Social and institutional determinants of digital financial inclusion in Africa: A system GMM Approach

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2022

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Abstract

African nations have shown remarkable promise in digital financial services in recent years. However, much more remains to be done. Given this background, this study empirically investigates the social and institutional determinants of digital financial inclusion for a panel of 42 African countries using system GMM for the period 1995-2018. The empirical results show that social factors such as literacy, infrastructure, unemployment rate and standard of living have significant influence on digital financial inclusion. These results suggest that social realities matter for digital financial services. Equally, institutional factors such as political stability and absence of violence, control of corruption, regulatory quality, government effectiveness and rule of law have statistically significant and positive effects. These results suggest that better governance and better institutions correlate with faster digital financial inclusion. The estimates are robust to changes in estimation methods.

Keywords: digital financial services, social and institutional determinants

**JEL Classification:** A10, C20, C83

1. Introduction

Digital financial inclusion is the utilization of digital technology to provide a variety of suitable formal financial services at low costs to financially excluded and underserved poor populations. It enables the financially excluded and underserved to make or receive payments and transfers using digital devices (mobile phones, etc) or instruments (payment cards, a point-of-sale [POS] terminal, etc). Digital financial services can enlarge the delivery of financial services to the poor especially in Africa through mobile-phone-enabled solutions, electronic money models and digital payment platforms. Digital financial channels can drastically reduce costs for customers and service providers, and thus open the door to remote and underserved African populations. Economic empowerment for marginalized citizens by boosting access to formal financial services is a powerful tool to achieve equitable development. Financial regulators around the world and even in Africa have realized this tremendous potential and many have therefore sought to unlock this potential by creating enabling environments for digital financial inclusion.

In 2011, a United Nations report called for substantial investment in broadband infrastructure and internet connectivity for attaining the Millennium Development Goals, or else lose the opportunity to reap the socio-economic benefits that broadband brings (UN Broadband Commission, 2011).

Accordingly, many African governments have invested in these technologies as part of their national infrastructural plans (e.g., South Africa's *National Broadband Policy*, Nigeria's *National Broadband Plan)*. The efforts has provided access to a surfeit of information and services beneficial to education, finance, growth and economic wellbeing (Broadbent and Papadopoulos, 2013; Evans, 2019). As a result, Africa has led the trend in mobile money services with more than 56 arrangements in place, especially Wizzit in South Africa and M-Pesa in East Africa. Particularly in Kenya, by 2018, M-Pesa has 28.5-million subscribers in East Africa able to transact with PayPal and Western Union. The provision of financial services via internet and mobile phones has shown great promise in overcoming geographic, demographic, and institutional constraints to financial inclusion, led by the mobile banking revolution in Kenya and demonstrated by the extraordinary success since 2007 of Safaricom's M-PESA, a mobile money transfer, payment, and banking service: as of June 2015, Safaricom had at least 22 million M-PESA subscribers served by over 90,000 M-PESA agents. A mix of several factors have fuelled M-PESA's success, including Kenya's political and economic context, and enabling regulatory policies (Rosengard, 2016). In South Africa, there are mobile money arrangements such as First National Bank with around 11.6 million customers, Flash Mobile Cash by Eezi with a network of 160,000 subscribers, Wizzit with over 300,000 subscribers, and MTN Mobile Money with 27 million active users in 14 markets. Yet, much more remains to be done: of all the world regions, Africa has the lowest levels of digital financial services despite the remarkable progress made in recent years (Figure 1).

