2021-06

What Drives Microfinance Institution Lending Behavior? Empirical Evidence from Sub-Saharan Africa

Tehulu, Tilahun Aemiro

International Journal of Emerging Markets

Published by *International Journal of Emerging Markets*.
Available at: https://doi.org/10.1108/IJOEM-08-2020-1002
Date Article is Accepted: 13 June 2021

What Drives Microfinance Institution Lending Behavior? Empirical Evidence from Sub-Saharan Africa

Tilahun Aemiro Tehulu

Abstract

While poverty alleviation is the first core goal of Sustainable Development Goals (SDGs) and microfinance institutions (MFIs) are considered important instruments for poverty alleviation in developing countries as they provide credit access to the poor, there is surprisingly little evidence of the drivers of the lending behavior of microfinance institutions. Hence, the purpose of this study is to identify the factors that influence the credit growth of MFIs in Sub-Saharan Africa (SSA). The study relies on unbalanced panel dataset of 130 MFIs operating across 31 countries in SSA during the period 2004–2014 constituting 546 usable observations. We use the Arellano-Bover/Blundell-Bond two-step Generalized Method of Moments (GMM) Windmeijer bias-corrected standard errors to estimate the models. We find that while capitalization, liquidity, and size are positively associated with credit growth, profitability negatively impacts credit growth; whereas, other MFI specific factors namely portfolio quality, deposit growth, and non-deposit borrowing growth have little direct effects on MFI credit growth. We also show that MFI credit growth is pro-cyclical but negatively related to GDP per capita consistent with the theory of convergence. On the other hand, inflation and employment are not important covariates in the credit growth of MFIs. The findings suggest that if MFIs improve their liquidity and size by attracting more deposits and non-deposit borrowings, among others, they can increase credit access to the poor. Moreover, since the lending behavior of MFIs is not resilient to GDP shocks, different measures are needed to increase the financial stability of the microfinance industry. In this respect, since MFI capitalization is positively associated with credit growth and MFI credit growth is pro-cyclical, the findings provide useful insights to central banks/regulatory authorities and the Basel Committee as to the need for a counter-cyclical capital buffer requirement in the microfinance industry. The study is the first comprehensive study to examine the drivers of MFI lending behavior as an extension to lending behavior models from the banking industry.

Key Words: Credit growth, Counter-cyclical capital buffer, Financial stability, Sustainability, Microfinance institutions, Sub-Saharan Africa

Article Type: Research Paper

1. Introduction

The first core goal of Sustainable Development Goals (SDGs) is to eradicate poverty[1]. In this regard, although Sub-Saharan Africa (SSA) has healthy economic prospects, it has the highest share – 57 percent in 2015 – of poor people (Beegle & Christiaensen , 2019) and the lowest share of banked households in the world (CGAP, 2018). One of the major constraints facing the poor is lack of access to credit (Tehulu, 2019; Akoh, 2020). Accordingly, numerous developing countries have introduced microfinance institutions (MFIs) to finance micro-entrepreneurs for income generating activities and job creation. Given the high population growth (2.7 percent per year) and the rising number of poor people in Africa (Beegle & Christiaensen, 2019), it is essential to expand credit access to the poor to reduce poverty. Empirical studies have confirmed that MFI credit supply contributes to poverty reduction (Imai *et al.*, 2012; Elsafi, 2020). In this respect, the credit growth of MFIs in SSA is encouraging as the Gross Loan Portfolio (GLP) is growing fast on average by about 42 percent annually (Tehulu, 2021). Nevertheless, Tehulu documents a significant variability in the credit growth of MFIs in SSA. Moreover, the GLP of MFIs in SSA was the lowest in absolute terms in contrast with the other regions[2]. These raise an important concern: What explains the disparity in the lending behavior of MFIs in SSA?

As a matter of fact, the loan portfolio constitutes the highest earning asset in the portfolio of MFIs. The recent attention of empirical research on drivers of portfolio risk in microfinance institutions (Ramírez Silva *et al.*, 2015; Lassoued, 2017; Chikalipah, 2018) also establishes a strong evidence that lending behavior is a strategic area in the decision of MFIs. Most notably, empirical research has revealed that MFI lending decisions matter in poverty alleviation (Imai *et al*., 2012; Khanam *et al.*, 2018; Elsafi, 2020). Specifically, Imai *et al*. (2012) found evidence that countries with larger microfinance institutions' gross loan portfolio per capita experience lower levels of poverty. Similarly, Khanam *et al*. (2018) and Elsafi (2020) have uncovered that the magnitude of MFI's loans granted to the poor have a significant positive impact on poverty alleviation and hence, enhance the living standard of the poor by increasing their income. These evidences clearly show the significance of lending decisions in assuring the wellbeing of the microfinance sector and in poverty eradication, the double bottom line of MFIs. Although microcredit/microfinance is a much favored intervention for poverty alleviation in developing countries (Imai *et al*., 2012; Elsafi, 2020), there is surprisingly little evidence of the drivers of the lending behavior of microfinance institutions.

The existing literature shows that several studies examined the drivers of lending behavior using empirical data from the banking industry in the United States (Berrospide & Edge, 2010; Karmakar & Mok, 2013), Italy (Cucinelli, 2016; Michelangeli & Sette, 2016), European Countries (Laidroo, 2012; Thibaut & Mathias, 2014), 90 countries worldwide (Igan & Pinheiro, 2011), the eleven G10 countries plus those of Austria, Australia, and Spain (Gambacorta & Shin, 2018) and Nigeria (Olokoyo, 2011). While the prior studies provide useful insights mainly on the effects of capitalization, portfolio risk, and/or business cycle on loan supply in the banking

[1] The 2030 Sustainable Development Agenda builds on the Millennium Development Goals (MDGs) and seeks to address what these did not achieve. While the 2030 Agenda has 17 SDGs and 169 targets that are integrated and indivisible and involve the entire world, developed and developing countries alike, it recognizes that eradicating poverty is the greatest global challenge and an indispensable requirement for sustainable development (https://sustainabledevelopment.un.org/post2015/transformingourworld).

[2] The mean GLP for MFIs in SSA was USD6,292,923; whereas, in other regions viz. East Asia and the Pacific, Eastern Europe and Central Asia, Latin America and the Caribbean, Middle East and North Africa and South Asia was USD6,811,602; 9,994,523; 1.32e+07; 1.21e+07, and USD9,790,410, respectively, during the period *2005–2014*.

industry, studies on the determinants of lending behavior in microfinance institutions are virtually missing. Therefore, this paper tries to identify the drivers of credit growth of MFIs by considering two categories of determinants: MFI specific and macroeconomic factors controlling for time invariant components including legal, regulation, and profit status as well as the location of MFIs.

Accordingly, we study the drivers of MFI credit growth using a sample of 130 MFIs operating across 31 countries in Sub-Saharan Africa during the period 2004–2014. Our results show that while capitalization, liquidity, and size are positively associated with credit growth, profitability negatively impacts credit growth; whereas, other MFI specific factors namely portfolio quality, deposit growth and non-deposit borrowing growth have little direct effects on MFI credit growth. We also show that MFI credit growth is pro-cyclical but negatively related to GDP per capita consistent with the theory of convergence. On the other hand, inflation and employment are not important covariates in the credit growth of MFIs.

