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June 2015

AFRICAN GOVERNANCE AND DEVELOPMENT INSTITUTE

A G D I Working Paper

WP/15/043

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Published: Journal of the Knowledge Economy

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AGDI Working Paper

Research Department

Conditional Determinants of Mobile Phones Penetration and Mobile Banking in Sub-Saharan Africa

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October 2015

Abstract

Using twenty-five policy variables, we investigate determinants of mobile phone/banking in 49 Sub-Saharan African countries with data for the year 2011. The determinants are classified into six policy categories, notably: macroeconomic, business/bank, market-related, knowledge economy, external flows and human development. The empirical evidence is based on contemporary and non-contemporary Quantile regressions. The following implications are relevant to the findings. First, mobile phone penetration is positively correlated with: (i) education, domestic savings, regulation quality and patent applications, especially at low initial levels of mobile penetration; (ii) bank density; (iii) urban population density and (iv) internet penetration. Second, the use of the mobile to pay bills is positively linked with: (i) trade and internet penetration, especially in contemporary specifications and (ii) remittances and patent applications, especially at low initial levels of the dependent variable. Third, using the mobile to send/receive money is positively correlated with: internet penetration and human development, especially in the contemporary specifications. Fourth, mobile banking is positively linked with: (i) trade in contemporary specifications; (ii) remittances and patent applications at low initial levels of the dependent variable and (iii) internet penetration and human development, with contemporary threshold evidence. The policy implications are articulated with incremental policy syndromes.

JEL Classification: G20; L96; O11; O33; O55
Keywords: Mobile phones; Mobile banking; Development; Africa

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1. Introduction

The Sub-Saharan African (SSA) mobile money market which was worth 655.8 million USD in 2014 is currently projected to reach 1.3 billion by 2019 (Caulderwood, 2015). This represents significant opportunities for more financial inclusion, business development and improvement of livelihoods, especially for the previously unbanked segment of the population. Relative to more advanced economies, firms in the sub-region lack proper access to credit facilities. Financing by equity markets is not a feasible alternative because stock markets are still underdeveloped[2]. The narrative sustains that consistent with the Global Findex Inclusion Database, only 23% of adults living under 2USD/day possess a bank account. Hence, they are more likely to recourse to informal credit alternatives like mobile phone based facilities[3].

Mobile phones and mobile banking have been substantially documented to, inter alia: empower women (Maurer, 2008; Ojo et al., 2012), mitigate income-inequality (Asongu 2015ab), promote financial inclusion (Kirui et al. 2013, p. 141; Singh, 2012, p. 466), bridge the rural-urban divide (Qiang et al., 2011, pp. 14-26; Chan & Jia, 2011, pp. 3-5), improve health services for the poor (Kliner et al., 2013), eliminate agricultural wastes by mitigating demand-supply mismatches as well as demand- and supply-side constraints (Muto & Yamano, 2009; Aker & Fafchamps, 2010), enhance business opportunities (Ondiege, 2010, p. 11; Mishra & Bisht, 2013, p. 505) and efficiency in household management (Al Surikhi, 2012; Asongu, 2015c). With growing requests for more research on the development outcomes of mobile phone/banking (Mpogole et al, 2008, p. 71), partly due to cautions that the phenomenon should not be considered a silver bullet for development (Asongu & De Moor, 2015), the World Bank, in its continuous efforts towards a world free of poverty, has recently made available the first macroeconomic database on mobile banking to the research community (Mosheni-Cheraghlou, 2013).

One of the most puzzling observations from Mosheni-Cheraghlou (2013) is the substantial asymmetry between the mobile phone penetration rate and mobile banking applications (for sending/receiving money and/or payment of bills). Two cases are used to defy the mainstream perception that regulation and the availability of technology are the most crucial determinants of mobile banking. While Russia with the 7th rank has one of the highest mobile phone subscriptions rates in the world, it also has one of the lowest mobile banking

[2] The interested reader can find in-depth insights into African stock market development in Allen et al. (2011).
[3] The term 'mobile phones' is used interchangeably with 'cell phones' and 'mobiles' throughout this paper.

rates. Conversely, whereas Somalia represents the 4th lowest mobile penetration rate by global standards, it ranks 3rd and 1st in terms of using mobile phones to send/receive money and pay bills respectively.

The asymmetries also extend to cross-country comparisons in the SSA region which has been recently documented to be one of the principal drivers of mobile phone applications (Caulderwood, 2015). For example, while Nigeria and Kenya have approximately similar mobile penetration rates (58.6 and 64.8 per 100 people respectively), they exhibit substantially different rates in mobile banking, with corresponding mobile usage for the payment of bills and employment to receive/send money at 1.4 and 9.9 per adults for Nigeria and 13.4 and 60.5 for Kenya[4].

While Mosheni-Cheraghlou (2013) has concluded that African countries are in the driver's seat in terms of mobile banking, he has not provided any answers as to why substantial disparities among these countries exist. The present line of inquiry intends to fill this gap by assessing the conditional determinants of mobile phone penetration and mobile banking. Hence, the determinants are investigated throughout the conditional distributions of the underlying dependents variables. The intuition for this approach has a twofold justification. On the one hand, it enables a distinction among determinants in least- and best-performing countries, to tackle the shortcoming highlighted from Mosheni-Cheraghlou (2013). On the other hand, from a policy perspective, blanket policies may not be effective unless they are contingent on initial mobile phone/banking levels and hence, tailored differently across least- and best-performing nations. Ultimately, more policy resources could be devoted to least-performing countries with lessons from their best-performing counterparts.

There are at least two more reasons for positioning the inquiry on Africa. First, consistent with Penard et al. (2012), the continent has experienced an uneven development in terms of internet penetration versus mobile phones. According to the narrative, while as of 2010, internet and mobile penetrations in developed countries had reached saturation points, in Africa the asymmetric development has been characterized by a 9.6% internet penetration rate against a 41% mobile penetration rate. Second, developing markets in Africa represent substantial business opportunities because high-end markets in Europe, Asia and North America are experiencing stabilization in the growth of mobile phones.

[4] The interested reader can find more information on these asymmetries on the following link: http://blogs.worldbank.org/allaboutfinance/mobile-banking-who-driver-s-seat

Other contributions of this study to the mobile phone/banking literature are at least threefold. While these contributions are briefly highlighted in what follows, the relevant literature on which they are based is engaged substantively in Section 2. (a) (i) We employ twenty-five macroeconomic determinants, hence steering clear of existing literature which has been limited to a few factors. To the best of our knowledge, Doshi and Narwold (2014) is the only study on mobile phone determinants to have employed at least eight variables. The determinants are categorised into six dimensions, notably: market-related, bank-oriented, external flows, knowledge economy, human development and macroeconomic variables. There is a minimum of three indicators in each of the six dimensions. Moreover, the specifications are such that, concerns of multicollinearity and overparameterization are mitigated. (ii) The mobile banking literature has been based on survey data for the most part and focused on mobile banking adoption intensions (Gu et al., 2009 ; Medhi et al., 2009; Daud et al., 2011; Akturan & Tezcan, 2012 ; Kazi & Mannan, 2013; Alsheikh &Bojei, 2014 ; Cudjoe et al., 2015). We also complement this strand by using macroeconomic determinants classified into six main categories, consisting of 25 variables. (b) The modelling exercise is contemporary and non-contemporary to increase subtlety in the timing of mobile phone/banking adoption policies. (c) We increase room for policy implications by providing policy syndromes based on a sample-decomposition of characteristics that are fundamental to the development of the sub-region, notably: income levels, legal origins, religion, openness-to-sea, oil exports and political stability.

Another motivation for this line of inquiry is its timely feature in the transition from Millennium Development Goals (MDGs) to Sustainable Development Goals (SDGs). Hence, highlighting how the positioning of this study aligns with the post-2015 SDGs agenda is worthwhile. In essence, mobile phones have been established to mitigate income-inequality (Asongu, 2015b), with a higher mitigating magnitude when mobile phones are used for banking activities (Asongu, 2015a) in the African continent. The conditional assessments are aligned to the SDGs agenda because they provide policy guidance on how determinants of mobile phone penetration and mobile banking in best-performing countries can be developed in their least-performing counterparts, hence indirectly sustaining the potential equalizing-income-distribution benefits from mobile phones/banking. It should be noted that the underlying literature clearly articulates that the inclusive effect of mobile phone/banking can

be sustained with sound government intervention[5]. For examples, Maurer (2008) and Ojo et al. (2012) have emphasized the crucial role of policy in sustaining the positive externalities of mobile phones in gender inclusiveness and usage of mobile services to ameliorate the livelihoods of women in Ghana respectively.

The rest of the study is organized as follows. Section 2 provides theoretical underpinnings and reviews the relevant literature. The data and methodology are discussed in Section 3. The empirical analysis, presentation of results and policy syndromes are covered in Section 4. Concluding implications are provided in Section 5.

2. Theoretical highlights and literature review

2.1 Theoretical highlights

Motivations behind the adoption of mobile phone/banking entail multifaceted and complex processes: (a) a customer-centric approach by system developers and managers on managing the formation of belief instead of directly influencing attitudes and; (b) essential factors like combined considerations such as: customers' behavioral, utilitarian, psychological, social and personal aspects. For brevity and lack of space, we are consistent with Yousafzai et al. (2010, p. 1172) in highlighting only three popular theories on users' attitudes, notably: theory of reasoned action (TRA), theory of planned behavior (TPB) and technology acceptance model (TAM). Hence, in what follows, the corresponding theoretical underpinnings are substantially drawn from the underlying study.

First, the Theory of Reasoned Action (TRA) pioneered by Fishbein and Ajzen (1975), Ajzen and Fishbein (1980) and Bagozzi (1982) assumes that customers are rational in considering all possible implications of their actions before adopting a given attitude. As a well grounded model, it is parsimonious, insightful and intuitive in its ability to elucidate attitudes and focuses on factors driving consciously-intended attitudes.

Second, the Theory of Planned Behavior (TPB) developed by Ajzen (1991) extends the TRA by identifying a fundamental shortcoming or the absence of a distinction between individuals that possess conscious control from those that do not. The TPB postulates that a third factor or perceived behavioural control (PBC) also affects actual behaviour and behavioural intentions, the first-two factors being: normative and attitudinal influences.

[5] There is also an interesting stream of literature on the need for good institutions in tailoring the positive externalities of technologies (Osabuohien, 2008, 2010; Osabuohien & Efobi**,** 2012; Oluwatobi et al., 2014; Efobi & Osabuohien**,** 2015).

Hence, the extension of the TRA by the TPB takes into account the scenarios in which people have limited situational control. According to the theoretical underpinnings, three main considerations guide human action: (a) behavioural beliefs on the possible results of a given attitude and assessment of the corresponding results; (b) "*normative beliefs about the normative expectations of others and the motivation to comply with these expectations*" (Yousafzai et al., 2010, p. 1175-1176) and (c) control beliefs on possessed and unpossessed opportunities and resources by individuals as well as foreseen obstacles towards performing an anticipating attitude. From an aggregated perspective, 'behavioural beliefs' results in either unfavourable or favourable attitudes towards the underlying behaviour; 'normative beliefs' leads to perceived subjective norm or social pressure; and 'control beliefs' produce perceived behavioural control.

Third, the Technology Acceptance Model (TAM) is pioneered by Davis (1989). Consistent with Yousafzai et al. (2007ab), the TAM has grown to be a parsimonious and strong model. According to the authors, the TAM adapts the TRA's framework and postulates that the adoption of a given technology by an individual is explained by his/her voluntary intention to accept and use the underlying technology. Intention within the context is defined as the individual's perception on the usefulness of the technology or attitude towards its use.

2.2 Determinants of mobile phone/banking

The first strand of this section focuses on determinants of mobile phone penetration. As far as we have reviewed, in spite of a growing consensus on the benefits of mobile phones in economic development, very few studies have assessed factors behind mobile phone adoption. Madden and Coble-Neal (2004) have provided a global assessment of economic determinants behind the adoption of cell phones to establish that 'price-ceilings' on fixed-line networks slow the growth of mobile network. Madden et al. (2004) extend the previous study to conclude that mobile adoption is fundamentally driven by 'technically advanced mobile cellular networks'. Telecom infrastructure is found to be the most significant determinant (Abu & Tsuji, 2010). Tseng and Lo (2011) examine what customer intentional antecedents motivate the decision to upgrade a mobile and conclude that most customers are not willing to adopt recent models if they are satisfied with the usefulness of the current applications. Penard et al (2012) investigate if processes of mobile adoption in Africa are different relative to those of other regions and conclude that the main impediments to the use of mobile phones are linked to the economy and age. A study with a broader scope is presented by Doshi and

Narwold (2014) who have recently investigated determinants of mobile penetration in Asia and Africa. They have concluded that, fixed line penetration, population density, rural rate, Gross Domestic Product (GDP) per capita and population are significant determining factors in Africa. We have discussed how the present study complements the underlying literature in the previous section.

In the second strand, to the best of our knowledge, the available literature on mobile banking determinants has employed the theories highlighted in Section 2.1 to assess factors that affect mobile banking adoption decisions. We have already engaged how this paper steers clears of the underlying literature in the introduction.

Gu et al. (2009) have assessed the determinants of behavioral intention to mobile banking by verifying the impact of perceived dynamics of usefulness, ease-of-use and trust on adoption intentions to conclude that self-efficiency is the most determining antecedent of foreseen ease-of-use, which affects behavioral intensions via the foreseen utility of mobile banking. They also find that structural assurances represent the best antecedent of trust that has the potential of increasing mobile banking behavioral intention. Medhi et al. (2009) have also assessed the adoption and usage of mobile banking by low-income and low-literate users in developing countries. They conclude that cross-country variations in mobile banking adoption are explained by several parameters: pace of uptake, ease-of-use, usage frequency, services adopted and household type.

Cudjoe et al. (2015) have recently investigated factors motivating mobile banking adoption in Ghana from 150 sampled Access Bank customers to establish that perceived financial cost and credibility are the main setbacks to the adoption of mobile banking practices offered by the underlying bank. These two factors also outweigh perceived usefulness and ease-of-use in adoption intentions. The authors suggest that: (a) more customer awareness programs intended to boost confidence and (b) review of mobile banking services cost to enhance affordability; are needed to increase mobile banking adoption.

Alsheikh and Bojei (2014) examine factors motivating customer's intention to adopt the service in Saudi Arabian commercial banks, located in major cities for the most part. The 403 responses analysed reveal that 'awareness of service' and mobile phone experience are important in understanding the technology and related functionalities and benefits, whereas lack of information and knowledge increase risk perception. In addition, the findings reveal that, at the initial stage of adoption, perceived risk, effort expectancy and performance expectancy are significant adoption determinants. They conclude that innovative services

should be offered and differentiation should be encouraged by incorporating more benefit than sacrifice factors in order to improve future 'perceived adoption value' of mobile banking services.

Using the TAM, Kazi and Mannan (2013) have assessed the determinants of mobile banking adoption in the two largest cities of Pakistan (Karachi and Hyderabad) using a survey of 372 respondents, with particular emphasis on banked/unbanked population in the low-income strata. The significant factors influencing adoption include: social influence, perceived usefulness, perceived risk and perceived ease-of-use, with the first (or social influence) being the significant positive determinant. Daud et al. (2011) have also used the TAM to investigate critical factors that affect mobile banking adoption in Malaysia. The findings from 300 users show that awareness, perceived credibility and usefulness substantially influence a user's attitude and hence, mobile banking intentions.

Akturan and Tezcan (2012) using the same TAM models on data from 435 university students assess the adoption of mobile banking in the youth market and established the following. (a) Perceived performance, perceived social risk, perceived benefit and perceived usefulness directly influence mobile banking adoption attitudes, which is a major determinant of intentions towards mobile banking. Moreover, no direct nexuses between: (a) perceived ease-of-use and attitude, (b) perceived usefulness and intention-to-use and (c) time risk, security/privacy risk, financial risk and attitude, were established. The authors recommend that banks should improve mobile banking perception benefits while at the same time decreasing performance and social risks.

2.3 Mobile phones/banking and inclusive development

We have partially motivated this line of inquiry with the potential benefits of mobile phones/banking in inclusive development. Hence, it what follows, we devote some space to briefly discuss the inclusive dimensions of mobiles. Consistent with Asongu and De Moor (2015), the mobile revolution has touched almost every fabric of African society: improving both corporate and household management by constantly upgrading interaction networks. Such include, inter alia: enhanced business-to-business interactions, better health-care monitoring mechanisms, improved payment facilities for Small and Medium Size Enterprises (SMEs), household-to-business and household-to-household interactions, women empowerment, education in terms of skills and training and mitigation of development gaps between rural and urban communities. To the best of our knowledge, the available inclusive

literature on mobile phone penetration can be presented in three main strands: improvement of health services, reduction of the rural/urban divide and gender-gap mitigation.

The first stream on mitigating the gender-gap documents evidence on the instrumentality of mobile phones in female empowerment through more financial inclusion mechanisms. Such channels constitute: improved coordination of household activities and female-managed SMEs (Asongu, 2015a). Other advantages like multi-tasking, education and cost reduction have also been documented as means to empowering women (see Jonathan & Camilo, 2008; Ondiege, 2010, 2013; Al Surikhi, 2012; Asongu, 2015ab). As highlighted in the introduction, the underlying literature is also consistent with the view that more government intervention is needed for women to reap more financial inclusive benefits from mobile phones. These include: Maurer (2008) on the instrumental role of policy in sustaining the gender inclusiveness of mobile services and Ojo et al. (2012) on the use of mobile phones to improve the livelihoods of Ghanaian women. Some examples of country-specific approaches/strategies are provided by Mishra and Bisht (2013, p. 505) and Ondiege (2010, p. 11).

In the second strand on health services, mobile phones are increasingly being improved for medical services and delivery of healthcare. These measures have led to more affordable health services of better quality (West, 2013). Hence, constraints of geography and income are easing with the continuous use of mobile applications to enhance health services. Mechanisms by which health services are ameliorated include: access to reference material, medical record and laboratory tests. Hence, mobile devices are increasingly being adapted for: clinical appointments (Da Costa et al., 2010), more tailored feedbacks due to enhanced self-monitoring (Bauer et al., 2010) and better observation and treatment of patients with tuberculosis (Hoffman et al., 2010). Rural communities are among the greatest beneficiaries of health-based mobile applications (Kliner et al., 2013), a stance that is consistent with the conclusions of Kirui et al. (2013) on the negative poverty externalities of mobiles in these communities: '*We conclude that mobile phone-based money transfer services in rural areas help to resolve a market failure that farmers face; access to financial services*' (p. 141). Hence, with increased targeted expenditure, such health services are instrumental in bridging the rural-urban divide (Ssozi & Amlani, 2015).