Figure 1. Evolution of digital financial services across world regions
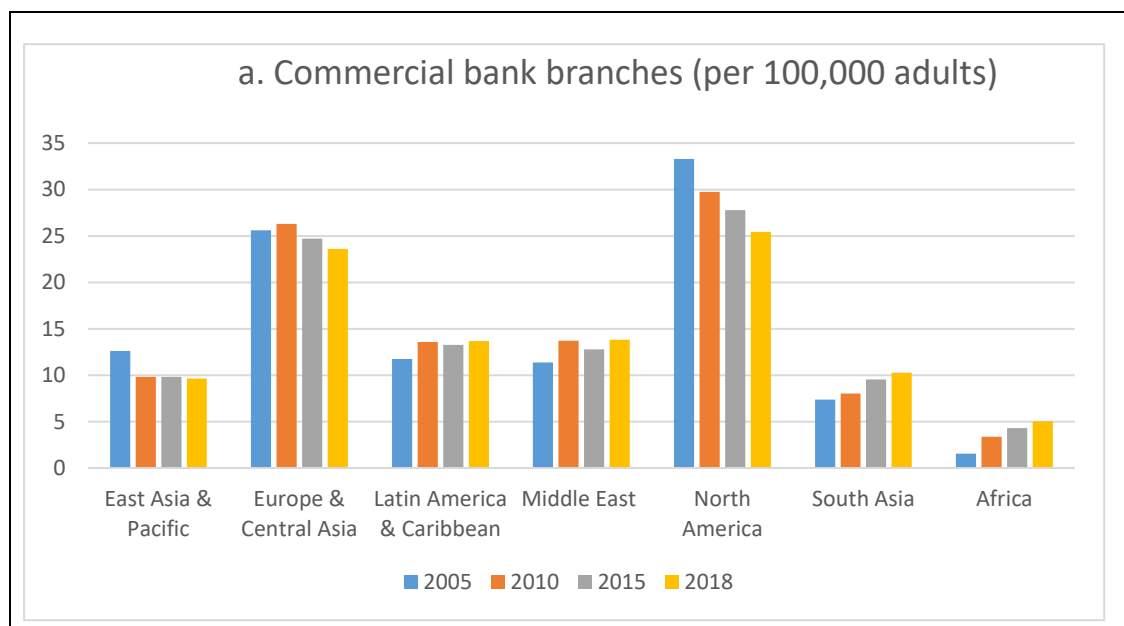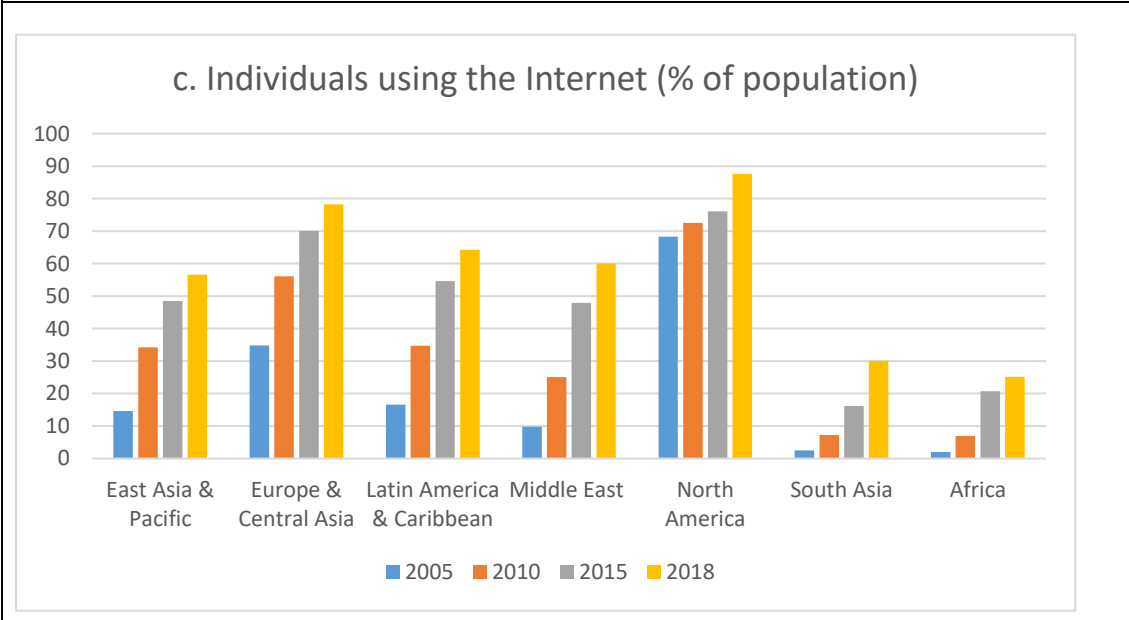