.e., MFIs and financial services offered by the mobile phone) engender significant influences. The main similarity between the present study and Ngono (2021) is that it employs the same dataset and periodicity. However, a number of distinctive features are apparent, notably in terms of (i) positioning, (ii) methodology, and (iii) policy relevance.

(i) With respect to positioning, this study examines how women can be more economically involved by assessing critical levels of microfinance institutions (MFIs) penetration that policy makers must endeavour to maintain in order for female unemployment not to represent a constraint in the doing of business in terms of the procedure that a woman has to go through in order to start a business. It follows that the objectives of the two studies are different in the light of distinct dependent variables as well as independent variables of interest.

(ii)The methodologies employed are also different because, contrary to the GMM technique employed by Ngono (2021), the present study is focused on assessing the investigated nexuses throughout the conditional distribution of doing business constraints or the outcome variables, within the remit of interactive regressions. It follows that beyond the difference in estimation technique, the interpretation of estimated coefficients is also distinct on two main grounds: the findings are contingent on initial levels of the outcome variable and not interpreted as in linear additive models, owing to the interactive specifications involved. Moreover, the motivation for assessing the linkages throughout the conditional distribution of the outcome variable is also premised on the perspective that blanket policy implications are unlikely to be efficient unless they are contingent on initial levels of doing business constraints and tailored differently across countries with varying initial levels of doing business constraints.

(iii)In terms of policy implications, contrary to Ngono (2021), which distinguishes how various mechanisms (i.e., mobile money innovations, MFIs and banking services) directly affect female self-employment, the present study investigates indirect linkages within the remit of interactive regressions that has the advantage of providing policy makers with actionable critical levels of MFIs penetration that are needed to prevent female unemployment from boosting doing business constraints. It follows that in terms of policy relevance, actionable thresholds of the moderating variables are provided such that the policy syndrome of female unemployment does not boost constraints in the doing of business.

The rest of the research paper is organized as follows. The theoretical framework and corresponding testable hypotheses are provided in Section 2, while the data and methodology are discussed in Section 3. The empirical results and corresponding discussion are covered in Section 4, while Section 5 concludes with implications and future research directions.

2. Theoretical underpinnings and testable hypotheses

The theoretical framework of the present study builds on Tchamyou *et al*. (2019a), which focuses on the nexus between financial access and inclusive development outcomes. MFIs are used in this study as a financial access channel, whereas female doing of business is also acknowledged as a means of inclusive development. This section is engaged in three main strands, notably: (i) the theoretical underpinnings; (ii) how the theoretical underpinnings are contextualized within the framework of the present research, and (iii) the hypotheses to be tested that are in accordance with theoretical underpinnings and contextual clarifications.

First, consistent with the extant literature on the subject (Tchamyou *et al*., 2019a), the importance of financial institutions (e.g., MFIs) in boosting inclusive development outcomes can be understood in the view of two fundamental underpinnings, namely: the intensive and extensive margin concepts. The two conceptual standpoints are in accordance with the perspective that when citizens are availed with opportunities for better financial access, the citizens are correspondingly provided with economic and financial opportunities. The conceptual premise is also in accordance with the extant contemporary and non-contemporary studies on the relevance of access to finance in driving inclusive development (Asongu & Odhiambo, 2018a, 2018b; Tchamyou & Asongu, 2017a; Beck *et al*., 2007; Aghion & Bolton, 2005; Galor & Moav, 2004; Galor & Zeira, 1993; Greenwood & Jovanovic, 1990).

To put the extant theoretical bases in more perspective, according to the intensive margin concept, inclusive development is promoted when existing customers of a financial institution are provided with more financial access opportunities with which to improve their household and corporate investment opportunities (Chipote *et al*., 2014). Conversely, according to the extensive margin concept, when the underlying financial access opportunities are extended to a population that did not previously benefit from the attendant financial access opportunities, more inclusive development outcomes can be apparent because the majority of the population that did not previously have access to the underlying financial access opportunities is from the poor fraction of the population (Odhiambo, 2014; Orji*et al*., 2015; Chiwira *et al*., 2016). Accordingly, just like females are not involved in the formal economic sector in the light of the motivation in the introduction, the extant studies are in accordance with the view that the extensive margin concept can be leveraged to promote inclusive development, especially when most women who were previously unbanked are provided with financial access opportunities for doing business, especially by means of MFIs (Evans & Jovanovic, 1989; Holtz-Eakin*et al*., 1994; Black & Lynch, 1996; Bae*et al*., 2012; Batabyal & Chowdhury, 2015).

