

Savings-investment gap in Sub-Saharan Africa: Does the interaction of financial sector development and migrant remittances matter?

Oluwatosin Adeniyi¹, Joshua Afolabi¹, Wasiu Adekunle^{1,2}, Musibau Babatunde¹ and Edward Omiwale¹,

This study analyzes the interactive effects of migrant remittances and financial development on savings-investment gap for a panel of 18 Sub-Saharan Africa (SSA) countries from 1990-2017. Results from a panel ARDL model show that migrant remittances reduce savings-investment gap in the long run. The gap is further reduced when the individual effect of financial development, and the interactive effects of migrant remittances and financial development are taken into consideration. Further analysis reveals evidence of widening effects of rising real GDP growth and bank deposits over a long-term horizon, while higher private sector credit widened the savings-investment gap only in the short-run. The study suggests the need for a policy to reduce migrant remittance transfer costs and encourage beneficiaries to prioritize investment over consumption.

Keywords: Financial development, migrant remittances, private sector credit, savings-investment gap.

JEL Classification: C51, C53, F24, G21

DOI: 10.33429/Cjas.13222.7/7

1. Introduction

Many SSA countries fall within the low-income group and have low savings, which translates to low domestic investment (Lee & Sami, 2019). The structure of the SSA economies portends saving-investment gaps, which, if positive, signals that the level of domestic investment exceeds domestic savings, and if negative, implies that domestic savings exceed domestic investment requirements. According to the World Bank (2019), there are varying disparities in the level of investments and savings in SSA countries, with the former exceeding the latter in some cases. This positive savings (savings-investment) gap reflects the bottlenecks underlying the financial sector

¹Department of Economics, Faculty of Economics and Management Sciences, University of Ibadan, Nigeria.

²Corresponding author: wasiuademola10@gmail.com

which reflects inefficiency in financial intermediation – the degree to which savings are matched with investment – in the SSA region (Ogunjimi & Amune, 2019; Afolabi & Oji, 2021; Afolabi, 2022).

The weakness in SSA's financial sector given its limited ability to mobilize funds for investment has been a major bane to the development of the region as unemployment, inequality and poverty continue to worsen (Ogunjimi, 2019, 2020a, 2020b; Akindipe, 2020; Bolaji *et al.*, 2021). This partly explains why sustainable development, which requires huge financial commitment, has been elusive in the region. Thus, closing the gap between investment and savings becomes expedient to foster domestic resource mobilization for dramatic economic transformation in the region. The relative importance of migrant remittances as a source of foreign capital flows is gradually becoming relevant in recent times given the upsurge in migrant remittances from developed to developing economies (Le, 2011). The financial sector plays a major role in delivering these migrant remittances to beneficiaries (Adegboye *et al.*, 2020). A well-developed financial sector eases the receipt of migrant remittances in the domestic economy and their transfer to beneficiaries. Migrant remittances increase the volume of savings in financial institutions which could be mobilized for investment. However, when the financial sector is not well-developed, migrants tend to send remittance through informal channels. Thus, an interplay of migrant remittances and financial sector development is important for bridging savings-investment gap in SSA (Bhattacharya *et al.*, 2018; Keho, 2020, Raifu & Afolabi, 2022).

Migrant remittances have outpaced foreign direct investment (FDI), both as a share of GDP and in absolute terms, to become the largest source of foreign capital inflows to low- and middle-income economies and it is three times larger than official development assistance (World Bank, 2019). Migrant remittances inflow to low- and middle-income countries rose markedly from about \$285 million in 1970 to \$531 billion in 2018 with the share of SSA countries averaging 8.2% over a similar period. Migrant remittances inflow to SSA rose sharply from \$23 million (0.04% of GDP) in 1970 to \$48 billion (2.82% of GDP) in 2018 (World Bank, 2019). However, it is not the absolute size of migrant remittances flow that matters for policy issues, but its share in total GDP of the recipient country (Akindipe, 2020). The low

share of migrant remittances in SSA's total GDP could be attributed to the migrant stocks, wage structure and economic conditions of the foreign countries where they reside, exchange rate movement, and transaction costs of sending and receiving migrant remittances, among others (Lartey, 2013; Dash, 2020; The Global Knowledge Partnership on Migration and Development (KNOMAD), 2020).

There are numerous country-specific studies on the linkage between migrant remittances and other macroeconomic variables such as financial sector development and economic growth (Adenutsi (2011), Hassan & Shakur (2017), Peprah *et al.*, (2019), Kousar *et al.*, (2019), Misati *et al.*, (2019), Olaniyan (2019) and Garba *et al.*, (2020)). These studies acknowledge panel-data studies on developing countries (Bjuggren *et al.*, (2010), Fayissa & Nsiah (2010), Abida & Sghaier (2014), Chowdhury (2016), Efobi *et al.*, (2016), El Hamma (2016), Karikari, *et al.*, (2016), Matuzeviciute & Butkus (2016), Ali *et al.*, (2018), El Hamma (2018), Tung (2018), Bangake & Eggoh (2019), Brown *et al.*, (2019), Eggoh *et al.*, (2019), Qiang *et al.*, (2019), Sobiech (2019), Dash (2020)). However, studies with specific focus on SSA countries did not consider the possible interactive effects of migrant remittances and financial development on domestic investment (Nyamongo *et al.*, (2012), Couharde & Generoso (2014), Adetou & Fiodendji (2019), Bandura *et al.*, (2019), Chitambara (2019), Olayungbo & Quadri (2019), Tah (2019)). The study by Okodua (2013) was limited to the impact of migrant remittances on private investment in 31 SSA countries using the GMM technique, while Lartey (2013) only examined the effects of migrant remittances on investment and growth. To this end, this study contributes to the extant literature by investigating whether the nexus between migrant remittances and financial sector development matters in plugging the domestic savings-investment gap in SSA.

This study is important for SSA due to the region's failure to achieve Millennium Development Goals (MDGs) as a result of its inability to effectively mobilize the huge financial resources needed to fund them (Durokifa & Ijeoma, 2018). Given the massive financial resources needed to finance the Sustainable Development Goals (SDGs) of the United Nations and the Agenda 2063 of the African Union, it is pertinent to devise strategic means of effectively mobilizing domestic and foreign

financial resources to power the development agenda. Bridging saving-investment gaps, harnessing migrant remittances, and improving financial sector development in the SSA offer a great opportunity to improve domestic resource mobilization in the region. Thus, this study proffers answers to the following research questions: (1) Are migrant remittances inflow, financial development and savings-investment gap correlated in SSA? (2) What role does the nexus between migrant remittances and financial development play in influencing the domestic savings-investment gap in SSA? Annual data spanning 1990-2017 were sourced and analyzed using the pooled mean group (PMG) estimator, developed by Pesaran *et al.* (2019).

The remaining part of the paper is structured thus: Section 2 presents a brief review of the relevant theoretical and empirical literatures. Section 3 comprises the data and methodology. Section 4 entails the presentation and discussion of results, while Section 5 concludes the study.