This article contributes to the literature on lending behavior in at least three ways. First, previous studies focused on bank lending behavior (Berrospide & Edge, 2010; Thibaut & Mathias, 2014; Covas, 2016; Gambacorta & Shin, 2018). To our knowledge, this study is the first comprehensive study to examine the determinants of credit growth of MFIs by incorporating MFI specific, macroeconomic and time invariant components. Second, our study focuses on MFI lending behavior in SSA where the GLP of MFIs is the lowest compared to the GLP of MFIs in other regions, and thereby providing empirical evidence on MFI lending behavior from developing economies. Third, we use a dynamic model so as to obtain consistent and unbiased estimates of the drivers of MFI lending behavior. The fixed effects estimation technique could be biased given a short panel such as ours and cannot estimate the effects of time invariant components as it drops them from the regression equation. Finally, in light of our findings, we provide useful insights to central banks/regulatory authorities and the Basel Committee as to the need for a counter-cyclical capital buffer requirement in the microfinance industry, among other things.

The remaining sections are structured as follows: In Section 2, we review the existing literature on lending behavior. In Section 3 we describe our data, present our econometric model, describe variables and their measurement, develop hypotheses and describe our estimation methodology. In Section 4, we present and discuss our results. Finally, Section 5 gives the conclusions and policy implications.

2. Literature Review

Loans are important sources of funds for individuals, households and firms. Financial institutions' lending behavior is also a determinant of financial crises. Accordingly, numerous studies have examined the factors that influence the lending behavior of financial institutions (Berrospide & Edge, 2010; Thibaut & Mathias, 2014; Cucinelli, 2016; Gambacorta & Shin, 2018; Awdeh & El-Moussawi, 2021). However, these studies were based on empirical evidences from the banking industry and similar studies from microfinance industry are virtually missing. In the existing empirical literature, researchers have modeled lending behavior as a function of supply and demand factors. As one of the main supply-side determinants of lending behavior, several empirical studies establish that capital matters in credit decision of financial institutions

consistent with the capital crunch hypothesis (Thibaut & Mathias, 2014; Covas, 2016; Gambacorta & Shin, 2018). The capital crunch hypothesis implies that financial institutions with higher capitalization increase loans while those with poor capitalization limit their lending in order to fulfill capital requirement. This, however, also implies that an increase in the regulatory minima could lead to a decline in credit supply as confirmed by the findings of Awdeh and El-Moussawi (2021).

Bernanke and Lown (1991) assert that there is a causal link between low capital-asset ratios and low lending growth in the subsequent period, which supports the capital crunch hypothesis. Gambacorta and Shin (2018) also found similar results. Gambacorta and Mistrulli (2004) underline that if equity is low and it is too costly to issue new shares, financial institutions could reduce lending in order to meet regulatory capital requirements. Moreover, Hearn *et al.* (2018) assert that African IPO firm's access to private equity investors is low although essential for mobilizing resources from internal markets. Consequently, capital adjustment difficulty in financial institutions could also lead to the positive capitalization and credit growth nexus as banks/MFIs with weak capitalization could be unable to raise the necessary capital to achieve the desired credit growth.

The literature, however, also shows that capitalization may be associated with risk aversion; this is in line with the literature that emphasized a link between risk aversion and capital (Michelangeli & Sette, 2016). Accordingly, the findings by Cucinelli (2016) show that banks with a higher level of equity to total assets reduce lending implying that the higher bank capital, the greater are the incentives for equity holders to reduce the riskiness of assets, thereby limiting bank lending activity. To the contrary, Michelangeli and Sette (2016) found that higher bank capital is associated with a higher likelihood of application acceptance; banks with lower capital reject applications by riskier borrowers. These results suggest that the direction of relationship between loan supply and capitalization depends on the link between risk aversion and MFI capitalization.

Prior studies also reveal that portfolio risk is one of the main drivers of subsequent lending behavior. Several evidences confirm that deterioration in portfolio quality impacts credit growth negatively (Berrospide & Edge, 2010; Karmakar & Mok, 2013; Cucinelli, 2016). In this respect, Berrospide and Edge (2010) found that out of the 2.9 percentage point decline in the quarterly loan growth rate from 2008:Q4 to 2009:Q3, of which the model explains 2.2 percentage points, 1.1 percentage points is explained by changes in net charge-offs rates, which captures the deterioration in loan quality. This implies that MFIs that have higher portfolio risk are more cautious in providing loans (Wagner & Winkler, 2013) since credit risk is one of the major impediments to the financial sustainability of MFIs.

While empirical findings on the relationship between lending and profitability are scant, the existing few studies show that there is a positive link between lending and profitability (Igan & Pinheiro, 2011; Laidroo, 2012; Hessou & Lai, 2018). Igan and Pinheiro (2011) uncovered that loan growth is positively related to profitability implying that higher profitability allows financial institutions to grow faster. Hessou and Lai (2018) also show that profitability as measured by return on assets (ROA) at time *t-1* is followed by subsequent more loan granting. They explain this positive relationship as follows: In MFIs which are particulary mutually owned ones such as

credit unions, dividends paid to members store up in saving accounts and available for granting new loans. They also argue that credit unions also adjust capital buffers by retaining earnings; this could lead to the positive relationship between lending and profitability.

On the other hand, the literature on the effect of liquidity on lending behavior is mixed. While some of the existing studies documented a positive relationship (Berrospide & Edge, 2010; Laidroo, 2012; Hessou & Lai, 2018), Cucinelli (2016) reported a negative relationship. Laidroo (2012) states that financial institutions with higher liquidity ratios could use their stock of liquid assets and be better able to shield their lending activity against shocks to the availability of external finance. In this respect, Hessou and Lai (2018) also reported that liquidity is positively associated with changes in loans-to-assets suggesting that credit unions with more liquidity in a particular year are likely to extend more loans in the following year. On the other hand, the empirical evidence by Olokoyo (2011) shows liquidity has an insignificant effect on lending behavior.

Similarly, the relationship between credit growth and firm size is inconclusive (Aydın, 2008; Laidroo, 2012; Thibaut & Mathias, 2014). Thibaut and Mathias (2014) found that the relationship between loan supply and size is not conclusive: Depending on the nature of the loans in terms of sectors (MFI vs. non-MFI[3]) and counterparties (domestic Vs non-domestic), the effect of size is either negative or positive. Similarly, while Aydın (2008) reported a positive association of size with credit supply, the findings by Laidroo (2012) revealed that loan growth is negatively related to size. Laidroo states that this may be due to scale effects. Hence, controlling for scale effects is essential in modeling lending behavior. We also identified that deposits (Laidroo, 2012; Cucinelli, 2016) and non-deposit borrowings (Wagner & Winkler, 2013) are important covariates to affect the lending behavior of financial institutions since both variables influence the availability of loanable funds.

Furthermore, previous studies document that demand-side determinants are also important factors in predicting loan growth. Berrospide and Edge (2010) show that a 1 percentage point reduction in GDP growth leads to about a 4 percentage point decline in annualized loan growth. Consistent findings include Igan and Pinheiro (2011) and Laidroo (2012) who confirm that GDP growth has a positive impact on credit growth. Igan and Pinheiro (2011) state that, during upturns, favorable investment opportunities and strong economic activity push asset prices up, which in turn improve the creditworthiness of borrowers and allow them to borrow more against higher values of collateral. During downturns, borrowers' financial situation deteriorates, customers become pessimistic and asset prices fall causing decrease in value of collaterals (Laidroo, 2012) which results in increased defaults and tightening of credit standards.

