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## Article

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RESEARCH

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# Migrant's remittance and investment financing nexus in Africa: Does investment climate matter?

Chinenye Ifeoma Nwokolo<sup>1\*</sup>, Matthew Ikechukwu Ogbuagu<sup>2</sup> and Wakeel Atanda Isola<sup>1</sup>

## Abstract

Development economists have enjoined Africans to leverage on remittance as their main source of investment financing due to its constant and undisrupted inflows despite structural distortions and economic weaknesses compared to other sources of financial flows in recent time. This ignited the motivation for this study, to unveil the nexus between migrant's remittance and investment financing and the modulating effect of the investment climate in this relation on a panel of 28 sub-Saharan African countries over the period 1995 to 2017. Using the panel autoregression distributive lagged estimation technique, the following empirical findings were established. First, the theoretical supposition underpinning the assumption in investment climate as a factor that motivates migrant's remittance inflow to be channelled to investment received a clear empirical support. Second, it was established that the interaction between remittance and components of investment climate (government size and open market) enhanced the growth of private investment. Last, remittance is found to exert a positive effect on private investment in as much as the former does not exceed the threshold of 78%, above which private investment would decline off the quadratic curve. The study suggests the policy-makers channel deliberate efforts at improving not only the efficiency of the market, but government participation especially in the area of tax policy and fiscal financing.

**Keywords:** Remittance, Investment financing, Investment climate, Panel data analysis, Sub-Saharan region

**JEL Classification:** E02, E22, P26, F24, O55

## Introduction

The motivation for this study is based on several important thoughts which include: first, the consequences of the Global Financial Crises that erupted at the tail end of 2008, which prompted researches to explore other means of sourcing for funds to finance investment rather than the widely known sources like FDI, portfolio investment, oversee development investment (ODA) among others. The consequential effect of the crisis brought about a decline in both foreign capital and financial resources from donor countries.<sup>1</sup> Base on the aftermath effect of

this, many developing countries refocus their financial-cum-capital dependency away from international sources of finance. This is premised on the ground that migrant remittance is a better option for financing investment in most countries as pinpointed in the literature coupled with relatively large volume flowing to the region as well. In the light of the above, African development economist advised Africans to leverage on remittance as their major source of financing, due to the constant and continuous flow despite the economic conditions or natural disruption compared to other financial sources. Ratha et al. [2], posits that remittance is more resilient in times of economic crises compared to other sources of finance.

Second, the volume of migrant remittance inflow in Africa has constantly increased up to \$52 billion in 2015 from \$14 billion and \$40 billion in 2001 and 2010,

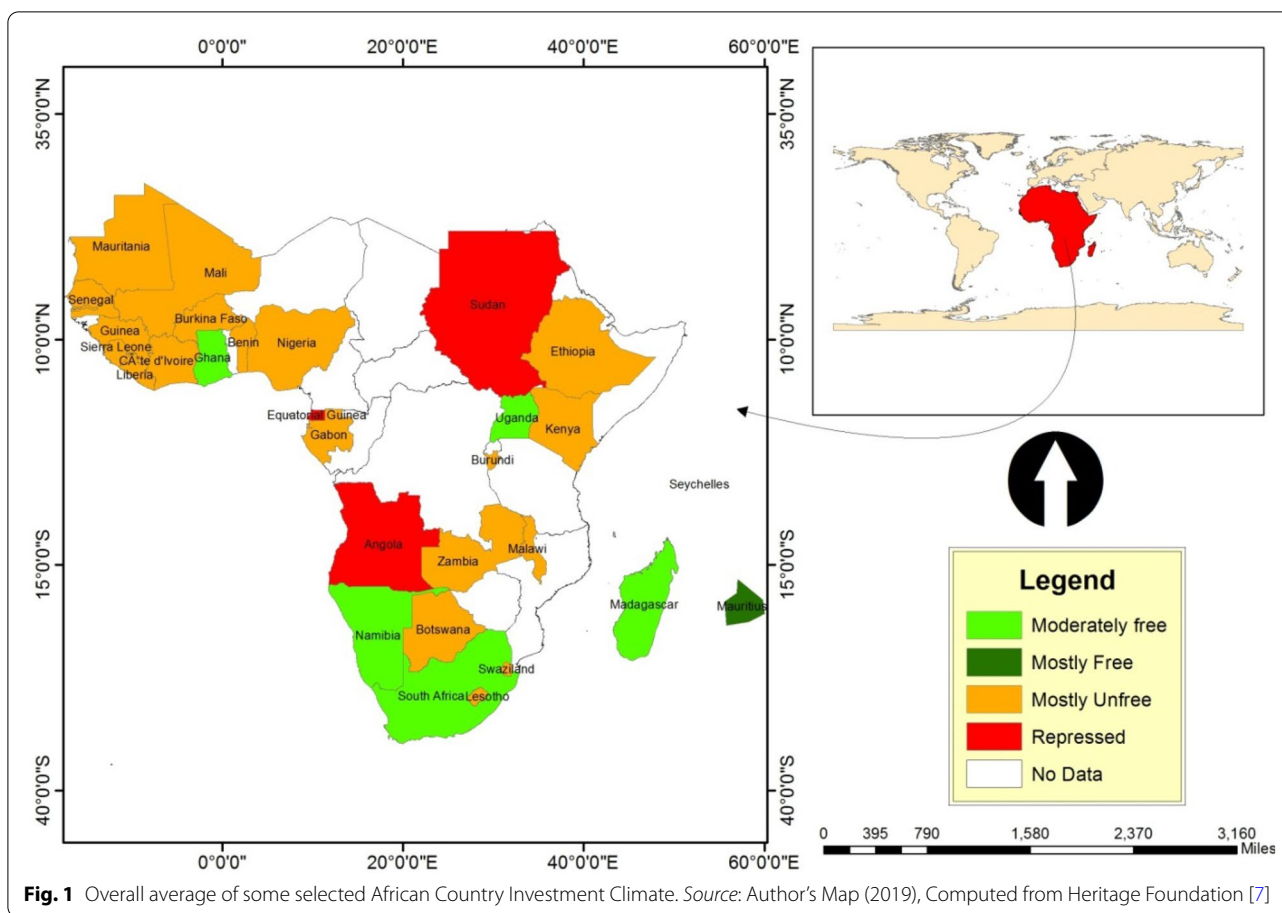
<sup>1</sup> Which decline from \$1.2 trillion in 2007 to \$707 billion in 2008 [1].