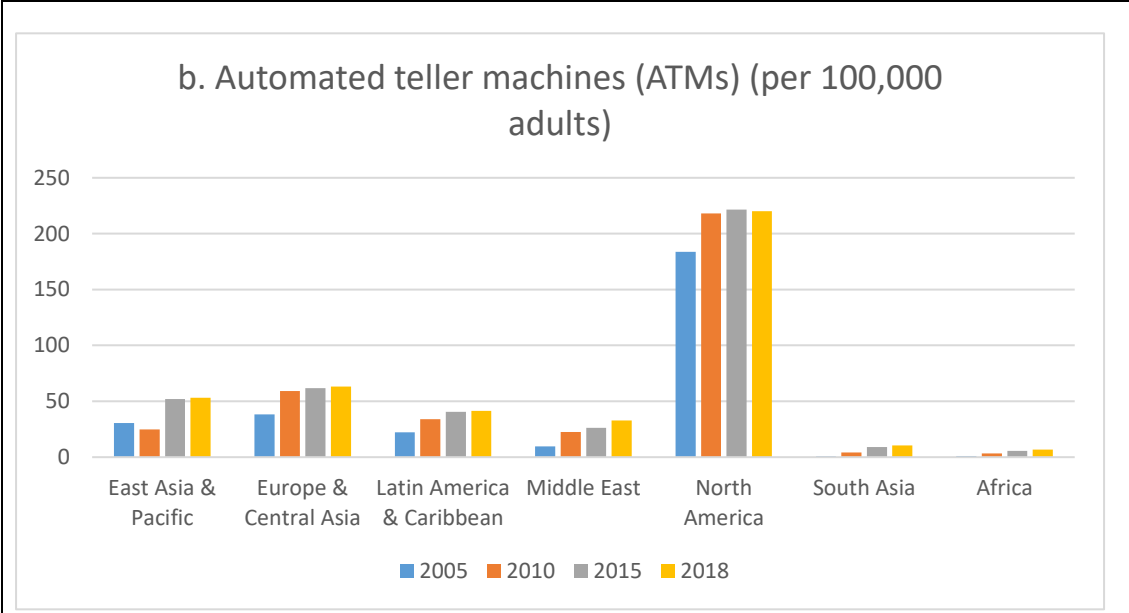
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b. Automated teller machines (ATMs) (per 100,000 adults)

