



## STRUCTURAL BREAKS AND SOCIOECONOMIC FACTORS IN THE REMITTANCE-ECONOMIC GROWTH NEXUS IN GHANA

**Adu-Darko, E. A.**

*Banking and Finance Department  
Central University  
Miotso, Ghana*

ORCID: <https://orcid.org/0000-0002-3445-3118>  
[eadu.darko@central.edu.gh](mailto:eadu.darko@central.edu.gh)

### Abstract

*The direction and degree of association between inward remittances and growth in economic growth literature has been largely inconclusive in the literature. Findings from Ghana are no different even in the presence of various moderating variables. Based on the aggregate Cobb-Douglas production relationship, this research seeks to address this lack of consensus by considering the role that structural breaks play in the remittance-growth relationship in the presence of socioeconomic factors that proxy as institutional variables in Ghana. First, we conduct the Johanssen cointegration analysis using data from 1984 to 2019. We find that although there are two cointegrating relationships among all the variables tested, there's no significant relationship between remittance and growth using both FMOLS and DOLS estimators. Second, when a level structural break is introduced into the unit root tests, the I (1) properties of all variables are non-existent and OLS regressions provide ample evidence that remittances and socioeconomic factors have a strong, positive and significant impact on economic growth in Ghana. The evidence suggests that there is a need to include structural breaks when investigating the remittance-growth relationship in Ghana to avoid misspecifying models and hence making inaccurate forecasts and policy decisions.*

**Keywords: Remittances, Economic growth, Structural breaks, Cointegration, Cobb-Douglas function**

### Introduction

Establishing the determinants of sustainable economic growth has been an ongoing argument in literature (Heshmati, 2018; Chirwa & Odhiambo, 2016). One school of thought on the macroeconomic determinants of growth stresses remittances as a major determinant of economic growth (Meyer & Shera, 2017; Nyeadi & Atiga, 2014), whilst another does not find any significant linkages between them (Clemens & McKenzie, 2018; Meyer & Shera, 2017). However, the evidence heavily leans in favour of a significant association between the two (Cazachevici et al., 2019). Indeed, based on the sustainable development goals (SDG), target 17.3, there is a need to build partnerships for global development that are

centred on facilitating and strengthening financial links between countries. Finding employment in another country and being able to send financial support home is very desirable and important for economically disadvantaged people (World Bank, 2020).

The World Bank's Global Knowledge Partnership on Migration and Development (KNOMAD, 2019) defines remittances as amounts of money that are typically transferred or sent from one party to another, usually overseas. Remittances are thus considered as a measure aggregated at three different levels: personal and total remittances as well as total remittances that include transfers made to non-profit institutions providing services to households

(NPISHs). KNOMAD (2019) further indicates that, remittances received by low and middle-income economies in that year was about \$529 billion. This value exceeds that of 2017 by 9.6%. According to Meyer and Shera (2017), recorded remittances were over two times the size of official aid and almost two-thirds of foreign direct investment (FDI) flows to developing countries as of 2016. Furthermore, remittances made up 27% of developing countries' gross domestic product (GDP). Indeed, the growth of remittances continues to spur on amid the COVID-19 era. A projected growth rate of 7.3 percent occurred in terms of remittances to low- and middle-income countries. This is translated as \$589 billion in 2021. This is quite remarkable considering the 1.7 percent decline in remittances during the COVID-19 pandemic in 2020 when the world was experiencing a global recession. Ghana, among other developing and emerging economies, has had its fair share of remittances with a remarkable growth rate. Ghana saw over 101 percent growth in remittances in the last decade. That is from \$2.135 billion in 2011 to \$ 4.292 billion as at 2020. Remittances as a proportion of GDP grew from 0.42% in 2010 to 10.49% in 2015 but fell to 5.93% as of 2020. These figures are an indication that remittances are a sizeable part of Ghana's GDP thus begging the question of its role in the growth of the country.

Studies so far have generated mixed outcomes (Nyeadi & Atiga, 2014; Oteng-Abayie et al., 2020) and have been largely inconclusive. The attempt to establish the moderating factors in the remittance-growth association in Ghana, the level of financial development (Adenutsi, 2011), human capital development, and foreign direct investment (Agbola, 2013) among many others have also generated mixed findings.

