

**DO MIGRANT REMITTANCES MATTER FOR FINANCIAL DEVELOPMENT IN  
KENYA?**

**ROSELINE MISATI AND ANNE KAMAU**

## ***Abstract***

*The paper analyzes the relationship between remittances and financial development on Kenyan quarterly data from 2006 to 2017. Five different indicators of financial development are used in the study. The study used credit to the private sector as a share of GDP, number of mobile transactions, value of mobile transactions, number of mobile agents and number of bank accounts. Using the autoregressive distributed lag (ARDL), the results show a strong positive relationship between remittances and financial development in the long run equations suggesting that higher levels of remittances provide opportunities for opening bank accounts, enhancing savings and accessing financial systems for recipients besides exposing the unbanked to existing and new financial products. The results also confirm the potential advantage of embracing modern and advanced technology that facilitates international mobile transfer channels. Usage of international remittance transfer through mobile technology reduces costs by eliminating the need for physical branches and personnel to attend to walk-in customers that dominates traditional remittance business models besides offering remittance actors convenience and safety. There is therefore a policy window for the Government to leverage on remittances as a tool of financial inclusion and financial depth particularly through continued expansion of the regulatory space that accommodates wider usage of international mobile remittance transfer channels. Moreover, given the strong positive relationship between remittances and credit to the private sector as a share of GDP and number of bank accounts, commercial banks and other players in the remittance market may also find it useful to develop customized products for migrants that can tap into their remittances. Financial intermediaries can for example consider providing better deposit interest rates to diaspora deposits compared to deposits in local currency and allowing usage of regular remittance flows as collateral for credit allocation among other incentives, to tap into the huge potential of money remitted by migrants to Kenya. The study also recommends consideration of expanded exploitation of diaspora bonds and diaspora Savings and Credit Cooperative Societies while drawing lessons from previous attempts in other countries.*

***KEY WORDS:*** *Remittances, financial inclusion and technology*

## 1.0. Introduction

For decades, economic policy makers have experimented many development mantras with various objectives ranging from increasing economic growth, reducing inequality to alleviating poverty especially for the bottom billion. However, the history of economic approaches in developing countries reveals no compelling evidence of any particular suitable model that has worked perfectly in the developing world, in particular, in Africa, (Ascher et al., 2016; Olu and Afeikhena). For instance, various models on financial development such as micro-credit and digital payment systems meant to increase access to finance for the poor are still being propelled in African countries but the level of poverty in Africa is increasing while it is declining in the rest of the other regions of the world (Asongu and Sara, 2018; Santos and Kvangraven, 2017; Bateman, 2017; World Bank, 2015; Maitrot, and Hume, 2014).<sup>1</sup>

Moreover, recent analysis of indicators of financial development in Africa show that less than one quarter of adults have an account with a formal financial institution, many adults use informal methods to save and borrow and a majority of small and medium enterprises are unbanked with access to finance being the greatest challenge, (Demirguc-kunt and Klapper, 2012). Among other reasons, the study found that low penetration of bank accounts in Africa is partly attributed to low levels of income which hinder savings, limited physical access points and high costs of maintaining bank accounts. While acknowledging the low levels of income across African communities as a possible constraint to financial inclusion through traditional banking systems, it is now evident that financial inclusion for the bottom billion is possible with technology. For instance, as pointed out by Ndung'u, (2018; 2017), digitalization has emerged as the driver for accelerated provision of financial services through retail payments, virtual savings and credit supply as demonstrated in Kenya where M-Pesa services have contributed to growth of bank accounts from 26.7 percent in 2006 to over 75 percent in 2016.<sup>2</sup> Although the debate of the finance-growth nexus is far from being concluded, based on the endogenous growth theories, evidence exists to suggest that a well-developed and inclusive financial system support higher levels of growth and lower levels of poverty (Mauzu and Alagidede, 2018; Zulfiqar et al., 2016; Andrianaivo and Kpodar, 2012).

Against this background and following a steady surge in remittance flows to Africa, focus has intensified towards leveraging on remittances to enhance financial inclusion and promote financial development. In addition research activity has intensified in this area, although the findings from these studies are mixed..<sup>3</sup> Some studies have confirmed that families that receive migrant remittances access better health facilities, have better education, high financial access and low poverty levels than households who do not receive remittances (Uzochukwu and

---

<sup>1</sup> Financial inclusion refers to all initiatives that make formal financial services available, accessible and affordable to all segments of the population.

<sup>2</sup> A detailed account of Kenya's experience with M-Pesa experience is provided in Appendix 1.

<sup>3</sup> Financial development refers to the improvement of the quantity, quality and efficiency of financial services and products. It occurs when financial instruments, markets and institutions emerge to minimize the effects of information asymmetry, limited enforcement and transaction costs, which, in turn influences savings rate, investment decisions, technological innovation and growth, (Sviryzdenka, 2016; Cihak et al., 2013; Chong and Chan, 2011). In this study, we mainly focus on the linkage between remittances and financial institutions or intermediaries, which are mainly banks as well bank-like products facilitated by technology, mainly, mobile financial services.

Chukwunonso, 2014; Dilip, 2013; Reanne et al.,2009). Moreover, remittance flows through formal channels provide opportunities for encouraging savings, increasing deposits and deepening financial inclusion (Al-Tarawneh, 2016; Meyer and Shera, 2016; 2013). However, other studies have shown that, remittances lead to relaxation of borrowing constraints, which in turn lowers the marginal utility of wealth and cause an increase in the consumption of all normal goods, including leisure. In this case, migrants reduce labor supply of non- migrants who substitute income for leisure. This may have adverse consequences for investment and capital accumulation, (Barrack et al., 2018; Guha, 2013).<sup>4</sup>

The afore mentioned debate on the remittance-finance link has not escaped policy circles in Kenya with about 3 million Kenyans, constituting approximately 7 percent of total population living abroad, (Ministry of Foreign Affairs, 2014). In Kenya, remittances have steadily increased at an average annual rate of 14.3 percent in the last one decade, rising from US \$ 934 million in 2011 to an estimate of US \$ 2.1 billion in 2018, constituting 2.5 percent of GDP, (Migration data, 2018). Kenya is one of the top five highest remittance-recipient countries in Africa after Egypt, Nigeria, Morocco and Ghana. Remittances to Kenya have been consistently increasing, recording higher levels than foreign direct investment and portfolio equity flows. Yet the statistics only reflect remittance flows through formal channels, which is believed to be grossly underestimated since migrants send money through informal channels and in-kind transfers that is often unrecorded.

As summarized in Filippo et al., (2014), money transferred through financial institutions paves the way for recipients to demand and gain access to other financial products and services. Moreover, providing remittance transfer services allows bank and financial institutions to gather information about recipients and mitigate the adverse selection problem. In the same paper, it is also noted that remittance channels can be used to sell financial service package geared towards low income individuals. This debate takes on special importance in the case of Kenya where cross border remittance transactions has been extensively revolutionized through the utilization of technology in mobile phone transactions. Kenya is one of the countries used as an example in the world of what adoption of technology can do through its famous M-Pesa products.<sup>5</sup> International remittance transfer services is one such product that has a huge potential to reach millions of people including low income and unbanked populations in the rural areas.

However, in spite of the potential impact of remittances on financial development, very few country-specific studies have empirically examined the remittances-financial development linkages in Africa region. Moreover, no consensus exists on the impact or direction of causality between remittances and financial development, (Coulibaly, 2015; Nyamongo et al., 2012; Gupta et al., 2009). Previous studies on migration and remittances have concentrated on remittances and growth ignoring the channels through which migration and remittances affect economic growth (Fayissa and Nsiah, 2010). Even the few studies that have considered some channels through which remittances affect growth have mainly focused on investment and

---

<sup>4</sup> While this study acknowledges that remittances have both negative aspects highlighted in the text and positive ones as summarized in, Amuedo-dorantes, (2014), it mainly focuses on examining the impact of remittances on financial development given the surge in remittances to Kenya in the recent past and the possibility of leveraging on technology to increase financial inclusion of the unbanked.

<sup>5</sup> M-Pesa products are explained in Appendix 1.

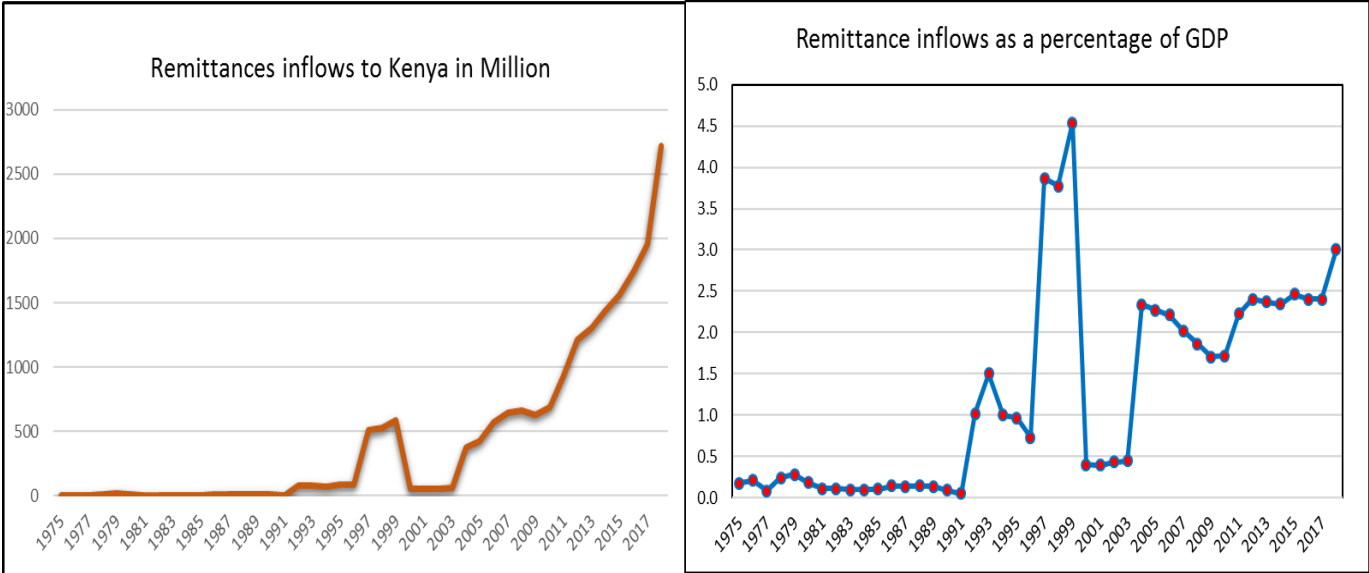
consumption channels ignoring the financial development channel. (Makori et al., 2015; Aboulezz, 2015; Mwangi and Mwendwa, 2015; Ocharo, 2014; Kiio, 2014).

This study attempts to fill this gap by analyzing the relationship between remittances and financial development contributing to existing knowledge in at least four respects. First, to the best of our knowledge, no study has been conducted examining the remittances-financial development nexus using Kenyan data. Second, the paper uses more than one indicator of financial development including indicators of financial inclusion such as number of bank accounts and mobile transactions that, have not been used in previous studies based on Kenyan data. Third, the paper also utilizes the bound cointegration technique or the autoregressive distributive lag model (ARDL) that has not been utilized in previous studies using our data set. Fourth, this study also examines if there is any reverse causality between remittances flows and financial development since existing literature shows a possibility of such a relationship. The results of this study are critical for policy makers keen on leveraging on technology to facilitate enhancement in remittances and improvements in financial inclusion. The study is also beneficial to private sector actors, mainly banks as well as governments who can benefit by developing customized products for the diaspora.