2. Literature Review

2.1 Theoretical Literature

The theoretical literature contains two major views on the relationship between migrant remittances and financial development especially as it relates to their role in promoting economic growth - substitutability and complementary hypotheses. Further, the foremost theory in the literature linking foreign flows (migrant remittances, in this case) with domestic investment is the two-gap model of financial aids. This study also takes note of the baseline accelerator theory of investment. Accordingly, these four theoretical postulations are reviewed in this study.

2.1.1 Substitutability Hypothesis

The substitutability hypothesis states that migrant remittances serve as an alternative available to economic agents who are unable to access funds from financial institutions or where the financial sector is underdeveloped or inefficient. The substitutability hypothesis holds mostly in countries with weak and underdeveloped financial sector as it occurs when migrant remittances pass through the informal sector instead of the formal financial institutions. Numerous studies give support to the substitutability hypothesis (Giuliano & Ruiz-Arranz, 2009; Hassan & Shakur, 2017; Bandura *et al.*, 2019; Brown *et al.*, 2019; Olayungbo & Quadri, 2019; Tah, 2019; Garba *et al.*,

2020) particularly, where interest rate spread is employed as the qualitative measure of financial development.

2.1.2 Complementarity Hypothesis

The complementarity hypothesis posits that migrant remittances and financial development are complements because they promote each other. The first attempt to quantify the impact of foreign remittances on economic growth depending on the complementarity between foreign remittances and financial sector development is attributed to Giuliano and Ruiz-Arranz (2009). The hypothesis suggests that a well-developed financial sector afford migrants the opportunity to send money easily and conveniently to their home country. This makes money available for the financial institution to fund investment, thereby instigating competitions among financial institutions and improving their performance. A competitive financial sector could engender a reduction in transfer cost thereby creating more incentives for migrants to keep sending money to their home country. This will make more money available for investment while simultaneously increasing migrant remittances, making the financial sector more developed and competitive, and increasing the recipient country's national income. Intuitively, migrant remittances and financial development can effectively serve as complements only when the financial sector is well-developed. The complementarity hypothesis has been widely supported in several empirical studies (Nyamongo *et al.*, 2012; Abida & Sghaier, 2014; Karikari *et al.*, 2016; El Hamma, 2016; El Hamma, 2018; Qiang *et al.*, 2019; and Misati *et al.*, 2019, Garba *et al.*, 2020) particularly, where liquid liabilities, private sector credit and total bank deposits are employed as the quantitative measures of financial development.

2.1.3 Two-Gap Model

Identifying the need for foreign capital inflows to fill the savings and foreign exchange gaps, Chenery and Strout (1966) developed the two-gap model of foreign aids. Whereas the difference between domestic investment and domestic savings describes the saving-investment gap, the foreign exchange gap is the discrepancy between the foreign exchange received and disbursed through exports and imports respectively. The postulations of the two-gap model were substantiated by the Harrod-Domar growth model through its advocacy for attracting foreign capital (such as, mi-

grant remittances, foreign portfolio investment, foreign direct investment and foreign aids, among others) to bridge the savings-investment gap especially in economies with low domestic savings in relation to domestic investments (Todaro & Smith, 2012). The model posits that foreign capital (including migrant remittances) can be used to equilibrate domestic savings and investment.

2.1.4 Accelerator Theory of Investment

The accelerator theory of investment, conceived by Thomas Nixon Carver and Albert Aftalion in 1903, postulates a positive relationship between income/consumption and investment, indicating that investment is an increasing function of income or consumption. The rationale behind this is that an increase in income will raise consumption (demand) which will require the production of more commodities thereby prompting additional investment expenditure especially when the available capital stocks are fully used. The investment induced by income or consumption dynamics is called induced investment.

2.2 Empirical Literature

There is a plethora of time-series and panel studies in the extant literature examining the relationship between remittances (domestic and migrant), financial development nexus, and different macroeconomic indicators, albeit with diverse findings. The variance in the findings could be attributed to the choice of estimation technique, scope, data types and sources, among other factors. With regards to the link between migrant remittances and financial development, there is overwhelming empirical evidence on the positive link between migrant remittances and financial development (Adenutsi, 2011; Adetou & Fiodendji, 2019; Bangake & Eggoh, 2019; Chitambara, 2019; Garba *et al.*, 2020; Hamma, 2016; Karikari *et al.*, 2016; Kousar *et al.*, 2019; Misati *et al.*, 2019; Nyamongo *et al.*, 2012; Olaniyan, 2019; Peprah *et al.*, 2019). However, some studies found that migrant remittances and financial development are inversely related (Bandura *et al.*, 2019; Tung, 2018) while others found no relationship between them (Chowdhury, 2016; Hassan & Shakur, 2017). Moreover, some studies showed that migrant remittances do not narrow investment gaps (Adegboye *et al.*, 2020; Tung, 2018;) while others showed that it increases domestic investment (Bjuggren *et al.*, 2010; Dash, 2020; Efobi *et al.*, 2016; Lartey, 2013; and Okodua,

2013).

Specifically, Ramirez and Sharma (2008) revealed that although foreign remittances have a positive effect on economic growth, both remittances and financial development acted as substitutes in promoting growth. Other authors that have confirmed the substitutability hypothesis, include, Giuliano & Ruiz-Arranz (2009) which covered 100 developing countries between 1975 and 2002. Mundaca (2009) reported that remittances have significant positive impact on growth in the long run, while financial intermediation helped to magnify the growth effects of remittances in their study of 25 Latin American and the Caribbean (LAC) countries between 1970 and 2002. Similar findings were obtained by Chia (2014) for the Malaysian economy between 1984 and 2013, and El Hama (2016) in relation to 12 MENA countries between 1984 and 2012. With the aid of dynamic panel data approach, Bjuggren *et al.* (2010) showed that remittances, high quality institutional framework and well-developed credit market increase investment in 79 developing countries sampled over the period of 1995-2005.

With regards to methodology adopted to estimate the relationship, some studies adopted the ARDL framework (Misati *et al.*, 2019); generalized method of moments (Hassan & Shakur, 2017; Lartey, 2013; Okodua, 2013); two-stage least square (Hassan & Shakur, 2017; Olaniyan, 2019; Garba *et al.*, 2020); and vector error correction model (Adenutsi, 2011), among others. However, these estimation techniques have their peculiar weaknesses, which undermine their application. The panel autoregressive distributed lag (PARDL) framework is employed in this study due to its inherent strengths.

The contribution to the literature is made in three perspectives: firstly, it examines the interactive role of migrant remittances and financial development in bridging the savings-investment gap in SSA countries both in the short-run and long-run, a study which to the best of the authors' knowledge is particularly rare for SSA countries. Besides, it employs the PARDL framework which is superior to other panel estimation methods in the following ways: it accommodates variables with mixed order of integration, that is, variables that are integrated of order zero and order one; it has the ability to estimate short-run and long-run models simultaneously; it is capable of

estimating models with varying degree of lags of both the dependent and independent variables, and it complies with small and large sample datasets, especially if the time dimension is relatively longer than the number of units being studied, thereby requiring that the issue of non-stationarity is addressed.

