

# *Mobile money development in sub-Saharan Africa: Its macroeconomic effects and role in financing development*

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**Abstract** — In developing countries, specifically in sub-Saharan Africa, mobile money comes with huge benefits to users by facilitating users to better manage their cash flows, it allows firms and start-ups to invest, foster the creation and expansion of businesses, reduce transaction costs, pool capital (funds) over time for effective allocation as well as it simplifies and speeds up efficient government transfers. These benefits enables mobile money users to realize and accept significant innovation processes and strategies, especially in the financial sector, which encourages better conduct of monetary policy. This paper analyzes the macroeconomic impact and its role in financial development including how the system can facilitate the funding of development projects. Particularly, we use GDP per capita and domestic credit from financial sector to proxy for economic growth and access to investment resources, respectively, and their link with mobile money services or activities using dataset from GSMA and the World Bank. To ensure that our study is not bias, we included the number of commercial bank branches as a control variable. Our results indicate that there is a significant positive relation between mobile money and all the variables used during the understudied period, thus confirming that mobile money plays significant role in economic development and the accumulation of capital for financing development projects in sub-Saharan Africa. This paper is important to economic literature as it addresses with evidence the impact of mobile money in Sub-Saharan Africa, which is instructive to policy makers to continue implementing strategic and effective policies that encourage mobile money development in the region.

**Keywords** — *mobile Money, economic growth, financing development, GDP per capita, financial sector, mobile banking, mobile payments, electronic payments*

## I. INTRODUCTION

Recent financial innovations have expedited electronic and mobile payment systems, which according to Kireyev (2017) is causing a growing trend of de-cashing in numerous countries, and also gaining approval globally. Klapper and Singer (2014) posits that a development of electronic payment systems, which is very critical in strengthening financial infrastructure, is capable of supporting long-term economic growth, especially in developing countries. The assessment of the short- and long-run macroeconomic effect of payment systems is vital and instructive for policy making in the future. This paper brings novel insights into the problem by drawing implications from sub-Saharan African electronic payment

systems, and builds on it to to evaluate the role of mobile money (payment) system in macroeconomic stability and the financing of development in the region. We use data from World Economic Indicators and GSMA to structurally analyze the degree of development of mobile payment system in sub-Saharan Africa and examine its impacts on economic growth as well as financing development in the region. To proxy the degree of electronic payment-system development, some empirical studies (Hasan, Renzis & Schmiedel, 2013) repeatedly use the share of non-cash transactions, although this maybe inaccurate as cashless transaction could be determined by consumers' preference for cash transactions in a particular economy or region, which may not necessarily be caused by limited access to electronic means of payment. Theoretical and empirical literature on the impact of payment system development in the real economy is still sparse, although the significance of payment systems is progressively acknowledged and underscored by scholars and policymakers. This paper focuses on this issue and attempts to close this aspect of literature gap.

Although, the growth of mobile phone coverage across developing countries, especially in African countries shows strong positive correlation with population density, however, there are other compelling factors that matter as well. Buys et al. (2009) found, using a spatially disaggregated data of mobile phone coverage and geographic feature, that the likelihood of mobile phone tower put in at particular place is strongly and positively linked to possible demand factors like population density, per capita income and the level of competitiveness within the mobile phone sector in a specific country. Also, factors relating to higher costs and distance from a major road and urban areas have negative link with mobile phone coverage (Buys et al. 2009), however, evidence shows that the rollout of mobile phone service within economies is partially explained by these factors. According to a report by Hootsuite and We Are Social (2019), globally, about 5.11 billion are unique mobile phone users and out of this number closed to 4.4 billion people use the internet, while the number of social media users is put at about 3.5 billion. The fast adoption of mobile phones in some of the least developed countries has far exceeded expectations. For instance, Safaricom (Kenyan-based service provider) projected in 1999 that by 2020 the mobile phone market in Kenya could

get to three million subscribers, as the number of Safaricom subscribers, alone, then was over 14 million (Safaricom, 2009). Also, the number mobile phone users in the Africa continent, within 8 years, had risen from 16 million to about 376 million in 2008, which then was about one-third of population of sub-Saharan Africa. Nevertheless, these figures of actual mobile phone users could potentially be overestimated as numerous individuals sometimes own more phones as well as multiple SIM cards, likewise there could be an understatement (with potentially more than 376 million mobile phone users) as there is a common practice of sharing mobile phones in the region.