**2.0. Remittances flows in Kenya**

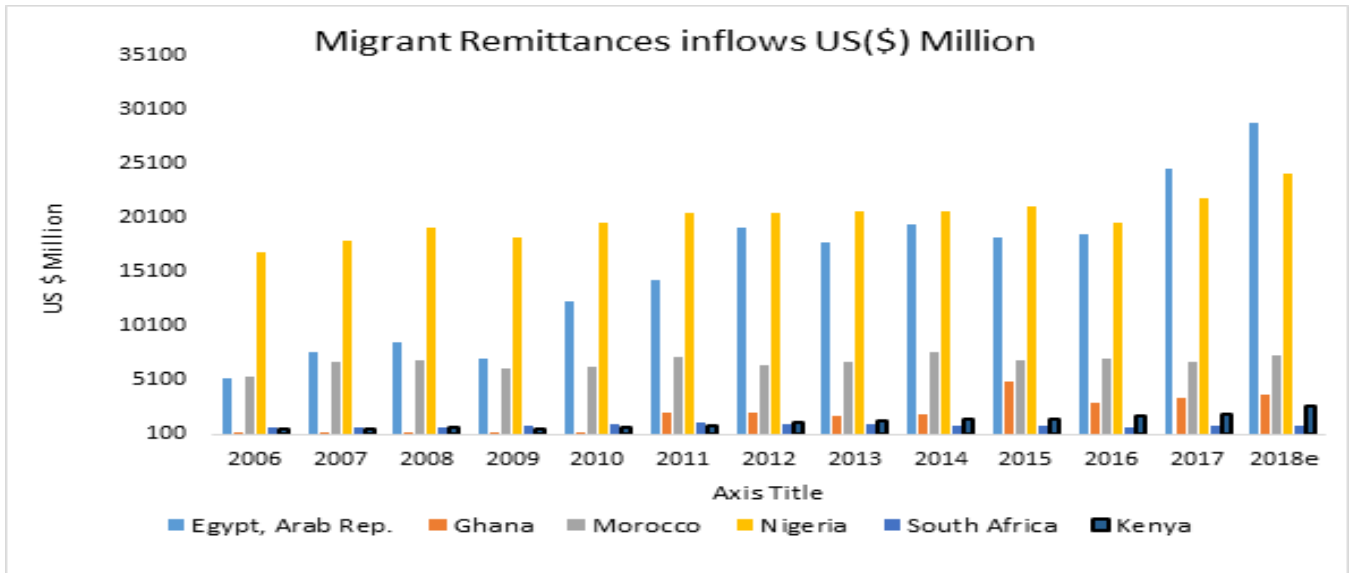
In this section, we present an overview of trends in the remittance flows as well as financial sector development indicators in Kenya. Figure 2.1 shows that remittance flows to Kenya picked in 2003 and has been growing steadily in the last decade. The flows were stable even during the global financial crisis when other capital flows were volatile. Remittance flows to Kenya constitute about 3 percent of gross domestic product based on 2018 numbers, (World Bank, various issues). Figure 2.2 shows that Kenya is one of the top five highest remittance-recipient countries in Africa after Egypt, Nigeria, Morocco and Ghana. In figure 2.3 we provide trends of remittances and other capital flows.

**Figure 2.1. Remittance inflows to Kenya (Totals and share of GDP), 2018**



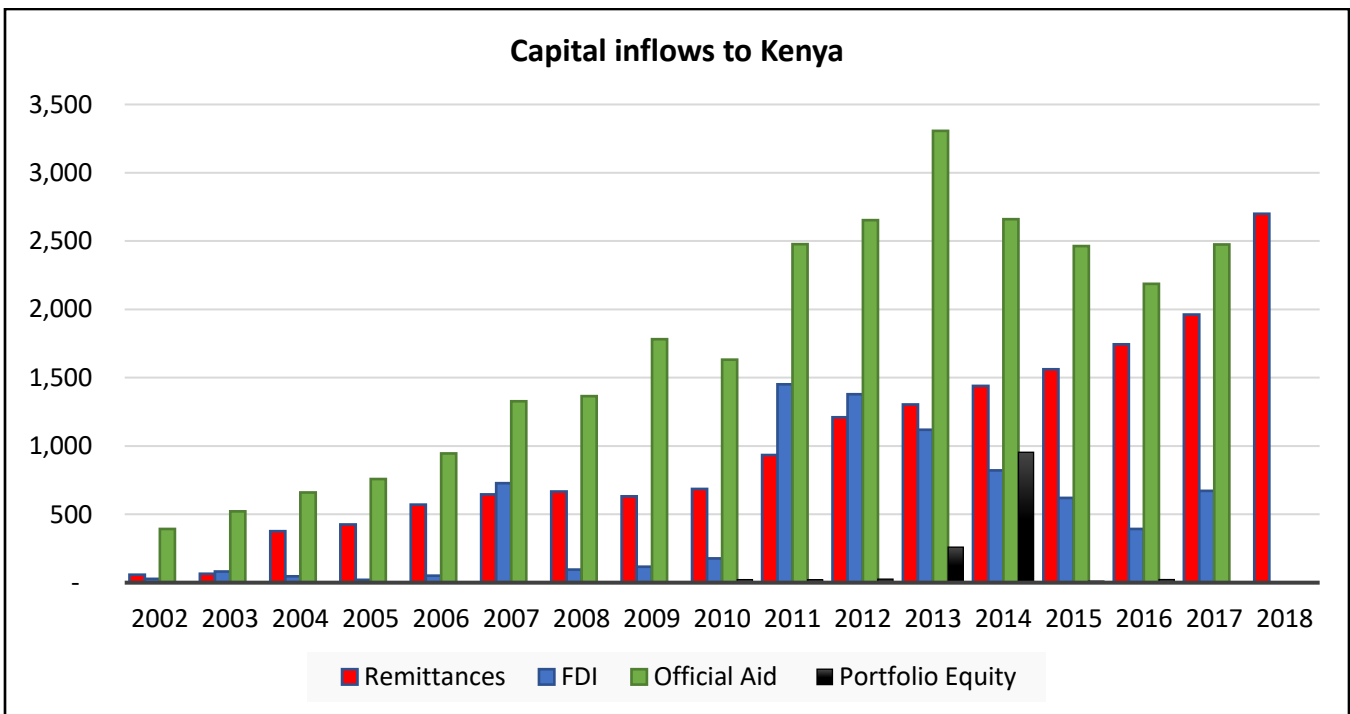
Source: World Bank Migration and Remittances data, Central Bank of Kenya

**Figure 2.2: Migrate remittance flows in selected countries in Africa**



Source: World Bank Migration and Remittances data

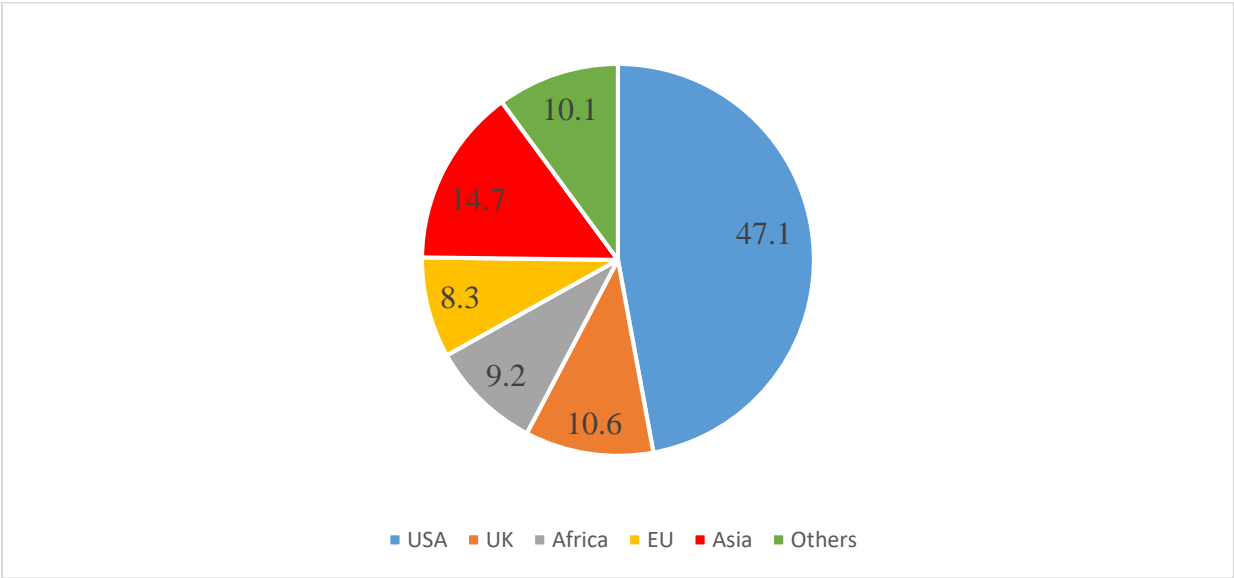
**Figure 2.3. Capital inflows, Million US \$**



Source: World Development Indicators, World Bank Migration and Remittances data

Remittances to Kenya have been increasing consistently, recording higher levels than foreign direct investment and portfolio equity flows. Although official development assistance flows increased, their developmental impact is not directly tangible compared to remittances that flow directly to the beneficiaries with potential impact on health, education, small scale businesses and the real sector. Moreover, a number of previous studies have shown that official development assistance does not necessarily translate to high economic growth rates, (Yiew and Lau, 2018; Phiri, 2017; Murshed and Khanaum, 2014). Official development assistance has a history of misappropriation at state and non-governmental levels, (Elayah, 2016; Kono and Montinola, 2013; Bodomo, 2013; Doucouliagos and Paldam, 2011; Maipose, 2000)<sup>6</sup>. Furthermore, remittance flows through formal channels to African countries, Kenya inclusive, are believed to be grossly underestimated since migrants send money through informal channels and in-kind transfers that is often unrecorded.

**Figure 2.4. Remittance inflows by sources to Kenya in May, 2019**



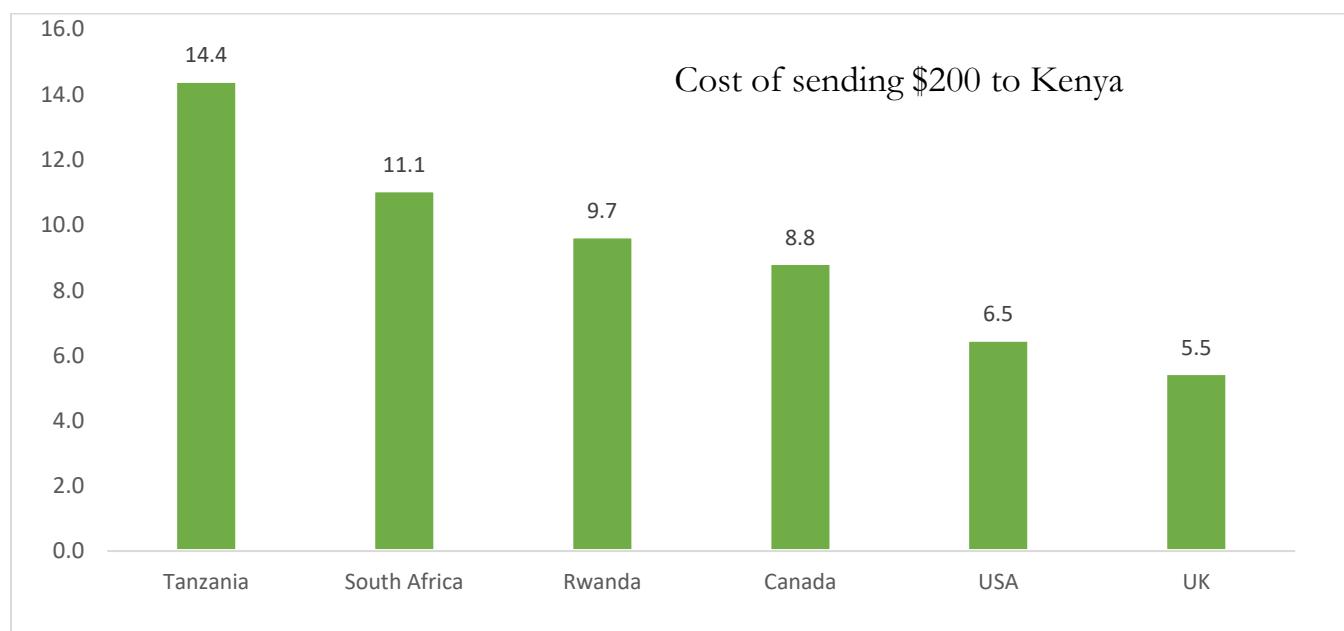
Source: Commercial Banks

Kenya receives the highest remittance flows from the United States of America, Asia and United Kingdom, constituting about 47 percent, 15 percent and 11 percent of total flows, respectively (Figure 2.4). These numbers indicate where focus should be laid in terms of bilateral agreements to ease and enhance remittance flows as well as where the private sector, especially commercial banks, mobile companies and online remittance platforms, would concentrate to attract more remittance flows and enlarge their market territory. The Government would also focus on these concentration corridors in terms of incentives and conducive policies to harness the flows.