Second, with respect to contextualizing the theoretical premise to be consistent with the focus of the present research, MFIs have been documented to provide both existing (i.e., the intensive margin concept) and new (i.e., the extensive margin concept) female customers with financial access opportunities, with which to engage in doing business prospects. For example, as documented by Assairh *et al.* (2020), women are promoted by means of MFIs mechanisms. Maldonado and González-Vega (2008) argue that MFIs enhance gender empowerment through, *inter alia*, a household gender incidence, an income impact and an effect on the management of risk. According to Swapna (2017), female entrepreneurship is promoted by MFIs. It is a view that is supported by Tariq (2019), who has documented that microenterprises are promoted with MFIs. In essence, the literature broadly supports the bases of intensive and extensive margin concepts in the role of MFIs in promoting the female gender, especially by means of enhancing their involvement in business activities (Kendall *et al.*, 2012; Fox & Van Droogenbroeck, 2017; Gasperin *et al.*, 2019; Obadha *et al.*, 2019; Ngono, 2021).

Third, in view of the positioning of this study, MFIs provide financial access opportunities to women for various motives, including self-employment and/or the doing of business. Contextualizing the above leads to the following testable hypothesis:

Hypothesis 1: Female unemployment discourages women from doing business.

Existing levels of doing business constraints can influence how the underlying nexus in Hypothesis 1 is established. This is essentially because female doing business characteristics are likely to be different in countries with high doing business constraints, compared to countries with low doing business constraints. Consistent with the earlier narrative, MFIs represent an instrument with which to reduce female unemployment and thus, high levels of MFIs can moderate the unfavorable incidence of female unemployment on doing business. The underlying intuition leads to the following testable hypothesis.

Hypothesis 2: At high levels of MFIs, female unemployment does not promote doing business constraints.

It is relevant to note that the stated hypotheses are consistent with the objective of the study, which aims to provide minimum MFIs penetration thresholds that are required in order for female unemployment not to positively affect the procedure that a woman should go through

to start a business. Hence, the assessment of *Hypothesis* 2 is based on the validity of *Hypothesis* 1.

3. Data and methodology
3.1 Data

The focus of the present study is on forty-four countries in SSA with data from 2004 to 2018 obtained from three main sources, notably: (i) the Financial Access Survey (IMF, 2020), (ii) World Development Indicators of the World Bank (2020a) and (iii) the Gender and Parity Statistics for Men and Women of the World Bank (2020b). The choice of the periodicity and attendant sample are consistent with the motivations outlined in the introduction. Accordingly, this study employs the same dataset as in Ngono (2021). Still, in line with the motivation of this research, the outcome variable is "the procedures a woman has to go through to start a business".

There are two main independent variables of interest, notably: the female unemployment rate, which is used as the main channel and MFIs, which are considered as the moderating variables. The two MFIs dynamics involved are MFIs per 100 000 adults and MFIs per 1000 km2.

In order to account for variable omission bias, six control variables are involved in the conditioning information set, namely: trade openness, inclusive education, female self-employment, female ownership of bank accounts like men, the cost it takes for a woman to start a business and the time it takes for a female to start a business. The selection of the control variables is motivated by the extant doing business and gender inclusion literature (Duflo, 2012; Tchamyou *et al*., 2019b; Asongu & le Roux, 2019; Asongu & Odhiambo, 2019, 2020; Ngono, 2021; Ofori *et al*., 2021; Nchofoung *et al*., 2021; Ngono, 2021). As opposed to Ngono (2021) which is understood within the framework of a linear-additive model, the present study involves interactive regressions and hence, the expected signs from the control variables cannot be established with certainty. Accordingly, as documented in Brambor *et al*. (2006), since the concern of multicollinearity is overlooked in interactive regressions, net effects and/or thresholds are computed. These net effects involve both the conditional and unconditional estimates of the engaged mechanisms through which the outcome variable is affected.