The third strand on reducing the rural-urban gap can be articulated in three main categories, notably: mitigation of demand- and supply-side agricultural productivity related constraints; concerns over unemployment, production and food distribution in rural societies;

and the support of cooperative and SMEs. (i) Consistent with the underlying literature, mobile technology is increasingly improving rural livelihoods by mitigating demand- and supply-side constraints (Muto & Yamano, 2009; Fafchamps, 2010). This dampening has improved return to and economic prosperity for rural farmers. In essence, the overarching concern addressed in this strand is the employment of mobile phones to mitigate demand and supply wastes by better matching practices and networks. (ii) Challenges of employment, production and distribution of food supplies are increasingly being tackled with mobiles. A case in point is Ghana where a study has shown that better information on the market by means of mobile telephony increases revenue for traders by about 10% (E-agriculture, 2012, p. 6-9). (iii) Mobile banking and agricultural finance are supporting cooperatives and SMEs. Illustrative cases include, inter alia: the Community Credit Enterprises (CCE) that is improving the sustainability of business models and financially-sustainable groups in Costa Rica (Perez et al., 2011, p. 316).

The three points above are consistent with the World Bank's view on the crucial role of mobile phones in rural and agricultural development (Qiang et al., 2011, pp. 14-26). A perspective broadly supported by Chan and Jia (2011) on the rewards of the mobile telephony in facilitating access to finance '*mobile banking is an ideal choice for meeting the rural financial needs*' (p. 3) due to increasing '*rates for bank transfers through mobile cell phones at commercial banks*' (Table 2, p. 5). The positive externalities of mobile telephony are better reaped by underprivileged citizens in rural areas (Warren, 2007) because relatively, more barriers to information acquisition and the purchase of goods are lifted. In India for example, the adoption of mobile banking is fuelling financial inclusion (Singh, 2012, p. 466) in rural communities partly because, in spite of efforts devoted by formal financial establishments '*Telecommunication infrastructure growth especially mobile phone penetration has created an opportunity for providing financial inclusion*' (Mishra & Bisht, 2013, p. 503).

3. Data and Methodology

3.1 Data

We assess 49 African countries with data from the World Governance and Development Indicators of the World Bank and Nguena et al. (2015). The mobile phone/banking indicators are from Mosheni-Cheraghlou (2013). The data structure is cross-sectional for the year 2011 because to the best of our knowledge, macroeconomic indicators for mobile banking are only available for this year. The dependent variables include: the

'*mobile phone penetration (per 100 people)*', '*mobile phone usage for the payment of bills (% of adults)*' and '*mobile phone usage for sending/receiving of money (% of adults)*'. A composite indicator of mobile banking is obtained my means of Principal Component Analysis (PCA) which we discuss in Section 3.2.1 (See Table 5).

The independent variables are classified into six categories. These include: (i) four trade policy and macroeconomic indicators (Gross Fixed Capital Formation (GFCF), trade openness, inflation and money supply); (ii) six bank/business-oriented variables to proxy for investment incentives (Bank density, Interest Rate Spread (IRS), Loan Deposit Spread (LDS), Net Interest Margin (NIM), Return on Equity(ROE) and Return on Assets (ROA)); (iii) three market-related variables for market structure, market growth and market size (GDP growth, Urban population and Population growth); (iv) five knowledge economy (KE) variables for the four components of the World Bank's Knowledge Economy Index (KEI) (regulation quality for institutional regime, patent applications representing innovation, private domestic credit denoting economic incentives, internet penetration for information & communication technology (ICT) and secondary school enrolment representing education); (v) three external flow indicators (Foreign aid, Foreign Direct Investment (FDI) and Remittances) and (vi) three human development variables (domestic savings, the human development index (HDI) and household capital expenditure).

The trade/macroeconomic policy, bank/business and market indicators are in line with the classification of economic determinants by the United Nations Conference on Trade and Development (UNCTAD, 2002). Apkan et al. (2014), Asongu and Nwachukwu (2015) and Asongu and Kodila-Tedika (2015) have recently employed these factors in the literature on macroeconomic determinants. The KE incorporation is consistent with Wang et al. (2009) who have established that knowledge significantly influences mobile adoption. We include external flows because Ssozi and Asongu (2015) have recently shown that, foreign aid, FDI and remittances have been substantially increasing in the sub-region. The inclusion of human development variables is in accordance with the literature covered in preceding sections.

Disclosing the expected signs of the 25 independent variables is not an easy task because of the absence of prior literature that has employed the underlying determinants. Therefore for brevity, we concurrently discuss our intuition for the expected signs with the results. Table 1 and Table 2 present the categorization and definition of variables respectively.

Table 1: Mobile phone/banking determinants

Determining Variables	Examples
Policy variables (4)	Trade policy, macroeconomic policy (Trade, M3, Inflation, GFCF)
Business/Bank variables (6)	Investment incentives (NIM, LSD, IRS, Bank density, ROA, ROE)
Market-related economic determinants (3)	Market size, market growth, market structure (GDPg, Popg, Ubanpop)
Knowledge Economy (5)	Education (SSE), Institutional Regime (RQ), Innovation (Patents), ICT (Internet), Economic incentives (Private credit).
External Flows (3)	FDI, NODA, Remi
Human development (3)	HDI, HHCExp, Domestic savings

Source: Authors. M3: Money Supply. GFCF: Gross Fixed Capital Formation. NIM: Net Interest Margin. LSD: Loan Deposit Spread. IRS: Interest Rate Spread. ROA: Return on Assets. ROE: Return on Equity. GDPg: GDP growth. Popg: Population growth. SSE: Secondary School Enrolment. RQ: Regulation Quality. Ubanpop: Urban population. FDI: Foreign Direct Investment. NODA: Net Official Development Assistance. Remi: Remittances. HDI: Human Development Index. HHCExp: Household Consumption Expenditure.

For lack of space, we do not discuss the fundamental characteristics on which the policy syndromes are derived to elaborate detail. The relevant information, which we can provide upon request, is found in a substantial bulk of recent African development literature (Asongu, 2015d). These characteristics are: legal origins (English common law & French civil law), income levels (upper-middle-income, lower-middle-income, middle-income & low-income), conflicts (conflicts & Nonconflicts), oil exports (Oil- & Nonoil-exporting), openness-to-sea (landlocked & unlandlocked) and religious domination (Christianity & Islam).

Table 2: Variable definitions

Categories	Variables	Signs	Definitions	Source
Mobile phone/ banking	Mobile Phone	Mobile	Mobile phone subscriptions (per 100 people)	WDI
	Mobile Billing	MBills	Mobile phone used to pay bills (% of Adults)	WDI
	Mobile S/R	MSR	Mobile phone used to send & receive money (% of Adults)	WDI
	Mobile Banking	MB	First principal component of MBills and MSR	PCA
Policy variables	Trade	Trade	Imports + Exports of Good & Services (% of GDP)	WDI
	Financial Depth	M3	Money Supply (% of GDP)	WDI
	Inflation	Infl	Consumer prices (annual %)	WDI
	Domestic Invt.	GFCF	Gross Fixed Capital Formation (% of GDP)	WDI
Business & Bank variables	Interest Margin	NIM	Net Interest Margin (%)	WDI
	Loan Spread	LDS	Loan-Deposit Spread (%)	WDI
	Interest Spread	IRS	Interest Rate Spread (Lending rate minus Deposit rate, %)	WDI
	Bank Density	Bbrchs	Commercial bank branches (per 100 000 adults)	WDI
	Bank Return 1	ROA	Return on Assets (annual %)	WDI
	Bank Return 2	ROE	Return on Equity (annual %)	WDI
Market-related economic variables	Eco. Growth	GDPg	Gross Domestic Product growth rate (annual %)	WDI
	Pop. Growth	Popg	Population growth rate (annual %)	WDI
	Urban Pop.	Ubanpop	Urban Population (% of Total)	WDI
External flows	Foreign Invt.	FDI	Foreign Direct Investment net inflows (% of GDP)	WDI
	Remittances	Remi	Remittance inflows (% of GDP)	WDI

	Foreign Aid	NODA	Net Official Development Assistance (% of GNI)	WDI
	Human dev.	HDI	Human Development Index	WDI
Household	HC Expenditure	HCE	Household Final Consumption Expenditure (% of GDP)	WDI
Development	Domestic Savings	DSav	Gross Domestic Savings (% of GDP)	WDI
	Education	SSE	Secondary School Enrolment (% of Gross)	WDI
Knowledge	Institutional Regime	RQ	Regulation Quality (Estimate)	WDI
Economy	ICT	Internet	Internet penetration (per 100 persons)	WDI
	Eco. Incentives	Credit	Private credit by deposit banks and other financial institutions (% of GDP)	WDI
	Innovation	Patents	Total patent applications	WDI

Eco: Economic. Pop: population. Ivt: Investment. HC: Household Consumption. PCA: Principal Component Analysis. WDI: World Development Indicators of the World Bank. GNI: Gross National Income. S/R: Sending & Receiving.

The summary statistics of the variables is presented in Table 3 below. Two points are worth noting. On the one hand, from mean values, the variables are quite comparable. On the other hand, from the standard deviations, we can be confident that reasonable estimated linkages would emerge due to substantial degrees of variations.

Table 3: Summary statistics

	Cross Sectional (2011)				
	Mean	**Standard Deviation**	**Minimum**	**Maximum**	**Observations**
Mobile Phone	60.66	32.72	4.467	147.2	48
Mobile Billing	3.284	4.97	0.000	26.20	38
Mobile Sending/Receiving	8.644	13.03	0.100	60.50	38
Mobile Banking	0.000	1.279	-0.896	4.505	38
Trade	84.27	33.90	33.28	152.6	46
Financial depth (M3)	36.70	10.84	19.83	53.95	11
Inflation	8.75	8.816	-3.70	47.27	46
Domestic Investment	23.76	9.75	8.80	52.53	42
Net Interest Margin(NIM)	6.009	2.724	2.130	11.36	41
Loan-Deposit Spread (LDS)	11.20	8.651	1.810	41.85	25
Interest Rate Spread (IRS)	11.31	8.579	1.808	41.85	25
Commercial Bank Branches	6.42	8.653	0.626	47.02	43
Return on Assets (ROA)	2.03	0.994	0.25	4.53	41
Return on Equity (ROE)	19.22	8.70	2.85	40.69	41
GDP growth rate (GDPg)	4.585	3.605	-4.728	15.00	47
Population growth (Popg)	2.303	0.852	-0.608	4.156	49
Urban Population (Ubanpop)	38.21	17.51	-1.175	86.14	49
Foreign Direct Investment	7.961	13.26	-2.904	85.36	46
Remittances	4.012	6.018	0.000	26.76	36
Foreign Aid	9.965	10.21	0.211	53.84	47
Human Development Index	0.485	0.103	0.323	0.759	47
Household Expenditure	70.75	21.02	12.26	124.8	39
Domestic Savings	14.65	22.91	-40.15	81.89	42
Secondary School Enrolment	45.78	24.19	14.44	123.8	27
Regulation Quality	-0.704	0.648	-2.37	0.849	49
Internet Penetration	10.34	10.42	1.100	43.60	46
Private Domestic Credit	23.84	24.50	5.340	141.4	40
Patents	149.1	1034	0.000	7245	49

Since we are employing 25 independent variables, potential concerns of multicollinearity and overparameterization are mitigated by: (i) using multiple specifications and (ii) avoiding highly correlated variables in the same specification. The substantially correlated variables are highlighted in bold colour in Table 4 or correlation matrix below.

Table 4: Correlation matrix

Policy Variables				Business/Bank Variables						Market-related			External Flows			Household Development			Knowledge Economy					Mobile penetration/banking				
Trade	M3	Infl.	GFCF	NIM	LDS	IRS	Bbrchs	ROA	ROE	GDPg	Popg	UPop	FDI	Aid	Remi	HDI	HCE	DSav	SSE	RQ	Internet	Credit	Patent	Mobile	MBills	MSR	MB	
1.00	**0.64**	-0.08	0.25	0.00	-0.07	-0.09	0.28	-0.08	-0.05	0.14	-0.37	0.18	0.29	0.05	0.31	0.32	-0.10	0.06	0.46	-0.07	0.20	0.00	-0.11	0.26	0.24	-0.01	0.09	Trade
	1.00	-0.35	-0.7	-0.12	**1.00**	**1.00**	**0.69**	-0.19	-0.07	0.20	**-0.73**	**0.85**	-0.01	-0.54	0.30	**0.78**	0.19	-0.04	**0.85**	0.09	**0.64**	0.27	0.19	**0.69**	0.34	-0.03	0.22	M3
		1.00	-0.1	0.27	0.29	0.26	-0.1	0.33	0.43	0.10	0.22	-0.27	0.06	0.07	-0.16	-0.16	-0.07	0.05	-0.05	-0.30	0.05	-0.04	-0.05	-0.14	0.24	0.26	0.28	Infl.
			1.00	-0.06	-0.24	-0.25	0.2	-0.28	-0.10	0.17	-0.10	-0.09	0.24	0.06	0.08	0.14	-0.18	0.26	0.10	0.21	0.01	-0.05	-0.07	0.18	-0.15	-0.09	-0.12	GFCF
				1.00	0.31	0.31	-0.3	0.54	0.21	0.42	0.30	-0.16	0.15	0.34	-0.06	-0.29	0.24	-0.15	-0.32	-0.21	-0.16	-0.36	-0.19	-0.26	-0.01	0.09	0.05	NIM
					1.00	**0.99**	-0.2	-0.04	-0.13	-0.13	0.39	-0.05	0.02	0.28	-0.02	-0.42	0.09	-0.03	-0.33	-0.42	-0.39	-0.39	-0.18	-0.43	-0.25	-0.18	-0.23	LDS
						1.00	-0.2	-0.04	-0.13	-0.15	0.40	-0.06	0.01	0.28	-0.02	0.43	0.08	-0.03	-0.33	-0.45	-0.40	-0.40	-0.18	-0.45	-0.27	-0.20	-0.25	IRS
							1.00	-0.28	-0.25	0.09	**-0.69**	0.13	-0.01	-0.08	-0.00	**0.67**	-0.06	0.03	**0.90**	0.37	0.77	0.40	0.07	0.54	0.26	0.08	0.17	Bbrchs
								1.00	**0.73**	0.17	0.10	-0.39	-0.02	0.08	-0.04	-0.22	0.33	-0.43	-0.34	-0.05	-0.16	-0.16	-0.15	-0.24	0.12	0.08	0.11	ROA
									1.00	0.16	0.02	-0.18	0.07	-0.08	0.04	-0.18	0.16	-0.25	-0.30	-0.09	-0.26	-0.16	-0.06	-0.07	-0.05	-0.13	-0.10	ROE
										1.00	-0.04	0.00	0.22	0.20	-0.04	0.11	0.13	-0.11	0.12	0.01	0.01	-0.02	-0.04	0.13	-0.06	-0.16	-0.13	GDPg
											1.00	-0.24	0.14	0.23	-0.03	-0.61	-0.11	0.12	**-0.81**	-0.27	-0.55	-0.46	-0.19	-0.38	-0.03	-0.06	-0.05	Popg
												1.00	0.11	-0.17	-0.03	0.39	-0.22	0.32	0.20	0.12	0.08	0.07	0.19	0.54	0.08	0.12	0.11	UPop
													1.00	**0.61**	0.49	-0.15	0.33	-0.27	0.001	-0.13	-0.13	-0.12	-0.07	-0.09	-0.001	-0.08	-0.05	FDI
														1.00	0.40	-0.45	0.55	-0.53	-0.18	-0.18	-0.29	-0.11	-0.14	-0.46	-0.12	-0.20	-0.18	Aid
															1.00	-0.12	**0.66**	**-0.73**	0.04	-0.15	-0.06	-0.13	-0.10	-0.13	0.10	0.001	0.04	Remi
																1.00	-0.42	0.40	**0.91**	0.54	**0.71**	0.51	0.23	**0.81**	0.26	0.32	0.35	HDI
																	1.00	**-0.96**	-0.04	0.00	-0.16	-0.03	-0.08	-0.48	0.00	-0.06	-0.03	HCE
																		1.00	-0.00	-0.01	0.12	-0.07	0.02	0.47	-0.02	0.18	0.11	DSav
																			1.00	0.42	**0.89**	0.60	0.00	**0.64**	0.08	0.36	0.21	SSE
																				1.00	0.38	0.61	0.25	0.48	-0.31	-0.07	-0.21	RQ
																					1.00	0.51	0.15	0.41	0.15	0.42	0.32	Internet
																						1.00	**0.77**	0.44	0.15	0.02	0.08	Credit
																							1.00	0.36	0.03	-0.04	-0.00	Patent
																								1.00	-0.08	0.15	0.03	Mobile
																									1.00	**0.63**	**0.90**	MBills
																										1.00	**0.90**	MSR
																											1.00	MB

M3: Money Supply. Infl: Inflation. GFCF: Gross Fixed Capital Formation. NIM: Net Interest Margin. LDS: Lending Deposit Spread. IRS: Interest Rate Spread. Bbrchs: Bank Branches. ROA: Return on Assets. ROE: Return on Equity. GDPg: GDP growth. Popg: Population growth. UPop: Urban population. FDI: Foreign Direct Investment. Aid: Net Official Development Assistance. Remi: Remittance. HDI: Human Development Index. HCE: Household consumption expenditure. DSav: Domestic savings. SSE: Secondary School Enrolment. RQ: Regulation Quality. Internet: internet penetration. Credit: Private Domestic Credit. Patent: Total patent applications. Mobile: Mobile phone penetration. MBills: Mobile phone used to pay bills. MSR: Mobile phone used to send and receive money. MB: Mobile Banking. Potential issues of multicollinearity highlighted in bold colour.

3.2 Methodology

3.2.1 Principal component analysis (PCA)

We use PCA because we aim to reduce the observed correlated variables into a smaller set of independent and/or uncorrelated composite variables. In other words, we wish to extract linear composites of observed variables. Factor analysis is inappropriate because we are not testing a theoretical model of latent factors causing observed variables. Accordingly, it is consistent with the test for a theoretical model of latent factors causing observed variables.

The interest of employing the PCA technique to obtain a composite mobile banking indicator is therefore twofold. On the one hand, the two mobile indicators for (i) paying bills and (ii) receiving/sending money are potentially highly correlated, since the same mobile phone may be used to send/receive money and pay bills. On the other hand, we need a mobile banking indicator for a conceptual justification. The PCA is a widely employed technique in econometrics that is used to reduce a set of highly correlated variables into a smaller set of uncorrelated variables called principal components (PCs).

The criteria we use to retain the common mobile banking factor is from Kaiser (1974) and Jolliffe (2002) who have recommended that we stop at PCs with eigenvalues that are greater than one (or higher than the mean). As shown in Table 5 below, the first PC (or mobile banking indicator) has an eigenvalue of 1.636 and represents more than 81% of combined information or variability in the constituent indicators.

Table 5: Principal Component Analysis for the Mobile banking composite indicator

Principal Components	Component Matrix (Loadings)		Proportion	Cumulative Proportion	Eigen Value
	MBills	MSend/Rec			
First PC	0.707	0.707	0.818	0.818	1.636
Second PC	-0.707	0.707	0.181	1.000	0.363

PC: Principal Component. MBill: Mobile phone used to pay bills. MSendRec: Mobile phone used to Send and Receive money.