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**Fig. 1** Overall average of some selected African Country Investment Climate. Source: Author's Map (2019), Computed from Heritage Foundation [7]

respectively [3]. Regarding this upshot, the need to well harness remittance inflow in Africa has become the major target of developmental economist.

Third, several benefits are attributed to migrant remittance inflows which include: technology and skill transfer, poverty reduction, improvement of the financial development mechanism, promote entrepreneurship/small-scale firms among others. Remittance has been a major source of investment financing for some developing countries. For instance, Mexico and Bangladesh have leveraged on migrant's remittance as a major source of investment financing [4, 5]. Hence, evidence from these countries is a clear-cut that remittance can drive investment in enterprise and entrepreneurship.

Fourth, the investment climate in Africa is not favourable. This assertion is found to be true to the extent of illustrating the case of poor business performance, and this was documented by the New Heritage Foundation index (NHFI [6]). According to New Heritage Foundation [6], out of 46 African countries, 40 were listed among the 100 worst performers in terms of doing business due

to unfavourable investment climate. More so, a clear scenario of some selected African countries investment climate, illustrated in the map in Fig. 1, showed that of all the selected countries only Mauritius has a relatively free investment climate and countries like Ethiopia, Kenya, Zambia, Botswana, Guinea, Sierra Leone, Liberia, Senegal, Burkina Faso, Gabon, and Malawi have mostly unfree investment climate. Uganda, South Africa, Ghana, Namibia, Swaziland and Madagascar have mostly free investment climate, while Sudan and Angola are repressed.

Thus, analysing how the investment climate affects migrant's remittance flows from influencing investment in most African countries may be of great help for policy-makers to take appropriate policy guidelines that will address the menace of unfavourable investment climate in the region.

Fifth, this become expedient giving the fact that migrant's remittance inflow and investment financing has been carefully highlighted by a growing body of literature and backed by extensive evidence via different channels such as financial development mechanism [8–12];

political stability [13]; positive economic shock [14]. Of all these determinants, the role of investment climate in this pursuit has been greatly undermined, hence availing this study the opportunity to fill the most recent gap in the literature. The study, therefore, assesses the nexus between migrant's remittance and investment financing and the role the investment climate plays in this link. In the light of the foregoing, this study has contributed to the existing literature in the following ways: first, to the best of our knowledge, studies have not looked at the tripartite relationship of the highlighted issue of context in Africa. Hence, this study concentrates on the SSA region due to the relatively poor investment climate which has an adverse effect on investment.

Second, unlike other studies, the study also unveils how unfavourable investment climate affects migrant's remittance inflow in driving investment in the region which has been undermined in other studies that focus on remittance-cum-investment nexus in Africa. More so, this study uses economic freedom index as a proxy for investment climate as used in these studies [15, 16]. The investment climate comprises four major aspects with twelve factors which include: Rule of Law (property right, government integrity, judicial effectiveness), Govt. Size (government spending, tax burden, fiscal health), regulatory efficiency (business freedom, labour freedom, monetary freedom), open market (trade freedom, investment freedom, financial freedom).