Others have accounted for structural breaks in the remittance-growth relationship especially in Africa. Structural breaks, although they are exogenous to econometric models tend to change model parameters and adversely impact the behaviour of unit root and other tests. Indeed, these breaks occur in the form

of shocks as a result of a system being affected by events such as natural disasters, pandemics like COVID-19, internal and external wars such as we are currently facing with Ukraine and Russia, changes in governance structure, major policy changes and financial crises such as the 2008 global financial crises among many others. Banerjee and Carrion-i-Silvestre (2015) as well as Lee and Strazicich (2004) highlight the need to consider the structural changes that such occurrences can result in when conducting econometric analysis to present a more accurate picture. Allowing tests to incorporate structural breaks therefore contributes to the avoidance of misspecification and misleading conclusions (Perron, 1989; Karavias et al., 2023). Over the past few decades, Africa and indeed Ghana, have witnessed typical examples such as the Structural Adjustment Programmes in the 1990s to early 2000s, the change in political regime in 1992, the 2017/2018 banking crises, and many more. These events are often likely to redirect the nation's development for years and sometimes, decades after their occurrence.

Although a few studies on the remittance-growth association in Ghana (Adu-Darko & Aidoo 2022; Akpa, 2018) have incorporated structural breaks, socioeconomic factors which measures the quality of institutions in an economy have largely been ignored in studies on remittances and economic growth in Ghana. Socioeconomic factors are a major indicator and component of political risk as provided by the categorisations of the International Country Risk Guide (ICRG, 2020). Generally, a lower socioeconomic status limits the availability for resources in the health, financial, educational and social resources leading to low remittance inflow which does not result in economic growth. Hence, socioeconomic development may be important remittances to propel growth. It is against these backgrounds that this paper seeks to introduce structural breaks and socioeconomic factors in considering remittances and their effect on growth in Ghana.

Following this introductory section, the next section is a review of the literature followed

by a discussion on the data, sources of data, and the empirical methodology. The results are presented and interpreted after that. The last section provides a summary, the conclusion, and policy recommendations from the study.

### **Literature Review**

Existing studies strongly indicate that the nature of the linkage between remittances and growth is largely inconclusive. Cazachevici et al. (2020) show that there are various routes by which remittances affect the receiving country's economy. Remittances can function as an important means of financing domestically, for the domestic economy, increase investment, remove barriers to obtaining credit and so positively impact economic growth. Indeed, during economy-specific recessions, Cazachevici et al., (2020) assert that remittances can boost consumption, raise the levels of disposable incomes which implicitly qualify their role as a form of insurance. Indeed, their findings are split evenly between studies that find remittances impacting growth positively and those that find no association between them. A smaller percentage finds a negative association.

Akpa (2018) applied the permanent income hypothesis to test whether private remittances had short run and long run associations with consumption in Ghana. Using data from 1980 to 2016, the study employed the Pesaran et al. (1996, 2001) ARDL model with exogenously determined structural breaks. The findings revealed that private remittances have a negative and insignificant association with household consumption. This study diverges from the Akpa (2018) study by estimating and comparing the outcome of one model without structural breaks and another with a level break. The results show that in the absence of structural breaks, remittances and growth are not significantly associated. The COVID-19 pandemic and ongoing war between Russia and Ukraine confirm the need to take sudden unanticipated events that shock the structure of both the global and domestic economy into account.

Adams and Cuecuecha (2013) and Asafo Agyei (2021) find support that human and physical capital investments and poverty reduction are positively linked with remittances in developing countries. However, this test did not incorporate the effect of structural breaks despite the proven necessity in modelling various economic phenomena (Perron, 1989; Karavias et al., 2023). We further argue that, it is important to determine whether socioeconomic conditions such as employment levels, education, access to health care, safety and security, housing, and income among others play a role in any way. In Ghana, remittances have been shown to enhance economic growth (Nyeadi & Atiga, 2014; Oteng-Abayie et al., 2020) and promote household welfare and health (Adenutsi & Ahoritor, 2008). However, some findings from Ghana also indicate that the dynamic relationship between the two was negative within the period (Amamoo-Otoo & Chi, 2020). These varied findings call for additional and in-depth investigations into the remittance-growth interrelations in Ghana.

### **Methodology**

The purpose of this study was to identify the main linkages between remittances, socioeconomic conditions, and economic growth with inflation, net trade, capital, and exchange rate as controls based on the Cobb-Douglas framework which can be depicted through the production function in line with Solow (1956) neoclassical growth model (Barro & Sala-i-Martin, 2004). According to Balach and Law (2015), the Solow (1956) growth model is one of the most widely used fundamental sources for growth studies. The unit of analysis in this study is Ghana and the period considered is between 1984 and 2019 with data sourced from the World Development Indicators (WDI), Penn World Tables, 10.0, and the International Country Risk Guide (ICRG). We apply cointegration, estimating the error correction term, fully modified as well as dynamic ordinary least square (FMOLS and DOLS) estimations to estimate the models. The choice of the adopted techniques is informed by the need to ensure that we adequately capture all

properties of the series as we study possible associations (Menyah et al., 2014). Secondly, the information that is unique to the unit of analysis (Ghana) is used in making decisions (Wooldridge, 2016). Thirdly, existing studies in Ghana have largely ignored the possible role played by structural breaks (Peprah et al. 2019; Oteng-Abayie et al., 2020). To this effect, we employ both integration and dynamic models in order to depict structural long-run equilibrium properties in the relationship between such macroeconomic variables.