Consistent with Asongu and Nwachukwu (2016) there are concerns with factor-augmented variables or indicators obtained from underlying or first-stage regressions. Three of such issues have been raised by Pagan (1984, p. 242) in relation to estimated parameters. These include: (i) consistency, (ii) efficiency and, (iii) validity of inferences obtained from the latter-stage estimations. The author established that while estimated parameters from a two-step procedure are efficient and consistent, inferences are not always valid. These concerns have been abundantly discussed in a recent current of the literature, inter alia: Oxley and

McAleer (1993), Ba and Ng (2006), McKenzie and McAleer (1997) and Westerlund and Urbain (2013a).

In this study we employ a mobile banking PC. To the best of our knowledge, concerns about inferences related to PC loadings have been documented by Westerlund and Urbain (2012, 2013b). Building on previous studies (Greenaway-McGrevy et al., 2012; Bai, 2009; Pesaran, 2006; Bai, 2003; Stock & Watson, 2002), they conclude that normal inferences are feasible with augmented regressions from PC-factors as long as the estimated coefficients converge towards their true values at the following rate: $\sqrt{NT}$ (with T being the number of periods in a time series and N, the number of agents or cross sections). While the authors have further postulated that N and T should be sufficiently large, they have not clearly articulated the magnitude of the largeness. We argue that our N and T do not constraint the analysis with issues of small sample bias for the following reasons. First, on the N constraint, the exposition is based on sub-Saharan African countries and all 49 countries in the underlying region are covered in the study. Second, with respect to the constraint on T, mobile banking indicators are only available for the year 2011. Moreover, Asongu and Nwachukwu (2015) have recently shown that in the presence of a high degree of correlation between the PC-augmented variable and constituent indicators, the resulting inferences are not significantly different.

3.2.2 Estimation technique

Consistent with the motivation of the study, in order to assess why some countries are more successful in mobile phone/banking activities, we employ an estimation technique that distinguishes countries in terms mobile phone/banking penetration rates. Hence, the quantile regression (QR) technique is adapted to the problem statement because it enables us to assess the determinants of mobile phone/banking penetration throughout the conditional distributions of the determinants. In this light, countries in low (high) quantiles are considered as least (best) performing in the underlying dependent variables.

Following Keonker and Hallock (2001), the QR technique is being increasingly utilized to assess multiple points in the distribution of development outcomes, inter alia in: corruption (Billger & Goel, 2009; Okada & Samreth, 2012) and financial development (Asongu, 2014a) studies. The proposed technique has also been recently applied on cross-sectional data (Asongu, 2014b).

In accordance with the empirical underpinnings, the θth quantile estimator of the dependent variable is obtained by estimating Eq. (1) below.

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

Where $\theta \in (0,1)$. Contrary to Ordinary Least Squares (OLS), which minimizes the sum of squared residuals, the approach in Eq. (1) consists of minimizing the weighted sum of absolute deviations. In this technique, the 10th or 90th quantiles (θ=0.10 or 0.90 respectively) are obtained by approximately weighing residuals.

The conditional quantile of dependent variables (y_i) given the determinants (x_i) is:

$$Q_y(\theta / x_i) = x_i'\beta_\theta \quad (2)$$

where unique slope parameters are estimated for each θth quantile (mobile phone penetration/ mobile banking or composite indicator). This formulation is analogous to $E(y / x) = x_i'\beta$ in the slope from OLS though parameters are modeled only at the mean of conditional distributions of the mobile phone/banking variables.

4. Empirical results

This section presents the empirical findings which are divided into two sub-sections. While Section 4.1 presents mobile phone determinants (Table 6), mobile banking determinants are covered in Section 4.2, notably for: 'mobile for bills payment' (Table 7), 'mobile for receiving/sending money' (Table 8) and the composite indicator or 'mobile banking' (Table 9). We present each of the tables in six different specifications to avoid issues of multicollinearity and overparameterization highlighted in Table 4. This specification strategy is consistent with the highlighted empirical underpinnings (see Billger & Goel, 2009). The Left-Hand-Side (LHS) and Right-Hand-Side (RHS) denote contemporary and non-contemporary specifications respectively.

From a general perspective, we notice that for the most part, the corresponding OLS specifications do not have valid information criteria, notably: negative adjustment coefficients and insignificant Fisher statistics used to assess the overall significance of models. We extend the OLS modelling with alternative specifications and find that, but for the modelling of 'OLS mobile phone determinants' in Appendix 1 for which the information criteria validates the significance of the underlying OLS models, OLS is not a good fit for modelling determinants of 'mobile usage for paying bills' (Appendix 2), 'mobile usage for sending/receiving money'

(Appendix 3) and 'mobile usage for banking' (Appendix 4). In light of the above, the quantile regression estimations are preferred because baseline OLS models are not good fits. When interpreting the quantile regression estimates, it should be noted that low quantiles correspond to dependent variables with the lower mobile phone/banking penetration rates.

4.1 Conditional mobile phone determinants

Table 6 presents conditional mobile phone penetration determinants. Differences in patterns, signs and 'magnitude of significance' between the OLS and QR estimations justify the need for using the latter approach to provide more robust estimations. The following can be established from the findings. First, mobile phone penetration is: (1) negatively correlated with inflation with the effects more apparent in the lowest (0.10^{th}) and highest (0.90^{th}) quantiles; (2) negatively correlated with domestic investment in the middle (0.50^{th}) of the non-contemporary specification and (3) positively linked to education with more significance in the bottom quantiles of the distributions.

Second: (1) the relationship with Net Interest Margin (NIM) is not clear-cut because a bottom (top) quantile is positively (negatively) linked to the dependent variables; (2) the lending-deposit-rate is negatively correlated, with the nexus most apparent in bottom and top quantiles of non-contemporary specifications; (3) bank density is significantly positively correlated throughout the distributions, but for the 0.90^{th} (0.25^{th} & 0.75^{th}) quantile (s) in non-contemporary (contemporary) specifications and (4) Return on Equity (ROE) is positively correlated only in one (0.90^{th}) of the top quantiles.

Third: (1) GDP is only significant in the LHS, with mixed signs or a negative nexus in bottom quantiles (0.10^{th} & 0.25^{th}) and a positive relationship in a top quantile (0.90^{th}); (2) but for the 0.75^{th} (0.50^{th}) quantile in the LHS (RHS), population growth consistently exhibits a negative sign; (3) there is a threshold correlation with positive increasing magnitudes in the LHS (RHS) throughout the distribution (from the 0.25^{th} to the 0.90^{th} quantile) in urban population and (4) there is also threshold positive evidence in internet penetration from the 0.25^{th} to the 0.75^{th} quantile in the LHS and RHS.

Fourth: (1) the positive correlation of FDI is apparent only in the 0.90^{th} quantile of the LHS; (2) foreign aid is negatively correlated only in bottom quantiles; (3) the negative nexus of remittances is only apparent in the 0.90^{th} quantile of the LHS; (4) the positive relationship of regulation quality is consistently significant in the LHS and sparsely significant in the RHS (0.10^{th} & 0.50^{th}); (5) while the effect of human development is consistently significant across

specifications in the LHS and RHS; (6) domestic savings, regulation quality and patent applications are only significant in the bottom quantiles of the LHS and (7) the relationship of private credit is mixed, with negative and positive signs respectively in the 0.10^{th} and 0.50^{th} quantiles of the LHS and a positive sign in the RHS (0.25^{th} quantile).

Table 6: Conditional determinants of Mobile phone penetration

	Contemporary						Non-contemporary					
	OLS	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**	**OLS**	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**
Constant	**24.22***	4.014	17.76	33.17	56.613	**61.93*****	**30.34****	3.094	13.511	**32.7*****	21.139	**3.71***
	(0.069)	(0.489)	(0.515)	(0.118)	(0.473)	**(0.001)**	**(0.018)**	(0.729)	(0.802)	**(0.000)**	(0.750)	**(0.089)**
Trade	0.065	-0.021	-0.104	0.040	-0.175	0.140	0.071	0.036	0.023	-0.055	0.026	**0.59*****
	(0.692)	(0.646)	(0.525)	(0.825)	(0.817)	(0.168)	(0.682)	(0.574)	(0.956)	(0.189)	(0.960)	**(0.000)**
Inflation	**-1.17*****	**-0.89*****	-0.793	**-1.06***	-1.382	**-2.34*****	-0.755	**-2.9*****	-0.745	-0.394	-0.022	**-0.93*****
	(0.002)	**(0.001)**	(0.112)	**(0.090)**	(0.560)	**(0.000)**	(0.257)	**(0.000)**	(0.798)	(0.242)	(0.994)	**(0.000)**
Domestic Investment	-0.035	0.212	-0.098	-0.353	-0.503	0.559	**-0.73****	-0.356	-0.401	**-0.80*****	-0.252	**-0.98*****
	(0.926)	(0.214)	(0.900)	(0.473)	(0.815)	(0.219)	**(0.038)**	(0.179)	(0.788)	**(0.000)**	(0.900)	**(0.000)**
Education	**0.76*****	**0.79*****	**0.88*****	**0.708****	0.947	0.272	**0.80*****	**1.03*****	**0.904***	**0.96*****	0.840	**1.26*****
	(0.007)	**(0.000)**	**(0.000)**	**(0.030)**	(0.447)	(0.185)	**(0.001)**	**(0.000)**	**(0.066)**	**(0.000)**	(0.308)	**(0.000)**
Fisher	**20.03*****	---	---	---	---	---	**17.6*****	---	---	---	---	---
Adjusted/Pseudo R^2	0.435	0.450	0.402	0.415	0.374	0.319	0.390	0.311	0.323	0.419	0.398	0.372
Observations	23	23	23	23	23	23	22	22	22	22	22	22
	OLS	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**	**OLS**	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**
Constant	**74.08****	11.492	87.215	**90.6*****	**106.1***	**116.0*****	**71.2*****	**15.3*****	**65.7*****	**62.3*****	**91.3*****	**131.2*****
	(0.028)	(0.324)	(0.344)	**(0.006)**	**(0.060)**	**(0.000)**	**(0.000)**	**(0.006)**	**(0.001)**	**(0.005)**	**(0.005)**	**(0.000)**
Net Interest Margin	-5.445	**2.091****	-4.757	**-5.27****	-7.853	**-10.5*****	-2.412	**1.83*****	**-2.957***	-2.479	2.703	**-4.65****
	(0.113)	**(0.044)**	(0.689)	**(0.046)**	(0.163)	**(0.000)**	(0.115)	**(0.000)**	**(0.067)**	(0.254)	(0.286)	**(0.012)**
Lending Deposit Rate	**-0.651****	-0.321	-0.496	-0.735	-0.673	-0.037	**-0.88*****	**-1.19*****	-0.516	-0.519	**-1.206***	**-1.73*****
	(0.038)	(0.316)	(0.777)	(0.131)	(0.628)	(0.916)	**(0.001)**	**(0.000)**	(0.165)	(0.169)	**(0.063)**	**(0.000)**
Bank Density	**1.443****	**2.13*****	0.375	**1.481****	1.072	**0.666****	**1.59*****	**1.89*****	**0.922****	**1.93*****	**1.365****	0.666
	(0.040)	**(0.000)**	(0.867)	**(0.015)**	(0.186)	**(0.011)**	**(0.020)**	**(0.000)**	**(0.046)**	**(0.001)**	**(0.026)**	(0.112)
Return on Equity	1.277	-0.205	0.056	0.483	1.254	**2.073*****	0.121	0.123	-0.039	0.020	0.202	**0.419*****
	(0.238)	(0.576)	(0.981)	(0.604)	(0.641)	**(0.000)**	(0.328)	(0.126)	(0.594)	(0.882)	(0.337)	**(0.000)**
Fisher	**16.34*****	---	---	---	---	---	**18.3*****	---	---	---	---	---
Adjusted/Pseudo R^2	0.532	0.297	0.368	0.467	0.584	0.675	0.540	0.333	0.337	0.451	0.495	0.515
Observations	22	22	22	22	22	22	24	24	24	24	24	24
	OLS	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**	**OLS**	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**
Constant	**48.78*****	**66.3*****	**59.41****	29.82	**40.94***	**84.80*****	**31.35****	25.98	**43.91****	19.43	**43.9*****	**56.1*****
	(0.001)	**(0.000)**	**(0.010)**	(0.129)	**(0.085)**	**(0.000)**	**(0.015)**	(0.107)	**(0.049)**	(0.259)	**(0.008)**	**(0.000)**
GDP growth	-0.612	**-2.26*****	**-1.75****	-0.012	-0.961	**2.325*****	-0.238	-0.634	-0.590	-0.227	0.425	0.530
	(0.209)	**(0.000)**	**(0.034)**	(0.989)	(0.380)	**(0.000)**	(0.600)	(0.383)	(0.506)	(0.778)	(0.560)	(0.477)
Population growth	**-12.7*****	**-17.9*****	**-16.0*****	**-8.689***	-7.971	**-19.8*****	**-8.91****	**-10.05****	**-12.3****	-4.595	**-12.3****	**-16.2*****
	(0.005)	**(0.000)**	**(0.000)**	**(0.097)**	(0.334)	**(0.000)**	**(0.016)**	**(0.021)**	**(0.037)**	(0.331)	**(0.016)**	**(0.004)**
Urban population	**0.983*****	**0.48*****	**0.592****	**1.01*****	**1.04*****	**1.054*****	**0.93*****	**0.655****	**0.456****	**0.84*****	**1.08*****	**1.16*****
	(0.000)	**(0.000)**	**(0.018)**	**(0.000)**	**(0.003)**	**(0.000)**	**(0.000)**	**(0.025)**	**(0.049)**	**(0.000)**	**(0.000)**	**(0.000)**
Internet penetration	**0.862****	**0.80*****	**0.834***	**1.31*****	**1.597****	0.108	**1.14*****	**1.136****	**1.32****	**1.67*****	**1.210****	**1.080***
	(0.017)	**(0.000)**	**(0.097)**	**(0.003)**	**(0.015)**	(0.694)	**(0.007)**	**(0.027)**	**(0.046)**	**(0.000)**	**(0.041)**	**(0.091)**
Fisher	**27.63*****	---	---	---	---	---	**40.09*****	---	---	---	---	---
Adjusted/Pseudo R^2	0.660	0.500	0.423	0.463	0.493	0.572	0.669	0.423	0.398	0.475	0.498	0.551
Observations	44	44	44	44	44	44	45	45	45	45	45	45
	OLS	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**	**OLS**	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**
Contant	**86.71*****	**55.23*****	**78.8*****	**76.6*****	**107.6*****	**124.5*****	**71.1*****	**38.6*****	**49.9*****	**67.4*****	**85.8*****	**105.7*****
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Foreign Investment	0.481	0.031	0.075	0.115	0.727	**1.613***	0.182	0.326	-0.029	0.465	0.290	-0.647
	(0.235)	(0.943)	(0.839)	(0.614)	(0.184)	**(0.083)**	(0.784)	(0.818)	(0.953)	(0.651)	(0.782)	(0.716)
Foreign Aid	**-1.208***	-0.599	**-1.75*****	-0.303	-1.168	-1.673	-0.240	-0.091	**-0.79*****	-0.586	-0.204	-0.112
	(0.050)	(0.152)	**(0.001)**	(0.380)	(0.248)	(0.211)	(0.346)	(0.811)	**(0.000)**	(0.161)	(0.579)	(0.783)
Remittances	0.329	0.994	0.394	0.439	-1.047	**-1.734****	0.153	0.803	0.244	0.328	-0.876	-0.487
	(0.574)	(0.119)	(0.557)	(0.418)	(0.226)	**(0.014)**	(0.767)	(0.130)	(0.345)	(0.775)	(0.420)	(0.784)
Regulation Quality	**29.15*****	**33.65*****	**28.8*****	**28.5*****	**30.41***	**31.75*****	**27.5*****	**29.1*****	5.591	**26.90****	27.03	26.814
	(0.000)	**(0.000)**	**(0.001)**	**(0.000)**	**(0.98)**	**(0.003)**	**(0.000)**	**(0.002)**	(0.180)	**(0.012)**	(0.151)	(0.154)
Fisher	**6.778*****	---	---	---	---	---	6.56***	---	---	---	---	---
Adjusted/Pseudo R^2	0.385	0.312	0.259	0.267	0.292	0.433	0.226	0.215	0.172	0.189	0.269	0.264
Observations	36	36	36	36	36	36	36	36	36	36	36	36

	OLS	Q 0.10	Q 0.25	Q 0.50	Q 0.75	Q 0.90	OLS	Q 0.10	Q 0.25	Q 0.50	Q 0.75	Q 0.90
Constant	**-33.93***	**-34.05***	-7.423	-27.27	-54.44	-27.37	**-43.4*****	-43.03	-20.20	-33.69	**-57.03***	-49.37
	(0.077)	**(0.099)**	(0.719)	(0.177)	(0.288)	(0.419)	**(0.007)**	(0.224)	(0.479)	(0.142)	**(0.058)**	(0.234)
Human Development	**203.8*****	**162.2*****	**122.8*****	**185.7*****	**263.0*****	**245.9*****	**206.5*****	**172*****	**140*****	**189*****	**259*****	**245*****
	(0.000)	**(0.000)**	**(0.001)**	**(0.000)**	**(0.008)**	**(0.000)**	**(0.000)**	**(0.006)**	**(0.007)**	**(0.000)**	**(0.000)**	**(0.000)**
Domestic Savings	0.063	**0.210****	**0.214****	-0.109	0.051	-0.031	0.019	-0.061	0.093	-0.074	-0.143	0.072
	(0.624)	**(0.015)**	**(0.033)**	(0.421)	(0.858)	(0.814)	(0.861)	(0.673)	(0.621)	(0.663)	(0.440)	(0.706)
Regulation Quality	6.146	**10.32****	**14.17****	5.473	0.080	9.00	2.684	8.078	6.844	3.960	0.917	0.706
	(0.355)	**(0.012)**	**(0.048)**	(0.356)	(0.996)	(0.353)	(0.624)	(0.220)	(0.510)	(0.551	(0.909)	(0.953)
Patent Applications	**0.003*****	**0.006*****	**0.006*****	**0.004*****	0.001	-0.001	**0.001***	**0.005*****	**0.004*****	**0.002***	-0.0008	-0.001
	(0.003)	**(0.000)**	**(0.000)**	**(0.000)**	(0.514)	(0.416)	**(0.089)**	**(0.000)**	**(0.002)**	**(0.071)**	(0.580)	(0.549)
Fisher	**201.4*****	---	---	---	---	---	**125.2*****	---	---	---	---	---
Adjusted/Pseudo R^2	0.664	0.487	0.449	0.440	0.479	0.566	0.661	0.434	0.435	0.471	0.518	0.473
Observations	41	41	41	41	41	41	41	41	41	41	41	41
	OLS	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**	**OLS**	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**
Constant	-7.183	-27.82	-29.56	-19.73	-46.08	1.246	**-43.00****	**-75.41****	-39.44	-36.61	-43.58	**-140*****
	(0.772)	(0.256)	(0.420)	(0.570)	(0.573)	(0.976)	**(0.024)**	**(0.023)**	(0.117)	(0.124)	(0.514)	**(0.000)**
Human Development	**169*****	**181.6*****	**158.2****	**162.5*****	**252.5***	**209*****	**196.6*****	**193.6*****	**137*****	**177*****	**246****	**342.2*****
	(0.000)	**(0.000)**	**(0.012)**	**(0.003)**	**(0.067)**	**(0.001)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.025)**	**(0.000)**
Household expenditure	-0.110	-0.082	0.143	0.008	-0.077	-0.140	0.072	**0.267****	0.100	0.078	-0.081	**0.807*****
	(0.467)	(0.373)	(0.349)	(0.963)	(0.811)	(0.586)	(0.511)	**(0.037)**	(0.438)	(0.488)	(0.796)	**(0.000)**
Regulation Quality	10.98	**10.89****	5.540	9.606	-1.303	15.984	2.357	-2.251	-6.664	4.951	2.933	-6.846
	(0.199)	**(0.011)**	(0.549)	(0.298)	(0.959)	(0.411)	(0.718)	(0.682)	(0.266)	(0.429)	(0.878)	(0.263)
Private Credit	0.058	**-0.145***	-0.043	**0.260****	0.103	-0.055	0.020	0.059	**0.335*****	0.123	-0.064	-0.152
	(0.287)	**(0.094)**	(0.775)	**(0.035)**	(0.806)	(0.834)	(0.875)	(0.451)	**(0.000)**	(0.144)	(0.717)	(0.129)
Fisher	**9.486*****	---	---	---	---	---	**14.99*****	---	---	---	---	---
Adjusted/Pseudo R^2	0.651	0.487	0.474	0.467	0.464	0.543	0.628	0.476	0.471	0.490	0.476	0.426
Observations	32	32	32	32	32	32	34	34	34	34	34	34

Notes. Dependent variable is Mobile Phone Penetration. *,**,***, denote significance levels of 10%, 5% and 1% respectively. Lower quantiles (e.g., Q 0.1) signify nations where the Mobile Phone Penetration is least. OLS: Ordinary Least Squares. In some specifications, non-contemporary observations may exceed contemporary-observations if there are missing observations in the latter.

