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Article

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DEVELOPMENT ECONOMICS | RESEARCH ARTICLE

The impact of remittances on economic growth in Ghana: An ARDL bound test approach

Abdul-Malik Abdulai^{1*}

Abstract: International remittances remained one major source of international financial resources in the world. Yet very limited empirical studies exist on the impact of these remittances on economic growth, more especially in Ghana. To bridge this void in literature, the study analyzes the impact of remittances on GDP growth in Ghana from 1990 to 2020. The ARDL estimation technique was used to test the long-run association between the selected variables. The results showed that GDP growth rate has a long-run relationship with remittance inflows, foreign direct investment, unemployment rate, inflation, trade, population growth rate and official development assistance. Lastly, the mediating effect of unemployment on remittance inflows negatively affects GDP growth rate in both runs. It is therefore recommended that to ensure sustained GDP growth rate in Ghana, government should consider tapping into the contribution of remittances by ensuring reliable transfer means and cutting down the cost of transfer.

Subjects: Development Studies; Economics and Development; Population & Development; Economics

Keywords: remittance; GDP growth; Ghana; ARDL

1. Introduction

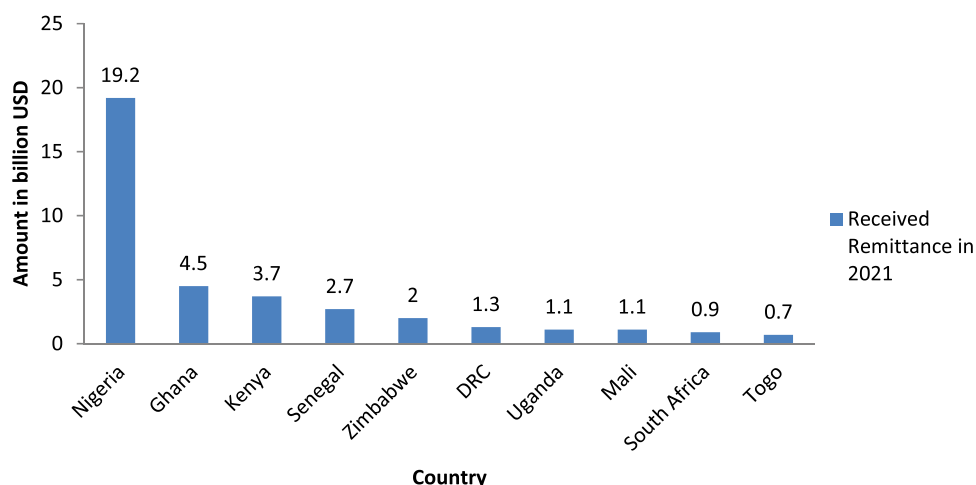
The movement of people from their country of birth or origin to another country is referred to as international migration. As migrants undertake this type of migration, they do send money or goods to relatives at the origins on periodic basis. These money or goods are referred to as remittances. The study of international migration and remittances is not new and dates back to the 1990s (see Borjas & Borjas and George, 1995; Carrington & Detragiache, 1998). According to United Nations (2020) report, international migrants' population in the world has reached 281 million, an increase from 173 million in 2000 and 220 million in 2010. Of the 281 million migrants, 25.46 million are from Africa. The report further observed that the growth rate of the world international migrants is more rapid than the growth rate of the world population. Owing to the faster growth rate, migrants' proportion in total population grew from 2.8 in 2000 to 3.6 percent in 2020. Between 2000 and 2017, international migrants from Africa grew by an average of 3.0 percent, a figure slightly lower than the current world's growth rate. International remittances from these migrants provide for many households in developing countries a greater amount of income, reducing the incidence of poverty and improving the general livelihood (Roy & Basu, 2018; UNCTAD, 2011). It is also argued that remittances constitute a larger portion of international capital flows to many emerging economies, exceeding foreign direct investment (FDI), export revenue and foreign aid (Giuliano & Ruiz-Arranz, 2005; Topsoba & Hubert, 2022). The amount of

remittances sent to developing countries in 2014 for example was three fold higher than the official development assistance (ODA) received. By the close of 2020, remittances to developing nations had soared up to US\$540 billion from US\$431 billion in 2014 (World Bank, 2021).