<sup>6</sup> The debate on aid is extensive and rich but largely inconclusive and biased towards ineffectiveness, particularly in Sub-Saharan countries. While a number of reasons such as poor policy environment, moral hazard, corruption and lack of coordination, among others, have been advanced for failure of aid effectiveness, no consensus exists of one set of reasons and differences abound in terms of the impact of the different components of aid in different countries and contexts. In this paper, the analysis focuses on the potentially greater benefits of remittances that are directly transferred to recipients rather than aid that passes through the state or non-governmental agencies, who more often do not transfer it to the beneficiaries.

However, in spite of the potential importance of remittance flows, the remittance market in Kenya and indeed elsewhere on the African continent is not devoid of challenges. Apart from inaccuracy of data due to remittance flows through informal channels, it is very expensive to send money to Africa with an average cost of sending money at about 9 percent against a global average of 7.6 percent (World Bank, various issues). This is 6 percent above the target 10c of the sustainable development goals.<sup>7</sup> The cost of sending money to Africa is high due to the exclusive regulatory framework leading to limited competition, compliance of Anti Money Laundering/Countering Financing of Terrorism (AML/CFT), few rural pay out stations, financial illiteracy and low utilization of cheaper and modern technology, among other factors.

**Figure 2.5. Cost of sending money to Kenya by corridor in Quarter 2, 2019**



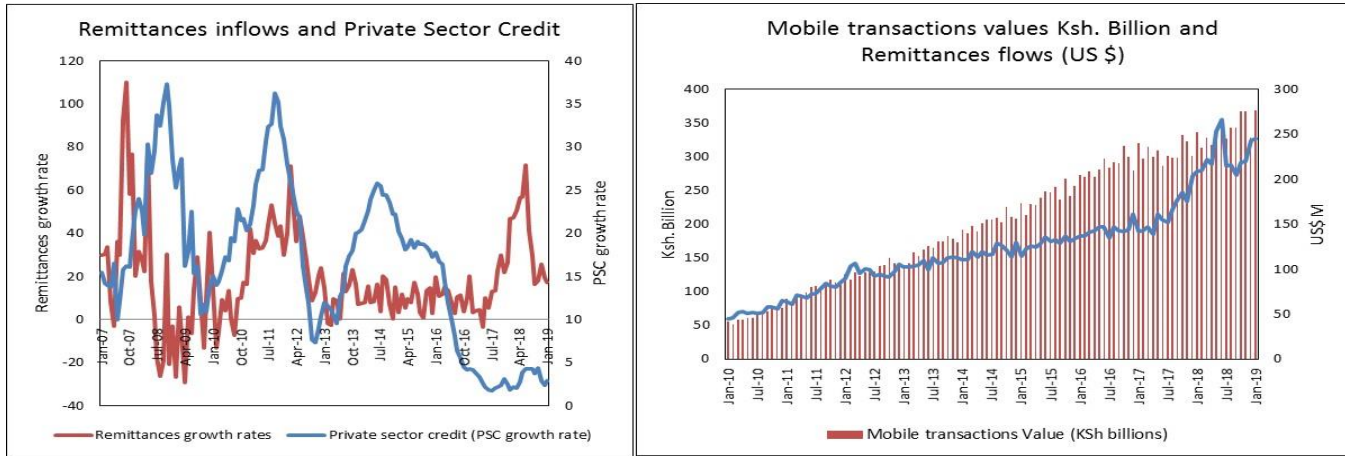
Source: Remittance Price Worldwide and Send Money Africa

As an illustration of the magnitude of costs, we present the cost of sending money to Kenya for selected corridors in figure 2.5. The figure shows that it is more expensive to send more from within the continent than from outside the continent. For example, the cost of sending US \$ 200 from Tanzania and South Africa to Kenya is 14.4 percent and 11.1 percent, respectively, while sending the same amounts cost 5.5 percent from the United Kingdom. Huge variations also exist across corridors as indicated by the cost of sending similar amounts of money from Rwanda recorded at 9.7 percent yet the neighboring Tanzania sends the same amount of money at nearly double the cost. High remittance transfer costs not only encourage usage of informal channels with negative implications on the financial sector but it also dis-incentivizes migrants from sending higher flows of remittances.

<sup>7</sup> The computations here are based on data from various issues of the Migration and data, Remittance Price Worldwide and Send Money Africa websites



**Figure 2.6: Remittance inflows, mobile transactions and credit to the private sector**



Source: Central Bank of Kenya

Figure 2.6 illustrates trends of remittance inflows and financial development indicators. The figure shows positive relationships between remittance inflows with the value of mobile transactions over the entire period under review. Private sector credit also trends positively with remittance inflows from 2007 to 2014. However, thereafter, private sector credit declines as remittances increase. This would be partly attributed to enhanced use of international mobile money transfer services including remittance transfers in the last three years. The trends can also be explained by considering the fact that other more important factors apart from remittance inflows such as the interest rate caps and the residual effects of the three banks under receivership during this period may have altered the trends of credit to the private sector.

### 3.0. Literature Review

Diverse arguments linking remittances to financial development exist in the literature, however, most of them lean towards its potential to enhance financial inclusion especially for the bottom, unbanked and low income earners in developing countries. One of the theories linking remittances and financial development is anchored in the financial literacy hypothesis. Proponents of this hypothesis argue that both remittance senders and recipients create demand for financial systems involved in international remittances and this can incentivise either party or both to seek and interact with financial institutions who are involved in other financial products beyond remittances. This in turn increases financial awareness both for the sender and recipient and can lead to demand for other financial products by remittance recipients such as savings, insurance, mortgage, among others. Thus increasing possibilities in this manner for formal money transfer services could be a response to existing demand. The financial literacy view assumes that exposure and knowledge of financial services induce usage of formal banking services by remittance recipients, (Brown et al., 2013; Toxopeus and Lensink, 2008).

Karikari et al., (2016) further supports the positive relationship between remittances and financial intermediation by arguing that migrant transfers in excess of consumption expenditures are likely to be saved thus allowing recipient individuals the opportunity to be introduced to financial products and services leading to enhanced financial development. Related to these arguments are postulations on how remittances provide an alternative option to finance entrepreneurs who

do not qualify for credit in mainstream commercial banks. These entrepreneurs may over time graduate to a “bankable” stage and influence commercial banks to compete for them. In the same line of argument, Ambrosius and Cuecuecha, (2016) provides a summary of linkages between remittances and financial access. Under this line of thought, remittances function as a substitute to credit in which case, different behaviour of spending by remittance receiving households is explained within a theoretical framework of imperfect credit markets where remittances help poor households overcome liquidity constraints that restrict investment in human or physical capital.

On the supply side, considerable arguments contend that a regular flow of remittances facilitates creation of a credit history and connections that establish credit worthiness of the recipients and possibility of considering the current and potential remittance flows as collateral for credit allocation (Guliano and Ruiz, 2009; Toxopeus and Lensink, 2008). This line of reasoning is corroborated in Anzoategui et al., (2014), who argues that remittances might increase household likelihood of obtaining a loan since processing remittance flows provides financial institutions with information on income of recipient households. In this case, remittances potentially lower a client’s risk profile since banks can obtain information about remittance recipients who are prospective loan clients. The bank can use this knowledge to base greater emphasis on soft data such as reliability and character of client. When remittances go through a bank, clients can use both current and future inflows as ‘collateral’ to access credit. If the inflows are accepted by a bank as explained, loans could be (partly) covered by remittance inflows, thus lowering the bank’s risk, and motivating payback and optimal project management. Moreover, deposits of remittance receipts in banks increases the loanable funds and thus banks’ ability to extend credit to both remittance and non-remittance receiving households, (Brown et al., 2013, Motelle, 2011).

Further arguments based on policy considerations contend that the government can encourage transfers through formal channels by removing taxes on income remittances, relaxing exchange controls and capital controls, allowing domestic banks to operate overseas, providing identity cards for migrants and providing financial products targeting the diaspora, among other incentives.<sup>8</sup> In cases where usage of formal financial institutions is constrained by lack of migration documentation, governments can consider entering into bilateral agreements to facilitate opening of bank accounts and usage of formal financial institutions. For example,

---

<sup>8</sup> In an attempt to leverage on remittances for financial development and encouraging usage of formal remittance channels, some countries such as Zimbabwe, Ethiopia, Kenya, Cape Verde have initiated incentive systems to encourage remittance flows. In 2016, Zimbabwe introduced the Diaspora Remittance Incentive Scheme (DRIS), which is a bonus programme to incentivise remittances to Zimbabwe by adding a percentage of the funds remitted to the total remittance amount. Transfers to mobile money accounts are eligible to receive an extra 7 percent added to the funds sent while the transmitting agent and recipient are paid 2 percent and 3 percent of the amount remitted, respectively, in case where payments are terminated through the banking system, (details are available in FinTrust, 2016). In 2018, through an amendment to Tax Procedures Act of the Finance Act 2016, Kenya offered a temporary tax amnesty to the diaspora for incomes earned since 2010. This may have partly led to an improvement in remittances in 2018. Moreover, the strong retail payment infrastructure facilitated through adoption of the agency model and M-Pesa enabled settlements discussed elsewhere in this paper has also led to cost reduction of remitting funds in Kenya. Other countries such as Egypt, India, Sri Lanka and Ethiopia have positively influenced remittance flows through tax breaks, (Hagen-Zanker, 2014).

Mexico devised alternative forms of identification involving issuance of Matricula Consular to Mexicans that is acceptable in the USA consulates (Toxopeus and Lensink, 2008).

In contrast, some of the arguments showing positive linkages between remittances and financial development, Brown et al, (2013) shows that it is possible that migrants would be distrustful of formal banking services due to other reasons apart from financial illiteracy, such as, avoidance of formal records of income flows occasioned by Anti-Money Laundering compliance requirements. In this case, remittances may not be associated with opening of bank accounts. Other negative views on the remittances-financial development nexus are found in Muktadir-Al-Mukit and Islam, (2016).