Appendix 1 provides insights into the definitions and sources of variables, while the corresponding summary statistics are disclosed in Appendix 2. Appendix 2 is thus relevant in the computation of net effects and/or thresholds associated with the interactive regressions. Appendix 3 discloses the attendant correlation matrix.

3.2 Methodology

Consistent with the motivational elements that are apparent in the introduction, the aim of the present study is to examine the considered nexuses throughout the conditional distribution of the dependent variable, which is a doing business constraint in terms of the procedure that a female has to go through in order to start a business. On the basis of this objective, the quantile regression (QR) technique is adopted as empirical strategy because it accommodates the objective of the research, which consists of investigating the nexuses by articulating initial levels of the outcome variable.

It is also worthwhile to emphasize that the adoption of the QR empirical technique is also to depart from Ngono (2021), which has employed the GMM estimation technique and investigated the corresponding nexuses at the mean value of female self-employment. Moreover, in accordance with contemporary literature, the QR technique is tailored to provide more room for policy implications, not least, because high, intermediate and low levels of the outcomes variables are articulated (Billger & Goel, 2009; Tchamyou & Asongu, 2017b; Boateng *et al.*, 2018).

It is also relevant to articulate that compared to the OLS technique that is based on error terms, which are normally distributed, with the QR technique, the underlying assumption of normally distributed error terms does not hold, not least because the assessed parameters are throughout the conditional distribution of the outcome variable or doing business constraint. In essence, the underlying narrative is consistent with the relevant QR-centric literature (Koenker & Bassett, 1978; Keonker & Hallock, 2001; Asongu, 2017).

In the light of the empirical strategy, the θth quantile estimator of doing business constraint is derived by solving for the optimization problem in Equation (1), that is provided without subscripts for the purpose of simplicity in presentation.

$$\min_{\beta \in R^k} \left[\sum_{i \in \{i: y_i \geq x_{i'}\beta \}} \theta \left| y_i - x_{i'}\beta \right| + \sum_{i \in \{i: y_i < x_{i'}\beta \}} (1-\theta) \left| y_i - x_{i'}\beta \right| \right], \tag{1}$$

where $\theta \in (0,1)$. Compared to the OLS approach, which is largely underpinned by minimizing the total sum of squared residuals, the framework in which the quantile regression operates embodies the maximisation of absolute deviations of the attendant quantiles. For example, in the considered technique, multiples quantiles such as the 50th quantile or the 25th quantile

(respectively, corresponding to θ =0.50 or 0.25) are minimised by approximately weighing the residuals. The corresponding conditional quantile of doing business constraint or y_i given x_i is:

$$Q_y(\theta / x_i) = x_{i'}\beta_\theta \quad (2)$$

where for the relative θ th quantile that is estimated, parameters characterised by unique slopes are modelled. The underlying formulation is parallel to $E(y / x) = x_{i'}\beta$ within the remit of the OLS slope, where parameters are investigated for the most part, at the average of the conditional distribution of the procedures a woman has to go through to start a business. For the model in Eq. (2), the dependent variable y_i is the doing business indicator while x_i contains a constant term, *MFIs*, *female unemployment, secondary female high school enrollment rate, trade openness, the cost it takes for a woman to set up a business, the time for women to set up a business,* and *women ownership of bank accounts like men.*

It is relevant to note that the stated hypotheses are consistent with the objective of the study, which is to provide minimum MFIs penetration thresholds that are required in order for female unemployment not to positively affect the procedure that a woman should go through to start a business. Hence, the assessment of Hypothesis 2 is based on the validity of Hypothesis 1.

