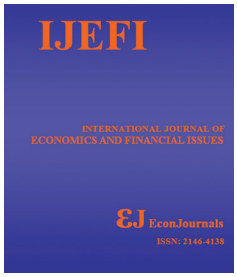

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Financial Inclusion, Mobile Phone Diffusion, and Economic Growth; Evidence from Africa

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ABSTRACT

Whether finance enhances growth has continued to be a major debate among academics in the bids to drive economic growth and development. Hitherto, empirical studies focusing on Africa in addressing these issues for the expected regional sustainable growth are rare. This study applied structural equation modelling to simultaneously analyse mobile phones diffusion, financial inclusion, and economic growth in a panel of 32 African countries over the period from 2004 to 2016. The results provided evidence that financial inclusion affects economic growth via mobile phones. This study has implication for managing the deployment of mobile phones by for finance and growth relevance in Africa.

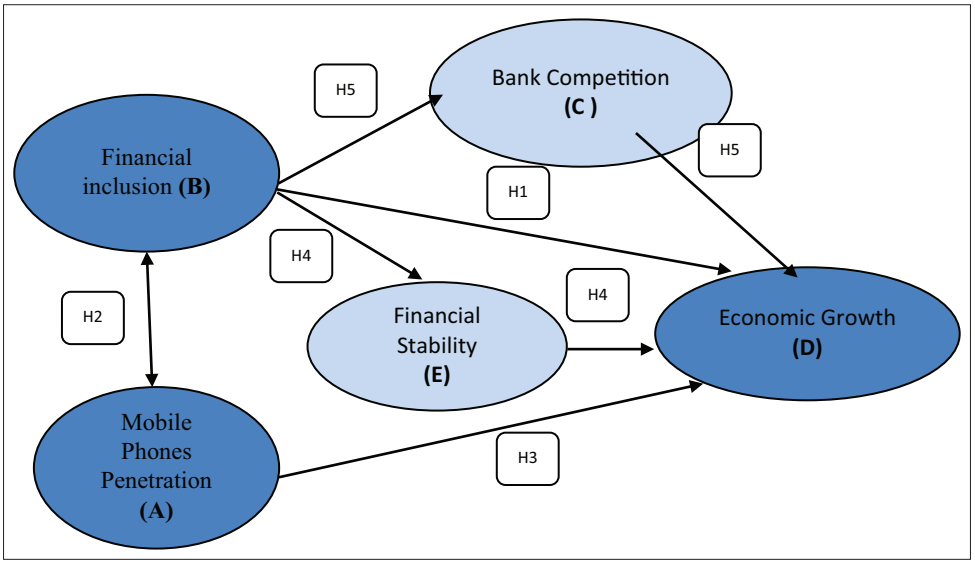
Keywords: Financial Inclusion, Mobile Phones Diffusion, Economic Growth, Structural Equation Modelling
JEL Classifications: B26, C58, G21

1. INTRODUCTION

The purpose of this study is to analyse the interaction between financial inclusion, economic growth, mobile phones diffusion, bank competition and stability in Africa. Among the developing and emerging economies, financial inclusion is lowest in Africa (Mehrotra and Yetman, 2015). There is wide heterogeneity in bank accounts ownership between countries in Africa. Only 7% of the adult population in Burundi, Guinea and Niger are banked compared to 82%, 75% and 70% in Mauritius, Kenya and South Africa respectively (Demirguc-Kunt et al., 2015). Despite the global economy's gloomy state, the African region has been globally ranked one of the highest in terms of economic growth, recording an unparalleled high economic growth for more than a decade (International Monetary Fund, 2013). Thus, the region has attracted lots of interest from researchers, investors, and other stakeholders as they attempt to either better understand the growth dynamics or take advantage of this growth trajectory within the region. Although financial inclusion is a world-wide challenge, the situation in Africa poses a unique economic challenge, not only because the region ranks among the lowest in terms of financial inclusion compared to other regions, but also because of the heterogeneity that exists within the region and the apparent anomaly between financial inclusion and the level of economic growth.This pose massive challenges to policy-makers of improving financial inclusion that could support the anticipated development in the African region. Theoretical predictions have claimed bank competition and stability as the other channels in which financial inclusion can be boosted (Fungáčová et al., 2014). In addition, mobile phones have also become a vital tool with the potential to promote financial inclusion (Kanobe et al., 2017). Thus, it requires empirical investigations of ways to improve financial inclusion in the region. The mediating effect between financial inclusion and economic growth is not much analysed (Sulong and Baker, 2018).