4.2 Conditional Mobile Banking Determinants

This section presents the findings of conditional determinants of mobile banking, composed of the use of mobile phones to: (i) pay bills and (ii) receive/send money. The following findings can be established for Table 7 on mobiles used to pay bills. First: (1) while the correlation with trade is mixed in the RHS with negative and positive signs in the a bottom (0.10^{th}) and a top (0.90^{th}) quantile, but for the 0.25^{th}, it is consistently positive throughout the distribution on the LHS; (2) the nexus with inflation is also mixed, with positive relationships in a bottom (0.10^{th}) quantile and top (0.75^{th} & 0.90^{th}) quantiles in the RHS, it is negatively linked to the dependent variable in a bottom (0.10^{th}) quantile of the LHS; (3) the correlation with domestic investment is only in a top or 0.90^{th} (bottom or 0.10^{th}) quantile of the RHS (LHS); (4) the relationship with education is mixed, with a negative sign in the 0.90^{th} quantile of both contemporary and non-contemporary specifications and only a positive in the 0.10^{th} quantile of the latter specification; (5) the relationships of NIM, lending-deposit-rate and bank density are consistently negative in the 0.10^{th} and 0.50^{th} in LHS and in the 0.50^{th} quantile of the RHS and (6) in the RHS, the nexus with the dependent variable is negative for the lending-deposit-rate in the 0.10^{th} quantile and positive for ROE in the 0.50^{th} quantile.

Second: (1) while but for the 0.75th quantile, the relationship with internet penetration is consistently positive in the LHS, it is only positive in bottom (0.25th) and top (0.90th) on the RHS; (2) the nexus of growth is negative in a top (0.90th) quantile and positive in a bottom (0.10th) quantile in the LHS and RHS respectively; (3) the nexus with population is only significantly negative in a bottom (0.10th) of the LHS; (4) the relationship with urban population is positive in a top (0.90th) quantile in both the LHS and RHS and only significantly negative in the 0.10th quantile of the RHS.

Third: (1) the nexus with FDI is positive in bottom quantiles of the LHS and negative only in a top (0.90th) quantile of the RHS; (2) while the nexus with foreign aid is negative in a bottom (0.25th) quantile and a top (0.90th) quantile in the LHS while, in the RHS, it is positive in the bottom quantiles and a top (0.90th) quantile; (3) the relationship with remittances is positive in the bottom-half of the LHS and only in a bottom (0.10th) quantile of the RHS and; (4) regulation quality is positively significant only in the bottom quantiles, at the 0.10th quantile of the LHS and 0.10th and 0.25th quantiles of the RHS.

Fourth: (1) human development is positively significant in the bottom-halves of the distribution and only in the 0.90th quantile of the RHS; (2) domestic savings are only negatively significant in the 0.25th of the LHS and RHS; (3) 'patent applications' is positively significant in the bottom-halves of the distribution and only negative in the 0.90th of the RHS; (4) household expenditure (regulation quality) is negative only in the 0.10th (0.90th) quantile of the RHS (LHS), while the positive effect of private credit is only significant in the bottom quantiles of the RHS.

Table 7: Conditional determinants of Mobile usage for Bills payment

	Contemporary						Non-contemporary					
	OLS	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**	**OLS**	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**
Constant	-0.572	0.032	-0.238	-0.068	-0.440	-1.434	2.825	**-1.24*****	-.679	0.226	0.013	0.818
	(0.413)	(0.813)	(0.915)	(0.970)	(0.834)	(0.224)	(0.356)	**(0.003)**	(0.821)	(0.975)	(0.998)	(0.449)
Trade	**0.045****	**0.004*****	0.011	**0.051*****	**0.062****	**0.055*****	0.042	**-0.009*****	0.005	0.042	0.037	**0.08*****
	(0.010)	**(0.009)**	(0.628)	**(0.004)**	**(0.018)**	**(0.000)**	(0.112)	**(0.000)**	(0.788)	(0.231)	(0.179)	**(0.000)**
Inflation	-0.094	**-0.044*****	0.025	-0.038	-0.058	-0.026	0.195	**0.071*****	0.073	0.095	**0.609****	**0.53*****
	(0.214)	**(0.000)**	(0.832)	(0.728)	(0.383)	(0.585)	(0.310)	**(0.000)**	(0.567)	(0.757)	**(0.044)**	**(0.000)**
Domestic Investment	0.0004	0.005	-0.005	-0.058	0.018	**0.071****	-0.110	**0.040*****	0.010	-0.045	0.012	-0.022
	(0.991)	(0.260)	(0.944)	(0.332)	(0.741)	**(0.042)**	(0.339)	**(0.002)**	(0.891)	(0.841)	(0.949)	(0.483)
Education	-0.024	0.0003	-0.0001	-0.028	-0.058	**-0.036****	-0.054	**0.033*****	0.015	-0.028	-0.052	**-0.10*****
	(0.277)	(0.878)	(0.997)	(0.298)	(0.110)	**(0.032)**	(0.209)	**(0.000)**	(0.462)	(0.637)	(0.300)	**(0.000)**
Fisher	**5.878*****	---	---	---	---	---	0.935	---	---	---	---	---
Adjusted/Pseudo R^2	0.4200	0.061	0.080	0.320	0.526	0.643	0.473	0.131	0.096	0.200	0.380	0.608
Observations	20	20	20	20	20	20	18	18	18	18	18	18
	OLS	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**	**OLS**	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**
Constant	**7.993****	**4.94*****	**9.627***	**12.05*****	12.23	3.242	**5.96****	**2.409*****	3.653	**8.52*****	6.487	4.930
	(0.038)	**(0.000)**	**(0.092)**	**(0.003)**	(0.462)	(0.726)	**(0.027)**	**(0.005)**	(0.125)	**(0.000)**	(0.675)	(0.445)
Net Interest Margin	-0.316	**-0.26*****	-0.533	**-0.583***	-0.566	0.657	-0.038	-0.087	-0.078	**-0.28****	0.079	-0.098
	(0.269)	**(0.000)**	(0.361)	**(0.072)**	(0.690)	(0.671)	(0.814)	(0.166)	(0.666)	**(0.015)**	(0.929)	(0.787)
Lending Deposit	-0.115	**-0.073*****	-0.131	**-0.16*****	-0.189	-0.124	**-0.14****	**-0.054****	-0.085	**-0.18*****	-0.170	-0.120

Rate												
	(0.165)	**(0.000)**	(0.163)	**(0.004)**	(0.569)	(0.679)	**(0.015)**	**(0.010)**	(0.178)	**(0.000)**	(0.593)	(0.506)
Bank Density	-0.085	**-0.099*****	-0.264	**-0.351****	-0.382	**1.185***	-0.090	-0.013	-0.078	**-0.28*****	-0.209	**0.869***
	(0.776)	**(0.001)**	(0.269)	**(0.020)**	(0.767)	**(0.089)**	(0.698)	(0.718)	(0.558)	**(0.001)**	(0.844)	**(0.073)**
Return on Equity	-0.003	-0.009	-0.033	-0.063	-0.023	-0.200	0.030	-0.001	0.004	**0.019*****	0.024	0.080
	(0.969)	(0.566)	(0.767)	(0.357)	(0.957)	(0.584)	(0.189)	(0.735)	(0.604)	**(0.007)**	(0.759)	(0.172)
Fisher	**2.710***	---	---	---	---	---	**4.51****	---	---	---	---	---
Adjusted/Pseudo R^2	-0.142	0.383	0.315	0.320	0.200	0.219	-0.057	0.254	0.181	0.206	0.146	0.315
Observations	18	18	18	18	18	18	20	20	20	20	20	20
	OLS	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**	**OLS**	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**
Constant	-1.714	0.122	0.503	1.449	-3.794	0.229	-1.198	**0.392****	0.525	1.613	-2.554	-2.006
	(0.612)	(0.566)	(0.462)	(0.400)	(0.740)	(0.891)	(0.701)	**(0.010)**	(0.552)	(0.593)	(0.861)	(0.328)
GDP growth	-0.090	0.017	0.015	-0.006	-0.146	**-0.40*****	0.058	**0.027*****	0.057	-0.004	0.109	0.022
	(0.482)	(0.475)	(0.714)	(0.956)	(0.755)	**(0.002)**	(0.494)	**(0.002)**	(0.191)	(0.967)	(0.769)	(0.815)
Population growth	0.842	-0.031	-0.013	-0.361	1.947	0.091	0.642	**-0.076****	-0.206	-0.393	1.033	0.291
	(0.376)	(0.599)	(0.943)	(0.462)	(0.539)	(0.827)	(0.463)	**(0.040)**	(0.375)	(0.634)	(0.797)	(0.593)
Urban population	0.034	-0.001	-0.008	0.003	0.046	**0.149*****	0.023	**-0.008*****	-0.0002	0.007	0.029	**0.10*****
	(0.381)	(0.565)	(0.312)	(0.848)	(0.685)	**(0.000)**	(0.564)	**(0.000)**	(0.982)	(0.844)	(0.825)	**(0.001)**
Internet penetration	**0.170***	**0.047*****	**0.044*****	**0.139*****	0.259	**0.39*****	0.167	**0.059*****	0.039	0.115	0.312	**0.86*****
	(0.092)	**(0.000)**	**(0.008)**	**(0.002)**	(0.310)	**(0.000)**	(0.133)	**(0.000)**	(0.177)	(0.263)	(0.335)	**(0.000)**
Fisher	1.138	---	---	---	---	---	1.230	---	---	---	---	---
Adjusted/Pseudo R^2	0.118	0.134	0.111	0.159	0.126	0.344	-0.000	0.128	0.110	0.109	0.112	0.185
Observations	34	34	34	34	34	34	35	35	35	35	35	35
	OLS	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**	**OLS**	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**
Constant	**3.03*****	**0.530*****	0.567	**1.185****	4.266	7.338	**2.96****	-0.084	0.442	0.820	4.727	**8.92*****
	(0.003)	**(0.002)**	(0.130)	**(0.014)**	(0.489)	(0.117)	**(0.014)**	(0.750)	(0.150)	(0.449)	(0.288)	**(0.003)**
Foreign Investment	0.025	**0.052*****	**0.050***	0.024	0.102	0.161	-0.105	0.021	0.009	0.075	-0.336	**-0.77*****
	(0.582)	**(0.000)**	**(0.073)**	(0.284)	(0.572)	(0.331)	(0.504)	(0.399)	(0.836)	(0.619)	(0.474)	**(0.000)**
Foreign Aid	-0.108	**-0.05*****	-0.037	-0.010	-0.174	**-0.350***	0.024	**0.042*****	**0.043*****	0.017	0.082	**0.17*****
	(0.155)	**(0.000)**	(0.207)	(0.761)	(0.620)	**(0.089)**	(0.509)	**(0.000)**	**(0.001)**	(0.670)	(0.388)	**(0.000)**
Remittances	0.090	**0.176*****	**0.119****	**0.139*****	0.020	-0.171	0.010	**0.056*****	0.025	0.122	0.030	-0.023
	(0.144)	**(0.000)**	**(0.020)**	**(0.000)**	(0.944)	(0.369)	(0.910)	**(0.000)**	(0.343)	(0.100)	(0.893)	(0.702)
Regulation Quality	-0.853	**1.060*****	0.400	0.674	-0.973	-6.311	-0.144	**0.930*****	**1.127*****	0.694	-1.574	-1.540
	(0.596)	**(0.000)**	(0.367)	(0.270)	(0.905)	(0.107)	(0.923)	**(0.000)**	**(0.000)**	(0.606)	(0.766)	(0.440)
Fisher	3.270	---	---	---	---	---	0.195	---	---	---	---	---
Adjusted/Pseudo R^2	-0.087	0.080	0.070	0.129	0.108	0.149	-0.154	0.071	0.052	0.064	0.044	0.282
Observations	27	27	27	27	27	27	27	27	27	27	27	27
	OLS	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**	**OLS**	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**
Constant	**-5.083***	-1.108	-1.512	-2.719	-6.410	-15.11	-3.550	-1.044	**-2.867***	-2.454	-5.586	**-14.18***
	(0.072)	(0.119)	(0.315)	(0.242)	(0.500)	(0.177)	(0.105)	(0.110)	**(0.050)**	(0.447)	(0.490)	**(0.082)**
Human Development	**15.61****	**3.75*****	**5.053***	**8.337***	19.306	37.75	**12.8*****	**3.45*****	**7.464****	8.347	17.069	**41.27****
	(0.012)	**(0.007)**	**(0.076)**	**(0.071)**	(0.284)	(0.108)	**(0.007)**	**(0.005)**	**(0.011)**	(0.191)	(0.279)	**(0.011)**
Domestic Savings	-0.030	-0.005	**-0.016****	-0.013	-0.044	0.021	-0.027	-0.006	**-0.022****	-0.025	-0.037	-0.009
	(0.121)	(0.293)	**(0.040)**	(0.401)	(0.444)	(0.759)	(0.161)	(0.228)	**(0.023)**	(0.329)	(0.650)	(0.889)
Regulation Quality	-1.377	0.093	-0.360	-0.603	-1.884	-5.481	-0.985	-0.024	-0.750	-0.513	-1.979	-2.692
	(0.228)	(0.736)	(0.417)	(0.337)	(0.516)	(0.240)	(0.323)	(0.918)	(0.131)	(0.564)	(0.454)	(0.492)
Patent Applications	0.000	**0.0004*****	**0.0004*****	**0.0001****	-0.000	-0.0004	0.0001	**0.0005*****	**0.0005*****	**0.0003***	0.00007	**-0.001***
	(0.713)	**(0.000)**	**(0.000)**	**(0.012)**	(0.987)	(0.591)	(0.461)	**(0.000)**	**(0.000)**	**(0.055)**	(0.850)	**(0.094)**
Fisher	**10.91*****	---	---	---	---	---	**8.64*****	---	---	---	---	---
Adjusted/Pseudo R^2	0.014	0.117	0.136	0.153	0.143	0.160	-0.022	0.119	0.135	0.152	0.112	0.121
Observations	34	34	34	34	34	34	34	34	34	34	34	34
	OLS	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**	**OLS**	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**
Constant	**-8.259****	-0.878	-2.269	-6.915	-10.27	-13.488	**-5.52***	0.402	-0.884	-4.877	-4.696	-13.853
	(0.044)	(0.571)	(0.411)	(0.474)	(0.666)	(0.297)	**(0.089)**	(0.520)	(0.693)	(0.577)	(0.779)	(0.166)
Human Development	**15.49****	2.867	3.924	11.316	18.578	**40.81***	**11.43****	-1.073	0.674	7.922	10.06	**39.64***
	(0.033)	(0.192)	(0.307)	(0.398)	(0.621)	**(0.076)**	**(0.036)**	(0.189)	(0.818)	(0.493)	(0.654)	**(0.063)**
Household expenditure	0.034	0.001	0.016	0.035	0.051	-0.047	0.025	**-0.005***	0.007	0.029	0.037	-0.008
	(0.165)	(0.706)	(0.216)	(0.476)	(0.664)	(0.587)	(0.343)	**(0.061)**	(0.592)	(0.587)	(0.696)	(0.936)
Regulation Quality	-2.033	0.256	-0.194	-1.403	-1.371	**-7.134***	-1.545	-0.303	-0.489	-0.607	-1.195	-4.747
	(0.243)	(0.426)	(0.787)	(0.554)	(0.868)	**(0.050)**	(0.294)	(0.120)	(0.419)	(0.766)	(0.745)	(0.497)
Private Credit	0.011	0.001	0.0007	0.017	0.001	0.019	0.014	**0.034*****	**0.025****	0.018	0.006	-0.033
	(0.321)	(0.541)	(0.945)	(0.485)	(0.992)	(0.791)	(0.252)	**(0.000)**	**(0.014)**	(0.404)	(0.883)	(0.657)
Fisher	1.744	---	---	---	---	---	2.069	---	---	---	---	---
Adjusted/Pseudo R^2	-0.040	0.085	0.076	0.114	0.129	0.243	-0.070	0.060	0.077	0.108	0.108	0.160
Observations	28	28	28	28	28	28	30	30	30	30	30	30

Notes. Dependent variable is Mobile Bill payment . *,**,***, denote significance levels of 10%, 5% and 1% respectively. Lower quantiles (e.g., Q 0.1) signify nations where the dependent variable is least. OLS: Ordinary Least Squares. OLS: Ordinary Least Squares. In some specifications, non-contemporary observations may exceed contemporary-observations if there are missing observations in the latter.

Table 8 below provides results on factors determining the usage of the mobile phone for services of receiving/sending money. The following findings can be established. First: (1) the correlation with trade is positive in the 0.10^{th} and 0.90^{th} quantiles of the LHS and negative in the 0.90^{th} quantile of the RHS; (2) inflation is positively significant in the 0.10^{th} (0.50^{th}) quantile of the LHS (RHS) while domestic investment is negatively significant only in a top quantile (0.90^{th}) of the LHS and RHS and (3) while, education is negatively correlated in the 0.10^{th} and 0.90^{th} quantiles of the LHS, it is positively linked to the dependent variable in the bottom quantiles of the RHS.