2.3 Stylized Facts

Migrant remittances inflows to low-and middle-income countries increased markedly between 2015 and 2018. East Asia and Pacific remain the region with the highest migrant remittances inflow among low-and middle-income countries, while it is worrisome that SSA maintains its position as the lowest recipient region of migrant remittances over time (Figure 1). Nonetheless, there has been a significant increase in migrant remittances inflow to SSA. This could be attributed to good economic conditions in high-income countries, which host many migrants from SSA. Senegal has the highest average share of remittance inflows (% of GDP) while South Africa has the least among the sampled countries (Figure 2).

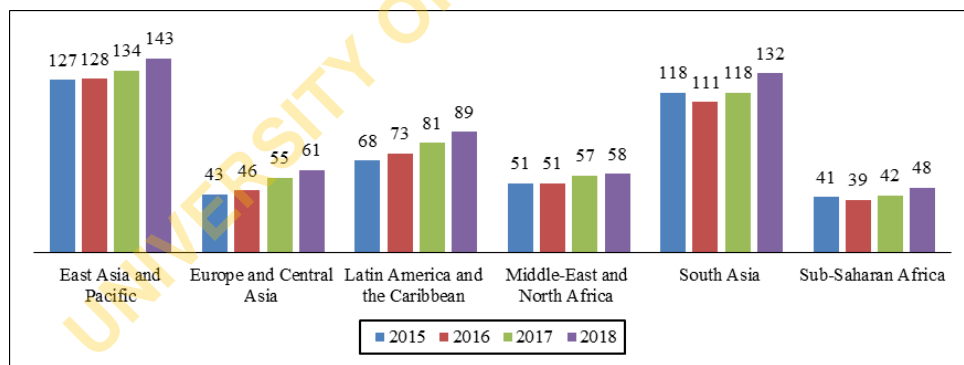


Figure 1: Migrant Remittances Flow to Low- and Middle-Income Regions (US\$' Billion).

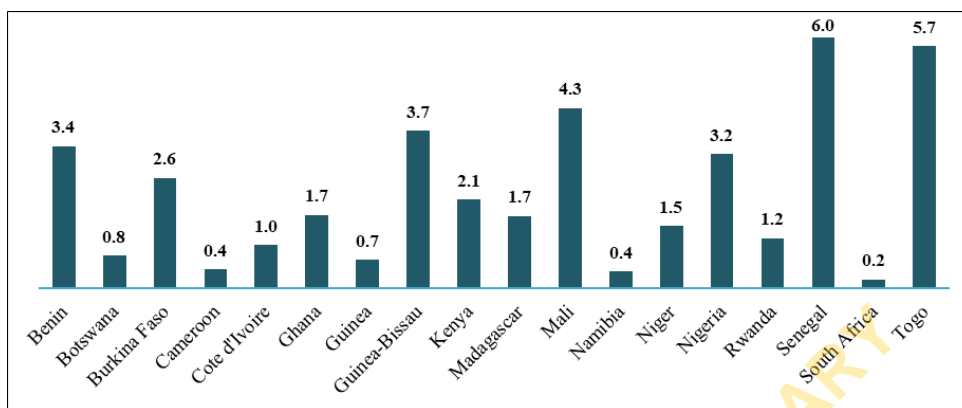


Figure 2: Average remittance inflows (% of GDP) to SSA countries (1990-2017).

The average values of the three financial development variables (liquid liability, private sector credit and bank deposit) employed in this study are presented in Figure 3. South Africa has the most developed financial sector in SSA given the high share of its financial development variables relative to other countries in the SSA region. Namibia also has a relatively strong financial sector. A well-developed financial sector can help narrow saving-investment gaps and aid the receipt of migrant remittance. As such, it is not surprising that South Africa has one of the least saving-investment gaps in SSA although the country also has the least share of remittance inflows in total GDP (Figure 4). Overall, the average share of remittance inflows in total GDP ranged between 0.2% and 6%. Even though, this average share is relatively small, remittance inflows to SSA countries have been increasing over the past decades. The growing remittance inflows in SSA is partly explained by the increasing rate at which citizens of the region emigrate for various reasons, including the quest for greener pasture, given the economic hardship in the region. These emigrants send money to their families, relatives or friends and as the number of emigrants increases, the remittance inflows are also expected to increase correspondingly. On the other hand, all the sampled countries, except Botswana, Cote d’Ivoire, Nigeria, and South Africa, have positive saving-investment gap – the difference between domestic investment and domestic savings. This indicates that investment exceeds savings for most of the country under study. This suggests that many SSA countries do not have domestic savings that are sufficient enough to meet the domestic investment requirements in

their domain (Figure 4).

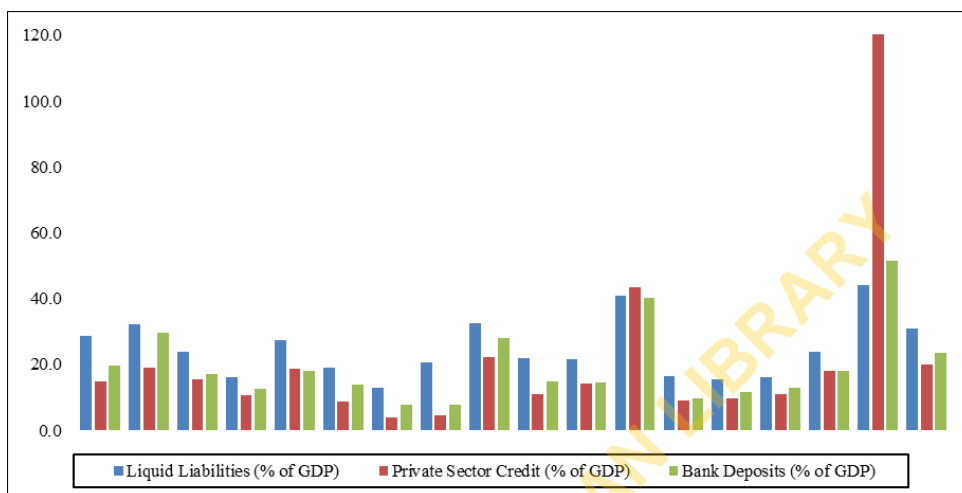


Figure 3: Average values of financial development indicators in SSA (1990-2017) .