Given that credit growth is a nominal variable, inflation could mechanically drive credit growth apart from capturing the demand for loanable funds. Hence, the literature documents a positive association of inflation with lending (Thibaut & Mathias, 2014). Similar to Thibaut and Mathias (2014), Laidroo (2012) also documents a positive relationship between lending and inflation. As to the effect of unemployment, there are two hypotheses on unemployment and entrepreneurship nexus: The "recession push" and "prosperity pull" hypothesis (Cheratian *et al.*, 2020 and the references therein). Depending on which hypothesis holds true in Africa, the relationship

[3] Loans to non-MFI, whether domestic or non-domestic, include loans to households, corporate sector and governments.

between demand for loan (and hence, credit growth) and employment could be negative/positive given the purpose of micro-credits is to finance micro-entrepreneurs. Finally, catch-up phenomenon, reflected in faster credit growth in poorer countries, is also important in explaining lending behavior (Igan and Pinheiro, 2011).

In summary, while the prior studies provide useful insights mainly on the effects of capitalization, portfolio risk, and/or business cycle on lending behavior in the banking industry, empirical evidences from the microfinance industry are virtually missing. Unlike the banking industry, the microfinance sector is diverse in nature where the MFIs are organized as micro-banks, NBFIs, NGOs, Credit Unions/Coop. or rural bank and with regulated or unregulated status. More importantly, while the banking industry is guided by profit motive, MFIs have to achieve financial sustainability on the one hand and social missions (outreach) on the other hand (Hermes & Hudon, 2018). Hence, managers of MFIs might have different incentives than managers of commercial banks. Therefore, whether the empirical evidences from the banking industry also hold true for MFIs is an empirical question.

The microfinance industry in SSA is also highly capitalized (Tehulu, 2021). It is argued that the effect of capitalization on loan growth for over-capitalized financial institutions could be less marked since financial institutions cannot force clients to borrow while they can prevent them from obtaining credits (Thibaut & Mathias, 2014). Therefore, it is also interesting to investigate whether capitalization contributes to the credit growth of MFIs. In addition, while the long-held view is that MFI credits are more stable source of finance than bank credits (Wagner & Winkler, 2013 and the references therein), there are no empirical evidences whether the lending behavior of MFIs is resilient to economic shocks. This article is also the first paper that offers useful insights to central banks/regulatory authorities and the Basel Committee on the need for a counter cyclical capital buffer requirement in MFIs.

In their study of "The vulnerability of microfinance to financial turmoil – Evidence from the global financial crisis", Wagner and Winkler (2013) have examined whether the global financial crisis affected credit growth of MFIs and whether the impact varies depending on MFIs' legal status and the region they are located in. While the aforementioned study did not focus on MFIs in SSA, it also failed to address whether MFIs' capitalization predicts lending behavior. The study did not also examine whether the lending behavior of MFIs is resilient to GDP shocks. Other MFI-specific variables such as profitability, liquidity, size[4] of MFIs, and scale effects, among others, are not also accounted by their model and all these limitations could make the validity of their findings questionable as the omission of the aforementioned variables are likely to cause bias in parameter estimates and/or make the hypotheses testing invalid.

Moreover, while Wagner and Winkler applied a static panel data analysis technique (i.e. Fixed Effect estimator), we used a dynamic panel data modeling which is preferred when we have short panel in order to obtain unbiased estimates (Cucinelli, 2016). The use of dynamic panel data modeling analysis (GMM) also allows to use the Sargan test to check whether the instruments are uncorrelated with residuals, and thereby showing whether our models suffer from omitted

[4] Wagner and Winkler (2013) measure size using the number of borrowers. This measure is not appropriate to represent size in lending behavior models since, obviously, credit expansion drives the number of borrowers and not the reverse as it is theoretically less sound (See Section 3.2.1 for more details on how we measured size).

variables bias or not. Therefore, this study is pioneering in studying MFI lending behavior using a comprehensive econometric model and advanced data analysis technique.

3. Modeling Lending Behavior: An Application to MFIs

3.1 The Data

This study relies on unbalanced panel dataset of 130 MFIs across 31 countries[5] in Sub-Saharan Africa during the period 2004–2014. Given the diversity of the nature of MFIs, empirical analysis is difficult and calls for cross-country data to obtain adequate number of observations for statistical analysis. More specifically, the use of cross-country data allows us to consider the determinants of MFI lending behavior more exhaustively. Following previous studies in the microfinance field (Imai *et al*., 2012; Wagner & Winkler, 2013; Lassoued, 2017), institution level data to be used in this study come from the MIX database. This dataset has been available online at www.mixmarket.org. The country level macroeconomic data are publicly available at http://data.worldbank.org/data-catalog/world-development-indicators.

3.2 The Model

The microfinance sector is diverse in nature where MFIs are organized as micro-banks, non-bank financial institutions, Credit Union/Cooperative, non-governmental organizations (NGOs) or Rural Bank; regulated or non-regulated; and for profit or not for profit. These show that there could be additional factors that determine the credit growth of MFIs in addition to the determinants of bank lending behavior. Hence, it is imperative that we account for such heterogeneities in examining the drivers of MFI lending behavior. Nevertheless, it is crucial that we start with a baseline specification and then test the robustness of the results as well as the effects of additional variables in alternative regressions. Therefore, our baseline model specification is as follows:

$$\begin{aligned} LB_{i,c,t} = {} & \alpha_0 + \beta_1 LB_{i,c,t-1} + \phi_1 CTAR_{i,c,t-1} + \phi_2 LIQ_{i,c,t-1} + \phi_3 RISK_{i,c,t-1} + \phi_4 PROF_{i,c,t-1} + \phi_5 DEPG_{i,c,t} \\ & + \phi_6 FUNG_{i,c,t} + \phi_7 LNTA_{i,c,t} + \phi_8 LSCA_{i,c,t-1} + \phi_9 SSCA_{i,c,t-1} + \pi_1 GDPG_{i,c,t} + \pi_2 INF_{i,c,t} \\ & + \pi_3 EMP_{i,c,t} + \pi_4 CUP_{i,c,t} + \gamma_1 GFC2008_t + \gamma_2 GFC2009_t + (\eta_i + \varepsilon_{i,c,t}) \end{aligned}$$

Eq.1

Where *LB* is the dependent variable (i.e. MFI credit growth). $LB_{i,c,t-1}$ is the lagged dependent variable; β_1, ϕ_k (k=1,2,3, …,9), and π_j (j=1,2, …,4) are the parameters to be estimated, α_0 is the constant, and the latter three variables in the model are a set of time fixed effects (γ_1, γ_2) and the 'fixed effects' decomposition of the error term $(\eta_i + \varepsilon_{i,c,t})$. The rest are as described in Table 1.

[5] The lists of countries included in our analysis comprise Angola, Benin, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Congo, Democratic Republic of the, Congo, Republic of the, Cote d'Ivoire (Ivory Coast), Ethiopia, Gambia, The, Ghana, Guinea, Kenya, Madagascar, Malawi, Mali, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Swaziland, Tanzania, Togo, Uganda, and Zambia.