This proposed a Financial Inclusion-Mobile phones diffusion-Economic growth (FME) model using structural equation modelling (SEM), see Figure 1 below. This is the first in the financial inclusion-growth literature to the best of our knowledge.

Figure 1: The research conceptual model (own source)



Source: B, C and E are mediating variables (2) A, B and D are major variables (3) B is both a major variable as A may not necessarily be its trigger and could be a mediating variable

We employed bank competition and stability variables to mediate the relationship between financial inclusion and economic growth. Overall the FME model affirms that financial inclusion, economic growth and mobile phones diffusion can be simultaneously managed in Africa to optimise financial inclusion without compromising economic growth. It addresses the extent to which financial inclusion can impact on economic growth through mobile phones diffusion. This model shows the impact of financial inclusion and economic growth policies and how effectively they can be assessed and evaluated. The rest of this article ensues as follows: section 2 covers theoretical and empirical literature review. Section 3 explains the methodology of the study including data source and description of variables employed. The results are presented in section 4, and section 5 provides the summary and conclusion.

2. LITERATURE REVIEW

2.1. Financial Inclusion and Economic Growth

Financial inclusion has been identified an important driver of economic growth (Sethi and Acharya, 2018). Akinboade and Kinfack (2014) have pointed out that improvements in the financial service sector result in an efficient resources allocation which leads to economic growth. According to Andrianaivo and Kpodar (2012), financial inclusion has the capacity to enhance efficiency of intermediation, increase the savings portfolio of the financial sector and enhancement of entrepreneurial activities which eventually lead to economic growth. In addition, Khan (2011), expounded that financial access increase employment opportunities for rural households as more people get involved in economic activities, also the disposable income for the rural household would rise, resulting in more savings and deposits which will lead to economic growth through the multiplier effect. Numerous empirical studies have investigated the interplay between financial inclusion and economic growth (Andrianaivo and Kpodar, 2012; Oruo, 2013; Wang'oo, 2013; Michael and Shaaron, 2014; Babajide et al., 2015; Onaolapo, 2015; Nkwede, 2015; Sharma, 2016; Gretta, 2017; Lenka and Sharma, 2017; Okoye et al., 2017; Iqbal and Sami, 2017; Adeola and Evans, 2017; Mwaitete and George, 2018). Some have concluded that financial inclusion catalyses economic growth; the supply-leading hypothesis (Sharma, 2016; Lenka and Sharma, 2017; Okoye et al., 2017; Iqbal and Sami, 2017). Others have concluded that economic growth drives financial inclusion; the demand-following hypothesis (Babajide et al., 2015; Evans, 2015). Others have observed a reciprocal causality between the two variables (Gourène and Mendy, 2017 and Kim et al., 2018). Others argue that there is simply independence or unimportant influence between financial inclusion and the growth of economies (Gourène and Mendy, 2017).

2.2. Competition and Financial Inclusion

Theoretical predictions on the effect of bank competition on financial inclusion has been ambiguous. On one side, the conventional market power hypothesis claims that bank competition increases the availability of credit as finance costs are reduced (Berger and Udell, 2006). Barth et al. (2009) proposed a channel where competition may be indirectly beneficial for financial inclusion. Corruption in lending emasculates the efficient allocation of scarce capital. In a simple bargaining model, they show that the higher the bank concentration the more the bank-lending corruption. Finally, Hainz et al. (2013) draw attention to another channel where competition can ease credit constraints for small firms. Limited competition may force banks to ask for collateral in loan contracts.

On the other side, the information hypothesis suggests that in the presence of agency costs and information asymmetries, competition can reduce financial access by making it more unattractive for banks to internalise the returns from investing in lending, especially, with opaque clients Marquez (2002). The information hypothesis contends that market power may ease

the information wedge between borrowers and lenders through monitoring and screening activities. Beck et al. (2003), and Fungáčová et al. (2014) contend that low competition increases difficulty to attaining finance. Moreover, Corvoisier and Gropp (2002) also argued that borrowers in markets with low competition face higher loans costs. The high cost of borrowing impacts negatively on small businesses that needs to grow which goes a long way to affect the growth of the economy and employment.

