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THE CAUSAL RELATIONSHIP BETWEEN ECONOMIC GROWTH AND REMITTANCE IN MINT COUNTRIES: AN ARDL BOUNDS TESTING APPROACH TO COINTEGRATION

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Abstract

The paper examines the causal relationship between economic growth and remittance during the period 1990 – 2017, by including some macroeconomic variables such as inflation, foreign direct investment, final consumption expenditure, gross capital formation, and trade as the control variable in MINT countries. Employing the ARDL bounds testing approach to cointegration, our results show that while 1% increase in remittance in Indonesia will cause 0.05% increase in the economic growth at the long-run, it has 0.03% and 0.05% increase on Mexico and Indonesia economic growth respectively in the short-run with a 1% change in remittance. However, remittance was found to have a 0.02% decrease on the Nigeria economy with a 1% percent increase in remittance.

Keywords: Economic growth, remittance, macroeconomic variables, ARDL, MINT countries.

JEL Classification: F22, F24, F60.

1. INTRODUCTION

The significance of remittance in compensating for the brain-drain from developing countries through migration and its potential of enhancing the economic growth of the receiving countries have gained the attention of scholars in recent time. It is believed that diaspora remittance is a way of resource transfer from developed countries to developing countries (Ratha, 2003; Kuckulenz, 2004 and Busc; Karagoz, 2009). The stability of remittance flow even in the face of financial crisis and economic downturns makes it be a reliable financial resource for developing countries (Karagoz, 2009). The influence of remittance on receiving countries has been established at a microeconomic level as a driver for investment enhancement and human capital, and educational attainment, as well as investment in public

infrastructure (Beine et al, 2010). However, Beine et al (2010) submitted that remittance if not properly used can give room for “Dutch disease” effects through the appreciation of domestic currencies, leading to less productivity in the receiving country. Jahjah et al, (2003) opined that most of the remittance is committed into consumption rather than investment, and in such case, the recipient may consider the remitted fund a substitute for labor and decide not to work by increasing their leisure activities, which may in turn negatively affect the economic growth of the country.

In 2017, World Bank experts observed that remittance flows to developing countries witnessed a decrease for two consecutive years. It declined by an estimated 1% in 2015, and 2.4 percent in 2016 (World Bank, 2017). The decrease was attributed to the weak economic growth in Europe during these periods and it affected the flows to Sub-Saharan Africa. Europe and Central Asia also experienced the decline, which has been on in the region for three consecutive years. However, during this period, Latin America and the Caribbean were found to be the only region that witnessed an increase of about 6.9% in their remittance flows.

Meanwhile, despite the decline of the flows in the previous years, the World Bank projected that remittance to developing countries will experience an increase of about 3.3% in 2017 (World Bank, 2017). The trend was projected to continue in 2018 with an estimation of about 10.8% over 2017 remittance flow to low and middle-income countries (World Bank, 2018a). Though, it was observed that the flows increased in all six regions in 2017. This increase was attributed to the stronger and employment conditions in the USA. But it was opined that the continuous increase in remittance flow could be hampered by immigration policies in some countries (World Bank, 2018a).

Despite the global and regional picture painted by remittance flows, the flows to Mexico, Indonesia, Nigeria, and Turkey (MINT) have been increasing significantly over the years (figure 1). Figure 1 shows the remittance flows to the MINT countries over the period 1990 – 2017. During the period under observation, Mexico experienced a sharp decline inflows in 2008, Nigeria and Turkey experienced the same as Mexico but was not as much as that of Mexico. Indonesia is the only country among the four countries that have been experiencing relatively stable flows growth. Figure 1 depicts that while the other three countries in this new emerging economic block are experiencing an increase in remittance flows, the same could not be observed for Turkey.

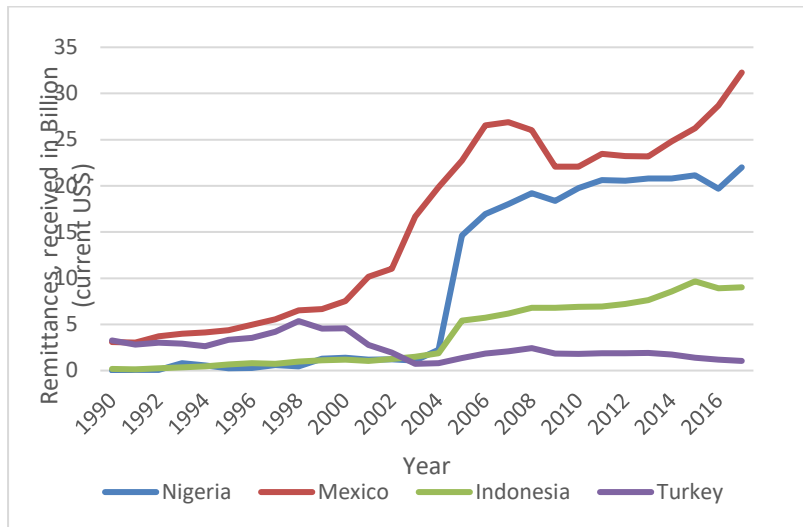


Figure 1. Remittance flows to MINT countries

Source: World Bank (2018a)

According to World Bank (2018a), the ten highest remittance receiver’s countries in the world are projected to be India, China, Philippines, Mexico, Egypt, Nigeria, Pakistan, Ukraine, Vietnam, and Bangladesh. Out of the ten countries, two of them are among the new emerging world economic block (MINT), while the remaining two countries are not. The MINT as an economic block was coined as new emerging economies in 2012 (Kokotovic and Kureici, 2016). It was opined that these countries will become an economic cornerstone in their respective region, and it’s believed that they will play a prominent role in International economic relations (Durotoye, 2014). The four countries are believed to be increasing in their economic growth (figure 2), and it is expected to continue unabated (World Bank, 2018b).