Existing studies indicate that ignoring structural breaks results in losing power in models (Gregory & Hansen, 1996), misspecification in the trend function which may lead to a bias in the standard unit root tests (Perron, 1989) and encounter serious size distortions that can lead to inconsistency and spurious rejections under the null (Lee & Strazicich, 2004). Concerning cointegration tests that incorporate structural breaks have more power and allow users to consider the possibility of cointegrating when the cointegrating model has shifted once or more at an unknown point (Gregory & Hansen, 1996; Banerjee & Carrion-i-Silvestre, 2015; Adu-Darko, 2021).

### **Data**

Thirty-six (36) years of annual data on Ghana's gross domestic product per capita (GDPPC) which is the explanatory variable and measure of economic growth, remittances, inflation, socioeconomic conditions, and foreign direct investment to Ghana between 1984 and 2019 were employed in this study. GDPPC is used in constant 2010 U.S. dollars and is sourced from the WDI which provides a comprehensive discussion on how it is measured. GDPPC is expected to be positively linked with remittances and socioeconomic conditions. Remittances, also obtained from the WDI, are defined as "all current transfers received by resident households from non-resident households" (World Bank, 2016). In this study, remittances will be measured as "personal remittances" which is defined as funds sent to family members by people who have

migrated from their home countries to work in another country (Agbegha, 2006). Remittances (REM) are expected to have a positive coefficient because it is assumed that an increase in personal remittances to the receiving country increases economic growth. Capital Stock is built up from investment data by four main assets namely, structures, machinery, transport equipment and other assets and is obtained from the Penn World Tables 10.0. (See PWT 10.0 for a more comprehensive description of the measure). Capital stock at constant national prices for each asset is derived by adding the investment at constant prices to the previous period's capital stock adjusted for the depreciation rate of the asset at constant prices and is measured in per capita terms and is theorised to have a positive effect on growth. Inflation (INF) which rate is measured annually, in this study, indicates an economy's general price level increases in goods and services. and depicts a currency's reducing purchasing power. In this study, the coefficient of inflation is expected to be negative. Net Trade, valued in current US dollars, is obtained by determining the difference between imports and exports of goods and services is expected to be positively associated with GDPPC.

The average annual official exchange rate, obtained from a country's legally set-up exchange market is quoted as local currency units relative to the U.S. dollar. It is expected to be negatively associated with GDPPC. Data on inflation, exchange rate, and net trade is from the WDI. Socioeconomic conditions, sourced from the ICRG assesses the current societal socioeconomic pressures that are likely to constrain government action or propel social dissatisfaction. The risk rating assigned is the sum of Unemployment, consumer confidence, and poverty are risk-rated and added to obtain this measure which is given a score of 4 points for very low risk and a score of 0 points for very high risk.

### **Modelling Strategy**

The Johansen (1991) cointegration was the analytical tool used in the study to investigate and determine associations between variables. To ensure that cointegration testing

was suitable, unit root tests were initially conducted without structural breaks and then with structural breaks. Given that variables were cointegrated, error correction modelling was used to estimate adjustment coefficients while cointegration equations were used to determine cointegration coefficients in order to establish both long-run and short-run causality and elasticities

### Unit Root Tests

Theoretically, for cointegration analysis, all measures used should be I (1). Initial unit root testing which did not involve breaks were the Augmented Dickey-Fuller [ADF, 1981] and the Phillips-Perron [PP, 1988] tests. The PP unit root test controls series with higher correlation. For series that is not an AR (1) model and which is correlated at its lags, the ADF test is preferred since it has the advantage of being able to correct the correlations of series with its lags by adding p-lagged difference terms of the variable y to the right-hand side of the test regression. Following Narayan and Popp (2010), a Newey-West automatic bandwidth using Bartlett kernel was chosen for the PP test and the lag length for ADF an automatic lag length based on the Schwartz information Criterion was chosen with a maximum lag of 7. For unit root testing with structural breaks, the ADF unit root test with one level break where the break selection is based on minimising the Dickey-Fuller t-statistic is adopted.