2.3. Bank Stability and Financial Inclusion

Literature suggests that there exists a positive and negative relationship between financial inclusion and stability. Khan (2011) suggests 3 ways in which financial inclusion enhances bank stability. The first channel is through an increase in bank assets diversification due to an increase in lending to small enterprises which enhances the potential to reduce bank loans portfolio riskiness. This has the effect of reducing the size of each borrower and the volatility of each portfolio. The second channel is through the increase in the stability and size of deposit base due to an increase in the number of small savers. Finally, the monetary policy transmission is enhanced through an increase in financial inclusion. Contrarily, Khan (2011) gives 3 approaches wherein financial inclusion reduces stability. The falling of the lending standards, reputation and improper regulation of micro finance institutions due to uncontrolled access to finance reduces bank stability.

2.4. Mobile Phones and Financial Inclusion

Notably, mobile phones have become a vital tool in promoting financial inclusion to the unbanked in developing countries (Kanobe et al., 2017). Due to their distinctive features such as being a personalised small devices, mobility, and always-on availability, mobile phones have diffused rapidly in most developing countries to overcome socio-economic and geographical barriers. Distance, costs and bureaucracy are the major barriers to financial inclusion (Demirguc-Kunt, and Klapper, 2012). Mobile phones reduce banks costs since they can switch from large fixed infrastructure costs in rural and poorer areas to a per-transaction variable cost structure. It is particularly cost-efficient for customers, as it reduces travelling costs to and from distant branches. Besides costs reduction, mobile phones also allow customers to network with their bank, initiate transactions and check balances more directly from wherever they are since the device offers convenience, a level of control and immediacy to customers that cannot be provided by other channels. The interaction between banks and their clients through mobile phones creates an opportunity for information capturing which is one of the barriers to financial inclusion. There also exists a possibility of a reverse causality from financial inclusion to mobile phone diffusion. There is an opportunity for people to either save or borrow and buy mobile phones as they get financially included. Maria and Frida (2014), Sekantsi and Motelle (2016), Ouma et al., (2017), and Lenka and Barik (2018) used various methodologies to examine the interplay between mobile phones and financial inclusion for African countries, Cambodia and South Asian Association for Regional Cooperation countries and found a stable positive relationship between internet enabled mobile phones and financial inclusion in the long run and that mobile phones Granger causes financial inclusion in the long run. Specifically, we contributed to extant literature in the transmission effect between financial inclusion and mobile phones, economic growth, bank competition and stability.

3. DATA AND METHODOLOGY

To structurally analyse the variables under consideration, we were faced with two alternatives; a stepwise regression model or a SEM (Li, 2011). Stepwise regression provides an easy and simpler estimation alternative, but it lacks measurements error control capabilities hence could not account for multiple mediators in a model. This gives SEM an upper hand and justifies its use in this study. Moreover, SEM utilises maximum likelihood estimates to implement hypothesis testing of number of factors and their relationship with observed variables (Kline, 2015). Therefore, this makes it a more fitting model for our study which contains five observed variables with three of them acting as mediating variables. With SEM model, variables could be simultaneously measured, and system of equation estimated without being constrained by any model. The strength is in the ability to measure both direct and indirect causal effects among structure variables hence the mediation analysis. As such allows one to fit chains of conditional relationships via the path analysis.

3.1. Data Sources and Variable Description

The SEM used in this study comprises five variables, namely, financial inclusion, proxied by the financial inclusion index (FII) computed through the principal component analysis, financial stability (Z-score), bank competition (BOONE), mobile phones penetration (MOBILE), and the rate of economic growth (GDPPCGR). Data on financial inclusion, mobile phones subscriptions, bank competition, financial stability and economic growth was obtained from the World Bank's Global Development Indicators Database, which provides data for 189 countries across the globe. The database is much broader and contain significant details on the variables under study thus facilitates a better comparison across countries. Therefore, data availability largely determines the selection of countries. We extracted annual data from a panel of 32 countries from the African region sourced over the period 2004 to 2016.