c. Individuals using the Internet (% of population)

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d. Mobile cellular subscriptions (per 100 people)
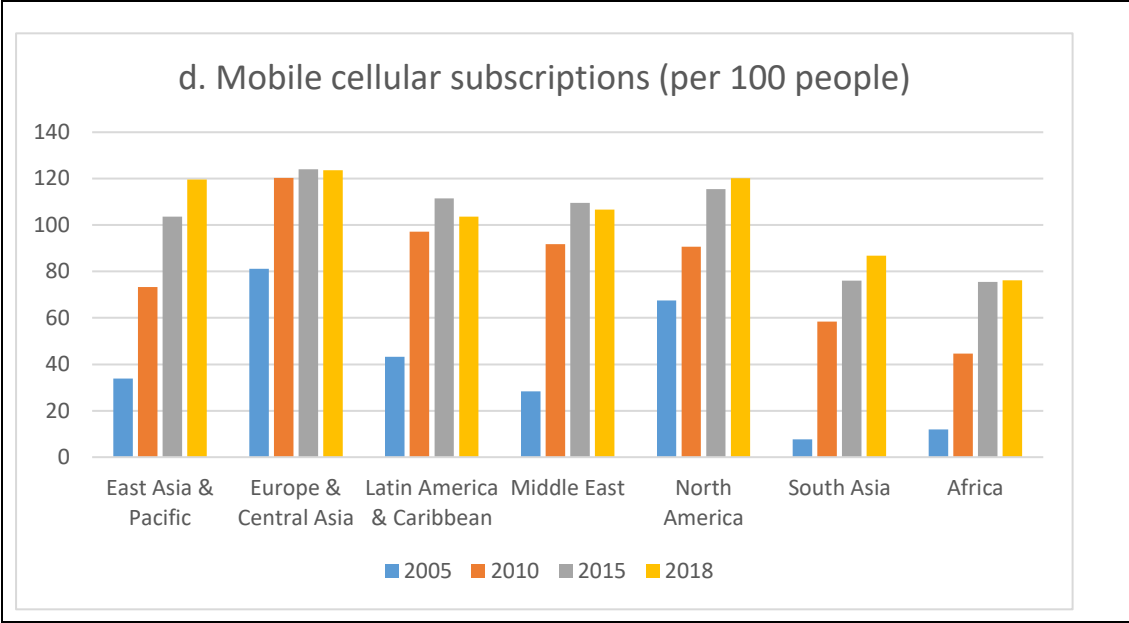
The increased adoption of digital financial services in the continent has caused much speculation concerning its contributing factors. The social and institutional determinants of digital financial inclusion are important and fascinating at the same time. The earliest known studies on the determinants of financial inclusion are Evans & Adeoye (2016), and Zins & Weill (2016). Much of the subsequent literature focuses on the empirical aspects of the relationship between the determinants and financial inclusion by considering various country groupings, data-sets, time periods, and different indicators of financial inclusion, and using a swarm of econometric techniques. With this backdrop, this study contributes to the financial inclusion literature by studying the social and institutional determinants of digital financial inclusion for a group of African countries, using advanced econometric techniques. Although there is a growing body of literature that investigates the linkage between the determinants of financial inclusion, far less is known about the determinants of digital financial inclusion. The focus on financial inclusion is probably due to the unavailability of adequate data to proxy digital financial inclusion. However, in recent years, data on ICT have increased in African countries enough for this analysis. Given that digital financial inclusion can be captured by several possible indicators, principal component analysis (PCA) is used to construct an indicator of digital financial inclusion that is as broad as possible and captures various dimensions of digital financial inclusion. To the best of the authors' knowledge, this is the first study that investigates the determinants of digital financial inclusion. By examining these issues empirically, therefore, this study provides solid evidence for policymakers. It will aid policymakers in designing programs that will broaden access to digital financial services.

The remainder of the study is organized as follows: Section 2 conducts an extensive review of the literature on digital financial inclusion in order to put the study in context. Section 3 discusses the data, the model and the econometric methodology used to analyze the determinants of digital financial inclusion. The empirical results are discussed in section 4. Section 5 concludes the study.

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2. Theory and Review of Literature

The theory of diffusion of innovations describes how, why, and at what rate new ideas and technology gains momentum and diffuses through a particular population or social system (Dearing and Cox, 2018)[1]. In line with the theory, the diffusion of digital financial products gained momentum in many African contexts due to the prevailing economic, social and institutional factors. Achieving financial inclusion is broadly recognized as crucial to reducing poverty and achieving inclusive growth because it has positive effects on employment status, consumption, income, and on other aspects of physical and mental health (Patwardhan, Singleton & Schmitz, 2018). Higher financial inclusion is a key priority of the United Nations' Sustainable Development Goals as it enables households and informal economies to capture economic opportunities and increase resilience.

A financial revolution is taking place around Africa, powered by access to mobile phones, internet, technological innovations and changing mindsets of consumers of financial services. Financial technology (Fintech) companies have enabled higher financial inclusion via four main verticals of impact: savings and financial planning, payments, lending and related ecosystem, and insurance (Patwardhan et al, 2018). They have mitigated frictions by designing innovative financial products and thereby increasing the financial capacities of households Africa-wide.

Various scholars have debated the determinants of financial inclusion (Evans and Adeoye, 2016; Zins & Weill, 2016; Bongomin, Ntayi, Munene & Malinga, 2018). For example, Bongomin et al (2018) investigated the moderating effect of social networks in the relationship between mobile money usage and financial inclusion in rural Uganda. Their results showed that there is a significant and positive moderating effect of social networks in the relationship between mobile money usage and financial inclusion. Besides, they showed that mobile money usage and social networks have direct and significant effects on financial inclusion.