### The Johansen Cointegration Test

Developed by Johansen (1991, 1995), this test is a Vector Auto Regression (VAR) -based cointegration test. Consider a VAR of order p:

$$y_t = A_1 y_{t-1} + \dots + A_p y_{t-p} + Bx_t + \epsilon_t \quad (1)$$

where  $y_t$  is a  $k$ -vector of non-stationary I (1) variables (GDPPC, Capital, Remittances, Socioeconomic, Exchange rate, Inflation, Net trade),  $x_t$  is a  $d$ -vector of deterministic variables, and  $\epsilon_t$  is a vector of innovations. We may rewrite this VAR as,

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-1} + Bx_t + \epsilon_t \quad (2)$$

where,

$$\Pi = \sum_{i=1}^p A_i - I, \quad \Gamma_i = -\sum_{j=i+1}^p A_j \quad (3)$$

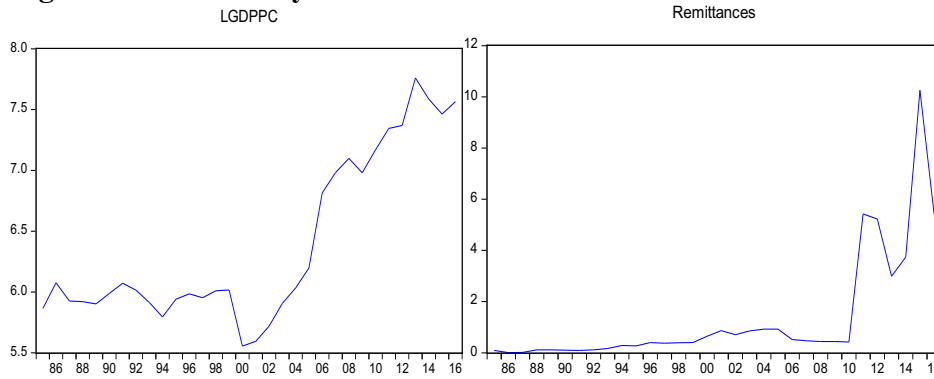
The representation theorem by Engle and Granger (1987) posits that, if the coefficient matrix  $\Pi$  has reduced rank  $< k$ , then there exists  $k \times r$  matrices  $\alpha$  and  $\beta$  each with rank  $r$  such that  $\Pi = \alpha\beta'$  and  $\beta'y_t$  is I (0).  $r$  is the number of cointegrating relations (the cointegrating rank) and each column of  $\beta$  is the cointegrating vector. The elements of  $\alpha$  are known as the adjustment parameters in the Vector Error Correction (VEC) model since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments. Johansen's method is to estimate the  $\Pi$  matrix from an unrestricted VAR and to test whether we can reject the restrictions implied by the reduced rank of  $\Pi$ . Capital per person, Socioeconomic conditions, Net trade, and GDPPC were natural logged for estimation purposes and in line with the general provisions of the neoclassical growth model. The test was conducted on the assumption of an intercept and a linear deterministic trending cointegrating equations and test VAR. The symbols \*, \*\*, \*\*\* indicate significance at 10%, 5% and 1% respectively and standard errors are in ( ) for all relevant tables. The cointegration vectors were estimated using DOLS and FMOLS estimations with long-run covariance estimate Bartlett kernel and Newey-West fixed bandwidth.

## Results and Findings

### Trend Analysis of Ghana's Remittance and Growth

Figure 1 shows that GDPPC has a general upward trend although there seems to be some breaks or dips in the graph. Remittances seemed to increase at a slow rate until 2006, then fell during the era of the global financial crises and beyond until the period between 2010 and 2011 during the recovery. Then sharp dips were experienced in 2013 and 2016. These graphs suggest from a pictorial perspective the need to investigate the link further for possible breaks in the series

**Figure 1 Trend Analysis for GDPPC and Remittance**



*Source: Constructed with data from WDI (2020)*

**Unit root test**

The outcome of unit root testing shown on Table I indicates that all the measures used are integrated of order one I (1). Thus, the necessary condition for cointegration to be used in analysing the data has been fulfilled.

**Table 1: Unit Root Test**

Variables		ADF	PP	Integrated
LGDPPC	Level	0.052[0]	-0.034[1]	I(1)
	First diff.	-4.768[0] ***	-4.779[1] ***	
LCKP	Level	-0.408[0]	-0.196[4]	I(1)
	First diff.	-6.083[0] ***	-6.324[5] ***	
REM	Level	-1.7116[5]	-2.848[0]	I(1)
	First diff.	-3.878[4] ***	-3.923[3] **	
LSOCECO	Level	-1.702[0]	-2.061[2]	I(1)
	First diff.	-3.878[0] ***	-3.819[2] ***	
EXCH	Level	-0.058[0]	0.050[1]	I(1)
	First diff.	-6.514[0] ***	-11.136[15] **	
INF	Level	-0.824[0]	-0.779[1]	I(1)
	First diff.	-5.173[5] ***	-8.652[20] ***	
LNETTRADE	Level	-1.352[0]	-1.263[2]	I(1)
	First diff.	-7.116[0] ***	-7.116[0] ***	

*Source: Computed with data from WDI (2020), PWT 10.0 and ICRG (2020).*

**Cointegration Analysis**

Having ascertained the I (1) properties of variables, findings from the Johansen cointegration test which followed, are presented in Table 2. the results of the trace statistics and max-eigen together with their probability values were computed and presented in Table 2. From the results, it was seen that the trace test finds two cointegrating equations while the maximum eigenvalue test results in one cointegrating equation at the 0.05 level.