Following the footsteps of Amidzic et al. (2014), we constructed an index of financial inclusion using ATMs and bank branches per population and per area, the ratio of outstanding loans to GDP and bank accounts per 1 000 adults as indicators of financial inclusion. To construct the index, we began by normalising the variables followed by an estimation of sub-indices, then aggregation of the sub-indices and finally normalising the index. We followed Siddik et al. (2018) who used bank Z-score to measure bank stability. Data for this variable is readily available and also allows for comparison across institutions. The bank *Z*-score enables the comparison of bank returns and capitalisation against the volatility of returns. A higher *Z*-score therefore designates a more stable banking system. Based on the works of Gourène and Mendy (2017) who used GDP per capita growth as an indicator of economic growth, the study proxy economic growth with GDP per capita growth to allow for cross country comparisons and capturing of income distribution effects. The values are obtained from the World Bank Development Indicators Database. Furthermore,

our study differs from Ndlovu (2017) who used Lerner Index to capture bank competition. We followed the footsteps of Banya and Biekpe (2017) who used the Boone indicator as a proxy for bank competition. The Boone indicator is a more recent New Empirical Industrial Organisation methodology for measuring competition. We followed Evans (2018) who used mobile phone subscribers per 100 adult people as a proxy for mobile phone penetration. The data were sourced from the International Telecommunications Union.

4. RESULTS

4.1. Summary Statistics

Table 1 below presents a summary statistic of the data used in this study over 13 periods (2004-2016). The summary statistics provide an intuition into the nature of data employed. Table 1 shows some remarkable features of the nature of financial inclusion in the African region. Some countries have very low financial inclusion levels, others have high levels of financial inclusion supporting the view that Africa is characterised by severe financial inclusion disparities and adamant financial exclusion (Ndlovu, 2017). The main essence of the summary statistics is to conform to the thresholds for implementing the SEM model. Overall, the data are normally distributed as confirmed by the Jarque-Bera statistics in Table 1 validating the use of SEM. Once we found the model to be fit, the expectation is a structural model where mobile phones, financial inclusion, financial stability and competition simultaneously interplay to provide insight into how best to manage the well-being of the African region. This suggests that all variables cannot be treated in isolation, as a variable's decision has a ripple effect on all the other variables in the region.

4.2. SEM Results

SEM provides an opportunity to model the region as a structural unit. To the best of our knowledge, no study has used the SEM to determine the mediating effect of mobile phones on the financial inclusion-growth relationship bringing in a major contribution to literature. Table 2 below shows the correlation results indicating the level of association among variables. We found that whilst there is varying level of weak association between variables, only mobile phones and financial inclusion show a strong positive association, however, the model results validity depends on the fitness of the model as appended in Figure 2.

4.2.1 Interpretation and discussion of SEM results

Since the model passed the model fitness test, Figure 2 below presents the result of the SEM model estimated to examine the structural relationship among the observed variables; financial inclusion, mobile phones diffusion, bank competition, financial stability, and economic growth. Our a priori expectations giving

Table 1: Summary statistics

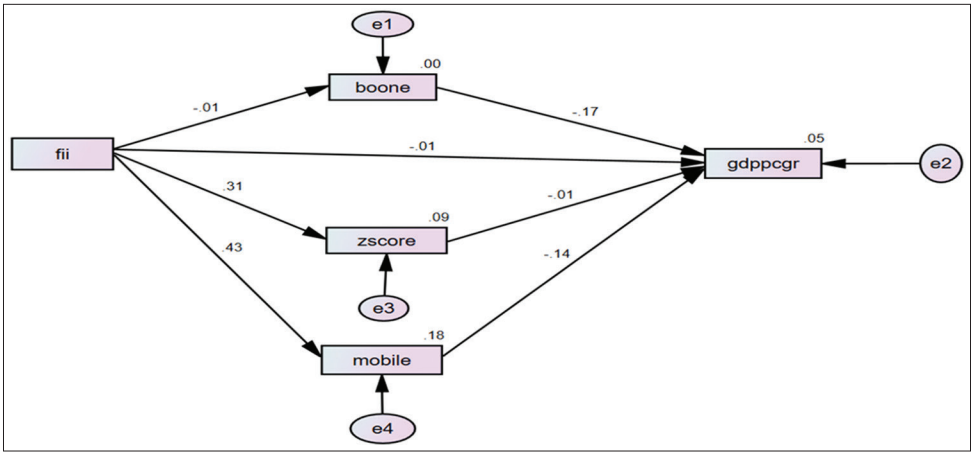
Description	BOONE	FII	GDPPCGR	Mobile	Z-score
Mean	−0.083131	0.168477	2.578027	58.30474	12.54634
Standard deviation	0.265531	0.169514	4.841117	42.45680	8.703130
Maximum	1.130000	0.880000	30.35658	176.6859	63.87000
Minimum	−3.200000	0.006435	−62.22509	0.208422	1.400000
Jarque-Bera	0.000000	0.000000	0.000000	0.000000	0.000000
Observations	394	394	394	394	394