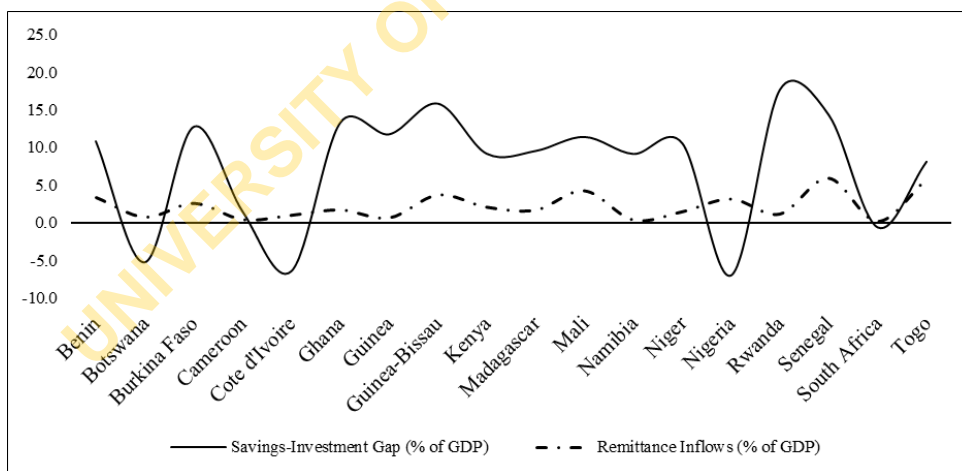


Figure 4: Average remittance inflows and saving-investment gap in SSA (1990-2017) .

3. Data and Methodology

3.1 Data

This study is limited to 18 SSA countries for the period 1990-2017. The sampled countries include: Benin, Botswana, Burkina Faso, Cameroon, Côte d’Ivoire, Ghana, Guinea, Guinea-Bissau, Kenya, Madagascar, Mali, Namibia, Niger, Nigeria, Rwanda, Senegal, South Africa and Togo. The choice of these countries is predicated on data availability on the variables of interest (migrant remittances, financial development indicators [ratio of liquid liabilities to GDP, ratio of credit to private sector to GDP and ratio of bank deposits to GDP], the ratios of domestic investment and savings to GDP and real GDP growth). While we obtained the data on the financial development indicators from Beck *et al.* (2019), other variables have their data sourced from the World Bank’s World Development Indicator 2019 as shown in Table 1. The sample period from 1990 to 2017 was selected because of the exceptional surge in emigration together with massive remittance inflows into most SSA countries.

Table 1: Data description and sources

Variables	Description	Source
Domestic investment	Gross domestic investment (% of GDP)	WDI (2019)
Domestic savings	Gross domestic savings (% of GDP)	WDI (2019)
Savings-investment gap (<i>is-gap</i>)	Difference between gross domestic investment and gross domestic savings (% of GDP)	Authors’ Derivation from WDI data
GDP growth rate (<i>growth</i>)	GDP growth rate (%)	WDI (2019)
Liquid liabilities (<i>llt</i>)	Liquid liability or M3 (% of GDP)	Beck <i>et al.</i> (2019)
Domestic credit to private sector (<i>credit</i>)	Domestic credit to private sector (% of GDP)	Beck <i>et al.</i> (2019)
Bank deposit (<i>deposit</i>)	Bank deposit (% of GDP)	Beck <i>et al.</i> (2019)
Migrant remittance (<i>remit</i>)	Migrant remittance inflow (% of GDP)	WDI (2019)

3.2 Theoretical Framework

This paper relied on the accelerator theory of investment, which posits that an increase in consumption or income will increase investment by a multiplier. In other words, the theory suggests a direct relationship between income (total output) and investment spending. The rationale behind this is that an increase in income will

raise consumption (demand) which will require the production of more commodities thereby prompting additional investment expenditure especially when the available capital stocks are fully used. The investment induced by income or consumption dynamics is called induced investment. A certain level of capital stock is required to produce a given level of output and this can be written as:

$$K_t = vY_t \quad (1)$$

Where K is capital stock; Y is output or income; v is capital-output ratio (K/Y) and t is time period.

Equation (1) shows that capital stock (net induced investment) is an increasing function of aggregate output or income with the assumption that the capital-output ratio (v) is constant. This assumption indicates that output and capital stock grow at the same rate such that when income or output is Y_t , the required capital stock will be $K_t = vY_t$ and when income or output is Y_{t-1} , capital stock becomes:

$$K_{t-1} = vY_{t-1} \quad (2)$$

Equation (2) implies that the previous level of capital stock is an increasing function of the previous level of output or income. Put differently, an increase in output in the previous period will instigate an increase in investment spending in the same period. The increase in capital stock in the previous and current period can be obtained by deducting Equation (2) from Equation (1) to give:

$$K_t - K_{t-1} = v(Y_t - Y_{t-1}) \quad (3)$$

$K_t - K_{t-1}$ signifies the increase in capital stock (or new investment) in the current year thus, Equation. 3 becomes:

$$I_t = v(Y_t - Y_{t-1}) \quad (4)$$

Equation (4) shows that the increase/decrease in current output (Y_t) over the previous period's output (Y_{t-1}) will increase/decrease investment v times beyond the increase/decrease in income. Thus, the capital-output ratio, v , is the accelerator as

it denotes the degree of acceleration such that when $\nu = 5$, investment spending will increase five times as much as the increase in output.

3.3 Model Specification

The current study adopts the accelerator model of investment as its baseline specification. The baseline is further augmented with the individual and interactive effects of migrant remittances and financial development on savings-investment gap, which in turn constitutes the over-parameterized such that restricting the partial slope coefficients on the explanatory variables (migrant remittances and financial development) to zero ultimately yields a reduced-form model, also known as, the accelerator model of investment. Following Pesaran and Smith (1995), Equation (4) is augmented with the individual and interactive effects of migrant remittances and financial development on savings-investment gap and is expressed in terms of a PARDL model of order (p, q_1, \dots, q_4) as follows:

$$\Delta is_gap_{it} = \mu + \theta_1 is_gap_{i,t-1} + \theta_2 growth_{i,t-1} + \theta_3 remit_{i,t-1} + \theta_4 fd_{i,t-1} + \theta_5 rem_fd_{i,t-1} + \sum_{j=1}^{p-1} \alpha_j \Delta is_gap_{i,t-j} + \sum_{j=0}^{q_1-1} \lambda_j \Delta growth_{i,t-j} + \sum_{j=0}^{q_2-1} \delta_j \Delta remit_{i,t-j} + \sum_{j=0}^{q_3-1} \gamma_j \Delta fd_{i,t-j} + \sum_{j=0}^{q_4-1} \theta_j \Delta rem_fd_{i,t-j} + \epsilon_{it} \tag{5}$$

Where p is the lag length associated with the dependent variable for $i = 1, \dots, N$ and $j = 1, \dots, p$; q_k is the lag length associated with the k -regressors (X 's) for $i = 1, \dots, N$; $j = 1, \dots, q_k$, where $k = 1, \dots, 4$.