**Table 2: Cointegration Test**

Hypothesised	Eigenvalue	Trace Statistic	Prob.	Max-Eigen Statistic	Prob
None *	0.929175	176.4106	0.0000	79.42639	0.0000
At most 1 *	0.682620	96.98419	0.0410	34.42969	0.1886
At most 2	0.608293	62.55450	0.1655	28.11720	0.2081

*Source: Computed with data from WDI (2020), PWT 10.0 and ICRG (2020).*

### **Cointegration Regression**

Table 3 displays the cointegration regression results from FMOLS and DOLS to examine the nature and direction of possible long-run associations between variables. The R-square recorded for FMOLS and DOLS were 0.9227 and 0.9998 respectively, this implies that 92.27% and 99.98% of the variables in economic growth can be explained by the model in FMOLS and DOLS respectively. The results show that in the DOLS model, both remittance and socioeconomic do not have a significant relationship with economic growth. Remittances are however positive and significant at 10% for the FMOLS model. However, capital, net trade, the trend which is indicative of technical progress as well as the constant depict a significant relationship although their coefficients are negative. The trend is positive in both specifications indicating positive technological progress.

**Table 3: Cointegration Regression**

Variables	FMOLS	DOLS
REM	0.6780* (0.3686)	-0.5620 (0.6552)
LSOCECO	0.3232 (0.2723)	-0.1662 (0.1227)
LCKP	-0.7711 (0.1815)	-1.3568*** (0.1093)
INF	0.0066* (0.0033)	-0.0038 (0.0054)
LNETTRADE	-0.0928 (0.3002)	-1.9432* (0.6731)
EXCH	-0.5225** (0.1959)	-0.9276*** (0.1394)
C	7.4499*** (1.2373)	13.6984*** (1.956)
@TREND	0.0937*** (0.0937)	0.2205** (0.0458)
R-squared	0.922665	0.999781
S.E. of regression	0.239824	0.035736
Long-run variance	0.065062	0.000428

*Source: Computed with data from WDI (2020), PWT 10.0 and ICRG (2020).*

### **Incorporating Structural Breaks in the Analysis**

The results from the FMOLS and DOLS show that remittance and socioeconomic factors do not contribute to economic growth. Similar findings were revealed in Cazachevici et al., (2020). We introduce a level break based on the endogenously determined break from the unit root analysis to determine a possible variation in the outcome (Adu-Darko & Aidoo, 2022).

#### *Unit root analysis with breaks*

Table 4 shows the results from Dickey-Fuller t-statistic with a level break. The breakpoint date from the variables ranges from 1996 to 2006. The results show that when structural breaks are accounted for, all variables are stationary at level. Consequently, we used ordinary least squares estimation to determine the regression coefficients.

**Table 4: Unit Root Level Break**

Variables	ADF at level	Break Date
LGDP	-5.4699**	2005
REM	-11.6047***	2010
LSOCECO	-6.6605***	1996
LCKP	-5.4691**	1998
INF	-5.6853***	2008
EXCH	-4.7181**	2002

*Source: Computed with data from WDI (2020), PWT 10.0 and ICRG (2020).*

#### *Regression Analysis with Level Break*

Table 5 details the estimates of the regression results with a level break. The results show that both remittances and socioeconomic factors are significant. Thus, remittances and institutional factors in the form of socioeconomic factors are positive and significant once structural breaks are introduced into the model. The results from inflation and trade openness are consistent with and without a structural break.

**Table 5: Regression Analysis with Level Break**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
REM	0.0284**	0.013344	2.126705	0.0444
LSOCECO	0.5790***	0.16719	3.463004	0.0016
LCKP	0.4889***	0.074969	6.521417	0.0000
INF	-0.0022	0.003616	-0.608824	0.5479
LNETTRADE	0.1759	0.285081	0.617044	0.5426
EXCH	0.0204*	0.010846	1.886782	0.0719
BREAK	1.1361***	0.230214	4.934759	0.0000
CONSTANT	6.3347***	0.704770	8.988318	0.0000
@TREND	-0.038478***	0.006503	-5.917407	0.0000
R-squared	0.975353	Durbin-Watson stat		1.629904
Adjusted R-squared	0.966781	F-statistic		113.7734
S.E. of regression	0.125758	Prob(F-statistic)		0.000000

*Source: Computed with data from WDI (2020), PWT 10.0 and ICRG (2020).*

To establish and ascertain the significance of the breakpoint estimated for the dependent variable in 2005 from the unit root test, a breakpoint test was performed using the Chow (1960) test. Results presented on Table 6 indicate that the break point of 2005 used in the regression is significant. Indeed, the period is close to 2004 when the nation held major elections coupled with the commissioning of the West African gas pipeline, a major economic event as well as the ending of the State of emergency declared in the north after a tribal conflict (British Broadcasting Corporation [BBC] News, 2018).