Finally, the study employed a panel autoregressive distributed lagged (PARDL) estimation technique propounded by Pesaran et al. [17]. This methodology controls some basic ordinary least square (OLS) estimation problems. More importantly, PARDL is the most appropriate technique for series when unit roots test possesses mixed orders of integration among others. The focal point of the study is to examine the mediating roles of investment climate on the interactive effect of migrant remittance and investment financing in Africa. The remaining part of this paper is structured as follows: second section contains the literature review, third section methodology and sources of data, while the presentation of findings is in fourth section and fifth section includes conclusion and policy recommendations.

## Literature review

### A succinct literature review

In this section, empirical review and theoretical underpinning and linkage between migrant remittance and investment financing are discussed. On the empirical fronts, there exists a large chunk of literature expediting the nexuses between migrant remittance and investment financing in developing economies. But the study will only focus on brief salient documented empirics

on the issue of context. Worthy of note is the fact that the main contention is centred on the channel through which migrant remittance drives investment. Studies like Aggarwal and Peria [18], Fromentin [9], Efobi et al. [11] and Adeoye et al. [12] focus on how remittance can spur investment indirectly through financial development mechanism. For instance, Aggarwal et al. [8] investigated the linkage between migrant remittance inflow investment through financial development in 109 developing countries spanning from 1975 to 2007. The findings reviewed that migrant remittance is positively significant to financial development. That is, remittance drives investment through financial development mechanism. Fromentin [9] assessed the impact of migrant remittances on financial intermediaries in financing investment both in Latin America and the Caribbean countries. The study showed that a positive relationship exists between migrant remittance and financial development mechanism across the countries examined. Efobi et al. [11] analysed the relationship between remittance–industrialization–financial development nexus in 49 developing countries from the period 1980 to 2014. The study revealed that remittance can only drive industrialization at the initial level (entrepreneurship investment level) through financial development mechanism. Similarly, in a more recent study, Adeoye et al. [12] scrutinized the tripartite relationship of migrant remittance–industrialization–financial development in 46 SSA countries spanning from 1980 to 2017 using multiple regression techniques and revealed that migrant remittance inflows can only drive industrialization through financial development at the early stage.

On the other hand, very few studies focussed on the direct impact on migrant remittance on investment. In Mexico, Massey and Parrado [19] examined sources of investment financing using primary data from some selected firms. Findings from the survey revealed that 21% of investment in Mexico gets their set-up capital from migrant's remittance inflow. Similarly, Woodruff and Zenteno [5] examined the link between remittance and investment growth and expansion in Mexico as well and found that the expansion and growth of enterprise were associated with migrant' remittance inflows. Yang [14] using a household data in Filipino examined the reactions of migrant's family member to financing investment during economic shock. The study showed that migrant's remittance inflow to family members during economic shock boosted the level of investment in entrepreneurship. Using a panel data of 40 developing countries, Dzansi [20] examined the impact of remittance on investment in the manufacturing sector from the period 1991–2004. It was observed migrant's remittance inflow drives the relative investment and growth

manufacturing sectors in these countries. In the case of Bangladesh, Hossain and Hasanuzzaman [4] assessed the linkage between migrant's remittance and investment. The findings from the study showed there is a positive long-run effect between remittance and investment. It also revealed that migrant remittance can spur domestic entrepreneurship and enterprise. In a similar vein, study by Syed and Miyazako [21] also found remittance to be relevant to investment in Ghana.

In the light of the above, rhetorics and empirics surrounding leveraging on migrant remittance for investment is awash in the literature, but these studies are centred on the issue of migrant remittance either through a direct or indirect channel. However, of all these links, the role of the investment climate in this pursuit has been greatly undermined, hence availing this study the opportunity to fill the most recent gap in the literature. We see these motivations as novel since the preponderance of extant study on the remittance–investment nexus has largely neglected the highlighted issue of context in SSA. To the best of our knowledge, studies have not looked at the tripartite relationship of the highlighted issue of context in Africa.

To this end, as far as we know, this study pioneers the frontier of knowledge in investigating the tripartite relationship of migrant remittance–investment financing investment climate nexuses in SSA region. This study specifically concentrates on SSA due to some salient factors: (1) unfavourable investment climate in the region; (2) migrant remittance inflow in the region is relatively large. Hence, the pertinent concern of this paper is to examine the nexus between migrant's remittance and investment financing and the role the investment climate plays in this link.