As a result of the huge amount of inflows to developing nations, remittances are receiving more attention not just because of its size but also its effects on economies of receiving countries. Between 2010 and 2017, remittances to Sub-Saharan Africa rose to 9.6 percent to nearly US \$33 billion compared to a growth of 26.2% for all developing nations combined. In rank order according to the World Bank's "Migration and Development brief 35", the top 10 recipients of remittances in SSA in 2021 are: Nigeria, Ghana, Kenya, Senegal, Zimbabwe, Dem Rep. Congo, Uganda, Mali, South Africa and The Gambia (see Figure 1) with the top and least ranked countries receiving US\$19.2 and US\$0.7 billion respectively. Regarding remittance inflow as a proportion of GDP, the Gambia recorded more than 20 percent, Zimbabwe and Senegal recorded more than 10 percent while Ghana and Mali recorded more than 5 percent (World Bank, 2022).

Figure 1. 10 top remittance receiving countries in Sub-Saharan Africa.

Source: World Bank (2022)



The nexus between remittance and economic growth has not been extensively explored more especially in Ghana, despite the growing importance remittance has become in the overall international financial inflows. Aside this, findings from empirical literature exploring the relationship between remittance inflow and economic growth are not conclusive. While some researchers found remittances to positively relate with gross domestic product (see Kristina & Mindaugas, 2016; Rehman et al., 2021; Tahir et al., 2015; Zizi, 2014; other empirical studies found no significant or negative relationship between economic growth and remittances (see Anetor, 2019; Barajas et al., 2009; Cazachevici et al., 2020; Jushi et al., 2021; Sutradhar, 2020; Ustarz & Issahaku, 2017). It is also argued that, the impact of remittances is country specific and therefore findings from other studies using other countries cannot be generalized. Also, most of the studies assessing the remittances-growth linkages failed to include unemployment and the mediating role of unemployment on remittance inflows in promoting growth. The current study bridges this lacuna in literature by assessing the growth impact of remittances in Ghana using a more robust econometric approach. The rest of the paper is structured as follows: Literature review and methodology of the study are respectively captured in sections 2 and 3. Section 4 presents data analysis while section 5 looks at the conclusions with policy implications.

2. Literature review

There have been a lot of discussions and debates on how sending money back home from outside affects the growth and development of economies in the countries that receive those funds.

Although there is a growing interest in the literature on the possible growth impact of remittances, academics and policy decision-makers are divided on the issue of the repercussion of remittances on economic growth over the long run (Kristina & Mindaugas, 2016).

2.1. Remittances and economic growth

It is indubitable fact that remittances sent by international migrants affect the growth and development of countries receiving them. Several scientific studies provide varied association between remittances inflow and economic growth of recipient countries. Olayungbo and Quadri (2019) conducted research in 20 countries in sub-Saharan Africa to investigate the relationship between remittances, financial development, and economic growth. Using the PMG-ARDL estimate technique, the research came to the conclusion that remittances and financial development had a favorable influence on economic growth in the short and long-run. Vargas-Silva et al. (2009) also examined the growth impact of remittances and poverty in Asia, and their finding revealed a beneficial influence of remittances on growth. It further noted that a 10 percent increase in remittances as a share of GDP increases annual growth by about a 0.9–1.2 percent. Similarly, Giuliano and Ruiz-Arranz (2009) examined the association between economic growth and remittances. They uncovered that in less financially developed countries, remittances promote economic growth. Rehman et al. (2021) investigated the impact of remittances and financial development on economic growth in six Western Balkan countries for the period 2000 to 2017. Applying the GMM methodology, the study found financial development and remittances to positively impacting economic growth. Similarly, Ekanayake and Moslares (2020) document a positive long-run effect of remittance on economic growth and poverty in 21 countries of Latin America. Sahoo et al.'s (2020) study looked at the association between remittance inflows, human development and economic growth among other macroeconomic variables for the period of time spanning 1990 to 2018. Applying the FMOLS and DOLS techniques, the study revealed a positive long-run relationship between remittances and human development. Depken et al. (2021) assessed the causal relationship between foreign remittance and economic growth in Croatia. Using the Granger causality test, the variance decomposition and the impulse response functions, the result revealed a one directional causal relationship running from remittances to economic growth. On his part, Islam (2022) analyzed the growth impact of remittances for a duration spanning from 1986 to 2019 on some selected Asian economies. Using the panel generalized least squares (GLS) and the fully modified ordinary least squares (FMOLS) techniques, remittances were reported to have a beneficial impact on economic growth. Applying monthly data for the years 2009 (01) through 2016 (06), Kruah (2017) used the vector autoregression method to evaluate the connection between remittance inflows into Liberia and the growth rate of its economy. He made the startling discovery that the growth of the nation's economy was positively impacted by the receipt of remittances from overseas.