3.2.1 Description and Measurement of Variables and Hypotheses

The Dependent Variable

The existing literature shows different alternative lending behavior (*LB*) measures: The logarithm of loans (Olokoyo, 2011), loans to asset ratio (Karmakar & Mok, 2013; Hessou & Lai, 2018), changes in the natural logarithm of loans (Covas, 2016; Gambacorta & Shin, 2018), and growth rate of loans (Thibaut & Mathias, 2014; Cucinelli, 2016). The (natural) logarithm of loans is not appropriate as we employ a cross-country data with different currencies. Since the data are available in U.S.D, consistent with Wagner and Winkler (2013), we converted it to local currency using the official exchange rate (LCU per US$, period average) calculated as an annual average based on monthly averages in order to mitigate the effect of changes in currency value on credit growth,. The use of (natural) logarithm of loans could be a valid measure when we consider the within variation; however, it cannot be used to capture between variations since loan supply values are now in different currencies. The loans to asset ratio is more appropriate to measure loan intensity rather than loan supply since the loans are scaled by total assets. The use of changes in the natural logarithm of loans is a generally accepted approach in the existing literature as a measure of credit growth. Although this approach is simpler than the next measure, it is less precise. Hence, we measure lending behavior as the growth rate of Gross Loan Portfolio (GLP).

The Independent Variables[6]

Capitalization: MFI capitalization (*CTAR*) is measured using the ratio of equity to total assets. Gambacorta and Mistrulli (2004) assert that if financial institution's capitalization is poor and it is too costly to issue new shares, financial institutions could limit their lending in order to meet regulatory capital requirements. Similarly, since financial institutions with higher capitalization are less risk averse (Michelangeli & Sette, 2016), they could extend more loans since they can absorb more loan losses. On the other hand, higher level of capitalization can reveal higher risk aversion and conservatively managed financial institutions which may be less willing to accept less credit worthy borrowers (Cucinelli, 2016). Alternatively, since the microfinance industry is highly capitalized, variations in the level of capitalization might not lead to differences in lending behavior given that MFIs can reduce their lending when capital is too low but they cannot force borrowers to borrow when capitalization is high (Thibaut & Mathias, 2014). Therefore, the expected relationship between lending behavior and capitalization is indeterminate.

Risk: In the existing literature, risk (*RISK*) is measured in different ways. One mechanism is to use the risk weighted assets to total assets ratio. This approach assumes that the risk weights assigned to each category accurately reflect the true risk profile; this, however, contradicts with recent literature which argues that the risk weights do not take the varying levels of risk within a specific portfolio category into account and therefore, fail to reflect the actual risk profile of the financial institutions (Vallascas & Hagendorff, 2013). Alternatively, prior research also uses the non-performing loans ratio as a measure of risk (Lassoued, 2017); this could reflect the true risk profile of MFIs. Thus, we use the non-performing loans ratio (specifically, the portfolio at risk greater than 30 days) for measuring risk.

[6] We rely on the MIX Market definition and formula for most of our explanatory variables since data is obtained from the same.

Igan and Pinheiro (2011) argue that the relationship between lending and risk could be positive since "less sound banks become more aggressive and take more risks as they bet all their resources in a last effort to survive" (P.3). However, we believe that a higher portfolio risk is likely to lead to pressures on MFIs in meeting capital requirements; the higher the risk the higher the required regulatory capital which could lead MFIs to limit their lending. A higher risk also implies higher loan loss provision which depletes capital and this in turn forces a MFI to limit its lending. Moreover, a higher portfolio risk could indicate lower cash flow which reduces the amount of money to be lent again. Therefore, we predict a negative relationship between lending and credit risk.

Profitability: Following Hessou and Lai (2018), we use the return on assets as a measure for profitability (*PROF*). The literature reveals a positive relationship between lending and profitability (Laidroo, 2012; Hessou & Lai, 2018). Hessou and Lai (2018) argue that in MFIs, particulary credit unions, dividends paid to members store up in saving accounts and available for granting new loans. They also assert that profitability is positively associated with lending since credit unions adjust capital buffers by retaining earnings. On the other hand, we can argue that profitable MFIs could follow conservative risk management strategies to generate consistently high profits. Thus, MFIs that are more profitable at time *t-1* could limit their lending at time *t* in order to limit portfolio risk and maintain their profitability. Thus, our a priori expectation is undetermined.

Liquidity: We use the non-earning liquid assets as a % of total assets as a measure of liquidity *(LIQ)*. This measure is an important liquidity indicator in the microfinance industry. Consistent with the findings of the prior studies (Berrospide & Edge, 2010; Laidroo, 2012; Hessou & Lai, 2018), we expect liquidity to be positively associated with credit growth of MFIs as higher liquidity ratio allows MFIs to shield their lending activity against shocks to the availability of external finance (Laidroo, 2012).

Size: We measure size (*LNTA)* of the MFI using the natural logarithm of total assets in line with Laidroo (2012) and Hessou and Lai (2018). Size may influence MFI's credit supply positively since large MFIs can attract more loanable funds to support their desired higher credit growth (Hessou & Lai, 2018). Large financial institutions could also enjoy economy of scale (Beccalli *et al.*, 2015) and also have lesser information asymmetries compared to small financial institutions (Laidroo, 2012). Nevertheless, large and diversified MFIs may hold lower capital buffer since they have a strong risk management culture (Hessou & Lai, 2018). Consequently, the lower capital buffer may pressure MFIs to limit their lending. Thus, we cannot predict the direction of relationship between credit growth and size of MFIs. We should, however, recognize that since bigger MFIs obviously have larger GLP in absolute terms, controlling for scale effects is essential in order to obtain a valid coefficient for the effect of size (Laidroo, 2012). Hence, we also include large scale (*LSCA*) and small scale (*SSCA*) dummies to control for scale effects as MFIs with lower GLP at time *t-1* are likely to have higher credit growth at time *t* and those with higher base value GLP are likely to exhibit lower credit growth given that the lag GLP is the denominator in the computation of credit growth.

Deposit Growth: Deposit growth (*DEPG*) is measured as the rate of growth of deposits (i.e. $(Deposit_t/Deposit_{t-1})-1$). We believe that this approach is more preferable compared to the deposit

to asset ratio as a measure of deposit growth since changes in deposit to asset ratio do not necessarily imply changes in deposits. Since the data are available in USD and that changes in currency value may distort the magnitude of changes in deposits, we first converted the values to local currency at the official exchange rate, contemporaneous, and then calculated the growth rates. The growth of deposits could be positively associated with loan growth since deposits are the main[7] sources of loanable funds for many MFIs. Thus, we expect a positive coefficient.

(Non-deposit) Funding Growth: Funding growth (*FUNG*) is measured as the growth of total non-deposit liabilities. In all other cases, we follow the same approach applied for deposit growth. Funding growth could influence loan supply positively as non-deposit liabilities are also part of loanable funds. Therefore, we predict a positive sign.

Macroeconomic Determinants: We include the macroeconomic factors to capture the effect of changes in loan demand. Since GDP growth (*GDPG*) has positive association with demand for loan, we expect *GDPG* to influence credit growth positively. The effect of employment (*EMP*) could be negative/positive depending on which hypothesis (recession push or prosperity pull) explains the unemployment–entrepreneur nexus. We include inflation (*INF*) in the set of covariates because, the GLP being a nominal variable, we do not want the credit growth to be mechanically driven by inflation (Thibaut & Mathias, 2014); hence, a positive relationship is expected. We use GDP per capita (*CUP*) as a proxy for the level of a country's economic development. The catch-up phenomenon implies that wealthier economies have lower demand for loans than poorer economies and hence, our expectation is a negative coefficient.