#### **Theoretical linkage between investment and remittance**

Historical and empirical reviews have shown that very few literature provided evidence on the theoretical links between remittance and private investment financing. First, Stark and Bloom [22] in Ang and Opiniano [23] argued that the New Economics of Labour Migration (NELM) theory proposed that household members make migration decisions to generate income for consumption and investment purposes. Since remittance can be utilized for investment, consumption and income insurance, communities as well as the households would benefit directly from migrants' remittance. The second theoretical framework is drawn from the Neoclassical Theory of Investment proposed by Jorgensen [24] who considered the stock of investment capital as a function of migrants' remittance (income). Here, the author argued that increased demand arises from increasing income which in turn spurs investors decision to expand

investment to meet up with the expected demand. This could be aligned with the 'accelerator principles'. While the neoclassical theorist proposed negative relationship between the real interest rate and investment, McKinnon [25] and Shaw [26] presumed the opposite. The former reiterated that the high cost of servicing credits as a result of high interest rates reduces investible funds. On the other hand, the latter rather argued that high interest rate spurs domestic savings and as such increases the volume of available funds for investment (see [27]). Interestingly, this argument is nicknamed McKinnon and Shaw's hypothesis, which assumes it is not the cost of financial resources that hinder investment, but rather the lack of available financial resources for investment. This is particularly true for African countries where despite high nominal interest rates, real interest rates are often negative because of high inflation rates [28]. Since the role of government and public investment policies might trigger crowding-in and crowding-out effects, it is crucial to examine the mediating roles of investment climate within the remittance–investment relation in SSA region.

#### **Methods**

This study employed secondary data for a panel of 28 sub-Saharan African countries (as classified by the United Nations, 29) which span from 1995 through 2017. Investment climate data were sourced from The Heritage Foundation [7] which started in 1995; thus, this data constraint determined the scope of the study. While the dependent variable which is private investment is proxied as gross fixed capital formation, remittance and other control variables such as economic growth, credit to the private sector and volume of trade were sourced from World Development Indicator [30]. More so, the investment climate proxied as economic freedom indices includes twelve factors as listed earlier. These factors are more robust compared to other investment climate factors. Consequently, this study utilized the principal component analysis (PCA) technique to bundle the twelve investment climate factors from The Heritage Foundation [7] databank into four main indicators, namely: Rule of Law (RULAW), government size (GOVSIZE), regulatory efficiency (REGEFF) and open market (OPENMAK). RULAW index measures laws and policies that help to protect investor's right and property, GOVSIZE captures resources managed by the government and the fiscal health of the economy, REGEFF deals mainly with economic factors that regulate the business environment, and OPENMAK is the open assess given to potential investors.

Based on the a priori expectations, all the constructed investment climate indicators are expected to have positive impact on investment which will channel migrants'

remittance to investment financing. By implication, if a country's investment climate is favourable, migrant's remittance to support family members back home can be directed to investment (entrepreneurship or small-scale enterprises). This will create employment, improve per capita income growth and reduce poverty rate. Notwithstanding the above, this study relies on the panel autoregressive distributed lagged (PARDL) technique of analysis. Although the study draws its theoretical underpinnings from the Neoclassical theoretical framework, it does so with some modifications (see [27]).

Thus, the functional model is stated as:

$$INV = f(REM, RULAW, GOVSIZE, REGEFF, OPENMAK, CONTROLS) \tag{1}$$

$$INV_{it} = \alpha + \delta_1 REM_{it} + \delta_2 RULAW_{it} + \delta_3 GOVSIZE_{it} + \delta_4 REGEFF_{it} + \delta_5 OPENMAK_{it} + \delta_6 GROWTH_{it} + \delta_7 INTRAT_{it} + \delta_8 CRED_{it} + \delta_9 TRAD_{it} + \delta_7 REM * INVCLIM_{it} + \delta_8 INVCLIM_{it}^2 + \varepsilon_{it} \tag{4}$$

where REM is migrants' remittance, RULAW is Rule of Law, GOVSIZE is government size, REGEFF is regulatory efficiency, OPENMAK is open assess to investors, and CONTROLS represents the control variables including economic growth, interest rate, credit to private sector and volume of trade as a percentage of gross domestic product (GDP).

Drawing from the above, the econometric model is specified as:

$$INV_{it} = \alpha_1 + \beta_1 REM_{it} + \beta_2 RULAW_{it} + \beta_3 GOVSIZE_{it} + \beta_4 REGEFF_{it} + \beta_5 OPENMAK_{it} + \beta_5 CONTROLS_{it} + \varepsilon_{it} \tag{2}$$

Introducing the control variables into Eq. (2), the resultant model is as specified below:

$$INV_{it} = \alpha_1 + \beta_1 REM_{it} + \beta_2 RULAW_{it} + \beta_3 GOVSIZE_{it} + \beta_4 REGEFF_{it} + \beta_5 OPENMAK_{it} + \beta_6 GROWTH_{it} + \beta_7 INTRAT_{it} + \beta_8 CRED_{it} + \beta_9 TRAD_{it} + \varepsilon_{it} \tag{3}$$

where GROWTH is per capital income growth rate, INTRAT is the interest rate, CRED is credit to private sector and TRAD is the volume of trade as a percentage of gross domestic product (GDP),  $\varepsilon$  is error term,  $i$  and  $t$  represent the cross section of countries in SSA and time period, respectively.