More recent theories have focused on leveraging on technology for financial inclusion especially in developing countries. Proponents of views associating technology and financial development contend that adoption of electronic payments generate important cost reductions in the management and safeguarding of cash as well as in money transmission services such as remittances (Santos and Kvangraven, 2017).

On the empirical front many studies have been done based on both secondary and primary data. Using primary data Li et al., (2014), show that people in households that receive remittances are more likely to have savings account and to use a bank account than households that do not receive remittances. A summary of some of the empirical findings including methods used and countries covered are summarised in Table 3.1 below.

**Table 3.1: Summary of International Empirical Evidence on remittances-financial development relationship**

<i>Year</i>	<i>Author/s</i>	<i>Country/ies</i>	<i>Data</i>	<i>Methodology</i>	<i>Findings</i>
2018	Bamahriz and Masih	Kenya	2004-2016	ARDL	No causal relationship between inward remittances and real estate bubble
2016	Karikari et al.,	50 Developing countries in Africa	1990-2011	Fixed Effects; Random Effects and Vector Error Correction Model	Remittances have a positive effect on financial development in the short run but a negative effect in the long run.
2016	Muktadir-Al-Mukit and Islam	Bangladesh	1976-2012	VAR and VECM	There is a positive relationship between remittances and credit disbursement in the long run. Bi-directional causality is also established in Bangladesh.
2016	Ambrosius and Cuecuecha	Mexico	Household survey data	Fixed effects and	There are positive effects of remittances on the

			(2002; 2005)	instrumental variables	ownership of savings account, existence of debts and borrowing
2016	Williams	Sub- Saharan Africa	1970-2013	Panel data	Remittances positively influence financial development
2015	Mbaye	Senegal	Household survey data (May-July 2009; April-June 2011)	Household fixed effects model	Receipt of remittances increases likelihood of having a loan in a household.
2015	Coulibaly	Sub- Saharan Africa	1980-2010	Panel granger causality	No strong evidence supporting the view that remittances affect financial development or vice versa
2014	Anzoategai et al.,	Elsavador	1995-2001, four wave rural household level survey data	Fixed effects	Households that receive remittances are more likely to have a deposit account at a financial institution
2014	Ojapinwa and Oladipo	32 SSA countries	1996-2010	Dynamic panel GMM	Remittances affect financial development in a positive and significant way implying that remittances complement financial intermediation in SSA countries.
2013	Brown et al.,	Developing countries	1970-2005	Panel Least Squares, 2SLS and Probit approaches	Remittances flows do not induce opening of bank accounts or increase in credit to the private sector
2012	Nyamongo et al.,	Africa	1980-2009	Panel data approaches	Remittances are complementary to financial development and are an important source of economic growth
2011	Motelle	Lesotho		Vector Error Correction Model and Causality tests	Remittances have a long- run effect on financial development. Causality is established from financial development to

					remittances but not vice versa
2009	Giuliano and Ruiz-Arranz	100 developing countries	1975-2002	System GMM; OLS and Fixed Effects	Remittances provide alternative way to finance investment and help overcome liquidity constraints
2009	Gupta et al.,	Sub Saharan Africa	1975-2004	Three stage least squares	Remittances have a direct poverty mitigating effect and promotes financial development
2009	Beine et al	66 developing countries	1980-2005	Dynamic generalized ordered logit model	A strong positive effect of remittances on financial openness.
2008	Toxopeus and Lensinki	Developing countries	2003	OLS	Remittance flows have a significant positive effect on financial inclusion in developing countries
2006	Aggarwal et al	99 Developing countries	1975-2003	GMM	Impact of remittances on financial development is positive though marginal.

#### 4.0. Data, variables and methodology

The study uses quarterly data obtained from the Central Bank of Kenya and the Kenya Bureau of Statistics covering the period 2006 to 2017. Data is selected based on availability in the frequency of our estimation and based on standard variables identified in the literature (Beck et al., 2018; Financial Sector Assessment Report, 2005). Consistent with previous studies, we use bank deposits to GDP, credit to the private sector to GDP, number of bank accounts, number of mobile transactions, value of mobile transactions, number of mobile agents and number of bank branches as proxies for financial development and financial inclusion and as dependent variables, (Ito and Kawai, 2018; Camara and Tuesta, 2014; Ayadi et al., 2013; Afi, 2013; Financial Sector Indicators, Note, 2006). Number of mobile accounts, value of mobile transactions, number of mobile agents and number of mobile transactions are the key indicators identified in the literature to capture usage of mobile money services, (Arif, 2018). Research on usage of mobile money services and its linkages to other economic variables is still nascent given that the usage of mobile money transfer services gained prominence in the last one decade. Thus apart from a few primary data based studies, most of the countries tracking such transactions has so far focused on the aforementioned indicators. This study therefore adopts similar indicators. The indicators of financial development used in this study are in line with the objectives of the topic of capturing the impact of remittances on financial development and inclusion. We thus use credit to the private sector and deposit to GDP to capture financial depth as is standard in the literature, (Ayadi and Arbak, 2013; Beck et al., 2000; 1999; Lynch, 1996). We abstain from using money supply as a share of GDP since some form of monetary base does not pass through the banking system but via mobile transfer payments, (Asongu, 2012). The remittance variable is regressed

against each of the dependent variables separately. Our control variables include inflation, real GDP, exchange rate, interest rate and trade openness (Al-Tarawneh, 2016).<sup>9</sup>

Following from previous studies, the basic general model is specified below:

$$FIND_t = \alpha_0 + \beta_1 Re m_t + \beta_2 X_t + \varepsilon_t, \dots, (1)$$

Where FinD represents financial development variables, Rem represents remittance variables while X represents all the control variables in all the models. Equation 1 is then reformulated into a long run relationship represented in equation 2.

$$\gamma_t = LFinD_t - \alpha_0 - \beta_1 LRe m_t - \beta_2 LX_t + \varepsilon_t, \dots, (2)$$

$$\Delta LFinD_t = \delta_0 + \sum_{i=1}^p \rho_i \Delta LFinD_{t-i} + \sum_{i=0}^q \delta_i \Delta LRe m_{t-i} + \sum_{i=0}^m \tau_i \Delta LX_{t-i} + Z\gamma_{t-1} + \varepsilon_t, \dots, (3)$$

Reformulation of equation 2 and equation 3 results in an ARDL specification in 4 below (Tung, 2015; Karamelikli, 2015)

$$\begin{aligned} \Delta LFinD_t = & \alpha_0 + \beta_1 LFinD_{t-1} + \beta_2 LRe m_{t-1} + \beta_n LX_{t-1} + \sum_{i=1}^p \rho_i \Delta LFinD_{t-i} + \sum_{i=0}^q \delta_i \Delta LRe m_{t-i} \\ & + \sum_{i=0}^m \tau_i \Delta LX_{t-i} + \varepsilon_t, \dots, (4) \end{aligned}$$

where LFinD represents log of financial development variables, LRem is the log of remittances while LX represent the log of the control variables in the model already described in previous paragraphs.

p, q and m are optimal lag lengths;

$\rho_i, \delta_i$  and  $\tau_i$  are short-run dynamics of the ARDL model;

$\beta_1, \beta_2, \dots,$  and  $\beta_n$  are long run multipliers;

$\Delta$  is the first difference operator;

$\alpha_0$ ' is a constant term, and

$\varepsilon_t$  is white noise error

In line with previous studies, other factors affecting financial development include: real gross domestic product, trade openness, CPI, exchange rate and interest rate, (Polat, 2018; Karikari et al., 2016; Ayadi et al., 2013; Chinn and Ito, 2006). We include trade openness (TOPEN) whose

<sup>9</sup> See Appendix 3 for details of the methodology

importance in fostering financial development has been identified in many previous studies.<sup>10</sup> Increase in trade openness generate demand for new financial products including instruments for trade finance and for hedging of risks. At the same time, trade openness may cause macro level uncertainty and lead to unfavorable influence on the finance-development-economic growth linkage (Rehma et al., 2015; Raza, 2014; Antonio et al.,1994). The apriori sign for this variable is therefore ambiguous. Trade openness constitutes the total of exports and imports divided by GDP.

We also include consumer price index (CPI) measuring the average price of consumer goods and services bought by a household. Several studies show that high inflation erodes returns on savings leading to reduced incentives to save hence low number of savers and amount of savings. Consequently, the pool of borrowing and credit allocation shrinks with negative implications on the financial sector. This challenge is aggravated in financial markets where collateral is required for efficient functioning of borrowing and lending since too little savings inhibit accumulation of collateral and impedes growth enhancing financial intermediation. Moreover, periods of high inflation are often followed by tight monetary policy implying high interest rates with the potential of leading to inefficient financial markets. High inflation also hampers long term contracting and hence induces financial intermediaries to maintain very liquid portfolio (see summaries in Akosah, 2013; Manoel, 2011). We expect a negative relationship between inflation and financial development.

The relationship between interest rate (INT) and financial development is entrenched in the work of McKinnon (1973) and Shaw (1973). The two authors argued that financial repression in the form of interest rate ceilings, high reserve ratios and directed credit lead to low savings and credit rationing and hence low financial depth in most developing countries. The liberalization theory that followed hinged on the premise of real rate of interest adjusting to equilibrium levels and thereby enabling expanded savings and real supply of credit with positive implications on financial deepening. We used the deposit rate to capture the effect of interest rate liberalization with expected positive sign since interest rate deregulation was meant to increase yields in deposit rates resulting in increased savings and hence financial depth.

The relationship between economic growth and financial development is positive based on the demand-following theories which postulate that, as the real sector develops, increased demand for financial services induces growth in the financial sector. As the economy grows, it generates additional and new demand for financial which brings about a supply response in the growth of the financial system. Lack of financial institutions therefore is an indication of the lack of demand for their services, (Sahoo, 2013; Huang, 2011; Al-Naif, 2012; Ghosh and Banerjee, 1998; Stammer, 1972; patrick, 1966).

Equation 4 represents the standard way of specifying an unrestricted error correction model capturing both short run and long run relationships among the variables in the study. We then

---

<sup>10</sup> This is one of the standard measures used in the literature to measure trade openness, (Polat, 2018; Fujii, 2017; Squalli and Wilson, 2011; Chinn and Ito, 2006)

test the null hypothesis,  $H_0: \beta_1 = \beta_2 = \dots = \beta_n = 0$  (Long run relationship does not exist) against the alternative  $H_1: \beta_1 \neq 0, \beta_2 \neq 0, \dots, \beta_n \neq 0$  (Long run relationship exists) for the long run relationship among variables. Rejection of the null hypothesis implies that there is a long run relationship among variables. We test the hypothesis by comparing the F-statistics obtained from the Wald-test with the critical values for small samples (between 30-80 observations) provided by Nayaran, (2005).

## 5.0. Discussion of findings

In this section, we present unit root tests results in table 5.1.<sup>11</sup> Then we estimate the ARDL model as well as the long run model with different dependent variables in each equation.<sup>12</sup> We consider five dependent variables representing financial development. Five different equations are estimated using five different financial development indicators. We use credit to the private sector as a share of GDP (CRED), bank deposits as a share of GDP, number of bank accounts, number of bank branches and value of mobile transactions as separate dependent variables in five separate equations. The results for the long run models and error correction models are presented in table 5.5 and 5.6, respectively.