4. Empirical results

4.1 Presentation of results

The empirical results are disclosed in this section in Table 1, which is divided into two main panels, notably, the left-hand side disclosing findings related to nexuses between female unemployment, MFIs per 1000 km2 and the procedure of doing business and while the right-hand side shows the corresponding nexuses between female unemployment, MFIs per 100 000 adults and the procedure of doing business. It is imperative to mention that in the light of the motivation for this study, the adoption of the QR technique is justified, not least, because compared to OLS estimates, the corresponding QR estimates are different in terms of both significance and magnitude of significance.

To establish the validity of the tested hypotheses in Section 2 that female unemployment discourages women from doing business (i.e., *Hypothesis 1*) and some critical levels of MFIs are needed for female unemployment not to promote doing business constraints (i.e., *Hypothesis 2*), the unconditional incidence of female unemployment on the procedure that a female has to go through to start a business should be positive while the interactive effect between MFIs and female unemployment should be negative, such that, increasing levels of MFIs dampen the positive unconditional incidence of female unemployment on the procedure

that a female has to go through to start a business. This is the case in the lowest (i.e., 10th) and highest (i.e., 90th) quantiles on the left-hand side pertaining to MFIs per 1000km2 and the lowest (i.e., 10th) and top (75th and 90th) quantiles in the right-hand side in the regressions focusing on MFIs per 100 000 adults.

The above validity of the hypotheses at the extreme points of the conditional distribution of the procedure to startup a business is a necessary but not a sufficient condition for policy making. This is essentially because it is policy-worthwhile to articulate critical levels or specific thresholds at which the penetration of MFIs completely dampen the positive incidence of female unemployment on the doing business constraint. To make this assessment, we are consistent with contemporary interactive regressions literature on the computation of thresholds (Nchofoung *et al.*, 2022; Nchofoung & Asongu, 2022a, 2022b), in order to address the pitfall of interactive regressions documented in Brambor *et al.* (2006). The main pitfall to be avoided is interpreting estimated coefficients from the interactive regressions as in linear additive models. This computation of thresholds is also to address the previously highlighted concern of multicollinearity that is overlooked in interactive regressions (Brambor *et al.*, 2006).

In order to articulate the computation of thresholds further, an example is worthwhile to illustrate for the purpose of enhancing readability and flow. For instance, in the 10th quantile or third column of Table 1, 1.026 (0.196/0.191) MFIs per 1000 km2 are needed to reverse the positive incidence of female unemployment in the process of starting a business. The corresponding threshold on the left-hand side of Table 1 is 0.262 MFIs per 1000 km2 in the 90th quantile. On the right-hand side of the table, the thresholds are: 3.505, 1.595 and 1.423 MFIs per 100 000 adults in the 10th, 75th and 90th quantiles, respectively. The computed MFIs thresholds are within policy range because they are situated within the statistical limit disclosed in the summary statistics in Appendix 2. It follows that the established thresholds are thus policy-worthwhile because they make both statistical and economic sense. It is worthwhile to emphasize that the second model on the right-hand side confirms the findings of the first model on the left-hand side, especially as it pertains to the establishment of thresholds at extreme points of the conditional distribution of the outcome variable.

Table 1: Female unemployment, microfinance institutions and female startup procedure to register a business