We have an unbalanced panel of series running from 1995 to 2017, with a sample of 28 selected SSA countries. These countries were selected based on availability of data for a significant period of time. Data analysis begins with the descriptive statistics which provides economic interpretations for the statistical characteristics of the variables, the unit roots test provides certification for the adoption of PARDL technique, and Kao residual cointegration test (panel cointegration) supports that long-run analysis is necessary. Further, the interactive model examines the impact of the explanatory variables when fortified with investment climate; hence, deductions are made on whether investment climate has complementary or substitution effect on the dependent variables (see [31, 32]). This is specified as:

where INVCLIM is the investment climate index computed using the principal component analysis (PCA) of all the four sub-components in the economic freedom index.

**Panel autoregressive distributed lagged (PARDL) estimation technique**

Transforming the static panel in Eq. (3), the PARDL model is derived if the lagged values of both the explanatory and explained variables are captured. More so, the equation is separated into short-run and long-run

**Table 1 Descriptive statistics. Source: Authors' computation 2020**

Variable	Mean	Maximum	Minimum	JB	Prob. value	Obs
INV	19.722	60.018	0.000	38.862	0.000	632
REM	3.499	87.560	0.000	44,678.06	0.000	632
GOVSIZE	0.002	1.853841	-3.806	497.397	0.000	632
OPENMAK	-0.005	3.078768	-4.008	264.681	0.000	632
REGEFF	-0.011	1.957099	-3.948	622.150	0.000	632
RULAW	-0.001	17.85079	-0.563	579,252.7	0.000	632
INTR	5.718	70.75000	-3.60167	7765.643	0.000	632
GROWTH	2.505	140.371	-31.333	814,102.4	0.000	632
TRAD	70.517	311.354	0.000	717.616	0.000	632
CRED	22.119	160.125	0.000	3508.599	0.000	632

INV private investment, REM remittance, Cred credit to private sector, Growth GDP growth rate, TRAD trade openness, RULAW Rule of Law, INTR interest rate, GOVSIZE government size, REGEFF regulatory efficiency, OPENMAK open market

**Table 2 Panel unit root test (Levin, Lin & Chu t\*). Source: Authors' computation, 2020**

Variables	At level			First difference		
	Statistic	Prob.**	Level of Int	Statistic	Prob.**	Level of Int
INV	-4.780	0.000	I (0)	-	-	-
REM	0.295	0.616	I (0)	-7.118	0.000	I (1)
GOVSIZE	-1.716	0.043	I (0)	-	-	-
OPENMAK	-2.924	0.002	I (0)	-	-	-
REGEFF	-3.326	0.0004	I (0)	-	-	-
RULAW	-12.657	0.000	I (0)	-	-	-
CRED	-0.643	0.260	I (0)	-	-	-
INTR	0.285	0.612	I (0)	-	-	-
GROWTH	-5.084	0.000	I (0)	-	-	-
TRAD	-10.732	0.000	I (0)	-	-	-

INV private investment, REM remittance, Cred credit to private sector, INTR interest rate, Growth GDP growth rate, TRAD trade openness, RULAW Rule of Law, GOVSIZE government size, REGEFF regulatory efficiency, OPENMAK open market

components, with the short-run component adhering strictly to the lag-length criterion. Following the above, the PARDL model is specified as:

Equation (5) is specified to capture both the short-run and long-run coefficient, respectively. Also, it computes

$$\begin{aligned}
 \Delta INV_{it} = & \alpha_0 + \sum_{i,t=0}^p \delta_1 \Delta INV_{it-1} + \sum_{i,t=0}^p \delta_2 \Delta REM_{it-1} + \sum_{i,t=0}^p \delta_3 \Delta RULAW_{it-1} + \sum_{i,t=0}^p \delta_4 \Delta GOVSIZE_{it-1} \\
 & + \sum_{i,t=0}^p \delta_5 \Delta REGEFF_{it-1} + \sum_{i,t=0}^p \delta_6 \Delta OPENMAK_{it-1} + \sum_{i,t=0}^p \delta_7 \Delta GROWTH_{it} + \sum_{i,t=0}^p \delta_8 INTRAT_{it} \quad (5) \\
 & + \sum_{i,t=0}^p \delta_9 \Delta CRED_{it} + \sum_{i,t=0}^p \delta_{10} \Delta TRAD_{it} + \sum_{i,t=0}^p \delta_{11} \Delta REM * INVCLIM_{it} + \sum_{i,t=0}^p \delta_{12} INVCLIM_{it}^2 + \varepsilon_{it}
 \end{aligned}$$