There are several reasons that account for the positive contribution of remittances on economic growth. Remittances, according to some studies, boost economic growth because they cover the gap created by the shortage of foreign currency more especially in developing countries (Bliss, 2008). Other reason by Fayissa (2008) for the positive impact of remittances is the fact that, it provides an alternative vehicle of financing investment and helps overcome liquidity challenges. Garza (2008) hypothesized that this positive impact of remittances can be realized only if a more congenial political and economic environment is guaranteed at the receiving country. This is because monies received will not only be utilized for the purposes of business, but for personal expenses/consumption also. While the above studies points to the positive influence of remittances on receiving economies, related studies revealed a negative relationship between remittances and economic growth. Oteng-Abayie et al. (2020) conducted a study on the effect of remittances on economic growth in Ghana using the ARDL approach. The findings of their study revealed that remittances have long-run effect that is negative to economic growth. Applying a balanced panel data for four countries of Southern Asia, Sutradhar (2020) assessed the effect of remittances on the growth rates of those countries for the period 1977 to 2016. The author employed the panel OLS technique for its analysis and the results revealed remittances to

have negative effect on economic growth. Similarly, Sobiech (2015) explored the growth impact of remittances of 54 developing nations between the 1970 and 2010. Results of the study revealed that for countries with underdeveloped financial sector, remittances are found to negatively affect its growth using the GMM estimation technique. On his part, Karagoz (2009) documented a negative effect of remittances on economic expansion of Turkey covering a 35 year period (1970 to 2005), with the explanation that remittances forms an insignificant source of capital for development of an economy. Chami et al. (2003) reported that remittances have a negative impact on growth in per capita incomes. Their investigation revealed three key facts: firstly, that a large portion of received remittances are used for personal expenses/consumption; secondly, that a much smaller portion of remittance funds is used for savings or for investment purposes and thirdly, the investment or savings made (mostly in the form of real estate, land or jewelry) “are not necessarily productive” to the economy as a whole. Other empirical studies imply that remittances have an indirect effect on economic growth through real exchange rate appreciation, which creates what is known as the “Dutch disease”. The economic growth would be hampered by the appreciation of exchange rate in countries with large volumes of remittance inflows. In their study, Devesh and Center for Global Development (2003) also argued that in communities that heavily rely on remittances develops the culture of dependency. This culture makes young men to prefer to be unemployed and waiting for the possibility of their turn to migrate. The received remittances increase consumption much faster than production, which raises the question of long term negative effect on the growth of local economies. On their part, Barajas et al. (2009) examined the effect of remittances on the growth rate of 84 receiving countries using annual data from 1970 to 2004. The study’s finding indicated that remittances did not have an influence or had a detrimental influence on economic growth. Jushi et al. (2021) applied data from 2000 to 2017 to analyze, using the VAR model, the effect of remittances on growth rate of eight Western Balkan nations. Their study revealed that while trade and FDI contribute significantly to the growth rates of the economies; remittances had insignificant influence on the later.

From the above review, it is clear that a plethora of reviewed literature have failed to provide a clear-cut answer on the exact effect of remittance inflows on the economic growth of nation states. Also, the remittance impact on growth differs from country to country and therefore results from such studies cannot be used to generalize and therefore the needs to conduct a study using Ghana as case study.

3. Methodology of the study

The section explores the various statistical tools and packages used for data analysis. Firstly, we conducted a statistical descriptive analysis of the variables. Secondly, the research used the Augmented-Dickey-Fuller (ADF) (Dickey & Fuller, 1979) for its stationarity test for all series. After confirming the non-existence of unit roots, the series’ cointegration was examined using the bound cointegration test. The null hypothesis of no level cointegration against the alternative that there is level cointegration was validated using the bound F-statistic. If the calculated F-statistic is greater than the critical F-statistic of the upper bound, we reject the null hypothesis and accept the alternative that there is long cointegration between the series. Once there is a confirmation of a long-run association among the series, we proceed to estimate the conditional ARDL long-run model. In functional form, our empirical model is as follows:

$$\text{GDP} = f(\text{FDI}, \text{UNEMPT}, \text{REMIT}, \text{INFLATION}, \text{TRADE}, \text{POP GROWTH}, \text{ODA}) \quad (1)$$