In another important study, Goldstein (2016) explored the development of financial inclusion in Jordan, and elaborated on the sustainable digital financial inclusion model adopted by the Central Bank of Jordan. He showed how the adoption of a collaborative model for mobile payments increases digital financial inclusion, connecting the citizens without bank accounts and allowing them to use their mobile phones to conduct all types of financial transactions, made possible through the model's interoperability.

David-West (2016) explored Nigeria's path to digital financial inclusion with experiences drawn from Firstmonie, the mobile money initiative of First Bank. Using public sources and interviews, the study presented the operating model of Firstmonie using the business model canvas (BMC) and subsequently drawing insights on Nigeria's path to digital financial inclusion. The study showed that Nigeria's mobile money adoption and performance has fallen short of expectations, as the first-hand experiences catalogue operator issues and challenges provides understanding of the contextual constraints of mobile money operations in the country.

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[1] Everett Rogers, a professor of communication studies, popularized the theory in his book Diffusion of Innovations.

Naumenkova, Mishchenko & Dorofeiev (2019) assessed the level of financial inclusion in Ukraine (compared to other countries) to determine the dominant effects of price and non-price barriers to access to financial services and to determine which part of the adult population is able to access the formal financial services system through the use of innovative channels. Based on the methodological approaches suggested by the World Bank and the G20 Financial Inclusion Indicators, the study emphasized the need to adhere to the principles of digital financial inclusion in order to regulate activities of financial institutions and their agents in the provision of digital financial services, strengthen regulatory control of innovative financial products and service systems, and protect the rights of consumers.

Koh, Phoon & Ha (2018) surveyed the status of digital financial inclusion in South East Asia. Employing the G20 Financial Inclusion Indicators and the theoretical digital financial inclusion development pathway framework of Radcliffe and Voorhies (2012), their analysis of data from 2011 to 2014 from the Global Findex database showed wide differences in banking account penetration rate among adults, the use of banking-technology and the stage of development of banking sectors' infrastructure, among the countries. They concluded that digital financial inclusion in countries like Cambodia and Myanmar will likely be driven by mobile network operators. In contrast, the other countries are projected to expand mobile banking services for the unbanked by the cooperation of the banking and mobile network operators.

There are many other studies that delved into the issues of digital financial inclusion (e.g., Bourreau & Valletti, 2015; Lauer & Lyman, 2015; Peric, 2015; Ozili, 2018; Siddik & Kabiraj, 2020). However, it is evident that most of the studies are conceptual and micro-based, with little empirical attention to the determinants of digital financial inclusion. Although some studies have been done on the determinants of financial inclusion (e.g., Evans & Adeoye, 2016, Zins & Weill, 2016; David, Oluseyi & Emmanuel, 2018; Chu, 2019; Sha'ban, Girardone & Sarkisyan, 2019), the literature has scarcely attempted to empirically establish the social and institutional determinants of digital financial inclusion in Africa. Moreover, compared to the developed countries, research on digital financial inclusion in Africa is still in its infancy and therefore requires further investigation. This study fills the gap.

3. Data and Methodology

3.1 Data

This study employs annual panel data from 1995 to 2018 for 42 African countries. The data on economic and social factors are extracted from the World Development Indicators (WDI). The most up-to-date global development database available, WDI is broadly used in the modern economic literature because of its international comparability (see Ram & Ural, 2014; Pinkovskiy & Sala-i-Martin, 2016). However, data on institutional variables are collected from World Bank Governance Indicators. This dataset has been used extensively by earlier studies to proxy institutions (e.g., Uddin, Ali and Masih, 2017; Javed, Waseem, Shabbir and Mushtaq 2018). The African countries included in the sample are Algeria, Angola, Botswana, Burkina Faso, Cameroon,

Cape Verde, Central African Republic, Republic of the Cote d'Ivoire, Djibouti, Egypt, Equatorial Guinea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Swaziland, Tanzania, Togo, Tunisia, Uganda, Zambia and Zimbabwe.