In line with Wagner & Winkler (2013), we believe that endogeneity is not a concern regarding macro-economic factors since it is unlikely that microfinance credit growth influences GDP growth or other macroeconomic variables as "most microfinance sectors are small in volume terms (Di Bella, 2011)" (Wagner & Winkler, 2013, P.73). We also test whether the instruments are uncorrelated with the residuals using the Sargan test. Finally, we incorporate time dummies to control for time fixed effects and time invariant components such as regulation, profit, and legal status dummies to control for individual fixed effects. In order to control for differences in credit growth across different geographical areas, we also include location dummies. A summary of the description of the variables and hypotheses is given in Table 1.

([Table 1 here])

3.3 Estimation Methodology

Given our dynamic panel models, we have to make a choice between the difference-GMM and system-GMM for data analysis. The Arellano-Bover/Blundell-Bond estimator extends Arellano-Bond with an assumption that the fixed effects are not correlated with the first differences of instrumenting variables and can dramatically increase efficiency as it allows the introduction of more instruments (Roodman, 2007); in our case, the Arellano-Bover/Blundell-Bond estimator is able to increase the number of observations from 387 in Arellano-Bond estimator to 546 while the number of groups has been increased from 112 to 130 which show its increased efficiency. In addition to efficiency concerns, the Arellano-Bond estimator does not also allow us to estimate

[7] The mean and 50 percentile values for deposits to total assets ratio is approximately 40 percent for MFIs in Sub-Saharan Africa

the effects of time invariant components as the differencing removes any time invariant explanatory variables. Hence, the system-GMM estimator is preferred to the differenced-GMM estimator.

The other problem is the choice between one-step and two-step system GMM estimation. The one-step GMM estimator is based on a weight matrix that assumes the error terms are i.i.d. while the estimator, $\hat{\beta}$, depends on the choice of the weight matrix in over-identified models. Because we have more instruments than parameters, we have an over-identified model. Therefore, the choice of the weight matrix does matter. So, the option is to use the two-step GMM estimator. However, the standard errors estimates of the two-step estimators are severely downward biased. Hence, we use Windmeijer[8] bias-corrected standard errors to resolve the bias of traditional two-step GMM standard errors observed in dynamic panel models (Roodman, 2007). Accordingly, we apply the Arellano-Bover/Blundell-Bond two-step Generalized Method of Moments (GMM) Windmeijer bias-corrected standard errors to estimate our models.

Compared to the Fixed Effect estimator applied by Wagner and Winkler (2013), the use of dynamic panel data modeling analysis (GMM) allows to obtain consistent and unbiased estimates of the drivers of MFI lending behavior in short panel data such as ours provided that the over-identifying moment conditions are valid and there is no autocorrelation in the idiosyncratic errors. The two-step system GMM also allows to test whether the instruments are uncorrelated with residuals, and thereby ensuring whether our models suffer from omitted variables bias or not. Moreover, the fixed effects estimation technique cannot estimate the effects of time invariant components as it drops them from the regression equation.

4. Empirical Results and Discussions

4.1 Summary Statistics

The descriptive statistics summarized in Table 2 show that the credit growth of MFIs in SSA is rapid growing on average by about 42 percent. The capital ratio also exhibits a value of 33 percent indicating that MFIs in SSA are highly capitalized[9]. However, SSA MFIs are on average unprofitable. The proportion of loans over 30 days overdue ranges from zero to seventy nine percent suggesting that some MFIs have high portfolio quality, but some others are suffering from loan defaults. The liquidity of MFIs also ranges from zero percent to seventy nine percent implying that some MFIs have severe liquidity problem to meet withdrawal and/or loan demands. The deposit growth and non-deposit borrowing growth are 52 percent and 56 percent, respectively, indicating rapid growth in MFI funding. Most importantly, the standard deviation shows that there is a significant variability in the values of each of the MFI specific and macroeconomic factors. There is also a significant variance among the credit growth of MFIs. Hence, in the next section, we discuss whether the observed variances with the MFI specific and macroeconomic factors lead to differences in MFI lending behavior.

([Table 2 here])

[8] A finite sample correction for the variance of linear efficient two-step GMM estimators. Journal of Econometrics, 126: 25–51.

[9] The capital requirement of most countries for MFIs range between 8% to 12% of total risk weighted assets (See Tchakoute Tchuigoua, 2016).

4.2 Econometric Results

The results from the two-step system-GMM are summarized in Table 3. The first column displays the results for our benchmark model and the second drops deposit growth and non-deposit borrowing growth from the benchmark model since the first regression model shows that these variables are not important determinants of loan growth and hence, their inclusion may increase the standard errors. Moreover, because of MFIs with no financial intermediation, we are able to increase the number of observations when we drop the variable "deposit growth", thereby achieving increased efficiency. The third extends column two by controlling for regulation and profit status. The fourth column controls for legal status by replacing regulation and profit status in column three as they are likely to be collinear with MFI legal status and the last column extends the fourth column by controlling for the effects of MFI locations.

In all GMM models (column1–5), the Sargan test fails to reject the null hypothesis (the instruments are uncorrelated with residuals) and, therefore, the over-identifying restrictions are valid. Similarly, in all models, the test results suggest that there is no autocorrelation in the residuals as reflected by the *p*-values of the AR(1) and AR(2) at the 95 percent confidence interval. In using GMM estimator, another concern is instrument proliferation problem. Roodman (2007) states that "… too many instruments can over-fit endogenous variables and fail to expunge their endogenous components" (P.43). In this respect, one rule of thumb is to check whether the instrument count is greater than the number of groups, N, although this approach may be too liberal; if so, then test the robustness of the results to reducing it using options such as collapsing instruments in xtabond2, and limiting the lags used in GMM-style instruments (Ibid). In our case, instrument proliferation is not a problem for two reasons: First, we use a short panel data and instrument proliferation is likely to be a concern in panel data with long time series dimensions. Second, the number of instruments (52) is significantly lower than the number of groups (130) and hence, instrument proliferation problem is not a concern in this study.

The results are generally in line with our expectations. The relative magnitude of influence and the statistical significance of the MFI specific and macro-economic factors are also more or less preserved in all regression models indicating that the results are robust**.**

([Table 3 here])

4.3 Discussions

4.3.1 Firm Specific Determinants of Lending Behavior

In this section, we discuss the GMM results (Table 3) on the short-run effects of MFI specific factors on the lending behavior of MFIs in SSA. In subsequent sections, we discuss the macroeconomic and other determinants of MFI lending behavior. The results show that capitalization, profitability, liquidity, and MFI size are the main MFI specific determinants of credit growth; whereas, portfolio quality, deposit growth, and non-deposit borrowing growth have no significant impacts on MFI loan growth. More specifically, we found new and interesting finding that profitability is negatively associated with credit growth. The findings establish that profitable MFIs make a balance between financial sustainability and social missions. Accordingly, MFIs that are more profitable at time *t-1* expand credits less at time *t*

possibly to limit portfolio risk and maintain their profitability since credit risk impacts profitability negatively. The result is significant at 1 percent level of significance (regression models2–5).