**Table 6: Testing for the Significance of the Breakpoint (2005)**

	Chow test	Factor Breakpoint
F-statistic	8.3826***	26.3995***
Log likelihood ratio	40.2232***	70.0249***
Wald Statistic	50.2954***	158.3970***

*Source: Computed with data from WDI (2020), PWT 10.0 and ICRG (2020).*

We find consistencies between this study and the findings of Meyer and Shera (2017); Tariq and Ali (2019); Zaman et al. (2021). According to Tariq and Ali (2019), remittances received positively affect economic growth. They explained that remittances stimulate aggregate demand,

which increases consumption and, as a result, accelerates economic growth. Remittances received increase household disposable incomes, and this reduces poverty and increases investment in human capital, and hence results in economic growth (Meyer & Shera, 2017). The results indicate that

socioeconomic factors have a significant positive relationship with economic growth aligning with the findings of Soltes et al. (2020).

### Conclusion

This paper examines the effect of remittances on economic growth in the presence of a structural break and socioeconomic factors in Ghana. The results indicate that without structural breaks remittances received and socioeconomic factors do not significantly affect economic growth. When the economic growth model was estimated using ordinary least squares with a structural break, the coefficient of remittances received was positive and highly significant. The findings further revealed that institutional quality as indicated by socioeconomic factors contributed positively to economic growth in Ghana. The main findings from this study are that remittances are important in increasing growth in the phases of crises and other structure-changing events. In the absence of these events, remittances do not significantly contribute to growth.

### Recommendation

The study shows that remittances which are an important avenue for capital inflows, play an important role in economic growth. The government should enhance the mechanisms for remittances such as formalisation efforts to reduce the informal channels, increase financial inclusion, and strengthen the various digital financial platforms being used. The flow of remittances should be facilitated and made a key component of government policies. These measures will ensure that remittances are being allocated efficiently for consumption and investment purposes and may help to raise the level of financial sector development given that remittances flow through the financial system. An enabling environment should be created by the government and other stakeholders as it can increase returns to investments and expand investment options for remittance-receiving households and support global recovery efforts following the COVID-19.

### References

- Adams Jr., R. H., & Cueduecha, A. (2013). The impact of remittances on investment and poverty in Ghana. *World Development*, 50, 24-40.  
<https://doi.org/10.1016/j.worlddev.2013.04.009>
- Adenutsi, D. E. (2011). Financial development, international migrant remittances and endogenous growth in Ghana. *Studies in Economics and Finance*, 28(1), 68-89.  
<https://doi.org/10.1108/10867371111110561>
- Adenutsi, D. E., & Ahoritor, C. R. (2008). Remittances, exchange rate, and monetary policy in Ghana. *West African Journal of Monetary and Economic Integration*, 8(2), 1-42.  
[https://www.researchgate.net/publication/50310809\\_Remittances\\_Exchange\\_Rate\\_and\\_Monetary\\_Policy\\_in\\_Ghana](https://www.researchgate.net/publication/50310809_Remittances_Exchange_Rate_and_Monetary_Policy_in_Ghana)
- Adu-Darko, E., & Aidoo, E. K. (2022). Government stability in the remittance-economic growth link in Ghana. *International Journal of Applied Economics, Finance and Accounting*, 14(1), 1-14.  
<http://dx.doi.org/10.33094/ijaefa.v14i1.630>
- Adu-Darko, E. A. (2021). *Institutional quality in the finance-growth nexus in Sub-Saharan Africa* [Doctoral dissertation, London Metropolitan University].
- Agbegha, V. O. (2006). *Does political instability affect remittance flows?* [Doctoral dissertation, Vanderbilt University].  
<https://ir.vanderbilt.edu/items/f72e1f0b-4349-431b-91a1-8bbc9c9a15ac>
- Agbola, F. W. (2013). Does human capital constrain the impact of foreign direct investment and remittances on economic growth in Ghana? *Applied Economics*, 45(19), 2853-2862.  
<http://doi.org/10.1080/00036846.2012.676735>