### 5.0.1. Unit Root tests

In this sub section, we present the unit root tests and ARDL findings based on different indicators of financial development as dependent variables. Although, unit root tests are not required in ARDL models, the unit root tests are carried out to ensure that the variables considered in our models are either I(0) or I(1) since inclusion of I(2) variables can lead to the collapse of the system and it renders the computed F-statistics provided by Pesaran et al., (2001) and Narayan(2005) invalid, (Nkoro and Uko, 2016; Sharaf, 2014). We transform all our variables into logs denoted by L in the equations and using Augmented Dickey Fuller (ADF) test in table 5.1, we establish that all variables are either I(1) or I(0) at the 1 percent significance level, thus satisfying the condition for using ARDL model.

---

<sup>11</sup> Unit root test are carried out to establish whether the data used is stationary or non-stationary. If the data used is found to have a unit root, then one may need to difference to make it stationary in order to use it in time series regression. Regressing non-stationary data leads to spurious regressions.

<sup>12</sup> We also conducted causality tests and the results largely show unidirectional relationship from remittances to financial development for most of the financial development indicators. The results are reported in Appendix 2.



**Table 5.1: Augmented Dickey-Fuller (ADF) Test Results for unit roots**

Variable	At level	At first difference	Order of integration
RGDP	-4.92	-	I(0)
CRED	-3.13	-5.10	I(1)
DEPGDP	-3.20	-7.44	I(1)
TOPEN	-3.59	-	I(0)
ER	-3.48	-5.62	I(1)
Lending	-1.665	-5.884	I(1)
INT	-1.22	-3.64	I(1)
CPI	-2.78	-4.64	I(1)
REM	-2.82	-11.66	I(1)

×× RGDP= real GDP ; Cred= private sector credit as a share of GDP; Depgdp= bank deposits as a share of GDP; Int =deposit interest rate; CPI=inflation; ER-Exchange rate; Topen=trade openness; Rem= total remittances; Lending=lending interest rates.

### 5.0.2. Cointegration tests

We conducted five cointegration tests based on the five different dependent variables but we only present the results that exhibit long run relationships between the dependent variable and the independent variables. In table 5.2, credit to the private sector as a share of GDP was considered as the dependent variable in testing for the presence of cointegration or long run relationship between the dependent variable and the explanatory variables. We conducted the F-test by restricting the coefficients of one period lagged level of the independent variables equal to zero. In table 5.2, the results show an F-statistics of 5.28 which is higher than the upper bound and lower bound values signifying presence of cointegration between credit to the

**Table 5.2: Credit to the private sector as a share GDP is the dependent variable**

Variables	F-Statistics	Cointegration
(CRED, RGDP, TOPEN, ER, CPI, REM, INT )	5.283*	Cointegration
Critical values	Lower Bound	Upper Bound
1 %	3.595	5.225
5%	2.643	4.004
10%	2.238	3.461

private sector and its determinants specified in the second row of table 5.2. In table 5.3 and 5.4, we replaced credit to the private sector as a share of GDP with the value of mobile transactions and number of bank accounts as other indicators of financial development/inclusion, respectively. In both cases we obtained an F-statistic that is higher than the upper bound values at 5 percent and 1 percent statistically significance levels for value of mobile transactions (Mob) and number of bank accounts, respectively. We therefore make similar conclusions of presence of long run relationships between the dependent and independent variables in both cases.

**Table 5.3: Value of mobile transactions is the dependent Variable**

Variables	F-Statistics	Cointegration
(MOB, RGDP, TOPEN, ER, CPI, REM, INT )	5.08*	Cointegration
Critical values	Lower Bound	Upper Bound
1 %	3.644	5.464
5%	2.676	4.130
10%	2.260	3.534

However, our results of the F-test changed when we substituted credit to the private sector as a share to GDP with deposits to GDP and number of bank branches as indicators of financial development. In this case, our results were inconclusive with an F-statistic of 3.47 when the dependent variable is deposits to GDP and 3.42 when the dependent variable is number of bank branches, which is lower than our upper bound values at 5 percent and 1 percent significance levels. The values lie in between the lower bound and upper bound values provided by Narayan, (2005) indicating inconclusive results.

**Table 5.4: Number of bank accounts is dependent variable**

Variables	F-Statistics	Cointegration
(ACC, RGDP, TOPEN, ER, CPI, REM, INT)	5.260*	Cointegration
Critical values	Lower Bound	Upper Bound
1 %	3.595	5.225
5%	2.643	4.004
10%	2.238	3.461

### 5.0.3 Econometric results of the long-run model

In this section, we present the coefficients of the long run equations for the credit to the private sector to GDP, value of mobile transactions and number of bank accounts equations. Although we did not report the Wald-test results for the number of mobile agents and number of mobile transactions, we use them separately as dependent variables replacing value of mobile transactions in each case and report the long run results in table 5.5. Accordingly, in table 5.5, we report results of five different models from columns 2-6, where we use five different dependent variables as indicators of financial depth and financial inclusion.

**Table 5.5: Estimated Long Run Coefficients**

Independent variables××	Coefficient (The dependent variable is credit to the private sector to GDP)	Coefficient (The dependent variable is Value of mobile transactions)	Coefficient (The dependent variable is Number of mobile agents)	Coefficient (The dependent variable is Number of mobile transactions)	Coefficient (Number of bank accounts)
RGDP	0.6069(4.61)***	7.15E-07(0.17)	0.0129(0.63)	0.0414(1.36)	0.7153(8.12)***
Topen	2.3219(2.14)**	5.469(0.56)	2.5584(2.70)***	3.1390(2.44)**	0.5784(5.86)***
ER	0.0142(4.50)***	5.28(1.82)*	5.3733(3.46)***	0.0766(2.70)**	-0.2202(-1.14)
CPI	-0.0008(-0.24)	0.0322(1.00)	-0.0665(-3.18)***	-0.0378(-1.21)	-0.0008(-0.29)
Int	0.0454(0.44)***	-2.653(-2.93)***	-0.9905(-1.56)	-0.149(-1.90)**	0.0106(0.11)
Rem	0.5416(5.30)***	2.293(2.43)**	1.4333(2.93)***	1.3524(2.02)**	0.2700(3.81)***
<i>R</i>	0.97	0.81	0.91	0.84	0.95

For all the coefficients the t-statistics are in parenthesis; \*, \*\*, \*\*\* denote 10%, 5% and 1% significance levels, respectively. ×× RGDP= GDP; Int =deposit interest rate; CPI=inflation; ER-Exchange rate; Topen=trade openness; Rem= total remittances.

The relationship between remittances and financial development is positive and significant in all the models presented in table 5.5. This implies that remittances are important for financial depth and financial inclusion since the relationship is maintained regardless of the indicator for financial development used. In column 2 where we have used credit to the private sector to GDP, the positive coefficient of remittances implies that higher levels of remittances boost savings and

therefore facilitate higher credit to the private sector. Similar interpretation is applicable to the relationship between remittances and number of bank accounts in column 6. This result is not surprising since remittances flows provide opportunities for opening bank accounts and accessing financial systems for recipients, particularly, in areas where banks serve as main remittance paying agents. Moreover, remittances received have the potential of exposing new financial products to both banked and unbanked remittance recipients. These results corroborate the findings of Fromentin, (2017); Karikari et al., (2016) and Aggarwal et. al., (2011), among others.

In column 3-5 where we have used proxies for mobile remittance transfers, the results seem to suggest that higher remittances boost the values of mobile transactions, number of mobile transactions as well as number of agents involved in mobile transfer. This strong positive relationship would imply that more remittances are being channeled through mobile technology and that if migrants take advantage of the low costs and convenience offered by mobile transfer channels, it is possible to increase remittances through formal channels and hence deepen financial inclusion, especially in the rural areas. The fact that coverage of mobile usage is huge in the rural areas enhances the potential for remittances to have a greater impact on financial inclusion in areas where formal services through banks are limited. Ouma et al, (2017), who assessed the impact of mobile financial services on savings in Kenya found similar results. Moreover, mobile to mobile remittances also save costs of travel and man hours that would otherwise be wasted in queues in traditional set ups. These saved costs can in turn boost remittance flows. The positive relationship between all indicators of mobile transactions and remittances further reflect the enabling regulatory environment that has led to the growth and acceptance of online remittance platforms such as skrill and Worldremit that facilitate international remittance transfer. These results and its analysis find support in Kim et al., (2018), IFAD, (2015), Mago and Chitokwindo, (2014) and Mashayekhi, (2014), among others.

The results show that the level of economic activity represented by real GDP positively affects financial development but the coefficient is significant in only two models where credit to the private sector to GDP and number of bank accounts are used as dependent variables. The results conform to the demand pulling hypothesis of financial development postulated by Patrick, (1966). The relationship between trade openness and financial development is also positive as expected and significant in all the models except one. This result supports the theory that trade openness increases demand for new financial products including instruments for trade finance and for hedging of risks. Similar results were found by Ho and Iyke, (2018), Kim et al., (2009) and Law and Demetriades, (2004). The coefficient of interest rate is positive and significant as expected in column 2 where we have used credit to the private sector to GDP as the dependent variable. However, when we replace credit to the private sector to GDP with value of mobile transactions and number of mobile transactions, the sign changes to negative with a significant coefficient. The plausible explanation for this negative relationship between deposit interest rate and mobile transactions would be that, as the commercial bank deposit interest rates increases, most of it is kept in bank accounts rather than in mobile accounts. Thus higher bank deposits attract more savings towards the commercial banks rather than in mobile accounts where they earn no returns. The coefficient of inflation has the expected negative sign but it is not significant in all the models except where we have used number of mobile agents as the dependent variable.

Table 5.6 presents the results of the short run model and the error correction term. The error correction term represents the speed of adjustment of the dependent and independent variables to their long-run equilibrium following any shock. The coefficient measures the proportion of the last period equilibrium error that is corrected for in the current period. The coefficient is negative and statistically significant in all the estimated models implying convergence in the long-run dynamics of the variables. In column 2, the error correction term imply that 11 percent of the last period disequilibrium is corrected in the current period. In case of a shock, it takes nearly ten quarters for the dependent variable and independent variables to restore their long run equilibrium relationship. In column 3 and 4, about 39 percent of the last period's disequilibrium is corrected

**Table 5.6: Econometric results for the error correction model**

Independent variables××	Coefficient (The dependent variable is $\Delta$ in credit to the private sector to GDP )	Coefficient (The dependent variable is $\Delta$ in the value of mobile transactions)	Coefficient (The dependent variable is $\Delta$ in number of mobile transactions)	Coefficient ( $\Delta$ in the number of bank accounts)
$\Delta RGDP$	0.1350(2.81)***			0.0402(1.03)
$\Delta RGDP_{t-1}$		2.3510(1.81)*		
$\Delta ER$	0.3030(3.16)***			-0.0511(-0.62)
$\Delta ER_{t-1}$			-3.2015(-2.44)**	
$\Delta Re m$	-0.0497(-1.75)*	-0.3592(-0.8108)	-1.8052(-3.55)***	
$\Delta Re m_{t-1}$			-1.9484(-3.20)***	0.0440(2.01)**
$\Delta Re m_{t-2}$	-0.0542(2.26)**		-1.1626(-2.29)***	
$\Delta Topen$	1.0226(3.52)***	10.3785(2.74)***	6.0101(2.09)**	0.5069(2.09)**
$\Delta Topen_{t-1}$		7.6800(2.11)**		
$\Delta Topen_{t-2}$	0.4713(2.92)***	7.2356(1.92)*		
$\Delta CPI$				-0.0002(-0.23)
$\Delta CPI_{t-1}$		-0.0355(-1.62)		
$\Delta CPI_{t-2}$	-0.3348(-21.65)			
ECM	-0.1117(-2.47)***	-0.3977(-5.72)***	-0.3950(-5.18)***	-0.0947(-2.13)**
$R$	0.50	0.56	0.65	0.25

For all the coefficients the t-statistics are in parenthesis; \*, \*\*, \*\*\* denote 10%, 5% and 1% significance levels, respectively. ×× RGDP= GDP; Int =deposit interest rate; CPI=inflation; ER-Exchange rate; Topen=trade openness; Rem= total remittances

in the current period. In this case, it takes about two and half quarters for equilibrium relationship between the variables to be restored. In the last column, about 9 percent of the last period disequilibrium is corrected in the current period while it takes about 10 quarters for equilibrium relationships among the variables to be restored.