Our finding contradicts with Hessou and Lai (2018) who, based on empirical data from Canadian credit unions, show that profitability influences lending positively. Since credit unions usually require cash collateral, credit expansion does not raise risk management issues. In other MFIs, since credit expansions may lead to defaults, those MFIs that are more profitable at time *t-1* may choose to limit their lending in order to reduce defaults and maintain their profitability. Conversely, MFIs that are less profitable have higher credit growth either because these MFIs take more risks and expand credits as a last resort to make profits and ensure the sustainability of the institution (Igan & Pinheiro, 2011) or because these institutions focus more on their social missions rather than financial sustainability and therefore, focus more on credit expansions despite possibility of higher future defaults.

Contrasting empirical findings from the banking industry include Igan and Pinheiro (2011) and Laidroo (2012). While the banking industry is a profit motivated financial industry and requires collateral for the loans, the microfinance industry has to achieve the twin missions of financial sustainability and poverty reduction (Mersland & Strøm, 2010) and may not hold tangible collaterals for the loans. Accordingly, unlike MFIs, more profitable banks may expand credits to maintain their profitability since credit risk may not be a critical obstacle to profitability in banks in comparison to MFIs.

Regarding capitalization, the results revealed that MFIs with higher level of equity to total assets at time *t-1* increase credit supply more in the following year. In all GMM models (Model 1–5); the result is statistically significant at 95 percent confidence interval. This finding suggests that MFIs with greater retention of earnings and therefore higher capital would be better able to increase credit access for the poor. The economic significance of the effect of capitalization is also comparable to the one observed from the banking industry. While we find that a 1 percentage increase in the equity ratio leads to a 0.5702 to 0.6226 increase in annual credit growth, Gambacorta and Shin (2018) document that a 1 percentage increase in the equity-to-total assets ratio is associated with a 0.5997 percentage increase in bank annual loan growth. The strong positive association of capitalization with MFI credit growth obviously confirms that certain MFIs in SSA are capital constrained.

The result is consistent with the literature that documents a positive association of capitalization with bank lending behavior (Berrospide & Edge, 2010; Covas, 2016; Gambacorta & Shin, 2018). It shows that MFIs with poor capitalization limit their loan supply since it is difficult to raise equity capital as the stock markets in SSA are underdeveloped (Hearn & Piesse, 2010). Given that the microfinance industry is diverse in status comprising both regulated and unregulated MFIs, the finding also confirms Thibaut and Mathias (2014) who argue that capitalization matters in financial institution lending behavior even when regulatory capital requirements are not binding. Financial institutions with lower capitalization could be more risk averse and limit their loan supply in order to fulfill market constraints since the market (including institutional and retail depositors, among others) requires adequate capitalization for the risk the financial institution assumes; the level of capitalization is a good indicator of bank/MFI insolvency, which

is one of the reasons for revocation of licenses of some financial institutions in Ghana (Ofori, 2020).

In all GMM models, the findings on the portfolio risk–lending nexus confirm the expected sign. A reduction in portfolio quality is associated with a decrease in the growth of gross loan portfolio. However, the result is not statistically significant. This implies that MFIs with higher portfolio risk in the current period either they are willing to take the risk and bet all their resources in a last effort to survive (Igan & Pinheiro, 2011) or these MFIs focus more on their social mission rather than financial sustainability and sustain their credit growth. The result is not consistent with the empirical evidences from the banking industry (Karmakar & Mok, 2013; Cucinelli, 2016) that document a significant negative relationship between lending behavior and risk. The banking industry is guided by profit motive. Consequently, banks with higher portfolio risk could expand credits less to limit portfolio risk since deterioration in portfolio quality impacts their profitability negatively. However, unlike banks, MFIs have to achieve the goal of financial sustainability on the one hand and poverty reduction on the other hand (Hermes & Hudon, 2018). Accordingly, MFIs with higher credit risk do not reduce their credit growth significantly since they have to sustain credit access to the poor.

As expected, in all regression models, the coefficient of liquidity is positive and statistically significant at least at the 5 percent level of significance. This result implies that MFIs with more liquidity at time *t-1* are likely to grant more loans at time *t*. In order to understand the crucial role of liquidity in MFI lending behavior, it is vital to compare the effect of liquidity with the effect of capitalization; the results show that the effect of liquidity has higher relative economic importance. It appears that a 1 percentage change in liquidity has a higher effect on credit growth in comparison to the effect of a 1 percentage change in capitalization (1.1306 Vs 0.6226 in model 2, for instance). The result is in line with the literature (Berrospide & Edge, 2010; Hessou & Lai, 2018) that revealed liquidity is positively associated with lending suggesting that higher liquidity allows financial institutions to grant more loans as the lending behavior of such financial institutions could be less vulnerable to economic shocks and shocks to their deposits (Laidroo, 2012).

The size of MFIs exhibits a positive association with loan growth controlling for scale effects. In all GMM models, the result is significant at 99 percent confidence interval. Size influences MFI's credit supply positively possibly because large MFIs can attract more loanable funds to support their desired higher credit growth (Hessou & Lai, 2018). Large MFIs could also enjoy economy of scale compared to small MFIs (Beccalli *et al.*, 2015). It could also be that bigger financial institutions have lesser information asymmetries (Laidroo, 2012) and/or stronger risk management culture (Hessou & Lai, 2018). While previous empirical evidences on the relationship between credit growth and firm size are inconclusive (Aydın, 2008; Laidroo, 2012; Thibaut & Mathias, 2014), our findings confirm Aydın (2008) who found that bank size positively impacts credit supply. The negative association of size with credit growth documented in some prior studies is likely to be due to the fact that their model did not control for scale effects.

Similarly, the coefficients for deposit growth and non-deposit borrowing growth are positive but statistically insignificant (Model 1). This does not imply that deposit growth and non-deposit

growth are not important factors in the lending behavior of MFIs. Considering model 2, when both variables are omitted from the regression equation, the economic importance of liquidity and size is improved suggesting that deposit growth and non-deposit borrowing growth could affect the lending behavior of MFIs by influencing the level of liquidity and size of MFIs. Nevertheless, the results do not support the prior studies which establish deposits (Laidroo, 2012; Cucinelli, 2016) and non-deposit borrowings (Wagner & Winkler, 2013) have significant direct effects on the lending behavior of financial institutions. Finally, the results reveal that the signs of scale dummies are as expected and statistically significant at 1 percent level of significance in all models. While lower gross loan portfolio (GLP) in the preceding year amplifies the magnitude of the current credit growth, higher GLP reduces credit growth.

4.3.2 Macroeconomic Factors and Lending Behavior

The results also show that in addition to MFI specific factors, macroeconomic factors also matter in the lending behavior of MFIs. In all GMM models except model 1, we find that GDP growth is positively associated with credit growth at 5 percent level of significance. This shows that MFI lending behavior is not resilient to GDP shocks. This phenomenon could be explained as follows: As national income increases, consumption will also increase which leads to more investment opportunities since business firms now have a recipient market for their goods and services which in turn increase the demand for loans. This pro-cyclicality of demand for loans makes the credit growth of MFIs pro-cyclical.