3.2 Model Specification

The model used in this study is consistent with the extant literature on the determinants of financial inclusion (See Evans & Adeoye, 2016; Zins & Weill, 2016). Based on the objectives of the study and the literature, the model for the study is stated as,

$$Dfi_{i,t} = \tau_0 + \tau_1 Soc_{i,t} + \tau_2 Ins_{i,t} + \xi_{i,t} \qquad (1)$$

Where *Dfi* represents digital financial inclusion, *Soc* represents social factors, and *Ins* represents institutional factors. The social factors are literacy rate, infrastructure, unemployment rate, income inequality and standard of living. Institutional factors are political stability and absence of violence, control of corruption, rule of law, regulatory quality and government effectiveness. Identification and proxies of the variables are based on the existing literature (e.g., Evans and Adeoye, 2016; Evans and Kelikume, 2018; Evans et al., 2018; Evans and Kelikume, 2019).

Digital financial inclusion is a multi-dimensional concept which no single variable can capture. However, there are three commonly used financial inclusion indicators in the literature: depositors with commercial banks per 1000 adults, commercial bank branches (per 100,000 adults) and automated teller machines (ATMs) (per 100,000 adults) (see Evans and Adeoye, 2016; Ogbeide, 2019). Likewise, there are two commonly used information communications technology (ICT) indicators in the literature: mobile penetration (% of population) and internet usage (% of population) (see Evans, 2019; Vincent & Evans, 2019). Using principal component analysis, the digital financial inclusion index (DFI) is constructed from depositors with commercial banks per 1000 adults, commercial bank branches (per 100,000 adults), automated teller machines (per 100,000 adults), mobile penetration (% of population) and internet usage (% of population). Theoretically, the merits of this index of digital financial inclusion are: (i) it captures most of the information in the original dataset which consists of three financial inclusion indicators and two ICT indicators; and (ii) it captures the demand side and supply side of an inclusive financial system[2].

3.3 Econometric Techniques

This study employs the two-step system generalized method of moments (GMM) versus the default one-step approach. The rationale is that the standard covariance matrix of the two-step technique is robust to panel-specific autocorrelation and heteroscedasticity. Key reasons usually

[2] Depositors with commercial banks per 1000 adults and commercial bank branches (per 100,000 adults) are a demand side indicator while automated teller machines (ATMs) (per 100,000 adults) is a supply side indicator.

proffered for using system GMM estimator are: First, it provides efficient and consistent estimates (Roodman 2009); second, it overcomes the problems of fixed effects and endogeneity (Nickell 1981). See Arellano and Bover (1995) and Blundell and Bond (1998) for more detailed discussion. In addition, there are two important robustness tests in GMM estimation: Arellano–Bond test and Sargan-Hansen test. In the current study, the Arellano–Bond test is used to test for autocorrelation while Sargan-Hansen test is used to test for over-identifying restrictions. Further to ascertain that the estimates are robust, Pooled OLS, Fixed Effects (FE) and Random Effects (RE) are used to examine whether the results are sensitive to different estimation methods.

4. Results and Discussion

The descriptive statistics are presented in Table 1. It reports the mean, median and standard deviation of the variables used in the estimations. The system GMM estimates are reported in Table 2. Column 2 of the table represents the results of one-step robust GMM estimators while column 3 represents the robust two-step bias corrected GMM. This study now proceeds to the presentation of the most critical diagnostics of the system GMM estimations and the regression results. The diagnostic tests indicate that the estimations are robust. The AR(2) test results show that the estimators are not subject to serial correlations of order two. In addition, the Hansen test results suggest that the methodology is valid. It can therefore reasonably be inferred that the estimators are unbiased and consistent (for further analysis).

Table 1. Descriptive Statistics of the dataset

	Mean	Median	Std. Dev.
Depositors with commercial banks (per 1000 adults)	296.75	266.09	106.43
Commercial bank branches (per 100,000 adults)	6.41	6.30	1.41
Automated teller machines (per 100,000 adults)	9.74	9.68	3.63
Individuals using the internet (% of population)	8.92	4.29	11.08
Mobile cellular subscriptions (% of population)	46.35	38.17	37.09
Gini coefficient	41.49	40.98	5.05
Gross fixed capital formation (% of GDP)	23.50	22.38	9.95
Household consumption per capita	1401.48	965.93	1333.38
Secondary school enrollment rate	49.50	43.85	24.22
Unemployment rate	11.19	7.90	7.51
Political stability and absence of violence	0.49	0.50	0.18
Regulatory quality	0.44	0.45	0.13
Rule of law	0.40	0.41	0.16
Government effectiveness	0.27	0.25	0.19