**Table 3 VAR lag order selection criteria. Source: Authors’ computation, 2020**

Lag	LogL	LR	FPE	AIC	SC	HQ
0	− 9845.849	NA	2.61e+12	56.97023	57.08140	57.01449
1	− 7689.239	4176.095	17,961,641	45.08231	46.30516*	45.56925*
2	− 7549.016	263.4238	14,253,717*	44.84981*	47.18435	45.77943
3	− 7475.535	133.7951	16,670,326	45.00309	48.44932	46.37539
4	− 7401.080	131.2649	19,446,308	45.15075	49.70867	46.96573
5	− 7337.093	109.1102	24,198,052	45.35892	51.02853	47.61658
6	− 7274.611	102.9337	30,530,684	45.57578	52.35708	48.27612
7	− 7186.930	139.3773*	33,509,099	45.64699	53.53997	48.79001
8	− 7107.731	121.3163	38,916,186	45.76723	54.77190	49.35292

the interactive and thresholds effects of investment climate using SSA data.

**Results and discussion**

This section presents results and economic interpretation for the descriptive analysis, units roots test, lag-length selection tests, panel cointegration and the PARDL regression results.

**Descriptive analysis**

The descriptive statistics provides robust explanations for the statistical characteristics of the series within the model.

Table 1 shows that the mean value of private investment, migrants’ remittance, the volume of trade and domestic credit to private sector have a mean of 19.722, 3.499, 70.517 and 22.119, respectively. Similarly, the maximum and minimum values of these variables are (60.18 and 0.00), (87.560 and 0.000), (311.354 and 0.000) and (160.125 and 0.000), respectively. The computed investment climate indices including government size, open market, regulatory efficiency and Rule of Law recorded mean, maximum and minimum values of (0.002, 1.853 and − 3.806), (− 0.005, 3.078 and − 4.008), (− 0.011, 1.957 and − 3.948) and (− 0.001, 17.85 and − 0.563), respectively. The probability values provide credence to the proposition that the time series data obeyed the basic statistical requirements such as the assumption of normality just to mention a few. The panel possesses about 632 observations.

**Panel unit roots test**

The stationarity tests ensure that the results of the regression analysis are not spurious. Evidence from Table 2 shows that the variables are stationary at level and first difference.

The unit root test shows that the variables are stationary at level and first difference. Since the levels of

integration are mixed, it is unarguable that PARDL is the most appropriate estimation technique. Thus, the model is comprised of the lagged values of both the explained and explanatory variables; hence, it is crucial to ascertain the lag-lengths. This is presented in Table 3.

Drawing from Table 3, it is obvious that the lag-lengths one and two are the most significant. However, to avoid the problem of multicollinearity, the study selects the lag-length one for the number of lags for both the explained and explanatory variables. Interestingly, the panel cointegration test supports the existence of cointegration in the long run because the probability value is less than 1%. This is presented in Table 4.

The cointegration tests shows that the variables co-move in the long run; and as such, both short and long-run analysis are important. The PARDL result is presented in Table 5.

**Discussion**

The regression results in Table 5 depict the results of six different models. The result in model one (with disaggregated components of investment climate) reveals that migrants’ remittance has a significant negative impact on private investment, since a 1% increase in remittance as a percentage of GDP reduces private investment by 0.25% all other things being equal. This empirical finding is in tandem with Balde [27]. Furthermore, individual components of investment climate such as government size,

**Table 4 Kao residual panel cointegration test. Source: Authors’ computation, 2020**

	t-statistic	Prob. value
ADF	− 4.654	0.000
Residual variance	38.809	
HAC variance	31.077	