The results also show that remittances have a negative effect on financial development and financial inclusion in the short run. This can be explained by arguing that initially when migrants

move, they focus on sending money for consumption but with time once their families are stable, possibilities of savings and increased deposits occur which is visible in our long run results.

## **6.0. Conclusions**

Remittance flows steadily increased to developing countries in the last two decades necessitating a review of the importance of various channels through which it affects growth besides consumption smoothening. Thus, research focus on the possible role of remittances on various macro dimensions ranging from the balance of payment through boosted forex reserves, increased financial inclusion and development through increased savings and enhanced bank deposits, and economic growth through increased diaspora investment dominated the last one decade.

It is against this background that this study examined the relationship between remittances and financial development using the ARDL cointegration technique on quarterly data for Kenya covering the period 2006 to 2017. The study considered private sector credit to GDP, indicators of mobile transactions, number of banks accounts, number of bank branches and commercial bank deposits to GDP as dependent variables. The results reveal sensitivity to the indicators used for financial development. They showed cointegration relationships between the dependent variable and explanatory variables when private sector credit to GDP, indicators of mobile transactions and number of bank account were used as dependent variables. However, no long run relationship was visible when deposits to GDP and number of bank branches were used as dependent variables.

In the long run models, we therefore considered only those equations that indicated cointegration between the dependent variable and the independent variables of interest. The results of the long run models showed strong positive linkage between remittances and financial development regardless of the indicators selected for financial development. The relationship was maintained when private sector credit to GDP, value of mobile transactions, number of mobile agents, number of mobile transactions and number of bank accounts were used as dependent variables. These results of the remittances-financial development linkage imply that there is potential for remittance flows to encourage opening of bank accounts, to enhance savings and influence credit allocation in Kenya. This is likely to have a positive impact on financial depth and inclusion by exposing the unbanked to existing and new financial products through the usage of mobile technology as a channel of international remittance transfer and promoting opening of bank accounts.

These results show a policy window for not only reducing remittance transfer costs by continued expansion of the regulatory space for more international remittance payment platforms but also increasing remittance flows and financial inclusion. It may therefore be important to promote policies that encourage the usage of modern and cheaper technology in the remittance transfer business. Given the importance of remittances in credit allocation, commercial banks may find it useful to increase tailored products for migrants to tap into the huge unexploited potential of the diaspora that can increase their deposit base, enhance savings and credit creation. These would include offering higher interest rate on deposits of remittances compared to local currency deposits to encourage opening of diaspora accounts in local banks as well as considering regular remittance flows as collateral for credit allocation. In addition, re-activation of diaspora bonds

to raise funds for infrastructure projects while at the same time providing an opportunity to accumulate savings, invest and participate in national development to the diaspora participants would be another possible avenue worthy fully exploring in Kenya.<sup>13</sup> Other relatively new diaspora frontiers not yet fully exploited include deepening the drive for increased remittances, savings mobilization and investment of diaspora funds through the Kenya Savings and Credit Co-operative Societies whose potential to enhance financial inclusion in Kenya is high. The success of this initiative would require collaboration between the Ministry of Industry, Trade and Cooperatives, Ministry of Foreign Affairs, Ministry of Labor and Social Protection, the National Treasury, Diaspora Organizations and private sector developers to come up with strategies on, among others: Identification, mapping and profiling, registration of diaspora; mobilization of savings and provision of information as well as education and sensitization and training of the diaspora on prospects not yet tapped through the cooperative movement.<sup>14</sup>

#### LIST OF ABBREVIATIONS

ABBREVIATIONS	Meaning
ACC	Number of bank accounts
ADF	Augmented Dickey Fuller
AML/CFT	Anti-Money Laundering/Counteracting Financing of Terrorism
ARDL	Autoregressive Distributed Lag
CBK	Central Bank of Kenya
CPI	Consumer Price Index
CRED	Private sector credit as a share of GDP
ECM	Error Correction Model
ER	Exchange rate
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
FinD	Financial Development
IFAD	International Fund for Agricultural Development
Int	Interest rate
Mob	Mobile transactions
NPS	National Payment Systems
OLS	Ordinary Least Squares
RGDP	Real Gross Domestic Product

<sup>13</sup> Kenya has had plans to launch Diaspora bonds since 2009. In the last decade it floated one major infrastructure bond to the Kenyan diaspora in 2011 for USD 600 million and got USD 141 million. The diaspora bond was unsuccessful due to restrictions in marketing the bond in foreign jurisdictions and perceived foreign exchange risk experienced in Kenya during that time, among other factors. Kenya has since offered other five infrastructure bonds targeting interested foreign and local investors without explicitly targeting the Kenyan diaspora. The government jointly with its newly established diaspora office is working on developing and enhancing modalities to ensure the diaspora bond floated in future works. Diaspora bonds have been issued in Ethiopia and Nigeria but were successful only in Nigeria. Kenya and other countries would draw lessons on diaspora bonds as highlighted in Seliatou and Nana, (2012)

<sup>14</sup> According to the International Cooperative Alliance, Kenya is rated first in the cooperative movement in Africa and seventh globally and it belongs to the Group 10 of the most developed Sacco movement in the World. The SACCO movement had a savings base of Kshs. 380 billion as at 31<sup>st</sup> December 2012 with a capacity of 30 percent savings mobilization per annum. Thus, given that the Diaspora SACCO initiative is a new venture with the first SACCO (Kenya USA Diaspora SACCO) registered in 2012, (Gatuguta, Kimotho and Kiptoo, 2014), there is still great potential evident from the strong local development of these savings mobilization and investment movement.

Rem	Remittances
VAR	Vector Autoregression
VECM	Vector Error Correction Model
2SLS	Two Stage Least Squares
SACCOs	Savings and Credit Co-operative Societies
SSA	Sub-Saharan Africa
TOPEN	Trade openness

## REFERENCES

- Aboulezz, N. (2015), “Remittances and economic growth nexus: empirical evidence from Kenya”, *International Journal of Academic Research in Business and Social Sciences*, Vol. 5, No.12, pp. 285-296.
- Afi, (2013), “Mobile financial services: Indicators for measuring access and usage”, Guideline Note No.11.
- Aggarwal, R., Asli, D., and Peria, M. (2011), “Do workers remittances promote financial development”, *Journal of Development Economics*, Vol.96, No.2, pp. 255-264.
- Akosah, N. (2013), “Dynamics of inflation and financial development: Empirical evidence from Ghana”, *Journal of Economics and Sustainable Development*, Vol. 4, No. 15, pp. 20-38.
- Alimi, R. (2014), “ARDL bounds testing approach to cointegration: A re-examination of segmented Fisher hypothesis in an open economy”, *Asian Journal of Economic Modelling*, Vol.2, No.2, pp. 103-114.
- Al-Naif, K. (2012), “Causality relationship between financial development and economic growth in Jordan: Supply-leading and demand-pulling hypothesis test”, *Middle Eastern Finance and Economics*, Vol. 6, pp. 100-109.
- Al-Tarawneh, A. (2016), “The role of workers’ remittances in development of Jordanian banking sector”, *International Journal of Business and Economics Research*, Vol. 5, No.6, pp.227-234.
- Ambrosius, C. and Cuecuecha, A. (2016), “Remittances and the use of formal and informal financial services”, *The World Development*, Vol. 77. No. C., pp. 80-98.
- Andrianaivo, M. and Kpodar, K. (2012), “Mobile phones, financial inclusion and growth”, *Review of Economics and Institutions*, Vol. 3, No.2., pp. 1-30.
- Amuedo-Dorantes, C. (2014), “The good and the bad in remittance flows: Remittances have the potential to lift up developing economies”, *IZA World of Labor*, No. 97.
- Andiva, B. (2015) ‘Mobile Financial Services and Regulation in Kenya’, in 1st Annual Competition and Economic Regulation (ACER) Conference. Victoria Falls: CCRED
- Antonio, O., Montfort, M., and Ashwin, M., “Does openness matter for financial development in Africa”, *IMF Working Paper*, WP/14/94.
- Anzoategui, D., Demirguc-kunt, A. and Martinez, S. (2014), “Remittances and financial inclusion: Evidence from El Salvador”, *World Development*, Vol. 54, pp. 338-349.
- Ascher, W. et al., (2016), “The evolution of development theories and doctrines since world war II. In: The evolution of development thinking. Politics, economics and inclusive development”, *Palgrave Macmillan, New York*
- Asongu, A. and Sara, R. (2018), “Understanding Sub-Saharan Africa’s extreme poverty tragedy”, *International Journal of Public Administration*, DOI: 10.1080/01900692.2018.1466900.
- Ayadi, et al., (2013), “Determinants of financial development across the Mediterranean”, *MEDPRO Technical Report*, No. 29.

- Bateman, M. (2017), "Small loans, big problems: The rise and fall of microcredit as international development policy introduction to development and change virtual issue", *Development and Change*, No. 1-21, pp. 1-21.
- Beck et al., (2018), "Financial development and structure database", *World Bank*
- Beine, M., Lodigiani, E., and Vermeulen, R., (2009), "Remittances and financial openness' *CREA Discussion Paper Series, Centre for Research in Economic Analysis*", University of Luxembourg.
- Berrack, B., Chatterjees, S. and Lebesmuehlbacher, T. (2018), "The macroeconomic consequences of remittances", *Journal of International Economics*, Vol.111., pp. 214-232.
- Bo, S. (2008), "Testing for unit roots and cointegration-guide", Linkoping University.
- Brown, R., Carmignani, F. and Fayad, G. (2013), "Migrants remittances and financial development: Macro and micro-level evidence of a perverse relationship", *The World Economy*, Vol. 36, No. 5. pp. 636-660.
- Bodomo, A. (2013), "African diaspora remittances are better than foreign aid funds", *World Economics*, Vol. 14, No.4, pp. 21-28.
- Camara, N. and Tuesta, D. (2014), "Measuring financial inclusion: A multidimensional index", *BBVA Research*, WP. No. 14/16
- Chinn, M. and Ito, H. (2006), "What matters for financial development? Capital controls, institutions and interactions", *Journal of Development Economics*, Vol. 81., No.1, pp. 163-192.
- Chong, C. and Chan, S. (2011), "Financial development and economic growth: A review", *African Journal of Business Management*, Vol. 5, No.6, pp. 2017-2027.
- Cihak, et. Al., (2013), "Financial development in 2005 economies: 1960-2010", *NBER Working Paper*, No. W18946
- Coulibaly, D. (2015), "Remittances and financial development in Sub Saharan Africa: A system approach", *Economic Modelling*, Vol. 45, No. C., pp. 249-258.
- Datta, K. and Sarkar, B. (2014), "Remittances and economic growth in Bangladesh: An ARDL cointegration approach", *International Journal of Economic Issues*, Vol.7., No.1, pp. 51-64.
- Demirguc-Kunt, A and Klapper, L. (2012), "Financial inclusion in Africa: An overview", *Working Paper Series*, No. 6088, World Bank.
- Dilip, R. (2013), "The impact of remittances on economic growth and poverty reduction", *Migration Policy Institute*, Policy Brief, No.8.
- Doucouliafos, C. and Paldam, M. (2011), "The ineffectiveness of development aid on growth: An update", *European Journal of Political Economy*, Vol.27, No.2, pp. 399-404.
- Elayah, M. (2016), "Lack of foreign aid effectiveness in developing countries between a hammer and an anvil", *Contemporary Arab Affairs*, Vol. 9., No.1, pp. 82-99.
- Engle, R. and Granger, J. (1987), "Co-Integration and error correction: representation, estimation and testing", *Econometrica*, Vol. 55, No.2, pp. 251-276.
- Fayissa, B. and Nsiah, C. (2010), "The impact of remittances on economic growth and development", *The American Economist*, Vol. 55., No.2, pp. 92-103.
- Filippo, C. et al., (2014), "The impact of remittances on financial inclusion in Veracruz, Mexico" Wageningen University.
- Financial Sector Assessment, (2005), "Indicators of financial structure, development and soundness", *Handbook*, Available at [www.imf.org/external/pubs/ft/fsa/eng/pdf/ch02](http://www.imf.org/external/pubs/ft/fsa/eng/pdf/ch02)
- Financial Sector Indicators Note 1, "Financial Sector Development Indicators", Financial Sector Operations Policy, WorldBank.
- Fromentin, V. (2017), "The long-run and short-run impacts of remittances on financial