Second: (1) but for ROE which is also significant in the 0.25^{th} quantile on the RHS, the relationships with NIM, lending-deposit-rate, bank density and ROE are only significant in the 0.10^{th} quantiles of the LHS and RHS and (2) the nexus of bank density is positive while those of the other three are negative.

Third: (1) the increasing negative relationship with growth is only apparent in the LHS and consistently significant with the exception of the 0.75^{th} quantile while the positive effect of population is also visible only at the 0.10^{th} quantile of the LHS and; (2) the nexus with urban population is negative (positive) at the 0.10^{th} (0.25^{th}) quantile whereas there is some evidence of increasing correlation with internet penetration from the 0.25^{th} to the 0.90^{th} in the LHS and from the 0.10^{th} to the 0.90^{th} (with exceptions of the 0.50^{th} & 0.75^{th}) in the RHS.

Fourth: (1) FDI is positively significant only in the 0.10^{th} quantile of the LHS and RHS; (2) foreign aid is negatively correlated in the bottom quantiles of the LHS and positively linked to the dependent variable in the 0.10^{th} quantile of the RHS while remittances are positively correlated in the bottom quantiles of the LHS and negatively linked in the 0.10^{th} quantile of the RHS and (3) regulation quality is only significant in the LHS with a positive (negative) correlation in the 0.10^{th} (0.25^{th}) quantile.

Fifth: (1) human development is consistently positively significant with some threshold effect from the 0.10^{th} to the 0.75^{th} quantile in the LHS; (2) domestic savings (regulation quality) are only negatively significant in the 0.10^{th} (0.50^{th}) quantile while household expenditure (private credit) is positively significant in the 0.25^{th} (0.10^{th}) quantile in both sides of the specifications and ; (3) the nexus of patent applications is positive in the 0.10^{th} quantile for both sides while negatively significant only in the 0.75^{th} of the RHS.

Table 8: Conditional determinants of Mobile usage for Receiving/Sending money

	Contemporary						Non-contemporary					
	OLS	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**	**OLS**	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**
Constant	0.596	-0.120	-0.923	-1.466	5.013	**15.19*** **	3.711	**-7.87***	-3.061	0.540	27.84	**36.6*** **
	(0.837)	(0.704)	(0.560)	(0.755)	(0.509)	**(0.000)**	(0.650)	**(0.092)**	(0.486)	(0.884)	(0.350)	**(0.001)**
Trade	**0.068***	**0.006** **	0.016	0.033	0.090	**0.054*** **	0.002	0.005	-0.012	0.026	-0.0008	**-0.14*** **
	(0.050)	**(0.011)**	(0.178)	(0.395)	(0.227)	**(0.000)**	(0.950)	(0.819)	(0.555)	(0.223)	(0.995)	**(0.003)**
Inflation	-0.128	**0.064*** **	-0.038	0.028	-0.152	-0.012	0.253	0.018	0.062	**0.55*** **	-0.455	-0.517
	(0.399)	**(0.001)**	(0.629)	(0.881)	(0.176)	(0.821)	(0.423)	(0.929)	(0.773)	**(0.003)**	(0.683)	(0.163)
Domestic Investment	-0.119	0.003	0.019	-0.018	-0.248	**-0.44*** **	-0.059	0.177	0.089	-0.062	-0.653	**-0.407***
	(0.437)	(0.704)	(0.668)	(0.912)	(0.473)	**(0.000)**	(0.811)	(0.191)	(0.482)	(0.560)	(0.550)	**(0.091)**
Education	0.009	**-0.011** **	0.003	0.050	-0.022	**-0.04*** **	0.065	**0.106** **	**0.100*** **	0.035	-0.037	0.096
	(0.789)	**(0.036)**	(0.889)	(0.422)	(0.775)	**(0.008)**	(0.279)	**(0.011)**	**(0.002)**	(0.216)	(0.826)	(0.389)
Fisher	**3.129** **	---	---	---	---	---	1.393	---	---	---	---	---
Adjusted/Pseudo R^2	0.292	0.093	0.121	0.224	0.362	0.476	-0.169	0.084	0.129	0.212	0.132	0.199
Observations	20	20	20	20	20	20	18	18	18	18	18	18
	OLS	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**	**OLS**	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**
Constant	**11.352***	**7.70*** **	5.409	9.564	11.515	9.878	**15.78** **	**1.68*** **	3.764	8.019	17.73	30.09
	(0.067)	**(0.000)**	(0.292)	(0.612)	(0.874)	(0.877)	**(0.031)**	**(0.002)**	(0.135)	(0.248)	(0.792)	(0.627)
Net Interest Margin	0.409	**-0.29*** **	-0.287	-0.299	-0.049	0.161	-0.060	0.029	-0.058	0.087	0.110	0.091
	(0.685)	**(0.000)**	(0.579)	(0.875)	(0.993)	(0.986)	(0.879)	(0.531)	(0.764)	(0.838)	(0.982)	(0.983)
Lending Deposit Rate	**-0.374***	**-0.05*** **	-0.067	-0.150	-0.445	-0.525	**-0.35** **	**-0.025***	-0.069	-0.187	-0.428	-0.731
	(0.078)	**(0.000)**	(0.420)	(0.664)	(0.693)	(0.772)	**(0.040)**	**(0.096)**	(0.323)	(0.309)	(0.752)	(0.592)
Bank Density	-0.128	**0.10*** **	0.123	-0.055	-0.381	-0.541	-0.403	**0.28*** **	0.199	-0.039	-0.533	-0.731
	(0.638)	**(0.006)**	(0.573)	(0.951)	(0.917)	(0.853)	(0.277)	**(0.000)**	(0.184)	(0.912)	(0.902)	(0.592)
Return on Equity	0.032	**-0.16*** **	-0.018	-0.034	0.480	0.699	0.022	**-0.07*** **	**-0.06*** **	-0.041	0.001	-1.152
	(0.885)	**(0.000)**	(0.855)	(0.931)	(0.790)	(0.751)	(0.723)	**(0.000)**	**(0.000)**	(0.148)	(0.997)	(0.717)
Fisher	1.345	---	---	---	---	---	**3.108** **	---	---	---	---	---
Adjusted/Pseudo R^2	-0.227	0.199	0.178	0.102	0.139	0.123	-0.197	0.180	0.165	0.122	0.100	0.111
Observations	18	18	18	18	18	18	20	20	20	20	20	20
	OLS	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**	**OLS**	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**
Constant	-9.544	**-1.851** **	-2.171	7.675	-9.772	-13.46	-7.306	**0.948***	**-5.396** **	-7.849	-0.323	-21.938
	(0.354)	**(0.023)**	(0.461)	(0.102)	(0.655)	(0.647)	(0.401)	**(0.052)**	**(0.020)**	(0.443)	(0.991)	(0.576)
GDP growth	**-0.77** **	**-0.13*** **	**-0.254***	**-0.69** **	-0.661	**-1.304***	0.208	0.047	0.161	0.156	0.100	0.289
	(0.026)	**(0.009)**	**(0.099)**	**(0.042)**	(0.391)	**(0.055)**	(0.393)	(0.197)	(0.181)	(0.759)	(0.929)	(0.647)
Population growth	3.633	**0.666*** **	0.590	-1.336	4.018	1.580	2.487	-0.134	0.908	1.473	1.133	4.031
	(0.233)	**(0.000)**	(0.516)	(0.300)	(0.460)	(0.757)	(0.317)	(0.395)	(0.183)	(0.607)	(0.881)	(0.597)
Urban population	0.158	-0.004	0.039	-0.004	0.140	0.495	0.097	**-0.025*** **	**0.059** **	0.119	-0.019	0.366
	(0.450)	(0.548)	(0.276)	(0.950)	(0.674)	(0.166)	(0.650)	**(0.004)**	**(0.019)**	(0.373)	(0.973)	(0.527)
Internet penetration	**0.763***	**0.256*** **	**0.254*** **	**0.50*** **	**1.010** **	**2.270*** **	0.701	**0.102*** **	**0.300*** **	0.290	1.245	**3.050** **
	(0.076)	**(0.000)**	**(0.006)**	**(0.001)**	**(0.038)**	**(0.000)**	(0.155)	**(0.000)**	**(0.000)**	(0.271)	(0.279)	**(0.040)**
Fisher	**2.922** **	---	---	---	---	---	1.159	---	---	---	---	---
Adjusted/Pseudo R^2	0.223	0.121	0.132	0.154	0.265	0.425	0.017	0.050	0.088	0.097	0.156	0.257
Observations	34	34	34	34	34	34	35	35	35	35	35	35
	OLS	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**	**OLS**	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**
Constant	**9.388** **	**0.883*** **	**1.855** **	4.332	11.719	19.027	**9.088***	0.071	0.735	**4.39***	8.919	24.844
	(0.014)	**(0.000)**	**(0.031)**	(0.108)	(0.158)	(0.431)	**(0.054)**	(0.577)	(0.457)	**(0.080)**	(0.192)	(0.420)
Foreign Investment	-0.002	**0.06*** **	0.024	0.029	0.274	-0.189	-0.059	**0.050*** **	0.053	-0.076	0.786	1.476
	(0.987)	**(0.000)**	(0.625)	(0.849)	(0.403)	(0.829)	(0.875)	**(0.000)**	(0.711)	(0.798)	(0.331)	(0.484)
Foreign Aid	-0.286	**-0.11*** **	**-0.18*** **	-0.029	-0.522	-0.744	-0.051	**0.013*** **	-0.021	0.033	-0.270	-0.498
	(0.147)	**(0.000)**	**(0.004)**	(0.879)	(0.436)	(0.430)	(0.693)	**(0.001)**	(0.619)	(0.758)	(0.330)	(0.279)
Remittances	0.186	**0.131*** **	**0.160** **	0.083	-0.251	1.543	-0.057	**-0.025*** **	-0.054	0.087	-0.371	-0.860
	(0.531)	**(0.000)**	**(0.025)**	(0.647)	(0.633)	(0.342)	(0.688)	**(0.001)**	(0.625)	(0.553)	(0.319)	(0.259)
Regulation Quality	-2.390	**0.348** **	**-1.797** **	1.361	-5.573	-7.853	-0.372	-0.006	-0.164	1.421	-5.846	3.490
	(0.579)	**(0.046)**	**(0.068)**	(0.703)	(0.668)	(0.708)	(0.930)	(0.935)	(0.870)	(0.642)	(0.518)	(0.876)
Fisher	-0.119	---	---	---	---	---	0.228	---	---	---	---	---
Adjusted/Pseudo R^2	1.394	0.045	0.043	0.043	0.085	0.163	-0.163	0.036	0.011	0.031	0.076	0.073
Observations	27	27	27	27	27	27	27	27	27	27	27	27
	OLS	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**	**OLS**	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**
Constant	**-19.71***	-1.760	-5.050	**-14.12***	-25.16	-38.29	-17.11	-1.871	-4.725	**-11.92***	-28.76	-28.95
	(0.083)	(0.171)	(0.424)	**(0.061)**	(0.497)	(0.429)	(0.107)	(0.133)	(0.329)	**(0.082)**	(0.104)	(0.541)
Human Development	**55.31** **	**5.587** **	15.66	**32.71** **	74.98	122.67	**51.63** **	**5.484** **	**15.29***	**30.12** **	**85.31** **	103.14
	(0.031)	**(0.024)**	(0.177)	**(0.022)**	(0.292)	(0.224)	**(0.024)**	**(0.018)**	**(0.076)**	**(0.021)**	**(0.017)**	(0.237)
Domestic Savings	0.007	**-0.016***	-0.034	0.065	0.011	-0.043	0.011	**-0.016***	-0.035	-0.027	0.137	0.056
	(0.937)	**(0.088)**	(0.363)	(0.205)	(0.954)	(0.899)	(0.897)	**(0.095)**	(0.207)	(0.576)	(0.387)	(0.852)
Regulation Quality	-3.206	-0.078	0.487	**-5.60** **	-2.539	-0.457	-2.200	-0.222	0.497	**-4.032***	-0.611	2.087
	(0.452)	(0.876)	(0.835)	**(0.019)**	(0.811)	(0.986)	(0.613)	(0.626)	(0.730)	**(0.065)**	(0.909)	(0.939)
Patent Applications	-0.001	**0.0005*** **	0.0001	-0.00007	-0.002	-0.004	-0.001	**0.0006*** **	0.0001	0.000	**-0.003*** **	-0.005
	(0.184)	**(0.000)**	(0.624)	(0.780)	(0.210)	(0.230)	(0.188)	**(0.000)**	(0.628)	(0.974)	**(0.000)**	(0.114)
Fisher	1.403	---	---	---	---	---	1.478	---	---	---	---	---

Adjusted/Pseudo R²	0.027	0.032	0.061	0.113	0.197	0.265	0.017	0.035	0.067	0.104	0.188	0.259
Observations	34	34	34	34	34	34	34	34	34	34	34	34
	OLS	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**	**OLS**	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**
Constant	**-19.15***	-2.262	-16.101	-16.967	-25.98	-24.628	**-20.08***	-1.985	**-19.92****	-18.00	-20.33	-35.43
	(0.098)	(0.640)	(0.141)	(0.147)	(0.330)	(0.770)	**(0.069)**	(0.592)	**(0.021)**	(0.192)	(0.620)	(0.724)
Human Development	**45.25****	4.662	21.06	**35.00****	**83.90****	96.67	**47.1*****	3.960	**26.11****	**34.01***	61.69	126.79
	(0.030)	(0.404)	(0.153)	**(0.035)**	**(0.040)**	(0.482)	**(0.009)**	(0.321)	**(0.027)**	**(0.063)**	(0.257)	(0.389)
Household expenditure	0.078	0.002	**0.093***	0.023	0.016	0.034	0.071	0.004	**0.107****	0.046	-0.002	-0.012
	(0.383)	(0.906)	**(0.063)**	(0.684)	(0.890)	(0.941)	(0.360)	(0.860)	**(0.024)**	(0.557)	(0.991)	(0.972)
Regulation Quality	-1.481	0.345	-2.287	**-5.879***	-0.603	5.793	-3.205	0.264	**-3.103**	-5.23	-4.771	0.996
	(0.720)	(0.804)	(0.476)	**(0.053)**	(0.934)	(0.785)	(0.578)	(0.781)	**(0.182)**	(0.113)	(0.695)	(0.985)
Private Credit	-0.049	**0.030*****	0.023	0.005	-0.166	-0.260	-0.043	**0.030*****	0.023	0.005	-0.080	-0.270
	(0.385)	**(0.002)**	(0.553)	(0.852)	(0.123)	(0.299)	(0.455)	**(0.000)**	(0.446)	(0.851)	(0.526)	(0.356)
Fisher	1.545	---	---	---	---	---	2.02	---	---	---	---	---
Adjusted/Pseudo R²	-0.090	0.049	0.095	0.129	0.155	0.184	-0.078	0.026	0.072	0.130	0.156	0.101
Observations	28	28	28	28	28	28	30	30	30	30	30	30

Notes. Dependent variable is Mobile Phone used for Sending/Receiving money. *,**,***, denote significance levels of 10%, 5% and 1% respectively. Lower quantiles (e.g., Q 0.1) signify nations where the dependent variable is least. In some specifications, non-contemporary observations may exceed contemporary-observations if there are missing observations in the latter.

Table 9 below shows results on factors determining the usage of the mobile phone for banking services. The following can be established with respect to the nexuses with the mobile banking composite indicator. First: (1) the correlation with trade openness is positive in the LHS, while it is negative in the RHS: (2) inflation is only positively significant in a top (0.90^{th}) quantile in both contemporary and non-contemporary specifications; (3) the relationship with domestic investment is mixed, with a negative sign in a top quantile (0.90^{th}) and a positive sign only the 0.10^{th} quantile of the LHS and (4) the relationship with education also has mixed signs, with a negative (positive) correlation in the LHS (RHS) for a bottom or 0.10^{th} and top quantiles (bottom quantiles).

Second: (1) while the negative relationship of NIM is only apparent in a bottom (or 0.10^{th}) quantile of the LHS, the nexuses with bank density and ROE are respectively positive and negative only in a bottom (or 0.10^{th}) quantile of the RHS and (2) the lending-deposit-rate is negatively significant only in the bottom quantiles.

Third: (1) the correlation of growth is negative (positive) in the 0.50^{th} (0.25^{th}) quantile of the LHS (RHS); (2) population growth and urban population density are negatively significant only in a bottom (or 0.10^{th}) quantile of the RHS while the nexus with internet penetration is increasingly positive on both sides, with some evidence of a threshold in the LHS (with a slight exception of the insignificant 0.75^{th} quantile).

Fourth: (1) FDI is only positively correlated in a bottom (or 0.10^{th}) quantile of the LHS while the relationship with foreign aid is negatively (positively) significant in bottom quantiles of the LHS (RHS); (2) remittances are positive only in the bottom quantiles while the relationship with human development is increasingly positive with some evidence of threshold in the LHS; (3) the relationship with domestic savings (private credit) is negative

(positive) in the 0.50th (bottom) quantile(s): (4) patent applications have mixed nexuses, with a positive (negative) relationship in the bottom quantiles (0.75th quantile) and (5) the relationships with household expenditure and regulation quality cannot be definitely established because they are respectively insignificant and contradictory across specifications.