The error correction version of Eqn. (5) is derived as follows:

$$\Delta is_gap_{it} = \mu + \theta_1 is_gap_{i,t-1} - \left(-\frac{\theta_2}{\theta_1} growth_{i,t-1} - \frac{\theta_3}{\theta_1} remit_{i,t-1} - \frac{\theta_4}{\theta_1} fd_{i,t-1} - \frac{\theta_5}{\theta_1} rem_fd_{i,t-1} \right) + \sum_{j=1}^{p-1} \alpha_j \Delta is_gap_{i,t-j} + \sum_{j=0}^{q_1-1} \lambda_j \Delta growth_{i,t-j} + \sum_{j=0}^{q_2-1} \delta_j \Delta remit_{i,t-j} + \sum_{j=0}^{q_3-1} \gamma_j \Delta fd_{i,t-j} + \sum_{j=0}^{q_4-1} \theta_j \Delta rem_fd_{i,t-j} + \epsilon_{it} \tag{6}$$

By letting,

$$ECT_{it} = is_gap_{i,t-1} - \beta_1 growth_{i,t-1} - \beta_2 remit_{i,t-1} - \beta_3 fd_{i,t-1} - \beta_4 rem_fd_{i,t-1} \tag{7}$$

Where $\beta_1 = -\frac{\theta_2}{\theta_1}$, $\beta_2 = -\frac{\theta_3}{\theta_1}$, $\beta_3 = -\frac{\theta_4}{\theta_1}$, $\beta_4 = -\frac{\theta_5}{\theta_1}$

Eqn. (6) becomes:

$$\Delta is_gap_{it} = \mu + \theta_1 ECT_{it} + \sum_{j=1}^{p-1} \alpha_j \Delta is_gap_{i,t-j} + \sum_{j=0}^{q_1-1} \lambda_j \Delta growth_{i,t-j} + \sum_{j=0}^{q_2-1} \delta_j \Delta remit_{i,t-j} + \sum_{j=0}^{q_3-1} \gamma_j \Delta fd_{i,t-j} + \sum_{j=0}^{q_4-1} \theta_j \Delta rem_fd_{i,t-j} + \varepsilon_{it} \quad (8)$$

Eqn. 8 is the general specification, such that, restricting $\delta_j = \gamma_j = \theta_j = 0$ yields the baseline accelerator model similar to Eqn. 4, that is,

$$\Delta is_gap_{it} = \mu + \theta_1 ECT_{it} + \sum_{j=1}^{p-1} \alpha_j \Delta is_gap_{i,t-j} + \sum_{j=0}^{q_1-1} \lambda_j \Delta growth_{i,t-j} + \varepsilon_{it} \quad (9)$$

Similarly, restricting $\theta_j = 0$ yields the baseline investment model that is augmented by the individual effects of migrant remittances inflow and financial development, that is,

$$\Delta is_gap_{it} = \mu + \theta_1 ECT_{it} + \sum_{j=1}^{p-1} \alpha_j \Delta is_gap_{i,t-j} + \sum_{j=0}^{q_1-1} \lambda_j \Delta growth_{i,t-j} + \sum_{j=0}^{q_2-1} \delta_j \Delta remit_{i,t-j} + \sum_{j=0}^{q_3-1} \gamma_j \Delta fd_{i,t-j} + \varepsilon_{it} \quad (10)$$

where subscripts i and t stand for country and time period, respectively; Δ is the first difference operator; is_gap is the savings-investment gap (difference between total investments and savings), % of GDP; $growth$ is real GDP growth rate (%); fd stands for financial development indicators - which in this case, are liquid liabilities, % of GDP (llt); domestic credit to private sector, % of GDP ($credit$) and bank deposits, % of GDP ($deposit$); $remit$ is migrant remittances inflow, % of GDP; rem_fd is the interaction term involving two explanatory variables, namely, migrant remittances inflow and a set of financial development indicators including, liquid liabilities, private sector credit and bank deposits (% of GDP); ECT stands for the error correction term, where θ_1 is the speed of adjustment parameter, which is expected to be negative, less than one in absolute term, and statistically significant. It signifies the convergence of each country to the same equilibrium long-run savings-investment gap following shocks to growth, migrant remittances inflow and financial development indicators. From Eqn 7, β_1, \dots, β_4 are long-run parameters, while from eq. 8, $\mu, \alpha_j, \lambda_j, \delta_j, \gamma_j, \theta_j$ are short-run parameters, and ε is the error term which is assumed to be normally distributed and serially uncorrelated.

With reference to Eqn. 7 and Eqn. 8, respectively, the expected signs of the regres-

sion coefficients are as follows:

$$\beta_1 > 0; \beta_2 > \text{or} < 0; \beta_3 > 0 \text{ or} < 0; \alpha_j > \text{or} < 0; \lambda_j > 0; \delta_j > \text{or} < 0; \gamma_j > 0 \text{ or} < 0$$

The parameters of interest in this study are β_4 , $\theta_j > \text{or} < 0$ (if both coefficients are negative, then migrant remittances inflow and financial development are substitutes in financing investment opportunities), whereas the positivity of both coefficients implies that migrant remittances and financial development are self-reinforcing and are complements in financing investment opportunities.

3.4 Estimation Procedures

3.4.1 Panel Unit Root Tests

The panel unit root tests can be classified on the basis of whether there are restrictions on the autoregressive process across cross-sections or series. For the purpose of this study, three of the panel unit root tests were employed and they include LLC, Breitung and Fisher-ADF unit root tests.

3.4.2 Panel Cointegration Tests

This study employs two panel cointegration tests developed by Kao, and Pedroni. Both tests have the null hypothesis of no cointegration. The Pedroni's test is an Engle-Granger-based cointegration test, concerned with the examination of the residuals of a spurious regression performed using $I(1)$ variables. If the variables are cointegrated, then the residuals should be integrated of order zero, that is, $I(0)$. However, if the variables are not cointegrated, then the residuals are said to be integrated of order one, that is, $I(1)$. Pedroni (2004) proposed several tests for cointegration that allow for heterogeneous intercepts and trend coefficients across-sections. The Kao test is another Engle-Granger-based cointegration test that follows the same basic approach as the Pedroni's test, except that the former captures cross-section specific intercepts and homogeneous coefficients on the first-stage regressors.

3.4.3 Estimation Technique

Pesaran and Smith (1995) showed that, unlike in static models, pooled dynamic heterogeneous models generate estimates that are inconsistent even in large samples (the problem cannot be solved by extending the sample through increasing the number of

cross-sections, N). The paper observed that while it is implausible that the dynamic specification is common to all countries, it is at least conceivable that the long-run parameters of the model may be common. Pesaran and Smith (1995) therefore, proposed estimation by either averaging the individual country estimates, or, by pooling the long-run parameters, if the data allow, and estimating the model as a system. In a later work, Pesaran *et al.* (1999) termed the second approach the pooled mean group (PMG) estimator, which combines the efficiency of pooled estimation while avoiding the inconsistency problem flowing from pooling heterogeneous dynamic relationships (Asteriou & Hall, 2007). In panel settings with individual effects, standard regression estimation of autoregressive distributed lag (ARDL) models is problematic due to bias caused by correlation between the mean-differenced regressors and the error term. This bias only vanishes for large number of observations T , and cannot be corrected by increasing the number of cross-sections N . To address this problem, a number of small T -large N , dynamic panel GMM estimators have been developed (for instance, Arellano and Bond's Difference GMM). However, in large T data sets, this assumption underlying dynamic GMM (which is $N > T$) is often inappropriate and the estimator breaks down. In such cases, a popular alternative is the pooled mean group (PMG) estimator developed by Pesaran *et al.* (1999). Pesaran *et al.* (1999) also refer to PMG as the maximum likelihood (ML) estimators since the long-run parameters are nonlinear functions of the short-run parameters in the PARDL model.