- development in developing countries”, *The Quarterly Review of Economics and Finance*, <http://dx.doi.org/10.1016/j.qref.2017.02.006>.
- Fujii, E. (2017), “What does trade openness measure?”, *CESIFO Working Papers*, No. 6656
- Gatuguta, E., Kimotho, P. and Kiptoo, S. (2014), “History, organization of cooperative movement and marketing sub-sector in Kenya”, *Ministry of Industrialization and Enterprise Development*, Kenya.
- Ghosh, S. and Banerjee, S., (1998), “Demand following and supply leading relationship: An empirical analysis for India, *MPRA*, pp. 22443”
- Giuliano, P., and Ruiz-Arranz, M., (2009), “Remittances, financial development and growth, *Journal of Development Economics*, Vol. 90, No.1, pp. 144-152.
- Guha, P. (2013). “Macroeconomic effects of international remittances: The case of developing economies”, *Economic Modelling*, Vol. 33., pp. 292-305.
- Gupta S., Pattillo, C. and Wagh, S. (2009), “Impact of remittances on poverty and financial development in Sub-Saharan Africa”, *World Development*, Vol. 37, No.1, pp. 104-115
- Hagen-Zanker, J. (2014), “Potential products and policies to leverage product use of migration and remittances”, *Economic and Private Sector PEAKS*
- Ho, S. and Iyke, B. (2018), “Short- and long-term impact of trade openness on financial development in Sub-Saharan Africa”, *MPRA PP*. No. 84272.
- Huang Y. (2011) General Determinants of Financial Development. In: *Determinants of financial Development*. Palgrave Macmillan, London.
- IFAD and the World Bank, (2015), “The use of remittances and financial inclusion”, *IFAD*
- Ito, H. and Kawai, M. (2018), “Quantity and quality measures of financial development: Implications for macroeconomic performance”, *Public Policy Review*, Vol. 14., No.4, pp. 1-21
- Jack, W., and Suri, T. (2011), “Mobile money: The economics of M-Pesa “, *National Bureau of Economic Research*, Working paper No.16721
- Karamelikli, H., and Bayar, Y., (2015), “Remittances and economic growth in Turkey”, *ECOFORUM*, Vol. 4, No.7, pp. 33-40.
- Karikari, N., Mensah, S. and Harvey, S., (2016), “Do remittances promote financial development in Africa”, *Springerplus*, Vol., 5, No.1011., pp. 1-21.
- Kenya Subsidiary Legislation, (2013), “The Money Remittance Regulations 2013”, *Kenya Gazette Special Issue*, No. 56, pp. 273-304, CBK ACT Cap 491.
- Kenya Subsidiary Legislation, (2014), “The National Payment Systems Regulations, 2014”, *Kenya Gazette Supplement*, No. 119, pp. 709-740, The National Payment System Act No. 39 of 2011,
- Kim et al., (2018), “Mobile financial services, financial inclusion and development: A systematic review of academic literature”, *E J Info Sys Dev Countries*, pp. 1-17.
- Kim, D., Lin, S. And Shen, Y. (2009), “Dynamic effects of trade openness on financial development”, *Economic Modelling*, Vol. 27, pp. 254-261
- Kiio J., Soi N., and Buigut K., (2014), “The impact of workers’ remittances on economic growth: Evidence from Kenya”, *Journal of Economics and Sustainable Development*, Vol 5, No. 26.
- Koay, Y. and Choong, C., (2013), “The nexus between worker’s remittances and economic growth in Malaysia”, *Prosiding Perkem*, Vol. VIII, No.1, pp. 507-515.
- Kono, D., and Montinola, G. (2013), “The uses and abuses of foreign aid: Development aid and military spending”, *Political Research Quarterly*, Vol. 66, No.3, pp. 615-629.
- Law, S. and Demetriades, P. (2004), “Capital flows, trade openness and financial development in developing countries”, *Department of Economics*, University of Leicester.

- Li, J., Salinas, J., Ramirez, T., Hoyo, C. and Serrano, C. (2014), "Do remittances foster financial inclusion in Mexico", *Financial Inclusion Economic Watch*, BBVA Research.
- Mago, S. and Chitokwindo, S., (2014), "The impact of mobile banking on financial inclusion in Zimbabwe: A case of Masvingo Province", *Mediterranean Journal of Social Sciences*, Vol. 5, No.9, pp. 221-230.
- Maipose, G. (2000), "Aid abuse and mismanagement in Africa: Problem of accountability, transparency and ethical leadership", *Corruption and Development in Africa*, pp. 87-103.
- Maitrot, M. and Hulme, D. (2014), "Has microfinance lost its moral", *Brooks World Poverty Institute*, University of Manchester
- Makori, A., Kagiri, A and Ombui, K. (2015), "Effects of external capital flows on the economic growth in Kenya", *Prime Journal of Social Science*, Vol. 4, No.11, pp. 1140-1149.
- Manoel, B., "Inflation and financial development: Evidence from Brazil", *Economic Modelling*, Vol. 28, No. 1-2, pp. 95-99.
- Mashayekhi, M., (2014), "Remittances and financial inclusion", Presentation of lessons learnt from the expert meeting on the impact of access to financial services, including by highlighting remittances on development: Economic empowerment of women and youth, 12-14 November 2014, Geneva.
- Mauzu, I. and Alagidede, P. (2018), "Nonlinearities in financial development-economic growth nexus: Evidence from Sub-Saharan Africa", *ERSA Working Paper* No. 728.
- Mbaye, L. (2015), "Remittances and credit markets: Evidence from Senegal", *IZA DP*. No. 9340.
- Mbiti, I., and Weil, D. N. (2011), "Mobile banking: The impact of M-Pesa in Kenya", *National Bureau of Economic Research*, Working paper No.17129.
- McKinnon, R. (1973), "Money and Capital in Economic Development", The Brookings's Institution, Washington.
- Meyer, D. and Shera, A. (2016), "The impact of remittances on economic growth: An econometric model", Available at <http://dx.doi-org/10.16/j.econ.2016.06.001>.
- Ministry of Foreign Affairs, (2014), "Kenya Diaspora Policy", Available at <http://www.mfa.go.ke/wp-content/uploads/2016/09/Kenya-Diaspora-Policy.pdf>
- Muktadir-Al-Mukit, D. and Islam, N. (2016), "Relationship between remittances and credit disbursement: A study from Bangladesh", *Journal of Business and Management Research*, Vol.1., No.1, pp. 39-52
- Murshed, M. and Khanaum, M. (2014), "Impact of foreign aid in the economic development of recipient country", *JBAYR*, Vol.2, No.1, pp. 33-37
- Mwangi, B. and Mwenda, S. (2015), "The effect of international remittances on economic growth in Kenya", *Microeconomics and Macroeconomics*, Vol. 3, No.1, pp. 15-24
- Mostafavi, M., (2012), "A comparative study between ARDL and Johansen procedures in narrow money estimation in the Iranian economy", *Quarterly Journal of Quantitative Economics*, Vol.8., No2., pp. 47-67.
- Motelle, S. (2011), "The role of remittances in financial development in Lesotho: Evidence from alternative measures of financial development", *Journal of Development and Agricultural Economics*, Vol. 3, No. 6, pp. 241-251.
- Narayan, P. (2005), "The saving and investment nexus for China: evidence from cointegration tests", *Applied Economics*, Vol. 37, No.17, pp. 1979-1990.
- Ndung'u, N. (2018), "Next steps for the digital revolution in Africa: Inclusive growth and job creations lessons from Kenya", *African Growth Institute*, Brookings.
- Ndung'u, N. (2017), "M-Pesa- A success story of digital financial inclusion", *Practitioner's Insight*,

*University of Oxford.*

- Nkoro, E. and Uko, A. (2016), "Autoregressive distributed lag (ARDL) cointegration technique: Application and interpretation", *Journal of Statistics and Econometric Methods*, Vol. 5., No, 4, pp. 63-91.
- Nyamongo, E et al., (2012), "Remittances, financial development and economic growth in Africa", *Journal of Economics and Business*, Vol. 64, No.3, pp. 240-260.
- Ocharo, K. (2014), "Remittances and economic growth in Kenya", *International Conference on Dynamics of Rural Transformation in Emerging Economics, 27-28 March 2014*.
- Ojapinwa, T. and Oladipo B., (2014), "Do workers remittances promote financial development in Sub-Sahara African Countries?", *International Journal of Finance and Research*, Vol 5, No. 2.
- Olu, A. and Afeikhena, J. (2014), "Economic development: the experience of Sub-Saharan Africa", *International Development: Ideas, Experience and Prospects*, Ed. By Currie-Alder, B; Kanbur, R; Malone, D. and Medhore, R.
- Ouma et al., (2017), "Mobile financial services and financial inclusion: Is it a boon for savings mobilization", *Review of Development Finance*, Vol.7, pp. 29-35.
- Patrick, H. (1966), "Financial development and economic growth in underdeveloped countries", *Economic Development and Cultural Change*, Vol. 14, pp. 174-189.
- Phiri, M. (2017), "The impact of aid on economic growth of developing countries (LDCs) in Sub-Saharan Africa", *Gettysburg Economic Review*, Vol.10, No. 4, pp. 28-48.
- Polat, B., (2018), "The impact of workers' remittances on financial market development: A case study for developing countries", *Journal of Business Research*, Vol. 10, No.2, pp. 27-36.
- Raza, S. (2014), "Explaining the determinants of financial development (using panel data on developed and developing countries)", *Journal of Finance and Economics*, Vol.2, No.5, pp. 166-172.
- Rehma, M., Ali, N. and Nasir, N., (2015), "Linkage between financial development, trade openness and economic growth: Evidence from Saudi Arabia", *Journal of Applied Finance and Banking*, Vol. 5, No. 6, pp. 127-141.
- Reanne, F. et al. (2009), "The relationship between remittances and health care provision in Mexico", *American Journal of Public Health*, Vol. 99, No.7., pp. 1227-1231
- Sahoo, S. (2013), "Financial structures and economic development in India: An empirical evaluation", *RBI Working Paper Series*, WPS (DEPR): 02/2013.
- Santos, P. and Kvangraven, (2017), "Better than cash, but beware the costs: Electronic payments systems and financial inclusion in developing countries", *Development and Change*, Vol. 48, No.2., pp. 205-227.
- Seliatou, K. and Nana, S. (2012), "Diaspora bonds: Some lessons for African Countries", *African Economic Brief*, Vol.3, No. 13, pp. 1-13
- Sharaf, M., (2014), "The remittances-output nexus: Empirical evidence from Egypt", *Economic Research International*, Vol.10, No.1155, pp. 1-8.
- Shaw, E. S. (1973), *Financial Deepening in Economic Development*, Oxford University Press, London.
- Shera, A. and Meyer, D. (2013), "Remittances and their impact on economic growth", *Social and Management Sciences*, Vol. 21, No.1, pp. 3-19.
- Squalli, J. and Wilson, K. (2011), "A new measure of trade openness", *The World Economy*, pp. 1745-1770
- Stammer, D. (1972), "Financial development and economic growth in underdeveloped countries:

- comment, *Economic development and cultural change*, Vol. 20, No.2, pp. 318-325”.
- Svirydzenka, K. (2016), “Introducing a new broad-based index of financial development”, *IMF Working Paper*, WP/16/5.
- Tolcha, T. and Rao, N. (2016), “The impact of remittances on economic growth in Ethiopia”, *Indian Journal of Commerce and Management Studies*, Vol. VII, No. 2, pp. 1-14.
- Toxopeus, H. and Lensink, R., (2008), “Remittances and financial inclusion in development”, *Development Finance in the Global Economy*, pp. 236-263.
- Tung, D. (2015), “Remittances and economic growth in Vietnam: An ARDL bounds testing approach”, *Review of Business and Economics Studies*, Vol.3, No.1, pp. 80-88.
- Uzochukwu, A. and Chukwunonso, I. (2014), “Impact of migrant remittances on health and education outcomes in Sub-Saharan Africa”, *International Journal of Humanities and Social Sciences*, Vol. 19, No. 8, pp. 33-44.
- Williams, K. (2016), “Remittances and financial development: Evidence from Sub-Saharan Africa”, *African Development Review*, Vol. 28, No.3., pp. 357-367.
- Worldbank, (2018), “World Development Indicators”, (2018), Available at <https://datacatalog.worldbank.org/dataset/world-development-indicators>
- Worldbank, (2018), “Migration and Remittances data”, Available at <http://www.worldbank.org/en/topic/migrationremittancesdiasporaissues/brief/migration-remittances-data>
- Yiew, T. and Lau, E. (2018), “Does foreign aid contribute to or impede economic growth”, *Journal of International Studies*, Vol. 11, No.3, pp. 21-30.
- Zulfiqar, K., Muhammad, C. and Aslam, A. (2016), “Financial inclusion and its implications for inclusive growth in Pakistan”, *Pakistan Economic and Social Review*, Vol.54, No.2, pp. 297-325

### Legend: Figures

Figure 2.1	Remittance inflows to Kenya (1975-2018), Million USD
Figure 2.2	Capital inflows (Remittances, Foreign Direct Investment, Official Aid and Portfolio equity), Million US \$
Figure 2.3	Remittance inflows by sources to Kenya in 2017 (UK; USA; EU; Africa; Canada)
Figure 2.4	Remittances as a share of GDP
Figure 2.5	Cost of sending money to Kenya by corridor in 2017

## Appendix 1: Summary of M-Pesa operations in Kenya

### M-Pesa

M-pesa is a mobile phone money transfer system launched in Kenya in 2007 by Vodafone, operated by SafariCom, the largest telecommunication network provider in Kenya. Initially, M-pesa was introduced as a means of making small –value person to person electronic transactions. However, over the years, it has undergone significant innovations leading to huge increases in volumes and values. For instance, since the adoption of mobile financial services in 2007, the mobile phone transfer service agents have brought about 70 percent of Kenyans within 3 kilometers of a financial access touch-point<sup>15</sup>. As of September 2018, mobile phone subscriptions stood at 46,630 million and mobile penetration was quoted at 100.10 percent, with the number of active registered mobile money transfer subscriptions at 29,678 million and 206,940 registered mobile money agents<sup>16</sup>. In December 2018 alone, 155.774 million transactions worth KShs. 367.77 billion were conducted using mobile payment platforms. In addition, the products under the M-pesa platform have tremendously evolved to include person to business transactions, business to business services and credit and savings services thus contributing to financial inclusion.

With this phenomenal growth of the usage of M-Pesa, over the years, the Central Bank has been at the forefront in developing regulation that would safeguard the public from usury and misuse. The bank revised the National Payment System (NPS) Act by providing regulations for electronic retail transfers, E-money regulation, regulation for the designation of a payment system and instrument, and a guide on Anti-Money Laundering. The regulations standardized operations in the mobile phone money transfer industry and strengthened the central bank in carrying out its mandate of promoting safety and efficiency of payment systems. Some of the regulations under the Central Bank Act Cap 491 are directly related to remittances and are mainly focused on facilitating operations and increasing remittance flows. Notably, the National Payment System Regulations have provided for interoperable payment systems both locally and internationally and revoked exclusivity clauses whereas Money Remittance Regulations govern establishment and licensing of money remittance operations.<sup>17</sup> In this case, NPS Regulations encouraged competition by prohibiting exclusive dealings with agents (National Payment System Regulations, 2014; Money Remittance Regulations, 2013). Moreover, the mobile networks and banks are accessible even in the remotest areas in Kenya facilitated by the agency banking model (branchless banking) where even retail shops/nonbank agents have been transacting banking services since 2010 when the Central Bank of Kenya provided agency banking guidelines, (CBK, 2010).

As described by Andiva, (2015), provision of mobile financial services is categorized into the bank model, the mobile network operator model and the hybrid model. The bank model involves a bank or any other licensed financial services institutions as the main provider of mobile financial services under the Banking Act. In this case the clients should own a bank account consistent with prudential guidelines provided by the Central Bank of Kenya. The mobile banking services available under this model include payments, transaction between accounts and online banking, among others, and they

---

<sup>15</sup> FinAccess Geospatial Survey 2015

<sup>16</sup> Communication Authority of Kenya Sector Statistics Report for The Financial Year 2018/2019, (July-September 2018)

<sup>17</sup> Interoperability allows for sharing of same infrastructure across networks while non-exclusivity allows agents to seek contracts with multiple service providers

are exclusively concluded by the client. The telecommunications company only provides menu based communication services in partnership with the bank. Mobile money transfer services under the mobile network operator model are operated under the telecommunications license and do not require ownership of a bank account. The hybrid model combines mobile banking services and mobile money transfer to offer such services as savings and loan products described below.

The M-pesa products are diverse including: provision of saving and loan products; payment services; investment channel; cross border transactions and international remittances services. For instance, commercial banks in Kenya have partnered with mobile network operators to enable customers to access their bank accounts through mobile phones. Mobile phones can be used for opening and operating virtual bank accounts and accessing traditional banking services like deposits, withdrawals and credit facilities without physical representation to the bank. Examples of such products include M-Shwari, Kenya Commercial Bank M-pesa, M-pesa Chama account and Mobi-Chama. Provision of these products has expanded financial access to the bottom billion in Kenya because mobile account holders can deposit, save and obtain micro credit as low as one dollar through these facilities. No minimum balances are required in maintaining the mobile accounts and no fee is charged on the account as was the case with most products offered in traditional banking systems.<sup>18</sup> While the first two products mainly benefit individuals, the last two examples are for groups, in which members are allowed to perform transactions such as funds transfer, deposits, loan applications and loan approvals through the mobiles platform.

In addition, most payments in Kenya are made via M-pesa including government services such as fees for licenses, passports, court fees and fines; utilities such as electricity, water and garbage collection; transport fares, hotel accommodation and restaurants and many more.<sup>19</sup> M-pesa registered customers also enjoy lower rates than other modes of sending and receiving international remittances. Empirical studies on the use of mobile money in Kenya show that the use of mobile money bring positive outcomes to persons. A market-level analysis conducted by Mbiti and Weil (2011) found that the introduction of M-pesa in Kenya led to significant decrease in the price of money transfer among competitors. Furthermore, they found an increase in the frequency of receiving remittances that contributed toward more financial inclusiveness in Kenya (Mbiti and Weil, 2011, Jack and Suri, 2011). Mobile Money Transfer has a clear edge over banks especially because it is fast, cost-effective and convenient (Ndungu, 2017 and 2018). One does not have to incur the opportunity cost of having to physically visit a bank to receive or send the payments.

---

<sup>18</sup> Details of initial development of M-Pesa as a bank product in partnership with SafariCom company and commercial bank of Africa and operations of M-Pesa loan products as well as discussion of the regulatory aspects that paved way for the fast take off for M-pesa is available in Ndung'u, (2017)

<sup>19</sup> Through such products as M-pesa lipa kodi, lipa karo, changa na M-pesa, e-citizen, lipa na M-pesa fuel loyalty, Okoa stima, M-pesa kadogo and Madaraka express ticket.

## Appendix 2: Granger Causality Tests

<b>Causality from remittances to financial development and inclusion indicators</b>	F-Statistic	Probability	<b>Causality from financial development and inclusion indicators to remittances</b>	F-Statistic	Probability
Credit to the private sector as a share of GDP	3.90	0.028**	Credit to the private sector as a share of GDP	0.75	0.475
Number of bank accounts	2.56	0.089*	Number of bank accounts	0.95	0.394
Number of mobile transactions	5.13	0.011***	Number of mobile transactions	7.14	0.002***
Value of mobile transactions	3.89	0.030**	Value of mobile transactions	0.63	0.537
Number of mobile agents	0.85	0.433	Number of mobile agents	1.80	0.180

## Appendix 3: Details on methodology

Various methods have been used in time series analysis of single equation frameworks but three approaches are more widely used. The most popular is the Engle and Granger two step procedure (Engle and Granger, 1987). Under this framework, the variables in the model are first tested for unit roots or order of integration to ensure they are of the same order of integration. Then a cointegrating test through OLS is conducted and the stationarity of the residuals from the cointegrating equation is tested (Tolcha and Rao, 2016; Bo, 2008). Stationary residuals imply cointegration and hence an error correction model constituting the residual from the cointegrating equation, lagged once, which is used as the error correction term is formulated. However, this approach does not work well when variables are more than two as there can be more than one cointegrating vector in such cases yet the method only provides one cointegrating relationship. Moreover, since it is a two-step regression involving estimation of residual series and another testing of unit root implies possibility of errors from first estimation being transferred to the final regression. The method also lacks power when considering finite samples and it is prone to simultaneous equation bias. Further, the approach is not applicable when testing hypothesis concerning the actual cointegration defined in the long run regression equation in the first step of estimation. The second approach is the Johansen and it is most suitable in cases of multiple cointegrating vectors and a large sample size, (Koay and Choong, 2013; Mostafavi, 2012).

The autoregressive distributive lag model (ARDL) which is a linear time series model in which both the dependent and independent variables are related not only contemporaneously but across historical values as well, is the third method that is gaining preference over the other two due to its advantages. ARDL also referred to as bound cointegration technique is a least squares regressions using lags of the dependent and independent variables as regressors. ARDL allows application of cointegration tests to time series having different integration orders. It also has

better statistical properties relative to Engle-Granger cointegration test because ARDL approach uses unconstrained error correction models and this approach also gives more reliable results in small samples relative to Engel-Granger and Johansen cointegration test. The ARDL also captures dynamic effects of both the dependent and independent variables, besides eliminating error serial correlation by including sufficient lags and allowing estimation of short run and long run simultaneously, (Nkoro and Uko, 2016; Karamelikli and Bayar, 2015; Datta and Sarkar, 2014; Alimi, 2014).