	Microfinance institutions per 1000 km2						Microfinance institutions per 100 000 adults					
	OLS	Q.10	Q.25	Q.50	Q.75	Q.90	OLS	Q.10	Q.25	Q.50	Q.75	Q.90
Constant	-0.334	5.137	**16.334***	5.572	1.602	-2.150	-0.651	4.685	-1.316	8.603	1.956	1.087
	(0.960)	(0.604)	**(0.094)**	(0.132)	(0.710)	(0.585)	(0.929)	(0.702)	(0.914)	(0.156)	(0.673)	(0.577)
FUmpl	0.086	**0.196***	-0.126	-0.006	0.037	**0.078***	**0.204***	**0.312****	0.130	0.026	**0.150****	**0.131****
	(0.440)	**(0.079)**	(0.236)	(0.874)	(0.429)	**(0.077)**	**(0.066)**	**(0.026)**	(0.339)	(0.688)	**(0.005)**	**(0.000)**
Nmfi1	0.205	0.100	-0.125	0.032	0.158	0.469***	---	---	---	---	---	---
	(0.221)	(0.677)	(0.593)	(0.718)	(0.136)	(0.000)						
Nmfi2	---	---	---	---	---	---	0.079	0.105	0.165	0.047	0.052	0.018
							(0.446)	(0.667)	(0.499)	(0.689)	(0.568)	(0.625)
FUmpl× Nmfi1	**-0.258***	**-0.191***	**-0.156***	**-0.213***	**-0.239***	**-0.297***	---	---	---	---	---	
	(0.000)	**(0.016)**	**(0.040)**	**(0.000)**	**(0.000)**	**(0.000)**						
FUmpl× Nmfi2	---	---	---	---	---	---	**-0.106***	**-0.089***	**-0.103***	**-0.077***	**-0.094***	**-0.092***
							(0.000)	**(0.012)**	**(0.004)**	**(0.000)**	**(0.000)**	**(0.000)**
SES	**0.054***	0.065	0.020	**0.052***	**0.047***	**0.040***	0.033	0.029	0.037	0.024	0.031	**0.048***
	(0.052)	(0.161)	(0.644)	**(0.004)**	**(0.023)**	**(0.032)**	(0.251)	(0.600)	(0.495)	(0.366)	(0.134)	**(0.000)**
Trade	**0.030***	**0.058***	**0.035***	**0.031***	**0.027***	**0.018***	**0.038***	**0.075***	**0.032***	**0.036***	**0.045***	**0.040***
	(0.000)	**(0.003)**	**(0.059)**	**(0.000)**	**(0.002)**	**(0.017)**	**(0.000)**	**(0.000)**	**(0.088)**	**(0.000)**	**(0.000)**	**(0.000)**
F.SelfEmploy	0.020	-0.078	-0.160	-0.047	0.007	0.060	0.035	-0.074	0.028	-0.073	0.002	0.015
	(0.780)	(0.463)	(0.125)	(0.225)	(0.875)	(0.159)	(0.671)	(0.590)	(0.836)	(0.279)	(0.955)	(0.480)
CostBusiness	**0.015***	**0.044***	0.006	**0.011***	**0.010***	0.005	**0.014***	**0.042***	0.0008	**0.007***	**0.012***	**0.009***
	(0.026)	**(0.000)**	(0.406)	**(0.000)**	**(0.005)**	(0.130)	**(0.037)**	**(0.000)**	(0.929)	**(0.083)**	**(0.001)**	**(0.000)**
TimeBusiness	**0.112***	0.046	**0.193***	**0.139***	**0.133***	**0.119***	**0.103***	0.045	**0.186***	**0.178***	**0.119***	**0.116***
	(0.030)	(0.368)	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.069)**	(0.443)	**(0.003)**	**(0.000)**	**(0.000)**	**(0.000)**
Bankaccount	0.416	-1.316	0.585	**1.141***	0.774	**1.150***	-0.493	-1.353	-0.055	0.119	0.110	0.314
	(0.557)	(0.305)	(0.636)	**(0.019)**	(0.167)	**(0.028)**	(0.426)	(0.298)	(0.966)	(0.851)	(0.822)	(0.130)
Thresholds	na	1.026	na	na	na	0.262	na	3.505			1.595	1.423
R²/Pseudo R²	0.920	0.674	0.758	0.797	0.797	0.775	0.921	0.660	0.760	0.799	0.799	0.803
Fisher	**155.60***						**126.78***					
Observations	52	52	52	52	52	52	52	52	52	52	52	52

*,**,***: significance levels of 10%, 5% and 1% respectively. OLS: Ordinary Least Squares. R² for OLS and Pseudo R² for quantile regression. Lower quantiles (e.g., Q 0.1) signify nations where female start up procedure to register a business is least. FUmpl: Female Unemployment. Nmfi1: microfinance institutions per 1000 km2. Nmfi2: microfinance institutions per 100 000 adults. SES: Secondary female high school enrollment rate. Trade: trade openness. F.SelfEmploy: Female Self-Emloyment. CostBusiness: The cost of women to set up a business. TimeBusiness: The time it takes for a woman to set up a business. Bankaccount: dummy variable who takes the value 1 if women can open bank accounts like men, 0 otherwise. na: not applicable because at least one estimated coefficient needed for the computation of the threshold is not significant.