**Table 5 Results of panel autoregressive distributed lagged (PARDL). Source: Authors' computation, 2020**

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
REM	-0.2458*	-0.1063	-0.1941**	0.0613	-0.6592*	-0.010*
GOVSIZE	2.2289*	-	3.2649*	4.2623*	-3.5510	1.6615*
OPENMAK	2.2224*	-	2.7864*	1.8681*	-1.7894	1.039*
REGEFF	0.4930	-	-0.2478	-	4.6268	1.244*
RULAW	-0.3470	-	-0.1175	-	-	0.036
CRED	-0.0054	-0.0313	0.0294	-0.0407*	-0.0262*	-0.010
GROWTH	0.2728*	0.3491*	0.3554*	0.3761*	0.0328	0.1218**
TRAD	0.1800*	0.2156*	0.2051*	0.2204*	0.2639*	0.2138*
INVCLIM	-	4.8223*	-	-	-	-
THRES(INVCLIM)	-	-	-	-	-	0.7780*
REM*INVCLIM	-	-0.1123	-	-	-	-
REM*REGEFF	-	-	0.0273	-	-	-
REM*GOVSIZE	-	-	-	0.0296	-	-
REM*OPENMAK	-	-	-	-	0.8489*	-
INV(-1)	-2.2694*	-0.2735*	-0.2463*	-0.2483*	-0.2636*	-0.3132*
D(REM)	-0.6124	0.6889	0.2987	-0.0257	-1.2460	-0.4836
D(GOVSIZE)	-0.3349	-	-0.2173	0.7610	1.1575	-1.9687**
D(OPENMAK)	0.1393	-	0.0670	-0.4837	0.0940	-1.1727
D(REGEFF)	0.3952	-	0.8422	-	-0.0771	-2.3193
D(RULAW)	1.3381	-	1.2851	-	-	1.9114
D(CRED)	0.3354*	0.2793*	0.3176*	0.3108*	0.2790*	0.2180**
D(GROWTH)	-0.006	-0.0170	0.0018	-0.0033	0.0318	-0.0466
D(TRAD)	0.0470	-0.0520	0.0650***	0.0538	0.0695**	0.0367
D(INVCLIM)	-	1.2370	-	-	-	-
D(THRESINVCLIM)	-	-	-	-	-	1.6274
D(REM*INVCLIM)	-	-1.2310	-	-	-	-
D(REM*REGEFF)	-	-	-0.4178	-	-	-
D(REM*GOVSIZE)	-	-	-	-1.2586	-	-
D(REM*OPENMAK)	-	-	-	-	-1.6717	-
C	1.3228**	0.7095	0.4631	0.4441	0.2102	1.053***
Aux. parameters						
Hausman test	5.71 (0.108)**					
Number of C/sections	28					
Number of Obsvtns	632					

*INV* private investment, *REM* remittance, *Cred* credit to private sector, *Growth* GDP growth rate, *TRAD* trade openness, *RULAW* Rule of Law, *GOVSIZE* government size, *REGEFF* regulatory efficiency, *OPENMAK* open market, *INVCLIM* investment climate

\*, \*\*, \*\*\* represents 10%, 5% and 1% levels of significance

open market and regulatory efficiency exerted a significant positive impact on investment at 2.23 and 2.22%, respectively. The impact of Rule of Law, though insignificant, rather exerted negative effect (-0.35%) on private investment. Interestingly, the impact of government size on investment exceeded that of open market and regulatory efficiency.

In model two, aggregate investment climate was computed using the four categorized components (government size, open market, regulatory efficiency and Rule of Law) as described earlier using the PCA; and the results

show that the impact of remittance on investment financing still maintained a negative but insignificant impact as revealed in model one. Interestingly, the impact of the aggregate investment climate had a mammoth impact on financial investment, since 1% increase in investment triggered approximately 4.82% improvement in investment. Unfortunately, the interactive effects of remittance and aggregate investment climate exerted a negative and insignificant impact on investment, since 1% increment in the interactive coefficient led to 0.11% fall in private investments. This finding supports the work of Khan

et al. [33]. Drawing from the above, it is obvious that remittance and investment climate are substitutes. Thus, an attempt to improve remittance inflows depletes the effect of investment climate on domestic investment.

Despite interacting regulatory efficiency and remittance in Model 3, it is observed that the effect of remittance on private investment continued in the negative direction. The result from model three shows that 1% increase in remittance as a percentage of GDP significantly reduces investment by 0.1941. Similarly, regulatory efficiency and Rule of Law exerted negative effects on investment, while government size and open market significantly influenced investment financing in a positive direction. The coefficient of the interactive effects between remittance and regulatory efficiency is positive, hence supporting the proposition that the variables are complementary. Here, an attempt to increase the inflows of remittance, increases the effect of investment climate on private investment in sub-Saharan Africa.

In model 4, contrary to the foregoing, the introduction of an interactive term between remittance and government size, influenced remittance to exert a positive effect on private investment. This model shows that one a percent increase in remittance as a percentage of GDP increases investment by 0.061%. More so, components of investment climate such as government size and open market exert positive impacts on private investment.

Model 5 reveals that interacting remittance and open market exert a positive effect on private investment. As a result, the effect of remittance rather maintained a negative sign, since 1% increment in remittance reduces investment by 0.659. Besides, the introduction of the interaction between remittance and open market tilts the effects of remittance and government size to negative, while regulatory efficiency is positive.

Probing the estimations in Table 5 further, it is obvious that the interactive effects between remittance and regulatory efficiency, remittance and government size as well as remittance and the open market turned out to exert positive impacts on private investment. Thus, these interactive factors in models 3, 4 and 5 support the existence of complementary effect between components of investment climate and remittance in SSA within the study period at approximately 0.027%, 0.029% and 0.849%, respectively (see [34]). This means that an attempt to improve remittance, activates the effects of investment climate to enhance the growth of private investment in Africa.

In addition, factors such as per capita growth and volume of trade as a ratio of GDP maintained a positive relationship with investment within the six models.