The PMG is an intermediate estimator which allows intercepts, short-run coefficients, and error variances to differ freely across groups but constrains the long-run coefficients to be the same. This is unlike the two extreme estimators, mean group (MG) and dynamic fixed-effects (DFE) estimators, where the former assumes heterogeneity in all coefficients (intercept, short-run and long-run coefficients) and error variances across the cross-sections, while the latter assumes that only the intercept coefficient differs across cross-sections, but other coefficients (short run and long-run) and error variance are homogeneous across groups/cross-sections. The selection of the appropriate estimator, particularly between MG and PMG estimators, is based on Hansen test. Under the null hypothesis, PMG is the efficient estimator, whereas MG is the efficient estimator under the alternative hypothesis. In addition, the advantage of

adopting the PMG estimator in the present study is that it allows for the level of financial development and migrant remittances to have similar effects across countries in the long run, while permitting heterogeneous short-run adjustments across groups. This follows a conventional wisdom that countries with similar socio-economic characteristics - as is the case with many SSA countries³ - are expected to converge to a common steady state level, that is characterized by a uniform growth rate across macroeconomic indicators, such as, output, investment, migrant remittances and financial development.

4. Results and Discussion

4.1 Descriptive Statistics

The statistical features for all variables employed in this study are summarized in Table 2. Considering the fact that the sampled countries have a mix of positive and negative savings-investment gap, the average savings-investment gap for the SSA region is positive at 7.6% of GDP. This is an affirmation of the existence of huge investment opportunities in SSA. Migrant remittances inflow averaged 2.3% of GDP for the region over the period 1990-2017. Comparatively, it can be inferred, on the average, that migrant remittances fall short of the amount that is required to bridge the savings-investment gap in SSA; hence the need to deepen the domestic financial sector and/or attract more inflow of migrant remittances. For the indicators of financial development, the average value of liquid liabilities is higher at 24.8% of GDP, compared to the mean values of other indicators: credit to private sector (20.9% of GDP) and bank deposits (19.6% of GDP).

By implication, it can sufficiently be stated that SSA's financial sector is highly liquid, but this has not adequately translated into higher volume of domestic credit to the private sector. Real GDP growth rate in SSA averaged 3.9%⁴ over the study

³About 51% of SSA countries are by nature oil producers and resource-intensive countries (see, International Monetary Fund (IMF), 2020: pp. 16). Also refer to the Appendix for the classification of the 18 SSA countries, by sub-region and economic structure, under study.

⁴The sampled SSA countries are a combination of fast-growing economies (such as, Benin, Burkina Faso, Cote d'Ivoire, Ghana, Guinea, Kenya, Mali, Niger, Rwanda, Senegal and Togo), whose real growth rates are at least 5% per annum from 2017 to 2019 and low/weak growth countries (including Botswana, Cameroon, Guinea Bissau, Madagascar, Namibia, Nigeria and South Africa), whose real GDP growth rates are strictly below 5% per annum over a similar period. Ironically,

period. In terms of standard deviation, the study showed that the three indicators of financial development are more volatile than migrant remittances inflow and real GDP growth. This clearly demonstrates the relative stability of migrant remittances over the sample period. Meanwhile, the increasing instability in the SSA's financial sector development puts the region at high risk of the contagious effects of global crises, such as the 2008-09 global financial crisis.

Table 2: Summary statistics

Variable	Obs.	Mean	Std. Deviation	Minimum	Maximum
<i>is_gap</i>	504	7.623	9.922	-23.051	58.491
<i>remit</i>	504	2.254	2.431	0.01	10.7
<i>llt</i>	504	24.758	11.084	2.29	62.17
<i>credit</i>	504	20.862	26.747	0.87	146.81
<i>deposit</i>	504	19.562	12.785	0.78	61.09
<i>growth</i>	504	3.923	4.752	-50.25	35.22

4.2 Pre-Estimation Results

4.2.1 Panel Unit Root Tests

The panel unit root test results using three approaches are presented in Table 3. The results show that irrespective of the approach, three variables including savings-investment gap, migrant remittances inflow and real GDP growth are stationary at levels, implying that these variables are integrated of order zero. The results of the tests for the three indicators of financial development (liquid liabilities, private sector credit and bank deposits); show that they are non-stationary, but become stationary at first difference. This implies that they are integrated of order one.

the middle income countries (Botswana, Cameroon, Namibia, Nigeria and South Africa) generally dragged the overall growth in the SSA region overtime, whereas the majority of fast-growing economies in the region belong to the low income group (see, IMF, 2020).

Table 3: Results of alternative panel unit root tests

Variable	Levin, Lin, Chu t*	Breitung t-stat	ADF Fisher Chi-square
<i>is_gap</i>	-2.156*** ^a	-2.391*** ^a	50.866* ^a
<i>remit</i>	-1.676*** ^a	-2.562*** ^a	52.256*** ^a
<i>llt</i>	-4.030*** ^a	-6.800*** ^b	48.626* ^a
<i>credit</i>	-6.851*** ^a	-3.469*** ^b	116.268*** ^a
<i>deposit</i>	-2.846*** ^a	-6.137*** ^b	134.364*** ^b
<i>growth</i>	-4.538*** ^a	-4.871*** ^a	139.689*** ^a

Note: ***, **, * implies the rejection of null hypothesis of the presence of a unit root at 1%, 5% and 10% levels of significance, respectively. Superscripts “a” and “b” denote ADF test regressions at levels and first differences, respectively.

4.2.2 Panel Cointegration Test Results

The current study employed two cointegration test approaches (Table 4). Except for model 6, results showed that, irrespective of the test procedure used, there exists a long-run relationship between savings-investment gap and its proposed determinants. To address the issue of spurious result among the financial development indicators, the study captured the indicators in separate savings-investment gap models.

Table 4: Results of alternative panel cointegration tests

	Kao Test (ADF t-stat)	Pedroni Test (Phillip-Perron t-stat)
Model I	13.998***	-5.644***
Model II	-1.454	-4.848***
Model III	-2.148**	-5.959***
Model IV	-3.195***	-5.864***
Model V	-2.192**	-4.229***
Model VI	-3.083***	-5.815

Note: ***, ** imply the rejection of null hypothesis of no cointegration among the variables at 1% and 5% levels of significance, respectively. Models I to III captures, respectively, liquid liabilities, private sector credit and bank deposits as the indicators of financial development. Also, Models IV to VI additionally capture the interaction between migrant remittances inflow and each of the three indicators of financial development, respectively.