- Akpa, E. (2018). Private remittances received and household consumption in Ghana (1980- 2016): An ARDL analysis with structural breaks. *International Journal of Management and Economics Invention*, 4(5), 1771-1777. <https://mpra.ub.uni-muenchen.de/id/eprint/87103>
- Amamoo-Otoo, C., & Chi, X. (2020). Assessing the impact of emigration and remittances on the economic growth in Ghana. *Open Journal of Business and Management*, 8(06), 2582. <https://doi.org/10.4236/ojbm.2020.86160>
- Asafo Agyei, S. (2021). The dynamics of remittances impact: A mixed-method approach to understand Ghana's situation and the way forward. *Social Sciences*, 10(11), 410. <https://doi.org/10.3390/socsci10110410>
- Balach, R., & Law, S. H. (2015). Effects of financial development, institutional quality, and human capital on economic performance in SAARC countries. *The Empirical Economics Letters*, 14(2), 131-141. <https://www.researchgate.net/publication/280722819>
- Banerjee, A., & Carrion-i-Silvestre, J. L. (2015). Cointegration in panel data with structural breaks and cross-section dependence. *Journal of Applied Econometrics*, 30(1), 1-23. <https://doi.org/10.1002/jae.2348>
- Barro, R., & Sala-i-Martin, X. (2004). *Economic growth* (2nd ed.). Massachusetts Institute of Technology (MIT) Press. <http://class.povertylectures.com/Barr/Sala-i-Martin2ndEdition.pdf>
- British Broadcasting Corporation [BBC]. (2018, My 1) *Ghana profile – Timeline*. <https://www.bbc.com/news/world-africa-13434226>
- Cazachevici, A., Havranek, T., & Horvath, R. (2019, November 5). *Remittances and economic growth: A quantitative survey*. (MPRA Paper No. 96823). <https://mpra.ub.uni-muenchen.de/96823/>
- Cazachevici, A., Havranek, T., & Horvath, R. (2020). Remittances and economic growth: A meta-analysis. *World Development*, 134(105021). <https://doi.org/10.1016/j.worlddev.2020.105021>
- Chirwa, T.G. & Odhiambo, N. M. (2016). Macroeconomic determinants of economic growth: A review of international literature. *The South East European Journal of Economics and Business*, 11(2), 33-47. <https://sciendo.com/article/10.1515/jeb->
- Chow, G. C. (1960). Tests of equality between sets of coefficients in two linear regressions. *Econometrica: Journal of the Econometric Society*, 28(3), 591-605. <https://www.jstor.org/stable/1910133>
- Clemens, M. A., & McKenzie, D. (2018). Why don't remittances appear to affect growth? *The Economic Journal*, 128(612), F179-F209. <https://doi.org/10.1111/ecoj.12463>
- Dickey, D. A., & Fuller, W. A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica: Journal of the Econometric Society*, 49(4), 1057-1072. <https://www.jstor.org/stable/1912517>
- Engle, R. F., & Granger, C. W. (1987). Cointegration and error correction: Representation, estimation, and testing. *Econometrica: Journal of the Econometric Society*, 55(2), 251-276. <https://www.jstor.org/stable/1913236>
- Gregory, A. W., & Hansen, B. E. (1996). Residual-based tests for cointegration in models with regime shifts. *Journal of econometrics*, 70(1), 99-126. [https://doi.org/10.1016/0304-4076\(99\)41685-7](https://doi.org/10.1016/0304-4076(99)41685-7)
- Heshmati, A. (2018). Introduction to determinants of economic growth in Africa and summary of the contributions. In Heshmati, A. (Ed.), *Determinants of Economic Growth in*