Mobile money can be referred to as electronic cash backed by equivalent amount of the notes and coins of the Central Bank of a particular economy and are stored with the help of the Subscriber Identification Module (widely known as SIM card) in a mobile phone, which thus serves as an identifier. Also GSMA (2013) described mobile money as a transformational service that extends the delivery of financial services, with the use of ICT and non-bank retail channels, to residents who have lack or limited access to (and also cannot be reached profitably through) traditional banking and other financial services. Mobile money services have electronic-wallets used for peer-to-peer (P2P) transfer, for receiving salaries as well as governments to person payments (G2P) (GSMA, 2013). In this system, the Mobile Money Operators supply the mobile infrastructure, client base and agents' network, and banks supply the interoperable infrastructure for the money flow of between two or more parties, hence providing a physical custody of this electronic money. The activities of mobile money including concerns of Anti-Money Laundering Countering Financing of Terrorism relating to mobile money sub-sector are being regulated by the Central Bank of that country, for instance, in Ghana their activities including the banks are supervised and overseen by the Bank of Ghana to ensure that there is a safe, reliable and efficient banking sector as well as payment landscape (Bank of Ghana, 2017).

National payment system usually consists of all activities, mechanisms, procedures, infrastructure, systems, institutions and users related to payment or settlement of transactions in a country. Preferably, participants of national payment system must operate in a specific direction as to how their payment system should evolve, this can be done by considering the consumer demands and other peculiarities of the country, thus the payment system of a particular economy depends on its nature and also comprises of a host of other features as presented in figure 1. It is important to note, various payment instruments and channels depend on the available of certain key supporting infrastructure in order to operate effectively and the need for this supporting infrastructure varies, however, mostly digital channels all need a specific level of connectivity and power supply, including other supporting infrastructure like road and transport, online connectivity, and the regulatory environment. The various aspects of payment systems use or rely on different elements to execute payments as shown above, as such the required infrastructures at each stage could vary. For instance, ICT networks, road and servers are used by economics actors of the real economy, various channels and instruments and for processing of payment (Cooper et al., 2018).

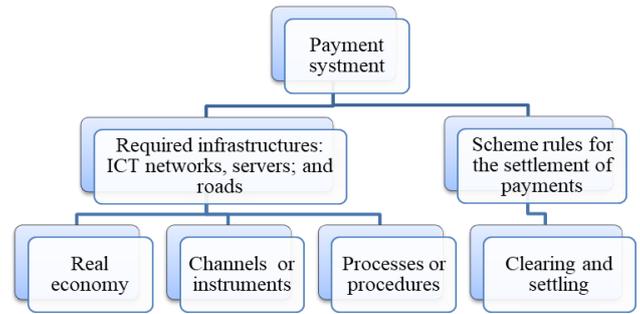


Fig. 1.1. A typical structure of a payment system (Cooper et al., 2018)

Payment system at the real economy level involves how businesses and citizens make payments for different purposes, thus the demand for payment differ depending on the nature of a particular economy or society, demand. For instance, sub-Saharan economies with large informal sectors largely transact in cash, whereas a modernized and digitized payment system is required in advanced economies with a large business sector. Some of the channels of payment systems through which payments are carried out include point-of-sale (POS), ATM, internet, paper, RTGS and so on. Also, certain channels can effect payment on specific instruments, thus particular channels have certain dictated instruments like cards in the case of POS, however, there are instruments such as cheques, cash, cards, EFT and e-money can be used to effect payments through numerous channels. Processing of payments mostly done by banks, PSPs or certain payments service providers, entails the sending and receiving of payment orders (messages) or authorization requests in order to effect payments. This could take the form of either paper, images, digital messages or bulk files. However, clearing, which involves the transfer of transactional information based on the obligations of parties involved and settling or settlement denoting the real exchange of value in performance of commitments. Payments can be cleared and settled in the same transaction (real-time) or are cleared and then settled at a later stage (deferred). This aspect of payments makes use of scheme rules required in the clearing and settlement of payments.

## II. METHOD

Prior to examining the role of mobile money services in sub-Saharan Africa, this paper reviews previous theoretical and empirical studies as this paves the way to close the existing literature gap in this field. All these papers used diverse research methodologies to obtain their results since electronic payment system, particularly mobile money, has been gaining a lot attention. For instance, Dahlberg et al. (2008) examined 73 peer-reviewed papers on 'mobile money and payments', which was Duncombe and Boateng, (2009 updated) by reviewing extra 43 works, and subsequently Diniz et al. (2011) reviewed and updated the body of literature on by studying 186 papers. Butler (2005), Sewanyana (2007), Srivastava (2008), and Etim (2012) reported a linkage between the volume of mobile phones adopted in sub-Saharan Africa and mobile money transfers (including payments), this might as well trigger the rise in mobile money agents as presented in figure 1.2. Jenkins (2008) argues that the usage of mobile money for transfers, utilities payments, government revenue and others extends and boosts financial integration as mobile money facilitates the integration of the excluded (unbanked population) into the financial system, which is a significant and effective tool for market participation and growth.