4.2 Discussion of results

The findings in this study confirm two main strands in the extant literature, notably: (i) the highest and lowest quantiles confirm a strand of the literature on the importance of microfinance in boosting female doing business opportunities (Tariq, 2019) and (ii) the findings from the other quantiles confirm another strand of the literature that microfinance does not necessarily lead to significant outcomes in terms of promoting the doing of business (Brana, 2013).

It is also important to note that the relevance of the MFIs in providing funding for the doing of business does not exclusively engender positive externalities in terms of achieving SDG5 of the United Nations, not least, because of the urgency of funding more business activities in the sub-region in order to address the growing concerns of unemployment associated with demographic change in the continent.

In the light of the above, the relevance of the findings also speaks to the importance of doing business in SSA in order to address unemployment issues. Accordingly, consistent with the relevant literature on demographic change, according to projections the population of Africa is to double in the next 15 years and represent approximately 20% of the population of the world in about 30 years (Asongu, 2015; Brixiova *et al.*, 2015). Hence, there is an associated challenge of how the rising population will be accommodated especially as it pertains to providing employment opportunities. According to Asongu (2013), within the specific remit of Africa, such population increase can only be accommodated by the private sector, not least, because the public sectors of attendant countries are almost saturated in terms of providing employment to the population. It follows that doing of business, as considered within the framework of this present study, is one of the mechanisms by which such unemployment issues associated with demographic change can be addressed.

5. Concluding implication and future research directions

The present study has complemented the extant literature by building on the policy challenges on gender economic inclusion and a scholarly gap in the literature in order to assess how females can benefit in terms of doing business contingent on existing female doing business constraints and microfinance institutions (MFIs). Accordingly, the study has assessed how the starting of business by females can be promoted by examining critical levels of MFIs penetration that policy makers must endeavour to maintain in order for female unemployment not to represent a constraint in the doing of business in terms of the procedure that a woman has to go through in order to start a business. The focus of the study is on 44 countries in Sub-Saharan Africa (SSA) for the period 2004-2018, while the empirical evidence is based on interactive quantile regressions. The following findings are established. The validity of tested hypotheses is exclusively apparent in the lowest and highest quantiles of the conditional distribution of the procedure women have to go through to start a business. Critical penetration levels of MFIs needed to reverse the unfavorable incidence of female unemployment in doing business are provided.

In the light of the above, from the established findings, it is apparent that some critical thresholds of MFIs are needed to prevent female unemployment from discouraging females from doing of business. These are: (i) 1.026 and 0.262 MFIs per 1000 km2 in the 10th and 90th quantiles, respectively and (ii) 3.505, 1.595 and 1.423 MFIs per 100 000 adults in the 10th, 75th and 90th quantiles, respectively.

Two main policy implications are worth articulating. First, the premise that the investigated hypotheses are overwhelmingly valid in the lowest and highest quantiles is indicative of the perspective that the policy relevance of the established findings speaks to countries in which the doing business constraint is highest and lowest, especially as it pertains to the procedure a woman has to go through to start a business. In other words, the validity of the tested hypotheses is worthwhile in the countries where the procedures a woman must go through to start a business are highest and lowest. Hence, blanket policies on nexuses between female unemployment, MFIs and doing business are unlikely to succeed unless these are contingent on initial levels of doing business and hence, tailored differently across countries with different initial levels of doing business constraints. Second, in terms of policy significance, less policy effort is worthwhile to reach the targeted MFIs thresholds, not least, because these recommended thresholds are closer to the minimum values of the MFIs apparent in the summary statistics on the one hand and on the other, are below the mean values of attendant MFIs. In other words, many of the sampled countries can achieve the recommended MFIs policy thresholds by either consolidating existing MFIs or slightly improving the penetration of MFIs to the targeted thresholds.