Source: Author's computation based on The World Development Indicators Database (2018)

Table 2: Correlation results

	FII	GDPPCGR	MOBILE	BOONE	ZSCORE
FII	1.000000	−0.071038	0.521831	−0.007420	0.328542
GDPPCGR	−0.071038	1.000000	−0.219798	−0.123091	−0.220225
MOBILE	0.521831	−0.219798	1.000000	0.042971	0.319544
BOONE	−0.007420	−0.123091	0.042971	1.000000	−0.041886
ZSCORE	0.328542	−0.220225	0.319544	−0.041886	1.000000

Figure 2: Model result



literature are that competition, mobile phones diffusion and financial stability each mediates the relationship between financial inclusion and economic growth to further underscore finance and growth relevance in African studies. The requisite for SEM analysis is for the model to pass a number of global fitness indices. Relevant indices extracted for this model are appended to Figure 2 below and are all considered to be within acceptable global range for the acceptance of SEM model (Marais and Andrich, 2007; Hooper et al., 2008 and others). These indices are the most frequently used in literature (Byrne, 2013).

Global model fitness indices: CMIN/DF → 2.598, SRMR → 0.005, TLI → 0.990, CFI → 0.955, RMSEA → 0.043, PCLOSE → 0.270.

The first objective is to determine the mediating effect of bank competition on the relationship between financial inclusion diffusion and economic growth. The results of the estimated SEM model showed that there is no direct path from financial inclusion to economic growth neither does competition mediates the path, as the path running from FII → GDPPCGR as well as from FII → Boone are both insignificant. However, only the path running from Boone → GDPPCGR is significant indicating an inverse relationship. This result appears counterintuitive given numerous empirical evidences that financial inclusion is key to economic growth. The insignificant negative impact of financial inclusion on economic growth obtained in our study means that the low levels of financial inclusion in Africa have negatively affected economic growth in the region between 2004 and 2016. This outcome is expected since the region is characterised by other intervening barriers which lead to higher levels of financial exclusion which is projected around 90% thereby affecting economic growth. Tackling these barriers could significantly increase economic growth. This entails the need for more efforts to increase financial inclusion in Africa. Credit risks and low financial literacy block utilisation of financial services. Regulators have to advocate for a cost-effective identification tool, and also educate clients with low financial literacy. However, this finding contradicts the results of several researchers (Michael and Sharon, 2014; Babajide et al., 2015; and Onaolapo, 2015; and Mwaitete and George, 2018 amongst others) who found a significant positive relationship between the two variables.

This suggest that competition influences economic growth. The inverse relationship implies that as banks losses competitive power indicated by the Boone indicator – lower indices signifies more competition and higher indices means less competition, growth in the economy reduces and vice versa. In other words, competitive banking system promotes economic growth in the African context. This is in line with the competition-efficiency and quiet life hypothesis which argues that increases in competition increases profit efficiency since banks are enforced to engage in proper monitoring and screening of borrowers leading to lower levels of non-performing loans (Schaeck and Cihák, 2014). Increased competition also leads to improved efficiency, implying that the relationship runs from competition to efficiency and is positive. Market share and bank size will increase resulting in increased economic growth. This is not unexpected as bank competition roles in finance and growth in terms of stimulating access to finance should ultimately indirectly lead to economic growth (Mengistu and Saiz, 2018) besides competition stability and competition efficiency nexus in literature (Moyo, 2018).