Where REMIT is the remittances received, UNEMPT is unemployment rate and POP GROWTH is the population growth rate. The rest of the variables are defined in Table A1 of the APPENDIX. Data was sourced for these variables spanning from 1990 to 2020 for analysis. The following is a linear form of equation 1, which can be expressed as:

$$GDP_t = \alpha_0 + \alpha_1 FDI_t + \alpha_2 REMIT_t + \alpha_3 UNEMPT_t + \alpha_4 TRADE_t + \alpha_5 ODA_t + \alpha_6 INFLATION_t + \alpha_7 POP\ GROWTH_t + \varepsilon_t \quad (2)$$

The ARDL is used because of its inherent ability to handle different levels of integration and also appear more superior over the traditional or popular cointegration models; Engle-Granger (Engle & Granger, 1987), the Johansen test (Johansen & Juselius, 1990) and the Phillip-Ouliaris test as its able to concurrently estimate both the short and long-run estimates (Işık, 2013). It also provides reliable results for small sample size (Wang et al., 2021) and lastly, incorporating lags into the model also addresses the endogeneity problem (Amin et al., 2020; Menegaki, 2019; Sam et al., 2019). The Autoregressive Distributed Lag model to be estimated is specified as:

$$\begin{aligned} \Delta GDP_t = & \beta_0 + \beta_1 GDP_{t-1} + \beta_2 FDI_{t-1} + \beta_3 REMIT_{t-1} + \beta_4 UNEMPT_{t-1} + \beta_5 TRADE_{t-1} \\ & + \beta_6 ODA_{t-1} + \beta_7 INFLATION_{t-1} + \beta_8 POP\ GROWTH_{t-1} \\ & + \sum_{r=1}^q \gamma_1 \Delta GDP_{t-r} + \sum_{r=1}^k \gamma_2 \Delta FDI_{t-r} + \sum_{r=1}^k \gamma_3 \Delta REMIT_{t-r} \\ & + \sum_{r=1}^k \gamma_4 \Delta UNEMPT_{t-r} + \sum_{r=1}^q \gamma_5 \Delta TRADE_{t-r} + \sum_{r=1}^k \gamma_6 \Delta ODA_{t-r} \\ & + \sum_{r=1}^k \gamma_7 \Delta INFLATION_{t-r} + \sum_{r=1}^k \gamma_8 \Delta POP\ GROWTH_{t-r} + \mu_t \end{aligned} \quad (3)$$

Where Δ in equation 3 is the difference operator, β_0 is the intercept term while β_1 to β_8 measures the long-run coefficients and γ_1 to γ_8 are the coefficients of short run, p reports the lag for GDP growth rates, q represent lags of the regressors, and μ_t report the error residuals. However, if there is cointegration among variables after the bounds test, both short-run and long-run relationships would be specified. Thus, an error correction model (ECM) is estimated to ascertain the short-run coefficients. The ECM equation is therefore specified as follows:

$$\begin{aligned} \Delta GDP_t = & \sum_{j=1}^p \gamma_1 \Delta GDP_{t-j} + \sum_{j=1}^q \gamma_2 \Delta FDI_{t-j} + \sum_{j=1}^q \gamma_3 \Delta REMIT_{t-j} \\ & + \sum_{j=1}^q \gamma_4 \Delta UNEMPT_{t-j} + \sum_{j=1}^q \gamma_5 \Delta TRADE_{t-j} + \sum_{j=1}^q \gamma_6 \Delta ODA_{t-j} \\ & + \sum_{j=1}^q \gamma_7 \Delta INFLATION_{t-j} + \sum_{j=1}^q \gamma_8 \Delta POP\ GROWTH_{t-j} + \phi ECM_{t-1} + \mu_t \end{aligned} \quad (4)$$

Where ϕ is the coefficient of ECM and which measures the adjustment speed to long-run equilibrium and it is supposed to be significantly negative. ECM is the error correction term which accounts for the long run representation in the specified model (Darko, 2016). After estimating the short and long-run coefficients, some diagnostic and stability test will be conducted to ensure that the model is free from serial correlation, heteroskedasticity and also stable.