- Africa* (1-14). Palgrave Macmillan, Cham.  
[https://link.springer.com/chapter/10.1007/978-3-319-76493-1\\_1](https://link.springer.com/chapter/10.1007/978-3-319-76493-1_1)
- International Country Risk Guide (ICRG). (2020). *International country risk guide (ICRG) researcher's dataset (V9)*. Harvard Dataverse.  
<https://doi.org/10.7910/DVN/4YHTPU>
- Johansen, S. (1991). Estimation and hypothesis testing of cointegration vectors in Gaussian vector autoregressive models. *Econometrica: Journal of the Econometric Society*, 59(6), 1551-1580.  
<https://www.jstor.org/stable/2938278>
- Johansen, S. (1995). Identifying restrictions of linear equations with applications to simultaneous equations and cointegration. *Journal of econometrics*, 69(1), 111-132.  
[https://doi.org/10.1016/0304-4076\(94\)01664-L](https://doi.org/10.1016/0304-4076(94)01664-L)
- Karavias, Y., Narayan, P. K., & Westerlund, J. (2023). Structural breaks in interactive effects panels and the stock market reaction to COVID-19. *Journal of Business & Economic Statistics*, 41(3), 653-666.  
<https://doi.org/10.1080/07350015.2022.2053690>
- Global Knowledge Partnership on Migration and Development (KNOMAD) (2019). *Migration and remittances. Recent developments and outlook. Migration and development brief 31*. World Bank.  
<https://reliefweb.int/report/world/migration-and-development-brief-31>
- Lee, J., & Strazicich, M. C. (2004). Minimum Lagrange multiplier unit root test with two structural breaks. *Review of economics and statistics*, 85(4), 1082-1089.  
<https://doi.org/10.1162/003465303772815961>
- Menyah, K., Nazlioglu, S., & Wolde-Rufael, Y. (2014). Financial development, trade openness and economic growth in African countries: New insights from a panel causality approach. *Economic Modelling*, 37, 386-394.  
<https://doi.org/10.1016/j.econmod.2013.11.044>
- Meyer, D., & Shera, A. (2017). The impact of remittances on economic growth: An econometric model. *Economia*, 18(2), 147-155.  
<https://doi.org/10.1016/j.econ.2016.06.001>
- Narayan, P. K., & Popp, S. (2010). A new unit root test with two structural breaks in level and slope at unknown time. *Journal of Applied Statistics*, 37(9), 1425-1438.  
<https://doi.org/10.1016/j.eap.2018.07.001>
- Nyeadi, J. D., & Atiga, O. (2014). Remittances and economic growth: Empirical evidence from Ghana. *European Journal of business and management*, 6(25), 142-149.  
<https://www.researchgate.net/publication/321268753>
- Oteng-Abayie, E. F., Awuni, P. A., & Adjeidjei, T. K. (2020). The impact of inward remittances on economic growth in Ghana. *African Journal of Economic Review*, 8(3), 49-65.  
<https://www.ajol.info/index.php/ajer/article/view/200436>
- Peprah, J. A., Kwesi Ofori, I., & Asomani, A. N. (2019). Financial development, remittances and economic growth: A threshold analysis. *Cogent Economics & Finance*, 7(1), 1625107.  
<https://doi.org/10.1080/23322039.2019.1625107>
- Perron, P. (1989). The great crash, the oil price shock, and the unit root hypothesis. *Econometrica: journal of the Econometric Society*, 1361-1401.  
<https://www.jstor.org/stable/1913712>
- Pesaran, M. H., Shin, Y., & Smith, R. J. (1996). *Testing for the 'Existence of a Long-run Relationship'* (No. 9622). Faculty of Economics, University of Cambridge.

- <https://ideas.repec.org/p/cam/camdae/9622.html>
- Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16(3), 289-326. <https://doi.org/10.1002/jae.616>
- Phillips, P. C., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika*, 75(2), 335-346. [doi.org/10.1093/biomet/75.2.335](https://doi.org/10.1093/biomet/75.2.335)
- Solow, R. M. (1956). A contribution to the theory of economic growth. *The quarterly journal of economics*, 70(1), 65-94. <https://doi.org/10.2307/1884513>
- Soltes, V., Stofkova, K. R., & Lenko, F. (2020). Socio-economic consequences of globalization on the economic development of regions in the context of security. In *SHS Web of Conferences* (Vol. 74, p. 04026). EDP Sciences. <https://doi.org/10.1051/shsconf/20207404026>
- Tariq, M., & Ali, H. (2019). An investigation of the effects of the official development assistance on GDP Per Capita in Pakistan. *Global Social Sciences Review (GSSR)*. IV (1), 233-239. [https://doi.org/10.31703/gssr.2019\(IV-I\),31](https://doi.org/10.31703/gssr.2019(IV-I),31). <https://www.humapub.com/admin/alljournals/gssr/papers/ES7jfn4jPb.pdf>
- Wooldridge, J. M. (2016). Should instrumental variables be used as matching variables? *Research in Economics*, 70(2), 232-237. <https://doi.org/10.1016/j.rie.2016.01.001>
- World Bank. (2016). Personal remittances. World development indicators. Retrieved from: <http://data.worldbank.org/indicator/BX.TRF.PWKR.CD.DT>.
- World Bank. (2020). Personal remittances. World development indicators. Retrieved from: <http://data.worldbank.org/indicator/BX.TRF.PWKR.CD.DT>.
- World Bank, (2020) 17 partnerships for the goals. Development assistance as a catalyst for progress. Retrieved from: <https://datatopics.worldbank.org/sdgatlas/goal-17-partnerships-for-the-goals/>
- World Bank (2021). Remittance flows register robust 7.3 percent growth in 2021. Retrieved from: <https://www.worldbank.org/en/news/press-release/2021/11/17/remittance-flows-register-robust-7-3-percent-growth-in-2021>
- Zaman, S., Wang, Z., & Zaman, Q. U. (2021). Exploring the relationship between remittances received, education expenditures, energy use, income, poverty, and economic growth: Fresh empirical evidence in the context of selected remittances receiving countries. *Environmental Science and Pollution Research*, 28, 17865-17877. <https://doi.org/10.1007/s11356-020-11943-10>