In the other objective, the target was to examine the mediating role of financial stability in financial inclusion and economic growth relationship. We found from the model estimated that beside the FII → GDPPCGR path that is insignificant, there is also no path between financial stability and economic growth as ZSCORE → GDPPCGR path is insignificant. Hence, the model suggests that financial stability failed to mediate the relationship. This could have been caused by a weak positive relationship between financial inclusion and financial stability in line with Al-Smadi (2018). A weak positive relationship between financial inclusion and financial stability in the model could have been caused by certain possible risks from financial inclusion on financial stability. These risks could emanate from financial innovation instruments and an increase in participants in the financial system due to new providers of the financial services and low-income earners. This emphasise the role of financial supervision to reduce risks which may be caused by unregulated financial system members. Another possible explanation could be that the relationship between the two variables is indirect. This however contrast with authors (Morgan and Pontines, 2014; Neaime and Gaysset, 2018) who suggest that boosted resilience of bank funding enhances the overall financial stability of the banking sector. A culmination of this relationship according to literature should translate to economic growth but not necessarily a mediation as the model suggests.

Lastly, our study sought to determine the intermediating effect of mobile phone diffusion in the interplay between financial inclusion and economic growth. The model reveals a significant relationship between financial inclusion and mobile diffusion, in which case financial inclusion influencing mobile diffusion in the path FII → MOBILE. We also found mobile diffusion influences economic growth given that the path MOBILE → GDPPCGR is significant. While financial inclusion according to the estimation is not directly significantly related to economic growth, we found an indirect relationship from financial inclusion through mobile diffusion to economic growth with the significant path, FII → mobile → GDPPCGR. This is in line with Ghosh (2018; 2019) who suggest that mobile phones exert a significant effect on economic growth and that there exists a strong complementary between mobile phones and financial inclusion. The inability of the financial system to reach the majority of the vulnerable and disadvantaged groups such as the poor, woman, and elders is a major reason for an insignificant relationship between financial inclusion and growth. Therefore, mobile diffusion mediates the effects of financial inclusion on economic growth in the African economies. The results are in line with Ntouba (2018) who posit that mobile phones diffusion attracts more investors leading to an increase in economic growth. Our finding also supports the argument by Asongu and Nwachukwu (2016) that mobile phones leads to knowledge diffusion thus reducing monopoly and information asymmetry which have a tendency of promoting bad governance and reducing economic growth. Focusing on African countries, our findings are consistent with Wamboye et al. (2015) who posit that mobile phones have recently became an important

driver of economic growth in Africa. This consolidate the efforts of many African countries such as Kenya and Zambia amongst others who have accelerated mobile penetration in an attempt to stimulate economic growth through enhanced financial inclusion. Higher mobile phone penetration also reduces the costs of distance, physical constraints and time (Wamboye et al., 2015) thus leading to economic growth. There is no study that has so far assessed the effect of financial inclusion on mobile phones diffusion. This makes this study unique as it shows that exists a significant positive effect of financial inclusion on mobile phones diffusion. This shows that as people have access to funds they can even buy more phones which assists in contributing towards economic growth. Policy makers should thus concentrate on policies that enhance financial inclusion which feeds into economic growth.

5. CONCLUSION AND POLICY IMPLICATIONS

Several researchers have investigated the interplay between mobile phones diffusion, financial inclusion and economic growth in Africa. By contrast this study examines possible mediating variables in the relationship between financial inclusion and economic growth in Africa using SEM. Using panel data on 32 African countries we found that a significant relationship between financial inclusion and mobile diffusion, in which case financial inclusion influenced mobile diffusion in the path FII → MOBILE. We also found that mobile diffusion influences economic growth given that the path MOBILE → GDPPCGR is significant. We also found an indirect relationship from financial inclusion through mobile diffusion to economic growth with the significant path, FII → mobile → GDPPCGR. Therefore, mobile diffusion mediates the effects of financial inclusion on economic growth in the African economies.

On the policy front, policy makers and regulators should craft policies that enhance financial inclusion such as financial literacy programs which feeds into mobile phones and growth. There exist vast policy implications for regulators and practitioners alike with need for further research to unbundle how policies should be fashioned to address these issues.

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