Table 9: Conditional determinants of Mobile banking

	Contemporary						Non-contemporary					
	OLS	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**	**OLS**	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**
Constant	**-0.98***** **(0.000)**	**-0.92***** **(0.000)**	**-0.98***** **(0.005)**	-1.000 (0.156)	-0.628 (0.298)	**-0.44***** **(0.000)**	-0.332 (0.662)	**-1.57***** **(0.001)**	**-1.17***** **(0.002)**	-0.877 (0.645)	-0.779 (0.726)	**0.94***** **(0.008)**
Trade	**0.010**** **(0.013)**	**0.005***** **(0.000)**	0.0008 (0.783)	0.009 (0.111)	**0.014**** **(0.019)**	**0.013***** **(0.000)**	0.006 (0.240)	-0.001 (0.495)	**-0.003**** **(0.035)**	0.007 (0.441)	0.016 (0.161)	**-0.003*** **(0.065)**
Inflation	-0.020 (0.263)	-0.0008 (0.187)	0.014 (0.385)	-0.002 (0.926)	-0.002 (0.933)	**0.006***** **(0.002)**	0.041 (0.311)	0.014 (0.420)	0.020 (0.165)	0.043 (0.590)	0.089 (0.317)	**0.09***** **(0.000)**
Domestic Investment	-0.006 (0.621)	**0.001***** **(0.000)**	0.001 (0.896)	-0.011 (0.639)	-0.018 (0.343)	**-0.01***** **(0.000)**	-0.018 (0.478)	0.017 (0.124)	0.010 (0.210)	-0.010 (0.864)	-0.003 (0.966)	**-0.02**** **(0.018)**
Education	-0.003 (0.527)	**-0.0004**** **(0.042)**	-0.0002 (0.962)	-0.001 (0.876)	**-0.010*** **(0.072)**	**-0.01***** **(0.000)**	-0.004 (0.576)	**0.01***** **(0.004)**	**0.01***** **(0.000)**	-0.001 (0.928)	-0.017 (0.280)	-0.001 (0.706)
Fisher	**5.31*****	---	---	---	---	---	1.013	---	---	---	---	---
Adjusted/Pseudo R²	0.397	0.072	0.089	0.291	0.540	0.671	0.024	0.090	0.126	0.218	0.257	0.409
Observations	20	20	20	20	20	20	18	18	18	18	18	18
	OLS	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**	**OLS**	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**
Constant	0.815 (0.255)	0.273 (0.426)	0.665 (0.368)	1.321 (0.251)	1.128 (0.866)	-0.271 (0.950)	0.767 (0.219)	**-0.52***** **(0.000)**	-0.071 (0.891)	0.279 (0.867)	1.293 (0.795)	0.408 (0.926)
Net Interest Margin	-0.022 (0.797)	**-0.053**** **(0.043)**	-0.075 (0.429)	-0.100 (0.382)	-0.066 (0.902)	0.286 (0.690)	-0.008 (0.808)	-0.008 (0.435)	-0.020 (0.628)	0.009 (0.948)	0.007 (0.982)	0.032 (0.914)
Lending Deposit Rate	**-0.036*** **(0.061)**	**-0.014***** **(0.008)**	**-0.023*** **(0.093)**	-0.032 (0.137)	-0.047 (0.675)	-0.033 (0.813)	**-0.03**** **(0.016)**	**-0.008**** **(0.015)**	-0.018 (0.215)	-0.030 (0.296)	-0.054 (0.593)	-0.042 (0.658)
Bank Density	-0.019 (0.725)	-0.010 (0.429)	-0.030 (0.340)	-0.053 (0.322)	-0.036 (0.937)	0.186 (0.542)	-0.034 (0.441)	**0.014***** **(0.009)**	-0.006 (0.839)	-0.029 (0.737)	-0.079 (0.808)	0.114 (0.704)
Return on Equity	0.001 (0.951)	-0.013 (0.144)	-0.004 (0.752)	-0.011 (0.643)	0.023 (0.887)	-0.064 (0.704)	0.005 (0.363)	**-0.004***** **(0.000)**	-0.002 (0.320)	0.00002 (0.997)	0.004 (0.897)	0.011 (0.772)
Fisher	**2.790***	---	---	---	---	---	**3.93****	---	---	---	---	---
Adjusted/Pseudo R²	-0.205	0.288	0.271	0.223	0.090	0.117	-0.131	0.203	0.177	0.147	0.143	0.173
Observations	18	18	18	18	18	18	20	20	20	20	20	20
	OLS	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**	**OLS**	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**
Constant	**-1.696*** **(0.068)**	**-0.80***** **(0.000)**	**-0.67***** **(0.003)**	-0.292 (0.617)	-1.787 (0.498)	-1.026 (0.470)	**-1.50*** **(0.061)**	**-0.68***** **(0.000)**	**-1.26***** **(0.000)**	-1.063 (0.509)	-1.072 (0.584)	-0.901 (0.678)
GDP growth	**-0.054*** **(0.069)**	-0.002 (0.701)	-0.014 (0.234)	**-0.072*** **(0.055)**	-0.032 (0.703)	-0.037 (0.244)	0.019 (0.373)	0.001 (0.735)	**0.021**** **(0.032)**	-0.001 (0.982)	0.022 (0.616)	0.003 (0.974)
Population growth	0.316 (0.248)	-0.025 (0.215)	-0.030 (0.643)	-0.064 (0.687)	0.431 (0.503)	-0.003 (0.987)	0.226 (0.327)	**-0.051***** **(0.007)**	0.048 (0.454)	0.018 (0.967)	0.002 (0.995)	-0.037 (0.966)
Urban population	0.013 (0.334)	-0.001 (0.148)	-0.003 (0.138)	0.002 (0.795)	0.012 (0.723)	0.021 (0.205)	0.008 (0.563)	**-0.004***** **(0.000)**	0.003 (0.163)	0.008 (0.646)	0.016 (0.995)	0.021 (0.620)
Internet penetration	**0.065*** **(0.074)**	**0.016***** **(0.000)**	**0.028***** **(0.000)**	**0.046***** **(0.004)**	0.080 (0.147)	**0.175***** **(0.000)**	0.061 (0.156)	**0.019***** **(0.000)**	**0.024**** **(0.018)**	0.026 (0.622)	**0.104*** **(0.060)**	0.147 (0.385)
Fisher	**2.690***	---	---	---	---	---	1.256	---	---	---	---	---
Adjusted/Pseudo R²	0.237	0.122	0.133	0.177	0.258	0.458	0.037	0.095	0.117	0.099	0.178	0.304
Observations	34	34	34	34	34	34	35	35	35	35	35	35
	OLS	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**	**OLS**	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**
Constant	0.005 (0.986)	**-0.74***** **(0.000)**	**-0.69***** **(0.000)**	**-0.401*** **(0.088)**	0.343 (0.448)	1.055 (0.602)	-0.020 (0.957)	**-0.95***** **(0.000)**	**-0.85***** **(0.000)**	**-0.513*** **(0.087)**	0.206 (0.785)	0.767 (0.758)
Foreign Investment	0.003 (0.811)	**0.010***** **(0.002)**	0.005 (0.534)	0.010 (0.412)	0.029 (0.134)	0.024 (0.740)	-0.018 (0.631)	0.005 (0.158)	0.003 (0.698)	-0.003 (0.922)	0.018 (0.864)	-0.037 (0.833)
Foreign Aid	**-0.031*** **(0.079)**	**-0.025***** **(0.000)**	**-0.021**** **(0.036)**	-0.012 (0.531)	-0.056 (0.105)	-0.080 (0.323)	0.0006 (0.954)	**0.008***** **(0.000)**	**0.008***** **(0.008)**	0.004 (0.750)	-0.010 (0.734)	0.0005 (0.989)
Remittances	0.022 (0.317)	**0.036***** **(0.000)**	**0.031**** **(0.010)**	0.018 (0.276)	-0.017 (0.566)	0.030 (0.821)	-0.001 (0.922)	**0.007***** **(0.002)**	0.001 (0.790)	0.023 (0.192)	-0.022 (0.661)	-0.030 (0.603)
Regulation Quality	-0.250 (0.490)	**0.079**** **(0.041)**	-0.064 (0.680)	0.059 (0.861)	-0.745 (0.245)	-0.615 (0.732)	-0.040 (0.915)	**0.158***** **(0.000)**	**0.192***** **(0.004)**	0.236 (0.476)	-0.655 (0.569)	-0.704 (0.758)
Fisher	**2.260***	---	---	---	---	---	0.108	---	---	---	---	---
Adjusted/Pseudo R²	-0.100	0.051	0.051	0.096	0.149	0.157	-0.166	0.038	0.049	0.049	0.068	0.153
Observations	27	27	27	27	27	27	27	27	27	27	27	27

	OLS	Q 0.10	Q 0.25	Q 0.50	Q 0.75	Q 0.90	OLS	Q 0.10	Q 0.25	Q 0.50	Q 0.75	Q 0.90
Constant	**-2.72*** **	**-1.21*** **	**-1.40*** **	**-2.03*** **	**-4.30** **	-4.917	**-2.3*** **	**-1.22*** **	**-1.50*** **	-1.748	**-3.65*** **	-4.812
	(0.004)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.014)**	(0.118)	**(0.004)**	**(0.000)**	**(0.003)**	(0.196)	**(0.004)**	(0.219)
Human Development	**5.218** **	**0.912***	**1.575** **	**2.66*** **	**8.74*** **	11.497	**4.6*** **	**0.879** **	**1.778** **	2.303	**7.61*** **	11.25
	(0.013)	**(0.081)**	**(0.012)**	**(0.005)**	**(0.007)**	(0.124)	**(0.009)**	**(0.035)**	**(0.044)**	(0.378)	**(0.001)**	(0.141)
Domestic Savings	-0.003	-0.002	**-0.004*** **	0.005	-0.0004	-0.009	-0.003	-0.001	**-0.005** **	-0.0008	0.005	0.002
	(0.589)	(0.313)	**(0.007)**	(0.117)	(0.956)	(0.751)	(0.657)	(0.258)	**(0.057)**	(0.934)	(0.684)	(0.949)
Regulation Quality	-0.369	-0.007	-0.047	**-0.431*** **	**-0.886***	-0.813	-0.259	-0.019	-0.083	-0.264	-0.591	-0.628
	(0.304)	(0.947)	(0.640)	**(0.008)**	**(0.090)**	(0.494)	(0.462)	(0.814)	(0.549)	(0.528	(0.236)	(0.735)
Patent Applications	-0.000	**0.00009 *** **	**0.00006 *** **	**0.00005 ** **	**- 0.0001***	-0.0002	-0.000	**0.0001*** **	**0.00007 *** **	0.00005	**- 0.0001** **	-0.0003
	(0.449)	**(0.000)**	**(0.000)**	**(0.018)**	**(0.051)**	(0.412)	(0.524)	**(0.000)**	**(0.000)**	(0.396)	**(0.018)**	(0.239)
Fisher	**3.803** **	---	---	---	---	---	**3.31** **	---	---	---	---	---
Adjusted/Pseudo R^2	0.030	0.057	0.119	0.129	0.209	0.275	0.008	0.060	0.120	0.125	0.185	0.253
Observations	34	34	34	34	34	34	34	34	34	34	34	34
	OLS	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**	**OLS**	**Q 0.10**	**Q 0.25**	**Q 0.50**	**Q 0.75**	**Q 0.90**
Constant	**-3.14*** **	**-1.184***	**-1.690***	**-3.367***	-3.620	-4.583	**-2.8*** **	**-1.125** **	**-1.946** **	**-3.56***	-3.311	-4.566
	(0.007)	**(0.058)**	**(0.096)**	**(0.052)**	(0.164)	(0.477)	**(0.004)**	**(0.054)**	**(0.030)**	**(0.088)**	(0.134)	(0.381)
Human Development	**4.656** **	0.680	1.065	**4.181***	**6.914***	11.430	4.183	0.455	1.160	4.229	**6.521** **	11.27
	(0.020)	(0.326)	(0.430)	**(0.098)**	**(0.095)**	(0.283)	(0.006)	(0.448)	(0.325)	(0.151)	**(0.043)**	(0.245)
Household expenditure	0.009	-0.0001	0.005	0.009	0.003	-0.001	0.007	-0.002	0.006	0.011	-0.0009	-0.0005
	(0.210)	(0.956)	(0.267)	(0.256)	(0.815)	(0.978)	(0.298)	(0.953)	(0.184)	(0.283)	(0.931)	(0.991)
Regulation Quality	-0.369	0.064	-0.099	-0.636	-0.680	-0.603	-0.393	0.027	-0.236	-0.642	-1.060	-0.632
	(0.364)	(0.710)	(0.693)	(0.130)	(0.503)	(0.718)	(0.395)	(0.853)	(0.325)	(0.192)	(0.207)	(0.838)
Private Credit	-0.001	**0.003** **	0.003	0.002	-0.005	-0.017	-0.0003	**0.005*** **	**0.006***	0.002	-0.002	-0.016
	(0.803)	**(0.025)**	(0.378)	(0.547)	(0.657)	(0.379)	(0.940)	**(0.000)**	**(0.061)**	(0.534)	(0.732)	(0.483)
Fisher	1.773	---	---	---	---	---	**2.502***	---	---	---	---	---
Adjusted/Pseudo R^2	-0.063	0.072	0.099	0.137	0.123	0.144	-0.068	0.044	0.095	0.148	0.1309	0.185
Observations	28	28	28	28	28	28	30	30	30	30	30	30

Notes. Dependent variable is Mobile Banking. *,**,***, denote significance levels of 10%, 5% and 1% respectively. Lower quantiles (e.g., Q 0.1) signify nations where the dependent variable is least. OLS: Ordinary Least Squares. In some specifications, non-contemporary observations may exceed contemporary-observations if there are missing observations in the latter.

4.3 Policy syndromes

Policy syndromes have been defined by Fosu (2013) as circumstances that are unfavourable to economic growth. Such situations include: 'state breakdown', 'administered redistribution', 'suboptimal inter temporal resource allocation' and 'state controls'. According to the author 'syndrome free' denotes alternative scenarios where the above characteristics are substantially absent. The author has further suggested that the highlighted policy syndromes have been the fundamental cause of the post-independence poor economic performance experienced by most African countries. Asongu (2014c) who has recently employed the concepts in a comparative assessment of knowledge economy gaps between South Korea and African countries has used 'policy syndrome' ('syndrome free') to denote high (low) deviations from the benchmark country. In the context of this study, we follow the same intuition by considering 'policy syndromes' (PS) and 'syndrome free' (SF) as fundamental features with the highest and least dispersions from the best-performing sub-panel, respectively.

In Table 10 below, while averages of fundamental characteristics are presented in Panel A, Panel B shows the corresponding PS and SF features. Extremes of the LHS (RHS)

of Panel B denote high (low) deviations from the benchmark. Therefore, the urgency of policy in stimulating mobile phones/banking penetration decreases from the LHS to the RHS.

Table 10: Policy syndromes based on fundamental characteristics

Panel A: Averages

Income Levels				Legal Origins		Religion		Landlockedness		Oil exporting		Conflicts		Full	
MI	LMI	UMI	LI	English	French	Christ	Islam	LL	NLL	Oil	NonOil	Conflict	Noncon.	Sample	
64.96	70.69	56.77	58.30	59.96	61.12	58.44	65.10	66.06	58.20	52.92	62.21	51.00	63.88	60.66	Mobile
3.10	4.22	1.15	3.35	3.73	2.83	2.39	4.80	2.75	3.59	3.95	3.15	5.07	2.55	3.284	MBills
7.22	10.15	2.10	9.22	7.96	9.32	6.81	11.77	8.69	8.61	12.21	7.97	8.64	8.64	8.64	MSR

Panel B: Policy Syndromes

Policy Syndromes ----------→ Syndrome Free															
Conflict	Oil	UMI	NLL	LI	Christ	English	Sample	French	NonOil	Noncon	MI	Islam	LL	LMI	Mobile
UMI	Christ	Noncon	LL	French	MI	NonOil	Sample	LI	NLL	English	Oil	LMI	Islam	Conflict	MBills
UMI	Christ	MI	English	NonOil	NLL	Conflict	Noncon.	Sample	LL	LI	French	LMI	Islam	Oil	MSR

Low ----------→ High

MI: Middle Income. UMI: Upper Middle Income. LMI: Lower Middle Income. LI: Low Income. English: English Common law. French: French Civil law. Christ: Christian. LL: Landlocked. NLL: Not Landlocked. NonOil: Non Oil Exporting. Oil: Oil Exporting. Conflict: Conflict-Affected. Non-Conflict Affected. MBills: Mobile Phone used to pay bills. MSR: Mobile phone used to send/receive money.

4. Concluding implications

The World Bank, in its continuous efforts towards a world free of poverty, has recently made available the first macroeconomic dataset on mobile banking to the research community. A very puzzling observation in the dataset is the substantial asymmetry between the mobile phone penetration rate and mobile banking applications. While the report concludes that African countries are in the driver's seat in terms of mobile banking, it does not provided any answers on the substantial disparities among African countries. The present line of inquiry fills this gap by assessing the conditional determinants of mobile phone penetration and mobile banking.

Using twenty-five policy variables, we investigate determinants of mobile phone/banking in 49 Sub-Saharan African countries with data for the year 2011. The determinants are classified into six policy categories, notably: macroeconomic, business/bank, market-related, knowledge economy, external flows and human development. The empirical evidence is based on contemporary and non-contemporary Quantile regressions. The following findings are established.

First, mobile phone penetration is positively correlated with: (i) education with more significance in the bottom quantiles of the distributions; (ii) bank density throughout the distributions, but for the 0.90^{th} (0.25^{th} & 0.75^{th}) quantile (s) in non-contemporary (contemporary) specifications; (iii) urban population, with increasing magnitudes in the

contemporary (non-contemporary) throughout the distribution (from the 0.25^{th} to the 0.90^{th} quantile); (iv) internet penetration, with an increasing threshold evidence from the 0.25^{th} to the 0.75^{th} quantile in contemporary and non-contemporary specifications; (v) regulation quality which is consistently (sparsely) significant in contemporary (non-contemporary) specifications; (vi) human development, with threshold evidence and (vii) domestic savings, regulation quality and patent applications only significant in the bottom quantiles of the contemporary specifications.

Second, the use of the mobile to pay bills has shown the following. (i) While the correlation with trade is mixed in non-contemporary specifications with negative and positive signs in a bottom (0.10^{th}) and a top (0.90^{th}) quantile, but for the 0.25^{th}, it is consistently positive throughout the distribution in contemporary specifications. (ii) But for the 0.75^{th} quantile, the relationship with internet penetration is consistently positive in contemporary specifications, it is only positive in a bottom (0.25^{th}) and a top (0.90^{th}) quantile of non-contemporary specifications. (iii) The relationship with remittances is positive in the bottom-half of contemporary and only in a bottom (0.10^{th}) quantile of non-contemporary specifications. (iv) 'Patent applications' is positively significant in the bottom-halves of the distributions and only negative in the 0.90^{th} quantile of non-contemporary specifications.

Third, the use of the mobile to pay send/receive money has two main threshold effects, (or increasingly positive correlation) for: (i) internet penetration from the 0.25^{th} to the 0.90^{th} quantile in contemporary specifications and from the 0.10^{th} to the 0.90^{th} quantile (with the exception of the 0.50^{th} & 0.75^{th}) in non-contemporary specifications and (ii) human development from the 0.10^{th} to the 0.75^{th} quantile in contemporary specifications.

Fourth, the use of mobile banking has shown the following findings. (i) The correlation with trade openness is positive (negative) in contemporary (non-contemporary) specifications. (ii) The nexus with internet penetration is increasingly positive on both sides, with some evidence of a threshold in contemporary specifications (with a slight exception of the insignificant 0.75^{th} quantile). (iii) Remittances are positive only in the bottom quantiles while the relationship with human development is increasingly positive with some evidence of threshold in contemporary specifications. (iv) Patent applications have mixed nexuses, with a positive (negative) relationship in the bottom quantiles (0.75^{th} quantile).

For brevity and lack of space, emphasis on the magnitudes of significant estimations are articulated at two levels: (i) evidence of threshold effects which are defined in the context of this paper as consistently increasing or decreasing effects from bottom to top quantiles and

(ii) consistent time-dynamic changes which are considered as consistent changes in comparative quantiles for contemporary and non-contemporary specifications. For example, the 0.10^{th} quantile in the former specification is compared with the corresponding 0.10^{th} quantile in the latter specification and if there is a threshold effect in at least two successive quantiles, the magnitude and changes are engaged in-depth. While the second point is important for policy in the timing of mobile phone/banking determinants because the contemporaneous feature of determinants is factored-into the analysis, the first point on threshold effects responds to the underlying problem statement of why some countries are more advanced in mobile phone/banking penetration than others. Most importantly, the two points are crucial for the policy relevance of this study because, fundamentally the results are treated as correlations and not causalities. Hence, some consistency in the significant correlations is essential.