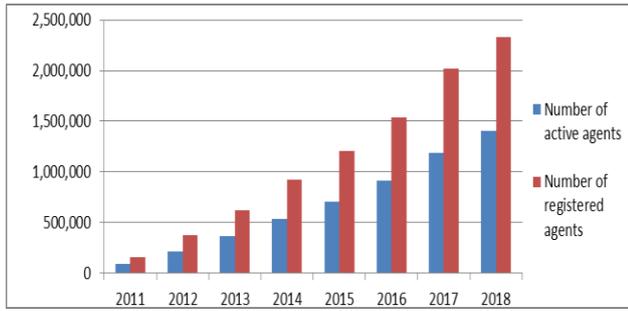


Fig. 1.2. The growth trend of mobile money agents

In support of the above, Bold et al. (2012) and Ehrbeck (2012) found that the adoption of mobile money and financial inclusion have a positive relationship, with Ehrbeck (2012) establishing that the evolving collaboration between banks and mobile network operators in Sub-Saharan African economies is an indication possibly expanding financial inclusion to include the about 80 percent unbanked population in the continent. In the same vein, Bold et al. (2012) espoused that the current progress in financial inclusion in sub-Saharan Africa is driven by the use of mobile phones for mobile money services in the region. This can be seen in figure 1.3, which depicts the annual values of mobile money transactions in sub-Saharan Africa.

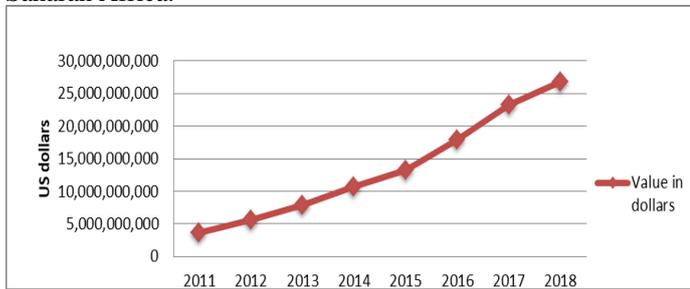


Fig. 1.3. The annual overall value of money services

Mobile money has two major components: mobile banking (m-banking) and mobile payment (m-payment) models. Mobile banking enables bank account owners to use their mobile phones to access their bank accounts and related services like checking of balance, fund transfers between accounts and so on, while mobile payment permits the unbanked to access financial products, via their mobile phones under services provided by mobile money operators, microfinance and non-bank agencies, without necessarily owning or opening traditional bank accounts (Weber and Darbellay, 2010). And Dias and McKee (2010) noticed that in Kenya and South Africa mobile subscribers, especially those without bank accounts, currently use mobile money for banking-related transactions and a variety of other financial services including payment of bills, payroll deposits, remittances, receipts and payments of loans, groceries, bus tickets and others. Similarly, Etim (2012) endorsed the importance of mobile payment as a key prerequisite in involving the unbanked in the formal financial sector after finding that the number of mobile phone owners has exceeded owners' bank accounts in sub-Saharan Africa.

In order to achieve the above stated objectives, linear regression model methods, particularly, partial least squares (PLS) regression was used to investigate the relationship between the following variables such mobile money services,

number of registered agents, number of active agents, annual volume of transactions, domestic credit from financial sector, number of commercial bank branches and GDP per capita, which was used to proxy for economic growth so as to examine the general stability and implications of these tools. The choice of partial least squares also known as bilinear factor model stemmed from the fact that this method makes use of linear model by projecting the predicted and the observable variables to a new space, and it helps in finding the fundamental relations between two matrices. In short, the PLS regression is suitable in situation, where there is a multicollinearity among variables, which would make standard regression unsuitable.

Datasets from World Development Indicators (2018) and GSMA (2018) on sub-Saharan African economies were explored for this study. Our econometric approach, and dealing with the data, was focused on trying to study the overall impact, stability and tendencies in the various variables and the impact of their structural changes on economic growth. Although there are a lot of studies in this field usually consisting of one or more countries, thus making the corresponding results not general, however, this study cover a large spectrum of data and subsamples on economies of sub-Saharan region. Thus, the use of a relatively large sample of countries could help us to prove the overall significance of the various variables in sustainable economic growth and to examine the robustness of these results of the understudied period.