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Control of corruption	0.28	0.25	0.21

The results from both specifications one-step and two-step robust system GMM provide comparable results. Literacy measured as secondary school enrollment rate has a positive and significant effect on digital financial inclusion. In other words, improved access to financial services requires higher levels of literacy, particularly digital financial literacy, to make effective use of them. Digital financial literacy is an increasingly important aspect of education for the digital age. The decentralized nature of fintech implies that African consumers need to have increasing financial sophistication to process the increasing load of financial information. Digital financial literacy is thus an important gap that needs to be filled. Equally, infrastructure as measured by gross capital formation (% of GDP) is found to have a positive and significant effect on digital financial inclusion. This finding highlights that enhancing households' access to and usage of the financial system requires provision of adequate levels of infrastructure, especially digital infrastructure. Standard of living measured as household consumption per capita has a positive and significant influence on digital financial inclusion. A reasonable standard of living for the populace encourages the usage of digital financial services and channels. This implies that the larger the amount and quality of material goods and services available to a given populationle, the higher the usage of digital financial services. The higher levels of income, necessities, luxury, and other goods and services requires higher number of transactions using digital channels.

Table 2. System GMM Estimates
Dependent Variable: *Digital Financial Inclusion*

	Robust One-Step	Robust Two-Step
Lagged digital financial inclusion	0.920*** (0.029)	0.925*** (0.008)
Social Determinants		
Literacy	0.566 (0.484)	0.545*** (0.033)
Infrastructure	0.522 (0.519)	0.430*** (0.085)
Unemployment rate	-0.512*** (0.122)	-0.513*** (0.024)
Income inequality	-0.111 (0.498)	-0.123 (0.104)
Standard of living	0.194*** (0.054)	0.184*** (0.001)
Institutional Determinants		
Political stability and absence of violence	0.188 (0.186)	0.178*** (0.022)
Control of corruption	0.311** (0.155)	0.311*** (0.025)
Regulatory quality	0.645* (0.344)	0.578*** (0.087)
Government effectiveness	0.086 (0.306)	0.128** (0.058)
Rule of law	0.646* (0.345)	0.603*** (0.066)
Sargan test for over-identifying restriction	19.65 [1.00]	18.46 [1.00]
Arellano and Bond test AR(2)	0.19 [0.43]	0.21 [0.40]

*, ** and *** denote the significance level of 10%, 5% and 1% respectively. ( ) denote standard errors.

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In contrast, the unemployment rate has a significant negative influence on digital financial inclusion. Countries with higher unemployment rates are more likely to witness low digital financial services. This finding is explained by the fact that under the situation of unemployment, an individual has no source of income. Unemployment causes poverty. Due to the loss of income, unemployed individuals will be unable to earn money so as to use digital financial services. Income inequality measured by the Gini coefficient has a negative but insignificant influence on digital financial inclusion. It simply implies that inequality has no direct effects on digital financial inclusion. That said, the effects may be nonlinear or indirect (perhaps through the other factors). This conjecture, however, needs to be substantiated by further research.

Political stability and absence of violence is significant and positive in predicting digital financial inclusion. Higher values of political stability positively influence digital financial inclusion due to the inherent security costs associated with volatile political regimes. Equally, control of corruption is found to have a positive and statistically significant effect on digital financial inclusion. The implication is that corruption directly hinders digital financial inclusion by hampering the trust of consumers in the public sector to act in their best interests. Thus, it can be inferred that less corrupt countries or countries with greater control of corruption should have larger digital financial services and be less prone to the adverse effects of corruption.