The results of this study evidently allow room for future research, especially as it relates to considering other channels and policy instruments by which gender economic inclusion can be boosted in SSA in particular and other developing countries in general. Moreover, using the same policy or moderating MFIs variables in this study within the remit of other 2030 United Nations' SDGs targets is also a worthwhile future research endeavor.

Compliance with Ethical Standards

Conflict of Interest: The author declares that he has no conflict of interest.

Ethical approval: This article does not contain any studies with human participants or animals performed by the author.

Data availability: the data for this research are available upon request.

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Appendices
Appendix 1: Definitions and sources of variables

Variables	Definitions	Sources
Female Self-Employment	Self-employed, female (% of female employment)	WDI (World Bank)
Female Unemployment	Unemployment, female (% of female labor force)	WDI (World Bank)
Education	School enrollment, high, female (% gross)	WDI (World Bank)
Trade	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.	WDI (World Bank)
Cost to start business	The cost it takes for a woman to set up a business.	Gender and parity statistics for men and women (2020)
Time to start business	The time it takes for a woman to set up a business.	Gender and parity statistics for men and women (2020)
Start up procedure	The procedures a woman has to go through to start a business	Gender and parity statistics for men and women (2020)
Bank accounts	Dummy variable which takes the value 1 if women can open bank accounts like men, 0 otherwise.	Gender and parity statistics for men and women (2020)
Microfinance 1	Microfinance institutions per 1000 km2.	Financial Access Survey (2020)
Microfinance 2	Microfinance institutions per 100 000 adults	Financial Access Survey (2020)

WDI: World Development Indicators.

Appendix 2: Summary Statistics

	Mean	S.D	Min	Max	Obs
Female Self-Employment	76.840	22.988	11.816	99.081	645
Female Unemployment	9.206	8.512	0.218	38.265	645
Education	43.377	26.076	6.542	112.824	391
Trade	74.769	34.486	19.100	225.023	604
Time to start business	40.416	39.625	4.000	261	635
Cost to start business	108.518	140.472	0.200	1229.100	635
Start up procedure	9.468	3.089	3.000	18.000	635
Bank accounts	0.836	0.370	0.000	1.000	660
Microfinance 1	1.799	1.877	0.020	9.282	97
Microfinance 2	4.189	3.092	0.244	11.532	97

SD: Standard Deviation. Min: Minimum. Max: Maximum.

Appendix 3: correlation matrix (uniform sample size: 52)

	FSE	FUmpl	SES	Trade	Cost	Time	StartupP	Account	Nmfi1	Nmfi2
FSE	1.000									
FUmpl	-0.629	1.000								
SES	-0.631	0.306	1.000							
Trade	0.607	-0.439	-0.196	1.000						
Cost	0.512	-0.295	-0.461	0.160	1.000					
Time	0.103	0.398	-0.213	0.052	0.488	1.000				
StartupP	0.038	0.116	-0.109	0.277	0.481	0.774	1.000			
Account	0.009	0.104	-0.349	0.117	-0.017	-0.032	-0.027	1.000		
Nmfi1	-0.224	-0.363	0.338	-0.199	-0.225	-0.689	-0.492	0.029	1.000	
Nmfi2	0.461	-0.144	0.122	0.184	0.066	-0.202	-0.412	-0.279	0.196	1.000

FSE: Female Self Employment. FUmpl: Female Unemployment. SES: Secondary female high school enrollment rate. Trade: trade openness. Cost: The cost it takes for a woman to set up a business. Time: The time of women to set up a business. StartupP: The procedures a woman has to go through to start a business. Account: dummy variable who takes the value 1 if women can open bank accounts like men, 0 otherwise. Contract: dummy variable who takes the value the value 1 if women can sign contracts like men, 0 otherwise. Business: dummy variable who takes the value the value 1 a woman can register a business in the same way as a man, 0 otherwise. Nmfi1: microfinance institutions per 1000 km2. Nmfi2: microfinance institutions per 100 000 adults.