Furthermore, we show that the lending behavior of MFIs is more resilient to GDP shocks compared to bank lending behavior. While our findings reveal that a 1 percentage decrease in GDP growth entails a 1.7486 to 1.8056 percentage reduction in MFI credit growth, Berrospide and Edge (2010) found that a 1 percentage reduction in GDP growth leads to about a 4 percentage decline in annualized bank loan growth. Nevertheless, the results are in line with the literature from the banking industry (Quagliariello, 2007; Laidroo, 2012) which documented that bank lending is pro-cyclical. The pro-cyclicality of MFI lending, however, implies that a negative shock to GDP growth is detrimental to MFI credit growth.

As to the effect of inflation, the results in Table 3 show that the coefficient of this variable is positive in line with theoretical expectations but statistically insignificant with the exception of model 1. While the effect of employment is statistically insignificant, the sign is also not conclusive; in some models it is negative, in other models it is positive. Finally, Table 3 shows that GDP per capita has a significant negative effect on MFI credit growth. In all GMM models (model 1–5), the result is statistically significant at least at 5 percent level of significance. This finding is consistent with the theory of convergence, which is predicated in part on the law of diminishing marginal returns, and implies that poorer countries have higher demand for credits which translates into higher credit growth in these economies. The result corroborates Igan and Pinheiro (2011) who found that financial institutions in richer countries have lower credit growth than financial institutions in poorer countries.

4.3.3 Other Determinants and Persistency of Credit Growth

In all GMM models except model 1, the coefficients of crisis dummies are not statistically significant. The average credit growth was 63.67 percent during the year 2007 and 28.89 percent during the year 2008. These evidences suggest that although there has been significant decline in

credit growth during the global financial crisis (specifically, during the year 2008), the decline may be due to shocks to the included firm specific and macroeconomic variables caused by the global financial crisis or some other factors. Similarly, though Tehulu (2021) using One-Way ANOVA shows that credit growth varies across legal forms of MFIs, the GMM results reveal that legal status has no significant effect on the loan growth of MFIs when we control for MFI specific and macroeconomic variables. This implies that the different MFI specific variables included in our model have absorbed the predictive power of legal status.

We also find no evidence to support a significant relationship between MFI credit growth and regulation/profit status. Dato *et al.* (2018) state that when a MFI is a regulated one, board committees may be directed mainly at improving financial performance of the institution than its social mission as the board has to win the expectation of central bank authorities. Accordingly, empirical research is needed to test the effect of regulation status on credit growth without controlling for MFI specific factors since the MFI specific variables included in our model might mediate the relationship between credit growth and regulation status. We suggest the same for profit status. The results also show that the location or sub-region of MFIs is not an important factor in explaining MFI credit growth.

Finally, we uncover that there is persistency in microfinance credit growth in Sub-Saharan Africa. The coefficient of the lagged credit growth (i.e. the lagged dependent variable) is significantly different from zero at 5 percent (Model 1–4) or 10 percent (Model 5) level of significance implying that a shock to loan supply in the current year will have a significant effect on loan supply in the following year. However, the results show that when there are shocks (positive or negative) to credit growth at a given year, the credit growth will adjust fast to its equilibrium level in the following year since the speed of adjustment is between 83.71 and 85.37 percent.

5. Conclusions

While microfinance institutions are considered important instruments for poverty alleviation in developing countries and could aid SSA countries in the attainment of the SDG, there is surprisingly little evidence of the drivers of the lending behavior of microfinance institutions. Accordingly, we study the determinants of MFI credit growth using a sample of 130 MFIs operating across 31 countries in Sub-Saharan Africa during the period 2004–2014. Using the Arellano-Bover/Blundell-Bond two-step Generalized Method of Moments (GMM) Windmeijer bias-corrected standard errors, we show that both MFI specific and macroeconomic factors matter in the lending behavior of MFIs. More specifically, we found new and interesting finding that credit growth is linked to the profitability of MFIs negatively. On the other hand, MFIs with greater retention of earnings and therefore higher capital would be better able to increase credit access for the poor.

In addition, we find that liquidity has a positive association with credit growth and more importantly, when we compare the effect of liquidity with the effect of capitalization, the results show that the effect of liquidity has higher relative economic importance. The size of MFIs is also positively related with credit growth. However, other MFI specific factors namely portfolio quality, deposit growth, and non-deposit borrowing growth have little direct effects on MFI credit growth. The results also show that, in addition to MFI specific factors, macroeconomic

factors matter in the lending behavior of MFIs. We uncover that MFI credit growth is pro-cyclical. Furthermore, we find that GDP per capita has a significant negative effect on MFI credit growth consistent with the theory of convergence. Nevertheless, inflation and employment are not important covariates in the lending behavior of MFIs.

The findings have several practical implications. The positive associations of liquidity and size with credit growth suggest that if MFIs are able to improve their liquidity and size by attracting more deposits and non-deposit borrowings, among others, they can increase credit access to the poor. In addition, in the light of the negative relationship between credit growth and profitability, we suggest that less profitable MFIs follow prudent risk management and appropriate loan pricing strategies; otherwise, such MFIs may suffer more from loan defaults which may severely affect their financial sustainability and ultimate goal of achieving poverty eradication since financially unsustainable MFIs will fail to survive in the future. Hence, prudent risk management and appropriate loan pricing strategies are essential for MFIs to sustain the rapid credit growth and attain the twin bottom line – financial sustainability and sustainable poverty alleviation.

Furthermore, since the lending behavior of MFIs is not resilient to GDP shocks, different measures are needed to increase the financial stability of the microfinance industry. In this respect, since MFI capitalization is positively associated with credit growth and MFI credit growth is pro-cyclical, the findings imply that central banks/regulatory authorities need to introduce a counter-cyclical capital buffer requirement in the microfinance industry. Although the microfinance industry in SSA is generally a highly capitalized financial sector, in the future when the microfinance sector grows larger as well as faces significant capital constraints as MFIs get more levered, the need for a counter-cyclical capital buffer requirement could be more obvious. The purpose of counter-cyclical capital buffer requirement could be three-fold: First, it could help MFIs to improve their solvency and be better able to absorb losses and still continue their normal business operations as well as meet capital requirements. Second, the introduction of counter-cyclical capital buffer requirement could also allow MFIs to grant more loans during an economic downturn, and thereby increasing aggregate demand and contributing to economic recovery. Third, since one of the dual goals of MFIs is to achieve poverty reduction by providing credit access to the poor, the microfinance industry could face excess credit growth during upturns and hence, the counter-cyclical capital buffer requirement could protect the microfinance sector from periods of excess credit growth that may lead to systemic risk.

Apart from its practical implications, the study could also contribute to the literature in various ways. The study provides new insights as to the relationship between credit growth and profitability of financial institutions. Unlike the banking industry where profitability contributes to the credit growth of commercial banks positively, we found new evidence that profitability has a negative effect on credit growth. This adds to the literature and arguments on the profitability–lending nexus in financial institutions in the context of MFIs. Besides, given the mixed prior empirical evidences on the link between credit growth and size of financial institutions, our findings suggest that future research shall control for scale effects since this is likely to be the reason for a negative association of size with credit growth documented in some prior studies. Moreover, this study provides new empirical evidence as to the need for a counter-cyclical capital buffer requirement in the microfinance industry.

Finally, we suggest that future research could test the replicability of our findings in other developing economies or regions. Due to differences in culture, value, institutional environment, and other factors that may be difficult to quantify and incorporate in lending behavior models, it is an empirical question whether what works for MFIs in SSA also holds true for other developing economies or regions. Additionally, although we find no evidence to support a significant relationship between MFI credit growth and regulation/profit status, empirical research is needed to test the effect of regulation/profit status on credit growth without controlling for MFI specific factors as the inclusion of MFI specific variables in our model might absorb the predictive power of regulation/ profit status.