4.3 Estimation Results

With the existence of a long-run relationship between savings-investment gap and its supposed determinants, this study estimated two variants of the model: the first looks at the individual effects of migrant remittances and financial development (Table 5), while the second combines the individual and interactive effects of both variables on

savings-investment gap in SSA (Table 6).

The results showed that migrant remittances inflow has negative impact on savings-investment gap both in the short- and long-run. An increase in migrant remittances by one percent will narrow saving-investment gap by 0.6-1.4 percentage points in the short-run and 0.6-0.8 percentage points in the long-run (Table 5). The impact becomes effective only over the long-term, considering the statistical insignificance of the short-run coefficients across specifications. This result affirms the possible role of migrant remittances as an alternative option to augment limited domestic savings in financing a given level of investment in the SSA region. These results reflected the findings of Bjuggren *et al.*, (2010); Okodua (2013), and Dash (2020).

Accounting for the individual and interactive effects of migrant remittances and the financial sector magnifies the impact of migrant remittances on the savings-investment gap in the region: a percentage point increase in migrant remittances translates to a range of 1.4 and 1.5 percentage points decline in savings-investment gap on the average keeping other variables constant in the long run (see models 4 and 5, respectively, in Table 6). In two out of the three specifications, high rates of economic growth have a knock-on effect in stimulating additional investments over a long-term (Tables 5 and 6), thereby building up the savings-investment gap. This parallels the findings of Tung (2018) that a positive relationship exists between per capita income and investment. This finding also clearly validates the postulation of the accelerator theory which states that a positive relationship exists between domestic investment and output.

The results are mixed regarding the impact of financial development on savings-investment gap. Irrespective of specifications (models 2 and 5), contrary to expectations, private sector credit widens the savings-investment gap in the short run; hence, for every 1 percentage point increase in private sector credit, the saving-investment gap widens by an average of 0.9 percentage point (model 2 in Table 5) and by 1.5 percentage points (model 5 in Table 6), keeping other variables unchanged. Nonetheless, these coefficients are not statistically significant at the conventional levels. In Models 1 and 4, liquid liabilities have no significant impact on savings-investment gap both in the short- and long-run, whereas, bank deposits significantly widen savings-

investment gap only in the long run (models 5 and 6).

Table 5: Pooled mean group estimation of savings-investment gap panel ARDL (Individual effects)

	Model 1	Model 2	Model 3
Short-run estimates			
<i>Constant</i>	1.083 (0.855)	1.632 (0.921)	-1.022 (1.019)
$\Delta remit_{it}$	-1.382 (1.344)	-0.557 (0.763)	-0.987 (1.119)
$\Delta growth_{it}$	-0.088 (0.065)	-0.062 (0.057)	-0.077 (0.059)
Δllt_{it}	0.228 (0.183)		
$\Delta credit_{it}$		0.944*** (0.329)	
$\Delta deposit_{it}$			0.249 (0.300)
<i>ECT_{it}</i>	-0.376*** (0.056)	-0.351*** (0.057)	-0.386*** (0.064)
Long-run estimates			
<i>remit_{it}</i>	0.014 (0.219)	-0.756*** (0.282)	-0.57** (0.245)
<i>growth_{it}</i>	0.325*** (0.118)	0.517*** (0.152)	0.237 (0.125)
<i>llt_{it}</i>	0.062 (0.056)		
<i>credit_{it}</i>		0.013 (0.023)	
<i>deposit_{it}</i>			0.438*** (0.079)
<i>Hansen Chi – square</i>	1.71 (0.635)	5.06 (0.168)	2.1 (0.552)

Note: ***, ** imply the statistical significance of the regression coefficients at the 1% and 5% levels, respectively. Values in parenthesis and block brackets are standard errors and probability values, respectively. Models I to III captures, respectively, liquid liabilities, private sector credit and bank deposits as the indicators of financial development. Hansen chi-square test has the null hypothesis that PMG is the efficient estimator and an alternative hypothesis that MG is the efficient estimator.

In this way, the beneficiary household considers the domestic financial sector and remittances inflow as substitutes. Meanwhile, the fact that most beneficiary house-

holds spend a large chunk of the remittances received on consumption rather than on investment widens the savings-investment gap⁵.

This result could be linked to the money creation effect of the initial deposit liabilities when banks operate a fractional reserve banking system, which stipulates that banks keep an excess reserve to meet demand deposits and to fund investment opportunities by extending loans to prospective investors. These loans, if kept in the bank, constitute a new deposit that is further partitioned into demand deposits and loanable funds after taking care of legal reserve requirement. In essence, a percentage point increase in bank deposits widens savings-investment gap by an average of 0.4 percentage point (model 3 in Table 5) and 0.2 percentage point (model 6 in Table 6). These long-run coefficients are statistically significant at 1% and 5% levels of significance, respectively.

With respect to the interaction between migrant remittances and financial development (Table 6), the study observed mixed results across the three indicators of financial development. Results showed that the interactive effect of migrant remittances and bank deposits has a negative impact on saving-investment gap in the short run, even though the associated impact coefficient is not statistically significant at the conventional levels (model 6 in Table 6). Nonetheless, this could mean that a combination of improved financial development in terms of higher bank deposits and inflow of migrant remittances reinforce each other in narrowing the savings-investment gap in SSA. This would be the case if migrants make remittances through the banking channel, and if beneficiaries save some part of the remittances received in the bank. However, results revealed that the interactive effects of migrant remittances and other financial development indicators are significant over the long-term only (models 4 and 5 in Table 6). By implication, higher migrant remittances inflow cou-

⁵This study's results also paralleled the previous findings of Ramirez and Sharma (2008); Giuliano and Ruiz-Arranz (2009); Mundaca (2009); Dzansi and Shukur (2010); Bettin and Zazzaro (2011); Nyamongo, Misati, Kipyegon and Ndirangu, (2012); Lartey (2013); Chia (2014), and El Hama (2016) while negating the findings of Chowdhury (2016). This study also affirmed the findings of Garba, et al. (2020) that there are both complementarity and substitutability effects of migrant remittances and financial sector development on economic growth via the investment channel. Similarly, Adeniyi, et al., (2017) revealed that the complementarity or substitutability effect of migrant remittances and financial development on output volatility depends on the indicators of financial development used.

pled with improved financial sector development in terms of higher liquid liabilities and private sector credit represent independent and alternative ways of bridging the savings-investment gap. This would play out if beneficiary households, already faced with high cost of borrowing from banks, depend hugely on remittances inflow to finance investment opportunities, thereby bypassing the huge debt servicing burden from bank loan.