Regulatory quality has positive and significant effect on digital financial inclusion. One plausible explanation for this finding is that regulatory quality may translate to lower implicit costs on financial intermediation leading to improved digital financial inclusion. Government effectiveness has positive significant effect on digital financial inclusion. This result is interesting. It indicates that digital financial services is likely to be higher in countries where the quality of public services, policy formulation and the credibility of the government's commitment to such policies are higher. The results show a positive and significant coefficient for the rule of law. This is expected as account ownership and usage of digital financial services is likely to be higher in countries with fair and efficient enforcement of law and respect for creditors' and debtors' rights. Financial constraints are more rife in countries where the legal and judicial system is compromised (Love, 2003). Depositors readily entrust their savings to financial institutions when contracts are honoured.

As mentioned before, to ascertain that the estimates are robust, Pooled OLS, FE and RE are used to examine whether the results are sensitive to different estimation methods. The results of the further estimations are presented in Table 3. As expected, Pooled OLS, FE and RE yields quite comparable results. Consequently, it is believed that different estimation methods do not pose a threat to the findings.

Table 3. Pooled OLS, FE and RE Estimates
Dependent Variable: *Digital financial inclusion*

	Pooled OLS	FE	RE

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Social Determinants			
Literacy	0.170*** (0.045)	0.442*** (0.071)	0.482*** (0.044)
Infrastructure	0.160*** (0.061)	-0.010 (0.061)	0.095** (0.047)
Unemployment rate	-0.621 (0.498)	-0.179*** (0.026)	-0.408 (0.694)
Income inequality	-0.528** (0.206)	-0.294** (0.137)	-0.328** (0.126)
Standard of living	0.286*** (0.007)	0.012*** (0.001)	0.640*** (0.008)
Institutional Determinants			
Political stability and absence of violence	0.659* (0.368)	0.550* (0.282)	0.707** (0.345)
Control of corruption	0.484** (0.235)	-0.220 (0.373)	0.608* (0.335)
Regulatory quality	0.729*** (0.038)	0.327*** (0.074)	0.224*** (0.054)
Government effectiveness	0.103* (0.054)	0.175* (0.092)	0.184*** (0.041)
Rule of law	0.048** (0.021)	0.360* (0.157)	0.144*** (0.051)
Adjusted R^2	0.54	0.84	0.77
Hausmann Test			292.560***
Akaike info criterion	2.917	1.731	
Schwarz criterion	3.046	2.353	

*, ** and *** denote the significance level of 10%, 5% and 1% respectively. ( ) denote standard errors.

5. Conclusion and Remarks

The study empirically investigates the social and institutional determinants of digital financial inclusion in the continent. The empirical results have confirmed that social factors such as literacy, infrastructure, unemployment rate and standard of living have significant influence on digital financial inclusion. Equally, institutional factors such as political stability and absence of violence, control of corruption, regulatory quality, government effectiveness and rule of law have statistically significant and positive effects. These findings suggest that the social factors as well as institutional factors play substantial roles in promoting digital financial services in Africa. Given the above findings, the government needs to provide enabling social and institutional environment. There are still ample opportunities to improve the usage and quality of digital financial services. A percentage of Africa's bankable population still lack access to any form of financial services (Muthiora, 2015). Digital financial services hold the key to drawing more Africans into the financial services net. More effort should therefore be directed into improving the consumer's financial access. This will require continued and deeper financial education frameworks, and the development of products based on a deep understanding of social and institutional dynamics.

A mix of social factors plague the continent of Africa. African governments should implement policies that are in line with current social realities in the continent. In with the findings of this study, the policymakers must implement policies to improve the levels of literacy, infrastructure, employment and standard of living. For example, most national financial education policies in African countries fail to address digital financial literacy. Improved access to financial services requires higher levels of literacy, particularly digital financial literacy. Digital financial literacy is an increasingly important aspect of education for the digital age. This points to the need for African nations to include digital financial education in national financial education policies.

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The quality of governance in Africa has been generally considered to be gloomy as absence of the rule of law, political crises, corruption abound in most countries in the region. This study has shown that institutional factors are important for digital financial inclusion. These results suggest that governance and institutions matter for digital financial services—better governance correlates with faster digital financial inclusion. In terms of policy, these suggest that priorities of governance reform are strategic and urgent. Policymakers should strive for the rule of law, tighter control of corruption, more effective government, and better regulatory quality.

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