The following implications are relevant to the findings. First, mobile phone penetration is positively correlated with: (i) education, domestic savings, regulation quality and patent applications, especially at low initial levels of mobile penetration; (ii) bank density; (iii) urban population density and (iv) internet penetration. Second, the use of the mobile to pay bills is positively linked with: (i) trade and internet penetration, especially in contemporary specifications and (ii) remittances and patent applications, especially at low initial levels of the dependent variable. Third, using the mobile to send/receive money is positively correlated with: internet penetration and human development, especially in contemporary specifications. Fourth, mobile banking is positively linked with: (i) trade in contemporary specifications; (ii) remittances and patent applications at low initial levels of the dependent variable and (iii) internet penetration and human development, with contemporary threshold evidence.

Evidence of thresholds or increasing positive linkages from the above implies that SSA countries are likely to engender more benefits in the underlying determinants with increasingly initial levels in mobile phone/banking penetration. Such benefits are also incremental from the 'syndrome free' to the 'policy syndrome' features provided in Table 10. Notably, (i) for mobile phones: Lower-middle-income, Landlocked, Islam, Middle-income, Non-Conflict, Non oil-exporting, French, English, Christianity, Low-income, Not landlocked, Upper-middle-income, Oil-exporting and Conflict. (ii) In relation to the use of mobiles to pay bills: Conflict, Islam, Lower-middle-income, Oil-exporting, English, Not landlocked, Low-income, Non-oil exporting, Middle-income, French, Landlocked, Non-Conflict,

Christian and Upper-middle-income countries. (iii) With respect to usage of the mobile phone to receive/send money: Oil-exporting, Islam, Lower-middle-income, French, Low-income, Landlocked, Non-Conflict, Conflict, Not landlocked, Non oil-exporting, English, Middle-income, Christian and Upper-middle-income.

We have observed from the above findings that, for the most part, contemporary determinants induce mobile phones/banking to a greater degree than non-contemporary determinants. This is interesting for policy in the timing of decisions that affect mobile phone/banking penetration. We have also broadly found that the positive determinants are more apparent in the bottom quantiles of the distributions. This may imply that when countries are approaching a saturation level in mobile phone penetration, factors that positively influenced them are no longer significant determinants. These broad interpretations should be treated with caution because given the cross-sectional data structure; the findings can only be interpreted as correlations, not causalities. Hence, as more data on mobile banking become available, extending the present analysis beyond the scope of correlations should be an interesting future research direction. Policy implications have been articulated with incremental policy syndromes.

Appendices

Appendix 1: Determinants of Mobile phones (OLS)

		Contemporary						Non-contemporary					
	Constant	**44.6*** (0.007)**	**86.9*** (0.007)**	**44.7*** (0.002)**	**17.20* (0.071)**	**-33.93* (0.077)**	-6.17 (0.803)	**30.34** (0.018)**	**69.5*** (0.000)**	**31.3** (0.015)**	**15.73** (0.042)**	**-43.4*** (0.007)**	**-43.*** (0.000)**
	Trade	0.114 (0.310)	---	---	---	---	---	0.071 (0.682)	---	---	---	---	---
	Inflation	**-1.35*** (0.005)**	---	---	---	---	---	-0.755 (0.257)	---	---	---	---	---
Policy Variables	Domestic Investment	0.251 (0.663)	---	---	---	---	---	**-0.73** (0.036)**	---	---	---	---	---
	Net Interest Margin	---	**-6.37** (0.024)**	---	---	---	---	---	**-2.32* (0.091)**	---	---	---	---
	Lending Deposit Rate	---	**-0.70** (0.039)**	---	---	---	---	---	**-0.88*** (0.010)**	---	---	---	---
Business/ Bank Variables	Interest Rate Spread	---	---	---	---	---	---	---	---	---	---	---	---
	Bank Density	---	**1.31** (0.044)**	---	---	---	---	---	**1.630*** (0.001)**	---	---	---	---
	Return of Assets	---	8.920 (0.159)	---	---	---	---	---	1.145 (0.773)	---	---	---	---
	Return of Equity	---	---	---	---	---	---	---	---	---	---	---	---
	GDP growth	---	---	-0.612 (0.435)	---	---	---	---	---	-0.238 (0.600)	---	---	---
Market-related	Population growth	---	---	**-12.7*** (0.003)**	---	---	---	---	---	**-8.91** (0.016)**	---	---	---
	Urban population	---	---	**0.98*** (0.000)**	---	---	---	---	---	**0.93*** (0.000)**	---	---	---
	Foreign Investment	---	---	---	**0.328* (0.085)**	---	---	---	---	---	0.205 (0.638)	---	---
External Flows	Foreign Aid	---	---	---	**-0.79*** (0.008)**	---	0.097 (0.769)	---	---	---	**-0.79** (0.010)**	---	---
	Remittances	---	---	---	0.075 (0.839)	---	---	---	---	---	0.315 (0.624)	---	---
	Human Development	---	---	---	---	**203*** (0.000)**	**169*** (0.000)**	---	---	---	---	**206*** (0.000)**	**196*** (0.000)**
House-hold Develo-pment	Household expenditure	---	---	---	---	---	-0.138 (0.449)	---	---	---	---	---	0.072 (0.511)
	Domestic Savings	---	---	---	---	0.063 (0.624)	---	---	---	---	---	0.019 (0.861)	---
	Education	---	---	---	**0.96*** (0.000)**	---		**0.80*** (0.001)**	---	---	**0.94*** (0.000)**	---	---
Knowledge Economy	Regulation Quality	---	---	---	---	6.146 (0.355)	11.45 (0.189)	---	---	---	---	2.684 (0.624)	2.357 (0.718)
	Internet penetration	**1.40*** (0.000)**	---	**0.862** (0.012)**	---	---	---	---	---	**1.14*** (0.007)**	---	---	---
	Private Credit	---	---	---	---	---	0.056 (0.790)	---	---	---	---	---	0.020 (0.875)
	Patent Applications	---	---	---	---	**0.003*** (0.003)**	---	---	---	---	---	**0.001* (0.089)**	---
Adjusted R^2		0.233	0.512	0.660	0.755	0.664	0.639	0.390	0.531	0.669	0.766	0.661	0.628
Fisher		**8.57***	**15.04***	**21.9***	**46.02***	**201***	**7.31***	**17.6***	**17.2***	**40.0***	**30.1***	**125***	**14.9***
RAMSEY RESET		**1.263 (0.297)**	**0.540 (0.593)**	**0.078 (0.925)**	**0.462 (0.639)**	**0.315 (0.731)**	**0.876 (0.429)**	**0.086 (0.918)**	**0.027 (0.973)**	**0.141 (0.868)**	**0.511 (0.61)**	**0.526 (0.595)**	**0.842 (0.442)**
Observations		37	22	44	22	41	32	22	24	45	22	41	34

*,**,***, denote significance levels of 10%, 5% and 1% respectively. The regressions are based on heteroscedasticity consistent standard errors. OLS: Ordinary Least Squares.

Appendix 2: Determinants of Mobile phones usage to pay bills (OLS)

		Contemporary						Non-contemporary					
Policy Variables	Constant	-0.572 (0.413)	**11.07* (0.077)**	-1.714 (0.612)	-0.011 (0.977)	**-5.08* (0.027)**	**-8.48* (0.059)**	2.825 (0.356)	**15.06*** (0.007)**	-1.198 (0.701)	6.549 (0.192)	-3.55 (0.105)	**-5.52* (0.089)**
	Trade	**0.045** (0.010)**	---	---	---	---	---	0.042 (0.112)	---	---	---	---	---
	Inflation	-0.094 (0.214)	---	---	---	---	---	0.195 (0.310)	---	---	---	---	---
	Domestic Investment	0.0004 (0.991)	---	---	---	---	---	-0.110 (0.339)	---	---	---	---	---
Business/ Bank Variables	Net Interest Margin	---	-0.361 (0.378)	---	---	---	---	---	**-1.033** (0.024)**	---	---	---	---
	Lending Deposit Rate	---	-0.284 (0.204)	---	---	---	---	---	0.058 (0.639)	---	---	---	---
	Interest Rate Spread	---	---	---	---	---	---	---	---	---	---	---	---
	Bank Density	---	-0.708 (0.120)	---	---	---	---	---	0.333 (0.601)	---	---	---	---
	Return of Assets	---	---	---	---	---	---	---	---	---	---	---	---
	Return of Equity	---	-0.170 (0.338)	---	---	---	---	---	**0.057* (0.079)**	---	---	---	---
Market-related	GDP growth	---	---	-0.090 (0.482)	---	---	---	---	---	0.058 (0.494)	---	---	---
	Population growth	---	---	0.842 (0.376)	---	---	---	---	---	0.642 (0.463)	---	---	---
	Urban population	---	---	0.034 (0.381)	---	---	---	---	---	0.023 (0.564)	---	---	---
External Flows	Foreign Investment	---	---	---	**0.032** (0.029)**	---	---	---	---	---	-0.071 (0.568)	---	---
	Foreign Aid	---	---	---	-0.026 (0.194)	---	-0.025 (0.663)	---	---	---	-0.175 (0.198)	---	---
	Remittances	---	---	---	**0.11*** (0.000)**	---	---	---	---	---	0.019 (0.848)	---	---
House-hold Develo-pment	Human Development	---	---	---	---	**15.61** (0.012)**	**15.2** (0.034)**	---	---	---	---	**12.8*** (0.007)**	**11.43** (0.036)**
	Household expenditure	---	---	---	---	---	0.041 (0.185)	---	---	---	---	---	0.025 (0.343)
	Domestic Savings	---	---	---	---	-0.030 (0.121)	---	---	---	---	---	-0.027 (0.161)	---
Knowledg e Economy	Education	-0.024 (0.277)	0.100 (0.277)	---	0.021 (0.118)	---	---	-0.054 (0.209)	-0.171 (0.319)	---	-0.041 (0.455)	---	---
	Regulation Quality	---	---	---	---	-1.377 (0.228)	-2.156 (0.259)	---	---	---	---	-0.985 (0.323)	-1.545 (0.294)
	Internet penetration	---	---	**0.170* (0.092)**	---	---	---	---	---	0.167 (0.192)	---	---	---
	Private Credit	---	---	---	---	---	0.011 (0.313)	---	---	---	---	---	0.014 (0.252)
	Patent Applications	---	---	---	---	0.000 (0.713)	---	---	---	---	---	0.0001 (0.461)	---
Adjusted R^2		0.420	0.608	0.118	0.489	0.014	-0.083	0.169	0.118	-0.00	-0.016	-0.022	-0.070
Fisher		**5.87***	3.869	1.138	**45.1***	**10.9***	1.365	0.935	**4.35***	1.230	0.941	**8.64***	2.069
RAMSEY RESET		**1.968 (0.179)**	n.a	3.186* (0.057)	**1.083 (0.375)**	**1.892 (0.17)**	**1.103 (0.351)**	4.79** (0.031)	**0.791 (0.513)**	3.65** (0.038)	3.692* (0.067)	**1.473 (0.247)**	**1.533 (0.237)**
Observations		20	8	34	17	34	28	18	12	35	16	34	30

*,**,***, denote significance levels of 10%, 5% and 1% respectively. The regressions are based on heteroscedasticity consistent standard errors. OLS: Ordinary Least Squares.

Appendix 3: Determinants of Mobile phones usage to send/receive money (OLS)

		Contemporary						Non-contemporary					
Policy Variables	Constant	0.596 (0.837)	**12.58* (0.077)**	-9.544 (0.354)	-1.193 (0.212)	**-19.71* (0.083)**	**-19.15* (0.098)**	3.711 (0.650)	**15.78** (0.031)**	-7.30 (0.401)	10.030 (0.100)	-17.11 (0.107)	**-20.08* (0.069)**
	Trade	**0.068* (0.050)**	---	---	---	---	---	0.002 (0.950)	---	---	---	---	---
	Inflation	-0.128 (0.399)	---	---	---	---	---	0.253 (0.432)	---	---	---	---	---
	Domestic Investment	-0.119 (0.437)	---	---	---	---	---	-0.059 (0.811)	---	---	---	---	---
Business/ Bank Variables	Net Interest Margin	---	0.011 (0.982)	---	---	---	---	---	-0.060 (0.879)	---	---	---	---
	Lending Deposit Rate	---	-0.770 (0.145)	---	---	---	---	---	**-0.352** (0.040)**	---	---	---	---
	Interest Rate Spread	---	---	---	---	---	---	---	---	---	---	---	---
	Bank Density	---	-1.941 (0.148)	---	---	---	---	---	-0.403 (0.277)	---	---	---	---
	Return of Assets	---	---	---	---	---	---	---	---	---	---	---	---
	Return of Equity	---	-0.510 (0.184)	---	---	---	---	---	0.022 (0.723)	---	---	---	---
Market-related	GDP growth	---	---	**-0.77** (0.026)**	---	---	---	---	---	0.208 (0.393)	---	---	---
	Population growth	---	---	3.633 (0.233)	---	---	---	---	---	2.487 (0.317)	---	---	---
	Urban population	---	---	0.158 (0.450)	---	---	---	---	---	0.097 (0.650)	---	---	---
External Flows	Foreign Investment	---	---	---	0.055 (0.204)	---	---	---	---	---	-0.023 (0.910)	---	---
	Foreign Aid	---	---	---	-0.046 (0.490)	---	---	---	---	---	**-0.300* (0.093)**	---	---
	Remittances	---	---	---	0.052 (0.435)	---	---	---	---	---	-0.012 (0.899)	---	---
House-hold Develo-pment	Human Development	---	---	---	---	55.31 (0.031)	**45.25** (0.030)**	---	---	---	---	**51.63** (0.024)**	**47.1*** (0.009)**
	Household expenditure	---	---	---	---		0.078 (0.383)	---	---	---	---	---	0.071 (0.360)
	Domestic Savings	---	---	---	---	0.00 (0.963)	---	---	---	---	---	0.011 (0.897)	---
Knowledge Economy	Education	0.009 (0.789)	0.477 (0.141)	---	**0.096** (0.047)**	---	---	0.065 (0.279)	---	---	-0.001 (0.988)	---	---
	Regulation Quality	---	---	---	---	-3.206 (0.452)	-1.481 (0.720)	---	---	---	---	-2.200 (0.613)	-3.205 (0.578)
	Internet penetration	---	---	**0.763* (0.076)**	---	---	---	---	---	0.701 (0.155)	---	---	---
	Private Credit	---	---	---	---	---	-0.049	---	---	---	---	---	-0.043 (0.455)
	Patent Applications	---	---	---	---	---	---	---	---	---	---	-0.001 (0.188)	
Adjusted R^2		0.292	0.604	0.223	0.020	0.027	-0.090	-0.169	-0.197	0.017	-0.072	0.017	-0.078
Fisher		**3.129****	2.833	**2.921****	**7.58*****	1.403	1.545	1.393	**3.108****	1.159	2.499	1.478	2.027
RAMSEY RESET		3.694** (0.053)	na	**0.711 (0.500)**	**0.946 (0.42)**	**0.225 (0.800)**	**1.080 (0.358)**	**0.336 (0.721)**	0.230 (0.797)	**2.259 (0.123)**	**0.379 (0.694)**	**0.266 (0.768)**	**0.541 (0.589)**
Observations		20	8	34	17	34	28	18	20	35	16	34	30

*,**,***, denote significance levels of 10%, 5% and 1% respectively. The regressions are based on heteroscedasticity consistent standard errors. OLS: Ordinary Least Squares.

Appendix 4: Determinants of Mobile banking

		Contemporary						Non-contemporary					
	Constant	**-0.98*** (0.000)**	1.320 (0.107)	**-1.696* (0.068)**	**-1.0*** (0.000)**	**-2.72*** (0.000)**	**-3.14*** (0.007)**	-0.332 (0.662)	0.767 (0.219)	**-1.502* (0.061)**	0.539 (0.539)	**-2.3*** (0.004)**	**-2.8*** (0.004)**
	Trade	**0.010** (0.013)**	---	---	---	---	---	0.006 (0.240)	---	---	---	---	---
	Inflation	-0.020 (0.263)	---	---	---	---	---	0.041 (0.311)	---	---	---	---	---
Policy Variables	Domestic Investment	-0.006 (0.621)	---	---	---	---	---	-0.018 (0.478)	---	---	---	---	---
	Net Interest Margin	---	-0.050 (0.331)	---	---	---	---	---	-0.008 (0.808)	---	---	---	---
	Lending Deposit Rate	---	**-0.082*** **(0.067)**	---	---	---	---	---	**-0.039**** **(0.016)**	---	---	---	---
Business/ Bank Variables	Interest Rate Spread	---	---	---	---	---	---	---	---	---	---	---	---
	Bank Density	---	**-0.205** (0.034)**	---	---	---	---	---	-0.034 (0.441)	---	---	---	---
	Return of Assets	---	**---**	---	---	---	---	---	---	---	---	---	---
	Return of Equity	---	-0.051 (0.109)	---	---	---	---	---	0.005 (0.363)	---	---	---	---
	GDP growth	---	---	**-0.054* (0.060)**	---	---	---	---	---	0.019 (0.373)	---	---	---
Market-related	Population growth	---	---	0.316 (0.248)	---	---	---	---	---	0.226 (0.327)	---	---	---
	Urban population	---	---	0.013 (0.334)	---	---	---	---	---	0.008 (0.563)	---	---	---
	Foreign Investment	---	---	---	**0.007* (0.075)**	---	---	---	---	---	-0.011 (0.667)	---	---
External Flows	Foreign Aid	---	---	---	-0.006 (0.319)	---	---	---	---	---	-0.041 (0.113)	---	---
	Remittances	---	---	---	**0.019** (0.017)**	---	---	---	---	---	0.002 (0.898)	---	---
	Human Development	---	---	---	---	**5.21** (0.013)**	**4.65** (0.020)**	---	---	---	---	**4.63*** (0.009)**	**4.18*** (0.006)**
House-hold Develo-pment	Household expenditure	---	---	---	---	---	0.009 (0.210)	---	---	---	---	---	0.007 (0.298)
	Domestic Savings	---	---	---	---	-0.003 (0.589)	---	---	---	---	---	-0.003 (0.657)	---
	Education	-0.003 (0.527)	**0.040* (0.052)**	---	---	---		-0.004 (0.576)	---	---	-0.006 (0.600)	---	
	Regulation Quality	---	---	---	---	-0.369 (0.304)	-0.369 (0.364)	---	---	---	---	-0.259 (0.462)	-0.393 (0.395)
Knowledge Economy	Internet penetration	---	---	**0.065* (0.074)**	---	---		---	---	0.061 (0.156)	---	---	---
	Private Credit	---	---	---	---	---	-0.001 (0.803)	---	---	---	---	---	-0.0003 (0.940)
	Patent Applications	---	---	---	---	-0.000 (0.449)	---	---	---	---	---	-0.000 (0.524)	---
Adjusted R^2		0.397	0.795	0.237	0.229	0.030	-0.063	0.024	-0.131	0.037	0.021	0.008	-0.068
Fisher		**5.31*****	**11.188***	**2.690***	**19.8*****	**3.80****	1.773	1.013	**3.930****	1.256	1.851	**3.315****	**2.502***
RAMSEY RESET		**1.800 (0.204)**	n.a	**2.301 (0.119)**	**0.457 (0.646)**	**0.571 (0.572)**	**0.913 (0.417)**	**1.748 (0.219)**	**0.296 (0.748)**	3.504** (0.043)	**0.979 (0.412)**	**0.625 (0.543)**	**0.644 (0.534)**
Observations		20	8	34	17	34	28	18	20	35	16	34	30

*,**,***, denote significance levels of 10%, 5% and 1% respectively. The regressions are based on heteroscedasticity consistent standard errors. OLS: Ordinary Least Squares.