4. Data analysis and discussions

Descriptive analysis is conducted to highlight the distribution of the variables. In Table 1 the mean amount of remittance inflows to the country over the period under study is 2.184. This relatively low figure indicates that remittances contribute marginally to the country's growth even in the recent spate of high emigration rates.

The mean gross domestic product is 5.374%, an indication that growth rate in Ghana is quite good. Ghana received more ODA (7.208) than FDI (4.040) on the average over the studied period. This could be explained perhaps by the fact that not much is done by way of providing incentives to attract foreign direct investment and therefore heavily relying on development assistances (ODA). Inflation recorded the second highest mean of 19.115 over the period, suggesting high price

Table 1. Summary statistic of Variables

Variables	Obs	Mean	Std. Dev.	Min	Max
GDP	30	5.374	2.553	0.514	14.047
INF	30	19.115	12.937	4.865	59.462
POPGROTH	30	2.478	0.205	2.131	2.896
FDI	30	4.040	2.738	0.303	9.467
REMIT	30	2.184	2.665	0.094	10.085
UNEMPT	30	6.202	1.778	3.490	10.460
ODA	30	7.208	4.145	1.333	15.977
GOVEXP	30	10.136	2.424	6.957	15.308
TRADE	30	75.110	18.959	38.517	116.048

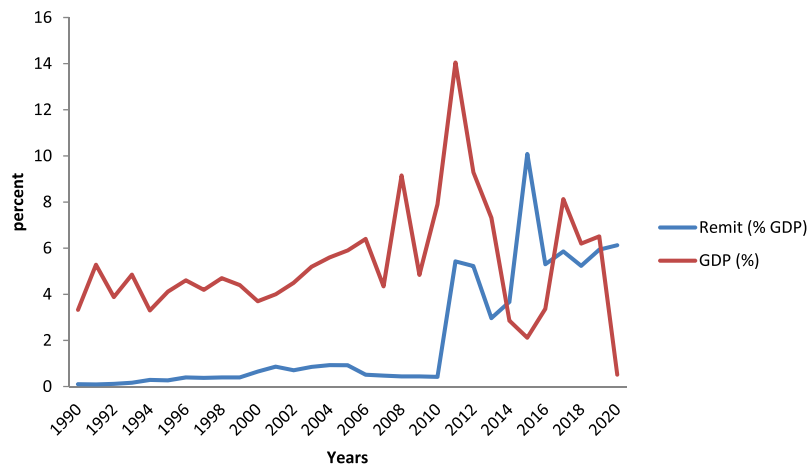
Source: Author's construct, 2022.

instability in Ghana. For standard deviation which measures the variation of the observed variable from its mean, economic openness (Trade) is revealed to be the most volatile among the variables and population growth being the most stable.

We also assessed the trend of remittances and economic growth over the period and the graph is shown in Figure 2. It is observed that both GDP and remittances remained positive and increased modestly over time until 2011 when they both became stochastic. There was a dip in both remittances and GDP growth from 2012 to 2014 and then increases thereafter. This period was characterized with very heated contested elections accompanied by legal battles that created a state of uncertainty, leading to low production and economic growth. Whiles GDP saw a sharp decline during the COVID-19 period, remittances received witnessed a modest increase.

Figure 2. Trend graph of Gross Domestic Product and received remittances as % of GDP.

Source: Author's construct, 2022.



4.1. Stationarity test

According to Bashar (2015) and Emeka and Aham (2016), regression analysis with non-stationary series yields spurious results that cannot be used for analysis, forecasting, or policymaking. To check for the stationarity or otherwise of the series, the Augmented Dickey-Fuller (ADF) test was applied.

Unit root test results are presented in Table 2 and which indicate that when intercept is considered, none of the variables were stationary at levels except inflation and GDP, but became stationary after first differencing. This demonstrates the absence of I(2) series among the

Table 2. Unit root test result (ADF)

Variable	Level Form		First differenced	
	ADF		ADF	
	Intercept	Prob.	Intercept	Prob.
UNEMPT	−2.3272	0.1709	−2.6774	0.0909*
REMIT	−0.5619	0.8647	−5.9297	0.0000***
FDI	−1.8001	0.3733	−4.4677	0.0014***
REMIT_UNEMPT	−2.1726	0.2199	−3.9371	0.0053***
INFLATION	−3.4768	0.0159**	−6.1514	0.0000***
TRADE	−2.0974	0.2470	−5.0768	0.0003***
POP GROWTH	1.3498	0.9981	−3.8594	0.0079***
ODA	−1.3267	0.6039	−6.2099	0.0000***
GDP	−3.1622	0.0325**	−6.1796	0.0000***
GOVCON	−2.5885	0.1064	−5.9979	0.0000***

Note: *, ** and *** denotes significance at 10%, 5% and 1% levels respectively.