In terms of the choice of estimator between PMG and MG, the result of Hansen's test showed that the null hypothesis that PMG is the efficient and most suitable estimator cannot be rejected, since the probability value associated with the Chi-square test statistic is greater than 5% level of significance or 0.05 (Tables 5 and 6). This outcome is valid for the three indicators of financial development. Moreover, the result of the redundancy test performed on the interactive terms in models 4 to 6 revealed that, except for model 6, the PARDL that captures the individual and interactive effects are preferred to the models that incorporate the individual effects (Table 6).

In addition, the adjustment parameter fulfils the convergence condition of being negative, less than 1 in absolute value and statistically significant at the 1% level across specifications. Its coefficient is approximately -0.4 across the six specifications (Tables 5 and 6), implying that previous errors arising from shocks to the explanatory variables are corrected in the current period at an adjustment rate of 40%, suggesting that there is a moderate convergence of savings-investment gap towards equilibrium value for SSA. Models 4 to 6 capture the interaction between migrant remittances inflow and each of the three indicators of financial development (liquid liabilities, private sector credit and bank deposits), respectively. Hansen chi-square test has the null hypothesis that PMG is the efficient estimator and an alternative hypothesis that MG is the efficient estimator. Also, Wald test for redundancy has the null hypothesis that the included variable has zero impact and hence is redundant.

Table 6: PMG Estimation of savings-investment gap panel ARDL (Interactive effects)

	Model 4	Model 5	Model 6
Short-run estimates			
<i>Constant</i>	2.477*** (0.833)	2.567*** (0.948)	1.412 (0.971)
$\Delta remit_{it}$	13.769 (12.406)	-0.93 (4.133)	12.757 (9.756)
$\Delta growth_{it}$	-0.099 (0.054)	-0.071 (0.781)	-0.088 (0.055)
Δllt_{it}	0.389 (0.363)		
$\Delta credit_{it}$		1.508 (0.808)	
$\Delta deposit_{it}$			0.455 (0.521)
Δrem_llt_{it}	-0.399 (0.833)		
Δrem_credit_{it}		-0.378 (0.358)	
$\Delta rem_deposit_{it}$			-0.495 (0.291)
<i>ECT_{it}</i>	-0.404*** (0.066)	-0.414*** (0.600)	-0.424*** (0.063)
Long-run estimates			
<i>rem_{it}</i>	-1.479*** (0.537)	-1.445*** (0.426)	-0.876 (0.489)
<i>growth_{it}</i>	0.152 (0.112)	0.186 (0.129)	-0.009 (0.124)
<i>llt_{it}</i>	-0.032 (0.316)		
<i>credit_{it}</i>		0.0001 (0.023)	
<i>deposit_{it}</i>			0.166** (0.075)
<i>rem_llt_{it}</i>	0.049*** (0.017)		
<i>rem_credit_{it}</i>		0.049** (0.020)	
<i>rem_deposit_{it}</i>			0.024 (0.021)

Table 6: continuation

	Model 4	Model 5	Model 6
<i>Hansen Chi – square</i>	3.41 (0.492)	3.46 (0.484)	2.87 (0.579)
<i>Wald test for redundancy</i>	8.29 (0.004)	5.95 (0.015)	1.36 (0.244)

Note: ***, ** imply the statistical significance of regression coefficients at the 1% and 5% levels, respectively. Values in parenthesis and block brackets are standard errors and probability values, respectively.

5. Conclusion and Policy Recommendations

This study contributed to the literature by investigating the nexus among savings-investment gap, migrant remittances and financial sector development (with proxies including liquid liabilities, private sector credit and bank deposits), unlike the majority of the previous studies that considered a pair-wise relationship between the variables. The study collected yearly data on 18 SSA countries over the period 1990-2017.

Utilizing a PARDL model estimated using the PMG estimator, the study observed that migrant remittances inflow narrows savings-investment gap both in the short- and long-run. Accounting for the individual and interactive effects of migrant remittances and financial development further makes savings-investment gap more narrower in the region, most especially in the long run. Generally, high rates of economic growth have a knock-on effect in stimulating additional investments over a long-term horizon. Contrary to expectations, private sector credit widens the savings-investment gap in SSA region, though the short-run and long-run impact are not statistically significant. Liquid liabilities have no statistically significant impact on savings-investment gap both in the short-run and long-run, whereas, bank deposits significantly widen savings-investment gap only in the long run, irrespective of model specifications. Moreover, results showed that the interactive effect of migrant remittances and bank deposits is negative only in the short run but not statistically significant, thereby justifying the complementarity hypothesis. On the other hand, the results revealed that the interactive effects of migrant remittances and the other financial development indicators - liquid liabilities and private sector credit - are significant and positive in the long-run only, thereby affirming the substitutability

hypothesis.

In addition, the study showed that the unrestricted model – which considers the individual and interactive effects of migrant remittances and financial development - is preferred to the restricted version that accounts for only the individual effects through the Wald test for variable redundancy. The study's findings showed that significant investment opportunities abound in the SSA region as a whole, which could be financed either by the domestic financial sector or the inflow of migrant remittances or a combination of both, following from the findings. Meanwhile, the win-win strategy for SSA countries is to improve the confidence of migrant workers and the beneficiary households in the domestic financial sector so that both parties are encouraged to make use of the formal channel, which is expected to enhance the capacity of banks to create more credit facilities and finance productive and profitable investment opportunities⁶. Achieving this would require a reduction of the remittance transfer costs in the region and encouraging the beneficiaries to spend more on investment rather than on consumption. Meanwhile, in the absence of a substantial inflow of migrant worker remittances as expected, the SSA countries should improve the efficiency of financial intermediation within their jurisdictions by ensuring that domestic savings are matched with domestic investment requirements. This is expected to have a positive multiplier effect on aggregated demand, output and employment in the SSA region.

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⁶In this regard, we acknowledge the recent directive by the Central Bank of Nigeria to the International Money Transfer Operators (IMTOs) to make migrant remittances available to the beneficiaries in dollar cash or through their domiciliary accounts, as well as, the monetary incentives that surround the transfer of migrant remittances through the formal channel - banks and IMTOs.

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Appendix

List of the 18 sampled SSA countries

Benin ^{c*}	Madagascar ^{c*}
Botswana ^{b**}	Mali ^{b*}
Burkina Faso ^{b*}	Namibia ^{b**}
Cameroon ^{a**}	Niger ^{b*}
Cote d'Ivoire ^{c**}	Nigeria ^{a**}
Ghana ^{b**}	Rwanda ^{c*}
Guinea ^{b*}	Senegal ^{c**}
Guinea-Bissau ^{c*}	South Africa ^{b**}
Kenya ^{c**}	Togo ^{c*}

Note: Selection of countries across the SSA sub-regions is strictly based on data availability. In

line with the classification of IMF (2020), “superscripts a, b and c” indicate oil exporting, resource-intensive and non-resource intensive countries, respectively. ** and * indicate middle-income and low-income countries, respectively, according to the IMF’s classification.

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