Acknowledgments

I thank Nguena, C. L., Tchana, T. F. and Zeufack, A., for sharing the dataset of their paper entitled 'Housing Finance and Inclusive Growth: Benchmarking, Determinants and Effects'. The underlying dataset which constitutes about 50 % of the data used in this study has been checked for consistency with the primary source (World Bank Development Indicators). Hence, any mistakes are assuredly mine and not theirs.

The project has benefited from partial funding from the African Economic Research Consortium (AERC).
The author is highly indebted to the editor and referees for constructive comments.

References

Abu S. T., & Tsuji, M., (2010). "The Determinants of the Global Mobile Telephone Deployment: An Empirical Analysis", *Informatica Economică*, 14(3), pp. 21-32.

Ajzen, I., (1991). "The theory of planned behaviour". *Organizational Behavior and Human Decision Processes*, 50, pp. 179-211.

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice-Hall.

Aker, J. C., & Fafchamps, M., (2010). "How Does Mobile Phone Coverage Affect Farm-Gate Prices? Evidence from West Africa", Department of Economics and the Fletcher School, Tufts University.

Akpan, U. S., Isihak, S. R., & Asongu, S. A., (2014). "Determinants of Foreign Direct Investment in Fast-Growing Economies: A Study of BRICS and MINT", *African Governance and Development Institute Working Paper* No. 14/002.

Akturan, U., & Tezcan, N., (2012). "Mobile banking adoption of the youth market: Perceptions and intentions", *Marketing Intelligence & Planning*, 30, (4), pp. 444-459.

Allen, F., Otchere, I., & Senbet, L. W., (2011). "African financial systems: A review", *Review of Development Finance*, 1(2), pp. 79-113.

Al Surikhi, H. F., (2012). "Knowledge and Financial Management in Households: An Examination of Married Women's Perspectives in Chadbourn, North Carolina", *Capstone Collection, Paper* No. 2489.

Alsheikh, L., & Bojei, J., (2014). "Determinants Affecting Customer's Intention to Adopt Mobile Banking in Saudi Arabia", *International Arab Journal of e-Technology*, 3(4), pp. 210-219.

Asongu, S. A., (2013). "How has mobile phone penetration stimulated financial development in Africa", *Journal of African Business*, 14(1), pp. 7-18.

Asongu, S. A., (2015a). "Mobile banking and mobile phone penetration: which is more pro-poor in Africa?", *African Finance Journal*: Forthcoming.

Asongu, S. A., (2015b). "The impact of mobile phone penetration on African inequality", *International Journal of Social Economics*, 42(8), pp. 706-716.

Asongu, S. A., (2015c). "Reinventing foreign aid for inclusive and sustainable development: Kuznets, Piketty and the great policy reversal", *Journal of Economic Surveys*.

Asongu, S. A., (2015d). "On Taxation, Political Accountability and Foreign Aid: Empirics to a Celebrated Literature", *South African Journal of Economics*, 83(2), pp. 180-198.

Asongu, S. A., (2014a). "Financial development dynamic thresholds of financial globalization: evidence from Africa", *Journal of Economic Studies*, 41(2), pp. 166-195.

Asongu, S. A., (2014b). "The impact of health worker migration on development dynamics: evidence of wealth-effects from Africa", *The European Journal of Health Economics*, 15(2), pp. 187-201.

Asongu, S. A., (2014c). "Knowledge Economy Gaps, Policy Syndromes and Catch-Up Strategies: Fresh South Korean Lessons to Africa", *African Governance and Development Institute* WP/14/04.

Asongu, S. A., & De Moor, L., (2015). "Recent advances in finance for inclusive development: a survey", *African Governance and Development Institute Working Paper* No. 15/005.

Asongu, S. A., & Kodila-Tedika, O., (2015). "Conditional determinants of FDI in fast emerging economies: an instrumental quantile regression approach", *African Governance and Development Institute Working Paper* No. 15/003.

Asongu, S. A., & Nwachukwu, J. C., (2015a). "Drivers of FDI in Fast Growing Developing Countries: Evidence from Bundling and Unbundling Governance", *African Governance and Development Institute Working Paper* No. 15/001.

Asongu, S. A., & Nwachukwu, J. C., (2015b). "Revolution empirics: predicting the Arab Spring", Empirical Economics: Forthcoming.

Asongu, S. A., & Nwachukwu, J. C., (2016). "The Role of Lifelong Learning in Political Stability and Non-violence: Evidence from Africa", *Journal of Economic Studies*: Forthcoming.

Ba, J., & Ng S., (2006). "Confidence intervals for diffusion index forecasts and inference for factor-augmented regression", *Econometrica*, 74(4), pp. 1133-1150.

Bai, J., (2003). "Inferential theory for factor models of large dimensions". *Econometrica*, 71 (1),pp.135-173.

Bai, J., (2009). "Panel data models with interactive fixed effects". *Econometrica*, 77(4), pp. 1229-1279.

Bagozzi, R., (1982). "A field investigation of causal relations among cognitions, affect, intentions, and behaviour", *Journal of Marketing Research*, 19 (4), pp. 562-584.

Bauer, S., De Niet, J., Timman, R., & Kordy, H., (2010). "Enhancement of care through self-monitoring and tailored feedback via text messaging and their use in the treatment of childhood overweight", *Patient Education and Counseling*, 79 (2010), pp. 315-319.

Billger, S. M., & Goel, R. K., (2009). "Do existing corruption levels matter in controlling corruption? Cross-country quantile regression estimates", *Journal of Development Economics*, 90, pp. 299-305.

Caulderwood, K., (2015). "Mobile Banking Market In Sub-Saharan Africa Could Be Worth $1.3B In Four Years", International Business Times, http://www.ibtimes.com/mobile-banking-market-sub-saharan-africa-could-be-worth-13b-four-years-1788648 (Accessed: 24/03/2015).

Chan, A., & Jia, T., (2011). "The Role of Mobile Banking in Facilitating Rural Finance: Reducing Inequality in Financial Services between Urban and Rural Areas", Accenture Banking Services, http://www.accenture.com/SiteCollectionDocuments/PDF/PoV-Mobile-Banking-051611-EN.pdf (Accessed: 17/03/2015).

Cudjoe, A. G., Anim, P. A., & Nyanyofio, J., (2015). "Determinants of Mobile Banking Adoption in the Ghanaian Banking Industry: A Case of Access Bank Ghana Limited", *Journal of Computer and Communications*, 3, pp. 1-19.

Da Costa, T. M. Salomão, P. L., Martha, A. S., Pisa, I. T., & Sigulem, D., (2010). "The impact of short message service text messages sent as appointment reminders to patients' cell phones at outpatient clinics in São Paulo, Brazil", *International Journal of Medical Informatics*, 79 (2010), pp. 65-70.

Daud, M., Kassim, N., Said, W., & Noor, M., (2011). "Determining Critical Success Factors of Mobile Banking Adoption in Malaysia", *Australian Journal of Basic and Applied Sciences*, 5(9), pp. 252-265.

Davis, F., (1989). "Perceived usefulness, perceived ease of use, and user acceptance of information technology", *MIS Quarterly*, 13(3), pp. 319-340.

Doshi, K. P., & Narwold, A., (2014). "Determinants of Mobile Phone Penetration Rates in Asia and Africa: A Panel Data Analysis", Proceedings of 9th International Business and Social Science Research Conference6 - 8 January, 2014, Novotel World Trade Centre, Dubai, UAE.

E-agriculture (2012). "Using ICT to enable Agricultural Innovation Systems for Smallholders", e-source book, ICT In Agriculture, Connecting Small Holders to Knowledge, Networks and Institutions, (Forum 4, September 2012). http://www.fao.org/docrep/018/ar130e/ar130e.pdf (Accessed: 18/03/2015).

Efobi, U & Osabuohien, E., (2015). Technological Utilization in Africa: How Do Institutions Matter? In S. Majumdar, S. Guha & N. Marakkath (eds.) Technology and Innovation for Social Change (pp.67-84). New Delhi: Springer. DOI: 10.1007/978-81-322-2071-8_5.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley.

Fosu, A., (2013). "Growth of African Economies: Productivity, Policy Syndromes and the Importance of Institutions", *Journal of African Economies*, 22(4), pp. 523-551.

Greenaway-McGrevy, R., Han, C., & Sul, D., (2012). "Asymptotic distribution of factor augmented estimators for panel regression". *Journal of Econometrics*, 169 (1), pp. 48-53.

Gu, J-C., Lee, S-C., & Suh, Y-H., (2009). "Determinants of behavioral intention to mobile banking", *Expert Systems with Applications*, 36(9), pp. 11605-11616.

Hoffman, J. A., Cunningham, J. R., Suleh, A. J., Sundsmo, A., Dekker, D., Vago, F., & Munly, K., (2010). "Mobile Direct Observation Treatment for Tuberculosis Patients A Technical Feasibility Pilot Using Mobile Phones in Nairobi, Kenya", *American Journal of Preventive Medicine*, 39(1), pp. 78-80.

Jolliffe, I. T. (2002), Principal Component Analysis (2nd Ed.) New York: Springer.

Jonathan, D., & Camilo, T. (2008). Mobile banking and economic development: Linking adoption, impact and use. *Asian Journal of Communication*, 18(4), 318-322.

Kaiser, H. F., (1974). "An index of factorial simplicity" *Psychometrika* 39, pp. 31-36.

Kazi, A. K., & Mannan, M. A., (2013). "Factors affecting adoption of mobile banking in Pakistan: Empirical Evidence", Bukhari Institute of Technology, Karachi, Pakistan https://ideas.repec.org/a/rbs/ijbrss/v2y2013i3p54-61.html (Accessed: 26/03/2015).

Kirui, O. K., Okello, J. J., Nyikal, R. A., & Njiraini, G. W., (2013). "Impact of Mobile Phone-Based Money Transfer Services in Agriculture: Evidence from Kenya", *Quaterly Journal of International Agriculture*, 52(2), pp. 141-162.

Kliner, M., Knight, A., Mamvura, C., Wright, J., & Walley, J., (2013). "Using no-cost mobile phone reminders to improve attendance for HIV test results: a pilot study in rural Swaziland", *Infectious Diseases of poverty*, 2(12), pp. 1-7.

Koenker, R., & Hallock, F. K., (2001). "Quantile regression", *Journal of Economic Perspectives*, 15, pp.143-156.

Madden, G., Coble-Neal, G., & Dalzell, B., (2004). "A dynamic model of mobile telephony subscription incorporating a network effect", *Information Economics and Policy*, 28(2), pp. 133-144.

Madden, G., & Coble-Neal, G., (2004). "Economic determinants of global mobile telephony growth", *Information Economics and Policy*, 16(4), pp. 519-534.

Maurer, B. (2008, May). Retail electronic payments systems for value transfers in the developing world. Department of Anthropology, University of California.

McKenzie C, R., & McAleer M (1997). "On efficient estimation and correct inference in models with generated regressors: A general approach." *Japanese Economic Review*, 48(4), pp. 368-389.

Medhi, I., Ratan, A., & Toyama, K., (2009). "Mobile-Banking Adoption and Usage by Low-Literate, Low-Income Users in the Developing World", *Internationalization, Design*

and Global Development, Lecture Notes in Computer Science, Volume 5623, 2009, pp 485-494.

Micheal, H., (2013). "Mobile penetration in Africa is now at 80% and growing fast", Phone Area, http://www.phonearena.com/news/Mobile-penetration-in-Africa-is-now-at-80-and-growing-fast_id50014 (Accessed: 19/03/2015).

Mishra, V., & Bisht, S. S., (2013). "Mobile banking in a developing economy: A customer-centric model for policy formulation", *Telecommunications Policy*, 37, pp. 503-514.

Mosheni-Cheraghlou, A., (2013). "Mobile Banking: Who is in the Driver's Seat?", Working for a World Free of Poverty, The World Bank, http://blogs.worldbank.org/allaboutfinance/mobile-banking-who-driver-s-seat (Accessed: 19/03/2015).

Mpogole, H., Usanga, H., & Tedre, M., (2008). "Mobile phones and poverty alleviation: a survey study in rural Tanzania", Proceedings of M4D 2008, Karlstad University, Sweden, pp. 62-72.

Muto, M., & Yamano, T., (2009). "The Impact of Mobile Phone Coverage Expansion on Market Participation: Panel Data Evidence from Uganda", *World Development*, 37(12), pp. 1887-1896.

Nguena, C. L., Tchana, T. F., & Zeufack, A., (2015). "Housing Finance and Inclusive Growth: Benchmarking, Determinants and Effects', *AAYE Policy Research Working Paper Series*, No. 15/027.

Ojo, A., Janowski, T., & Awotwi, J., (2012). "Enabling development through governance and mobile technology", *Government Information Quarterly*, 30 (2013), pp. S32-S45.

Okada, K., & Samreth, S. (2012). "The effect of foreign aid on corruption: A quantile regression approach", *Economic Letters*, 11, pp. 240-243.

Oluwatobi, S., Efobi, U.R., Olurinola, O.I., Alege, P. (2014), Innovation in Africa: Why Institutions Matter, *South African Journal of Economics*. http://onlinelibrary.wiley.com/doi/10.1111/saje.12071/abstract

Ondiege, P., (2013). "Fostering financial inclusion with mobile banking", African Development Bank. http://www.proparco.fr/webdav/site/proparco/shared/PORTAILS/Secteur_prive_developpement/PDF/SPD16/SPD16_Peter_Ondiege_UK.pdf (Accessed: 03/02/2015).

Ondiege, P., (2010). "Mobile Banking in Africa: Taking the Bank to the People", *Africa Economic Brief*, 1(8), pp. 1-16.

Osabuohien, E**.** (2008), "ICT and Nigeria Bank Reforms: Analysis of Anticipated Impacts in Selected Banks", Global Journal of Business Research, 2(2), pp. 67-76.

Osabuohien, E**.** (2010), "Technological Innovation and Africa's Quest for Development in the 21st Century", Covenant Univerity, Nigeria. In book: Nanotechnology and

Microelectronics: Global Diffusion, Economics and Policy, Chapter: 22, Publisher: IGI-Global, Editors: N. Ekekwe, pp. 382-398

Osabuohien, E., & Efobi, U. R., (2012) "Technological diffusion and Economic Progress in Africa: Challenges and Opportunities", In book: Disruptive Technologies, Innovation and Global Redesign: Emerging Implications, Chapter: 24, Publisher: GI-Global, Editors: N. Ekekwe, N. Islam, pp.425-440.

Oxley L, & McAleer, M., (1993). "Econometric issues in macroeconomic models with generated regressors." *Journal of Economic Surveys*, 7(1), pp. 1-40.

Pagan, A., (1984). "Econometric issues in the analysis of regressions with generated regressors", *International Economic Review*, 25(1), pp. 221-247.

Perez, F., Gonzalez, C. J., & Aaronson, X., (2011). "Village banking development model: FINCA Costa Rica", *Journal of Business Research*, 64 (2011), pp. 316-324.

Pesaran, M. H., (2006). "Estimation and inference in large heterogeneous panels with a multifactor error structure". *Econometrica*, 74 (4), pp. 967-1012.

Penard, T., Poussing, N., Yebe, G. Z., & Ella, P. N., (2012). "Comparing the Determinants of Internet and Cell Phone Use in Africa : Evidence from Gabon ", *Communications & Strategies*, 86, pp. 65-83.

Qiang, C. Z., Kuek, S. C., Dymond, A., & Esselaar, S., (2011). "Mobile Applications for Agricultural and Rural Development", ICT Sector Unit, World Bank http://siteresources.worldbank.org/INFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/MobileApplications_for_ARD.pdf (Accessed: 17/03/2015).

Singh, A. B., (2012). "Mobile banking based money order for India Post: Feasible model and assessing demand potential", *Procedia - Social and Behavioral Sciences*, 37, pp. 466-481.

Ssozi, J., & Amlani, S., (2015) "The Effectiveness of Health Expenditure on the Proximate and Ultimate Goals of Healthcare in Sub-Saharan Africa", Economics Department, Hankamer School of Business, Baylor University.

Ssozi, J., & Asongu, S. A., (2015). "The Effects of Remittances on Output per Worker in Sub-Saharan Africa: A Production Function Approach", *South African Journal of Economics*: Forthcoming.

Stock, J. H. & M. W. Watson (2002). "Forecasting using principal components from a large number of predictors". *Journal of the American Statistical Association*, 97 (460), pp.1167-1179.

Tseng, F-M & Lo, H-Y., (2011). "Antecedents of consumers' intentions to upgrade their mobile phones", *Telecommunications Policy*, 35(1), pp. 74-86.

UNCTAD. (2002). World Investment Report: Transnational Corporations and Export Competitiveness. New York: United Nations.

Wang, Y-S., Wu, M-C., & Wang, H-Y., (2009). "Investigating the determinants and age and gender differences in the acceptance of mobile learning", *British Journal of Educational Technology*, 40(1), pp. 92-118.

Warren, M., (2007). "The digital vicious cycle: links between social disadvantage and digital exclusion in rural areas". *Telecommunications Policy*, 31(6-7), pp. 374-388.

West, D. M., (2013). "Improving Health Care through Mobile Medical Devices and Sensors", *Centre for Technology and Innovation at Brookings*, http://www.brookings.edu/~/media/research/files/papers/2013/10/22%20mobile%20medical%20devices%20west/west_mobile%20medical%20devices_v06 (Accessed: 19/03/2015).

Westerlund, J., & Urbain, J-P., (2013a). "On the estimation and inference in factor-augmented panel regressions with correlated loadings", *Economic Letters*, 119, pp. 247-250.

Westerlund, J., & Urbain, J-P., (2013b). "On the implementation and use of factor-augmented regressions in panel data", *Journal of Asian Economics*, 28, pp. 3-11.

Westerlund, J., & Urbain, J-P., (2012). "Cross-sectional averages versus principal components", *Maastricht University*, RM/11/053.

Yousafzai, S. Y., Foxall, G. R., & Pallister, J. G., (2010). "Explaining Internet Banking Behavior: Theory of Reasoned Action, Theory of Planned Behavior, or Technology Acceptance Model?", *Journal of Applied Social Psychology*, 2010, 40(5), pp. 1172-1202.

Yousafzai, S., Foxall, G. R., & Pallister, J. (2007a). "Technology acceptance: A meta-analysis of the TAM. Part 1". *Journal of Modelling in Management*, 2(3), pp. 251-280.

Yousafzai, S., Foxall, G. R., & Pallister, J. (2007b). Technology acceptance: A meta-analysis of the TAM. Part 2. *Journal of Modelling in Management*, 2(3), pp. 281-304.