Source: Author's construct, 2022.

variables, but contains only the I(0) and I(1) series and therefore employing the ARDL is more appropriate.

4.2. Bounds test for cointegration

We conducted the bound test of cointegration having tested the stationarity of the series. As indicated earlier, this is required when using the ARDL model. The result of the bound test for cointegration is as presented in Table 3. The F-statistic value of 13.0154 as shown in Table 3 far exceeds the value of the upper bound, I(1) at 5% significant level and therefore we accept the alternative hypothesis and conclude that there is a long-run joint cointegration.

Having established the existence of long-run relationship between gross domestic product (GDP) and the covariates using the bound test for cointegration, the ARDL framework was employed to estimate the long-run coefficients. Results from Table 4 revealed that GDP has a long-run relationship with received remittances (REMIT), unemployment rate (UNEMPT), foreign direct investment (FDI), Inflation, population growth rate, trade, official developmental assistance (ODA) and the interaction of unemployment and remittances (UNEMPT_REMIT). The coefficient of remittances is positive and statistically significant at 5%, indicating that personal remittances positively affect GDP growth in the long-run. A unit increase in remittance inflows increases growth in GDP by 8.27 units holding all other variables constant. This result is expected as part of the inflows is expended on feeding and the rest are invested into developmental projects which are expected to promote economic growth. This

Table 3. Bound test results

F-bounds Test				
H ₀ : No levels relationship				
Test Statistic	Value	Sig	I(0)	I(1)
F-Stat	13.01542	10%	1.95	3.06
K	8	5%	2.22	3.39
		2.50%	2.48	3.7
		1%	2.79	4.1

Source: Author's construct, 2022.

finding agrees with those of Depken et al. (2021), Islam (2022), Adnan et al. (2020), Oteng-Abayie et al. (2020), Nyeadia and Atiga (2014), Imai et al. (2014), Ratha (2013) and Cooray (2012). It is however at variance with the findings of Oteng-Abayie et al. (2020); Ustarz and Issahaku (2017); Sutradhar (2020) and Singh et al. (2010). Also, FDI positively relates to economic growth, indicating that in the long-run foreign direct investment boost economic growth of Ghana, though not as much as remittance inflows. This positive sign of FDI is expected given that FDI inflow has spillover effect on developing countries through boosting productivity, enhancing business prowess and facilitating technology transfers (Alfaro, 2003; Carkovic & Levine, 2002; Nicolini & Resmini, 2006). Also, due to insufficient supply of capital for investment a larger proportion of developing economies depends on FDI to stimulate their economic growth. FDI is also found to promote the transmission of new knowledge in the form of acquiring new skills and modern management practices (Shirazi et al., 2018). This positive effect of FDI on economic growth supports the result of Oteng-Abayie et al. (2020).

Trade, which proxy openness, produces a plus sign and significantly affects growth in the long-run. Holding all other variables constant, Ghana's growth rate will increase by 14.01percentage point for every percentage point increase in trade volume. This positive sign for trade implies that countries that engage in foreign trade can grow their economies through exports and imports. Goods and services exported for example are argued to be a significant source of foreign exchange that eases the strain on the balance of payments and also contributes to job creation (Shihab et al., 2014). This result is consistent with reports by Islam (2022) and Emrah et al. (2019) that trade volume contributed positively to economic growth. As expected, the coefficient of Official Development Assistance (ODA) is positive and significant; suggesting that in the long-run ODA promotes the growth of Ghana's economy.

Table 4. Long-run effect of Remittance on GDP

Levels Equation

Model: ARDL (1, 0, 2, 2, 1, 2, 1, 2, 1)

Case 3: No trend with unrestricted Constant

Variable	Coefficient	Std. Error	Prob.
UNEMPT	14.8458	2.3739	0.0002
REMIT	8.2658	1.3148	0.0002
FDI	0.9602	0.1605	0.0003
REMIT_UNEMPT	-0.8389	0.1232	0.0001
INFLATION	0.1234	0.0395	0.0140
TRADE	0.1401	0.0231	0.0003
POP GROWTH	41.3032	5.8419	0.0001
ODA	0.3660	0.1654	0.0579

Source: Author's construct, 2022.