The results of this study and proposed methodology may help fill the existing gap in literature in this field of research and, thus contribute meaningfully to the present literature. The regression analysis was carried out using the equation below, and the results are presented here accordingly.

$$\beta_0 + \beta_1(X_1)_i + \beta_2(X_2)_i + \beta_3(X_3)_i + \beta_4(X_4)_i + \epsilon_i = \text{Economic growth} \quad (1)$$

### III. RESULTS

The summary statistics on analysis of variance are provided in Table 1.1, while Table 1.2 presents correlation matrix that shows the relationship among all variables used in this study.

TABLE I. ANALYSIS OF VARIANCE (GDP PER CAPITA)

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	5	307954.776	61590.955	1153.929	0.022
Error	1	53.375	53.375		
Corrected Total	6	308008.151			
Computed against model Y=Mean(Y)					

<sup>a</sup>. Sample of a Table footnote. (Table footnote)

Correlation matrix tests the multicollinearity among independent variables including the dependent variable and corresponding standard deviations show substantial variations, and therefore, making it possible to obtain reasonable estimated nexuses from the regressions. It can be noticed from correlation matrix (Table 1.2) that the variables used are

positively correlated to GDP, which is the proxy for economic growth.

TABLE II. CORRELATION MATRIX

	Comm. bank branches	Active agents	Reg. agents	Mobile money services	Fin. sector credit	GDP per capita
Com. bank branches	1	0.968	0.967	0.826	0.762	0.935
Active agents	0.968	1	1.000	0.827	0.774	0.952
Reg. agents	0.967	1.000	1	0.833	0.769	0.955
Mobile money services	0.826	0.827	0.833	1	0.341	0.940
Fin. sector credit	0.762	0.774	0.769	0.341	1	0.553

It is apparent from the summary of the goodness of fit statistics (Table 1.3), which test the validation and fitness of our model, that the model is reliable and credible given the p-value and R-squared values.

TABLE III. GOODNESS OF FIT STATISTICS

Statistic	Training set	Validation set	Statistic	Training set	Validation set
Observations	7.000	1.000	Cp	6.000	
DF	1.000	-5.000	AIC	26.220	
R <sup>2</sup>	1.000		SBC	25.895	
Adjusted R <sup>2</sup>	0.999		PC	0.002	
MSE	53.375		Press	4625.256	
RMSE	7.306		Q <sup>2</sup>	0.985	0.000
MAPE	0.070	0.000			
DW	3.302				

**IV. DISCUSSION**

Most of the existing literature on payment system development, especially mobile money stresses its significant impact on banking performance (Humphrey et al., 2006; Hasan, Schmiedel, and Song, 2009); payment choices of households (Callado et al., 2009); economic growth (Hasan, Renzis, and Schmiedel, 2013); and asset prices (Piazzesi and Schneider, 2017). This paper confirms the study of Hasan et al. (2013), with the results suggesting that payment system such as the development of mobile money system boosts sustainable economic growth, by influencing the households' choices of payment, which helps pool resources and their allocation for effective development projects. However, the results of our study shed light on the role of mobile money development, for that matter payment system as a whole in sub-Saharan Africa, a developing region, but Hasan et al. (2013) study was done on developed economies.

The multiple linear models presented above (results section) demonstrate the overall good reliability, credibility and goodness-of-fit measures. Thus, this makes it possible to be used after satisfying the assumptions thereof as the model was put into adequate evaluation using regression statistical analysis. The R squared represent coefficient of determination, and the value 1.0 proves that there is a significant link between dependent variable (GDP per capita) and the independent variables used for the study. P-value indicates the reliability and the significance of the model, and the lower p-value of 0.022 shows that the model for the specified period of study is our reliable. Thus, it is safe to confirm that mobile money development is boosts the financing of economic development, and has a significant impact on economic growth in sub-Saharan African region.

**V. CONCLUSION**

This paper examines the impacts of mobile money development on economic development and its role on funding development projects in sub-Saharan Africa. Our model shows significant macroeconomic impacts of mobile money on economic growth and its source of funding development in sub-Saharan African region. Particularly, we found that mobile money development is positively associated with domestic credit from financial sector as well as economic development. The results suggest that mobile money also has positive links with: the number of commercial bank branches it has the potential to expand the effectiveness of the transmission of monetary policy. Thus, our results provide extra evidence for policy makers to keep supporting the development of mobile money platforms; hence strengthening the monetary policy. However, the results hereof should be interpreted with caution due to the relative short period and nature of dataset used for this study. Nevertheless, exploring tools through which mobile money development could facilitate and contribute to financing economic growth is a significant field for further investigation.

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