It points to the argument that migrants' remittance improves household income which in turn spurs investment via the aggregate demand pathway. This supports the New Economics of Labour Migration Theory proposed by Bloom [35] and the Neoclassical Theory of Investment by Jorgensen [24]. Also, improvements in the volume of trade transactions especially exports cause domestic investments and entrepreneurship to grow exponentially just like in the case of the Asian Tigers. Model 6 represents the threshold effects of investment climate at which private investment will be at an optimal level as a result of improved migrants' confidence to invest domestically being positive. Here, it is obvious that 1% increase in investment climate results in 0.78-point increase in domestic private investment. However, the threshold above which investment is hampered is 78%. This indicates that investment climate is associated with higher levels of investment financing in SSA up to the threshold of approximately 78%, beyond which it may cause a decline in domestic investment. This indicates that the expansion of investment climate propels growth; however, excessive expansion of the investment climate may cause a decline in investment financing (see [31]). This is the long-run result. Notably, the Hausman test presented in Table 5 confirmed homogeneity in the long-run coefficients which are the precondition for selection of the ARDL/pooled mean group (PMG) estimation over the mean group (MG) results (see Pesaran et al. 36; Onanuga et al. 37). Given that the null hypothesis is "long-run homogeneity does not exist", we reject it because the t-statistic falls within the rejection region (5.71). Thus, the paper concludes that long-run homogeneous relationship exists among the selected countries sampled within the estimated model.

The error correction model (ECM) represented by the lagged values of the private investment reveals that their values are negative and significant. This is in tandem with a priori expectations. For instance, error correction terms for model 1, 2, 3, 4, 5 and 6 are  $-2.27$ ,  $-0.27$ ,  $-0.246$ ,  $-0.248$ ,  $-0.264$  and  $-0.31$ . This supports the arguments that there exists short-run disequilibrium which can be cleared in the long run. Notwithstanding the above, in the short run, the benchmark model indicates that the impact of remittance on private investment is negative. However, introduction of the interaction between remittance and aggregate investment climate into the benchmark model reversed the influence of remittance into positive. Similarly, the interaction between remittance and regulatory efficiency, influenced remittance to exert positive effects on investment in SSA.

## Conclusion

Existing literature has emphasized that remittance flows are mainly channelled to meet households' consumption and investment needs [23, 38]. Relying on data obtained from 28 selected SSA countries from 1995 to 2017, the study employed the panel autoregressive distributed lagged (PARDL) technique to examine the bundled and unbundled effects of remittance and investment climate on private investment. Empirics from the estimated models rather suggest among others that remittances may have direct negative effects on private investments as witnessed in models 1, 2, 3 and 5 despite the introduction of a mediating factor (investment climate) into the models in 2, 3 and 5. However, in model 4, the effect of remittance on investment was positive (see [39, 40, 33]) which might be as a result of the interaction between remittance and government size. Here, it is obvious that the effect of government size and other components of investment climate cannot be overemphasized. This component of investment climate focusses more on the degree of tax burden and ability of the government to provide basic amenities in order to attract investment into the region via remittance. Here, migrants' remittances would spur investment if the investment climate possesses both attractive and retentive capacity. More so, model 6 provides credence to the fact that the investment climate threshold is 78%, which is the turning point on the quadratic term of investment climate. Based on the depth of analysis and empirical findings, future researches can focus on drawing comparative analysis among regional economic blocs in Africa and individual cross sections using pooled mean group (PMG) and mean group (MG) regression techniques, respectively. These would ascertain which regional blocs and countries are sensitive to investment characteristics of SSA.

Therefore, it is pertinent for the region to build a strong financial system that can differentiate remittances sent for family support from those cut out for investment purposes, and channel the same specifically for investment purposes [31, 34]. Similarly, facilitating regulatory effectiveness such as reducing the time required to secure new business licences and lowering restrictions on new businesses within the region would help to complement the effectiveness of remittance as a pathway towards investment prosperity. More importantly, the government should improve the synergy between macro-economic conditions and investment climate, since it has been confirmed that the former influences investment positively. Lastly, the study recommends 78% threshold for investment climate at which remittance inflows into SSA region would be at its peak.

## Abbreviations

NHF: New Heritage Foundation index; PARDL: panel autoregressive distributed lagged; RULAW: Rule of Law; GOVSIZ: government size; REGEFF: regulatory efficiency; OPENMAK: open market.

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## Authors' contributions

CIN conceived the idea, designed and drafted the work. She also wrote the background, reviewed literature and methodology. MIO collated data, analysed and interpreted the data, drawing up conclusions and policy recommendations based on the findings. WAI was a major contributor in writing the manuscript as he modified the work and gave directions of how it is to be done. All authors read and approved the final manuscript.

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## Availability of data and materials

The dataset used for analysis in the study is available from the corresponding author on reasonable request.

## Competing interests

The authors declare that they have no competing interest.

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