Inflation enters the equation with a significant positive sign, suggesting that higher inflation rates promote economic growth. This positive impact of inflation is not expected and also not desirable. This is because inflation driven growth is not welfare enhancing. Population growth appears positive and substantially affects economic growth in the long-run all things being equal. This result is expected though appears controversial in the development economics literature. Peterson (2017) analyzed several research exploring the connection between economic growth and population growth rate and came to the conclusion that population growth rate is beneficial to overall economic growth, particularly in low-income nations.

Finally, what is mostly missing in the remittance-growth nexus's literature is the inclusion of unemployment. We observed a positive and significant effect of unemployment on economic growth. This implies that a unit increase in unemployment would lead to an increase in GDP in Ghana by 14.8 units. This suggests that Ghana is experiencing a jobless growth over the studied period. This finding is congruent with that of Ahmed and Ambreen (2014) who found unemployment to positively relate to output growth and productivity in Pakistan, but at variant to the results of Clement and Khobai (2018) and the Okun's law. It is also argued by some researchers that remittance receiving households are more likely to consider the received remittances as a means of survival and therefore unlikely to offer themselves for work (see Amamoo-Otoo & Chi, 2020). This then suggest that the impact of remittances on growth may vary based on the level of unemployment in the receiving country. We therefore included the interaction term to capture the threshold of unemployment level that can support remittances to have a beneficial influence on economic growth. The interaction term (REMIT_UNEMPT) adversely impacted growth in the long-run, suggesting that increases in remittance inflows will continue to decrease growth rate if unemployment rate in Ghana remain within a threshold of 41% holding all other variables constant.

5. Short-run dynamics

The ARDL has three components: the long-run, the short-run and the error-correction term (ECT) which quantifies the rate of adjustment required to restore equilibrium after disturbance. From Table 5, ETC (CointEq) has the expected negative sign and also statistically significant at 1% significance level. This corroborates the presence of a long-run relationship among variables as earlier on established by the bound test. The ETC suggests that to maintain long-run convergence to equilibrium, fluctuations in GDP growth (that is above or below its equilibrium level) is adjusted

Table 5. Short Run Remittance impact on GDP growth

ARDL Error Correction Regression

Model: ARDL (1, 0, 2, 2, 1, 2, 1, 2, 1)

Case 3: No Trend with unrestricted Constant

Variable	Coefficient	Std. Error	Prob.
C	-422.0628	27.4956	0.0000
D(REMIT)	9.8995	0.5338	0.0000
D(REMIT(-1))	-1.2245	0.2250	0.0006
D(FDI)	0.9322	0.0999	0.0000
D(FDI(-1))	-1.1445	0.1461	0.0001
D(REMIT_UNEMPT)	-1.1551	0.0678	0.0000
D(INFLATION)	0.0323	0.0102	0.0131
D(INFLATION(-1))	-0.1179	0.0110	0.0000
D(TRADE)	0.0274	0.0097	0.0229
D(POPT GROWTH)	162.7227	14.1843	0.0000
D(POP GROWTH(-1))	-80.8459	9.7635	0.0000
D(ODA)	0.8072	0.0996	0.0000
CointEq(-1)*	-1.5830	0.1034	0.0000
R-squared	0.9736		
S.E. of regression	0.5909		
Log likelihood	-17.2696		
Schwarz criterion	2.7005		
F-statistic	49.1537		
Prob(F-statistic)	0.0000		

Source: Estimation from data, 2022.

at a speed of 1.583 units. The short-run estimates revealed a positive and significant impact of remittances on GDP growth. A unit hike in remittances will boost economic growth in the short-run by 9.9 units all else remain constant. Its one-lagged period however negatively and significantly affects GDP growth.

Similarly, FDI, inflation and trade positively and significantly affect GDP growth in the short-run. A unit increase in FDI will increase GDP growth in the short-run by 0.93 units. It one lagged-period however presented a negative and significant effect on GDP growth. In the same vain, inflation marginally increases GDP growth by 3.2% for a 1% increase. This result is in line with the thought of many economists like John Keynes who argued that some amount of inflation is necessary in an economy to prevent the “Paradox of thrift”. Finally, the interaction variable adversely affects GDP growth in the short-run, suggesting that a hike in remittance inflows will continue to increase growth rate if unemployment rate in Ghana remains within a threshold of 8.57% all things being equal.