References

Akoh, A. (2020). Barriers to the growth of micro tailoring businesses in Nigeria: assessing socio-economic and socio-cultural environments. *Society and Business Review*, DOI: 10.1108/SBR-06-2019-0081.

Awdeh, A., & El-Moussawi, C. (2021). Capital requirements, institutional quality and credit crunch in the MENA region. *International Journal of Emerging Markets*, DOI: 10.1108/IJOEM-05-2020-0527.

Aydın, B. (2008). *Banking structure and credit growth in Central and Eastern European countries.* International Monetary Fund, WP/08/215.

Basel Committee on Banking Supervision (BCBS). (2010). *Microfinance Activities and the core principles for effective banking supervision.* Basel, Switzerland: Bank for International Settlements.

Beccalli, E., Anolli, M., & Borello, G. (2015). Are European banks too big? evidence on economies of scale. *Journal of Banking & Finance*, DOI:10.1016/j.jbankfin.2015.04.014

Beegle , K., & Christiaensen , L. (2019). *Accelerating Poverty Reduction in Africa.* Washington, DC: World Bank.

Bernanke, B., & Lown, C. S. (1991). The credit crunch. *Brookings Papers on Economic Activity, 22*(2), 205–248.

Berrospide, J. M., & Edge, R. M. (2010). The effects of bank capital on lending: What do we know, and what does it mean? *Finance and Economics Discussion Series, Divisions of Research & Statistics and Monetary Affairs, Federal Reserve Board, Washington, D.C.*

CGAP. (2018). *Empowering the poor through financial services.* Washington DC: CGAP.

Cheratian, I., Golpe, A., Goltabar, S., & Iglesias, J. (2020). The unemployment–entrepreneurship nexus: New evidence from 30 Iranian provinces. *International Journal of Emerging Markets*, 15(3), 469–489.

Chikalipah, S. (2018). Credit risk in microfinance industry: Evidence from sub-Saharan Africa. *Review of Development Finance, 8,* 38–48.

Covas, F. (2016). *Bank capitalization and loan growth.* Research Note, New York: The Clearing House.

Cucinelli, D. (2016). Can speed kill?: The cyclical effect of rapid credit growth: evidence from bank lending behavior in Italy. *The Journal of Risk Finance, 17* (5), 562–584.

Dato, M. H., Mersland, R., & Mori, N. (2018). Board committees and performance in Microfinance Institutions: Evidence from Ethiopia. *International Journal of Emerging Markets*, *13*(2), 350–370.

Elsafi, M. H. (2020). The impact of microfinance programs on monetary poverty reduction: Evidence from Sudan . *World Journal of Entrepreneurship, Management and Sustainable Development, 16*(1), 30–43.

Gambacorta, L., & Mistrulli, P. E. (2004). Does bank capital affect lending behavior? *Journal of Financial Intermediation, 13,* 436–457.

Gambacorta, L., & Shin, H. S. (2018). Why bank capital matters for monetary policy. *J. Finan. Intermediation*, *35*, 17–29.

Hearn, B., Oxelheim, L., & Randoy, T. (2018). The institutional determinants of private equity involvement in business groups–The case of Africa. *Journal of World Business*, *53*(2), 118–133.

Hearn, B., & Piesse, J. (2010). Barriers to the development of small stock markets: A case study of Swaziland and Mozambique. *Journal of International Development, 22*(7), 1018–1037.

Hermes, N., & Hudon, M. (2018). Determinants of the performance of microfinance institutions: A systematic review. *Journal of Economic Surveys, 32*(5), 1483–1513.

Hessou, H., & Lai, V. S. (2018). Basel III capital buffers and Canadian credit unions lending: Impact of the credit cycle and the business cycle. *International Review of Financial Analysis, 57,* 23–39.

Igan, D., & Pinheiro, M. (2011). *Credit growth and bank soundness: Fast and furious?* International Monetary Fund, WP/11/278 .

Imai, K. S., Gaiha, R., Thapa, G., & Annim, S. K. (2012). Microfinance and poverty- A macro perspective. *World Development, 40*(8) , 1675–1689.

Karmakar, S., & Mok, J. (2013). *Bank capital and lending: An analysis of commercial banks in the United States.* Portugal: Banco de Portugal, Economics and Research Department, working papers 18.

Khanam, D., Mohiuddin, M., Hoque, A., & Weber, O. (2018). Financing micro-entrepreneurs for poverty alleviation: a performance analysis of microfinance services offered by BRAC, ASA, and Proshika from Bangladesh. *Journal of Global Entrepreneurship Research, 8*(1), 1–17.

Laidroo, L. (2012). Lending growth determinants and cyclicality: Evidence from CEE Banks. *4th International Conference "Economic Challenges in Enlarged Europe" Conference Proceedings.* Tallinn, Estonia.

Lassoued, N. (2017). What drives credit risk of microfinance institutions? International evidence. *International Journal of Managerial Finance, 13*(5), 541–559.

Mersland, R., & Strøm, R. Ø. (2010). Microfinance mission drift? *World Development*, 38(1), 28–36.

Michelangeli, V., & Sette, E. (2016). *How does bank capital affect the supply of mortgages? Evidence from a randomized experiment.* Monetary and Economic Department of the Bank for International Settlements, BIS Working Papers No 557.

Ofori, E. (2020). The effects of Ponzi schemes and revocation of licences of some financial institutions on financial threat in Ghana. *Journal of Financial Crime*, DOI: 10.1108/JFC-01-2020-0003.

Olokoyo, F. O. (2011). Determinants of commercial banks' lending behavior in Nigeria. *International Journal of Financial Research, 2*(2), 61–72.

Quagliariello, M. (2007). Banks' riskiness over the business cycle: A panel analysis on Italian intermediaries. *Applied Financial Economics, 17*(2) , 119–138.

Ramírez Silva, R. A., Cruz Aké, S., & Venegas Martínez, F. (2015). Differentiated determinants of risk in portfolio at risk of the microfinance institutions in Mexico (2007-2012). *Contaduría y Administración, 60*(1), 175–194.

Roodman, D. (2007). *How to Do xtabond2: An Introduction to "Difference" and "System" GMM in Stata.* The Center for Global Development, Working Paper Number 103.

Tchakoute Tchuigoua, H. (2016). Buffer capital in microfinance institutions. *Journal of Business Research, 69*, 3523–3537.

Tehulu, T. A. (2019). Deterrents to the success of micro and small enterprises in Ethiopia: The case of Amhara region MSEs. *Journal of Social Economics Research, 6*(2), 117–125.

Tehulu, T. A. (2021). Do location and legal status matter in microfinance institutions' performance? Evidence from Sub-Saharan Africa. *Development in Practice, 31*(3), 404–420.

Thibaut, D., & Mathias, L. (2014). Bank capital adjustment process and aggregate lending.

Vallascas, F., & Hagendorff, J. (2013). The risk sensitivity of capital requirements: Evidence from an international sample of large banks. *Review of Finance*, *17*(6), 1947–1988.

Wagner, C., & Winkler, A. (2013). The vulnerability of microfinance to financial turmoil–Evidence from the global financial crisis. *World Development, 51*, 71–90.