6. Residual and stability diagnosis

The residual and stability diagnosis are conducted in this section having estimated the effects of the covariates on the dependent variable in both runs. This is to ascertain if the estimated models are reliable and stable. The study tested for normality, serial correlation and heteroskedasticity using the Jarque-Bera test, the Breusch-Godfrey serial correlation LM test and Breusch-Pagan residual test respectively.

Table 6. Results of Residual and Stability Tests

Method	F-Statistic	Prob
Serial correlation	25.76395	Prob. F(2,6) = 0.0011
Heteroscedasticity	1.187268	Prob. F(20,8) = 0.4225
Normality (Jarque-Bera)	1.345	0.5104, Normal

Source: Author’s construct, 2022.

The results in Table 6 demonstrate that the model does not suffer from the problem of heteroskedasticity and also, the data follows a normal distribution. This is due to the F-statistic probability value exceeding the 5% level of significance. Lastly, the stability of the parameters is also confirmed to be stable using the CUSUM and CUSUMSQ as presented in Figure A1 at the Appendix. As seen in the figure, all the blue lines fall within the red line’s borders, showing that the study’s models are stable at the 5% level of significance.

7. Conclusions and recommendations

The study examines the impact of remittance inflows on Ghana’s GDP growth rate. Yearly data spanning from 1990 to 2020 was retrieved from the website of the World Bank and used for analysis. Using the ARDL cointegration technique to explore the long-run relationship, the study revealed that GDP growth rate has a long-run relationship with remittance inflows, FDI, inflation, unemployment rate, trade, population growth rate and official development assistance. The increasing flow of remittances into the economy of Ghana helps promote GDP growth rate both in the long and short-run. As expected, foreign direct investment positively affect GDP growth rate in both runs. This is because most emerging economies depend on FDI to spur their economic growth due to insufficient supply of capital for investment. The coefficient of trade is positive and significant, implying that countries that are engaged in international trade in the long-run grow their economies through export and import of goods and services. Also, inflation positively and significantly affects GDP growth both in the short and long-run, though the short-run effect is marginal which is expected. The long-run promotion of growth by inflation is undesirable. This is because inflation driven growth is not welfare enhancing. Finally, the mediating effect of unemployment on remittance inflows negatively affects GDP growth rate in both the short and long-run. Thus increases in remittance inflows will continue to increase GDP growth rate if unemployment rate in Ghana remain within the threshold of 8.57 percent at least in the short-run. Contingent on

the afore mentioned conclusions, the study recommends that aside putting resources in the area of the traditional sources of growth such as investing in physical and human capital (example, government flagship program on free Senior High School education and digitalization), trade and foreign direct investment, government should consider tapping into the contribution of remittances by ensuring reliable transfer means and cutting down the cost of its transfer. Secondly, government should develop policies that should provide tax incentives to investors from foreign countries so as to facilitate more FDI inflows into the economy. This will help propel the economy both in the short and long-run. Furthermore, Ghana is an emerging economy that produces mostly primary and low-tech products and therefore policies should be formulated to broaden the country's export to include more manufactured goods in order to maximize the economic benefits of trade. Finally, government should also partner with the private sector to create job opportunities for the teaming unemployed youth by creating the enabling environment as the effect of remittance inflows on GDP growth varies with unemployment rate.

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Appendix

Table A1. Variables and their Measurements

Variable	Definition	Measurement
GDP	Gross Domestic Product	Annual percentage growth rate of GDP at market prices
POP GROWTH	Population growth rate	Annual Population growth rate (%)
FDI	Foreign Direct Investment	Foreign Direct Investment to GDP
REMIT	Remittances received	International migrants' remittances received to GDP
ODA	Official Development Assistance received	Net Official Development assistance received to GDP
UNEMPT	Unemployment rate	Unemployment, total (% of total labor force)
INFLATION	Inflation rate	Inflation as measured by the consumer price index
TRADE	Trade (Openness of the economy)	Import plus export (% of GDP)

Source: Author's own construct, 2022.

Figure A1. CUSUM and CUSUMSQ test results for the model.