According to Asongu, Akpan, and Isihak (2018), the MINT countries shares the same traits, for instance, the large growing and youthful population; they all have an advantage of geographical location close to developed economies (Indonesia located close to China, Mexico is on the doorstep of America, Turkey’s proximity to European Union, and Nigeria being the largest growing economy in Africa, will serve as the economic hub of Africa. Kokotovic and Kurecic (2016) observed that in 2012 when Goldman Sachs coined MINT countries, Mexico, Indonesia, Nigeria, and Turkey was ranked 14th, 16th, 39th, and 17th economies in the world respectively. But going with the World Bank economies ranking of 2018, Mexico, Indonesia, Nigeria, and Turkey occupied 15th, 16th, 31st, and 18th position respectively, while it was projected that by 2023, the four countries will be among the 20 world economies by standing in 15th, 16th, 20th, and 17th positions for Mexico, Indonesia, Nigeria, and Turkey respectively (World Bank, 2018b).

Meanwhile, despite the increase in remittance to these four countries and a considerable proportional contribution to their respective GDP, the macroeconomic significance in the long-run of the remittance have not been thoroughly researched.

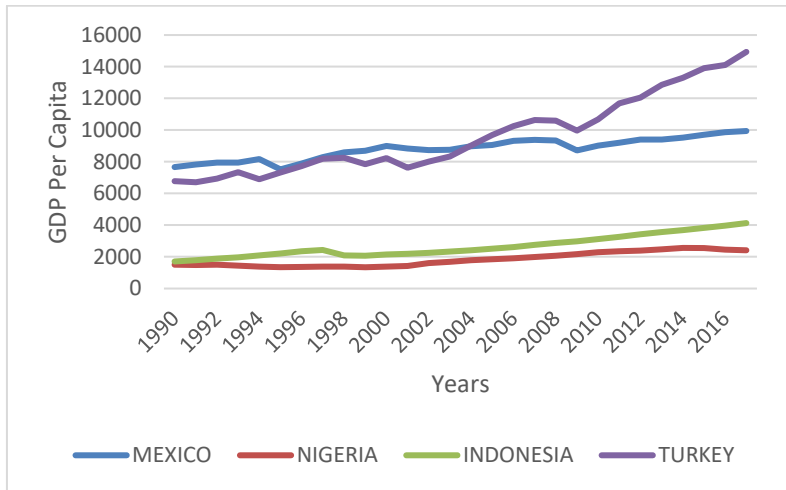


Figure 2. Real GDP of MINT Countries

Source: World Bank Development Indicators.

To determine the long-run macroeconomic significance of remittance, we employed the ARDL bounds test cointegration test developed by Pesaran et al (1999). The techniques have an advantage of addressing the endogeneity of all regressors that are in the model. It is also advantageous in combining the variables that are integrated on different orders I(0) and I(1). Unlike the Vector Error Correction model that requires that the variables must be integrated on order (1).

This study is significant in two ways. Firstly, its focus on the MINT countries. This makes some economic sense because these countries possess similar characteristics and are being coined as the new world economic block after BRICS. Secondly, the paper contributes to the empirical literature on the macroeconomic implication of remittance in MINT countries, and developing countries by extension. The remainder of the paper is structured as follows; the following section provided a literature review on the relationship between economic growth and remittance. The next section provides information on data and methodology, which is followed by results and discussion. Finally, the paper summarizes and concludes the findings.

2. LITERATURE REVIEW

The relationship between remittance flows and economic growth has received great attention from scholars all over the globe. The theoretical approach as reveals by Adam (2009); Rapoport & Docquier (2006) highlighted two approaches which are self-interest, and altruism or family approach. Frankel (2011) was of the opinion that in the case of altruism approach, the increase in the remittance depends

on the earnings of the diaspora, when the earnings increases, the remittance increase, and vice-versa. The self-interest approach views it from the perspective that the diaspora remits the purpose of investment, which will in the long-run enhance economic growth (Lueth & Ruiz-Arranz, 2008; Lim & Simmons, 2015).

Meanwhile, the empirical literature on remittance and economic growth have been mixed. While some authors found a positive relationship, some found a negative influence of remittance of economic growth, and some could not establish any relationship. In the study of Jahjah et al. (2003), the study found a negative influence of remittance on economic growth and concluded that the remittance decreases labor force involvement, decrease work potential and eventually led to a reduction in the output growth. The study also tried to examine if remittance correlates positively with GDP, but found negative impact on GDP, which is also statistically significant.

Other studies that found a negative influence of remittance on economic growth argued that remittance puts productivity and growth in low-income countries at disadvantages because the families of diaspora spent the money received on consumption instead on investment (Gapen et al. 2009; Brown & Ahlburg, 1999). The study of Karagoz (2009) found a negative influences of remittance on the economic growth of Turkey. The study argued that remittance reduces labor supply which has an impact on labor market development. In a recent study, Abdih et al. (2012) established that remittance only influence private consumption, but do not influence domestic investment. Meanwhile, Gjini (2013) found a small negative influence of remittance on economic growth.

On the contrary, some authors supported the significant positive influence of remittance on economic growth (Mundaca, 2009; Bugamelli & Paterno, 2011). For instance, Rao and Hassan (2012) argued that remittance improves human capital. Similarly, Acosta et al. (2008) analyzed the influence of remittance on poverty and the study concluded that the increase of remittance, increases income, and raises consumption which leads to improvement in living standards. Acosta et al. (2008) also established that remittance flows positively influence the balance of payment in several developing countries, and also enhance their economic growth. Acosta et al. study was in agreement with some previous studies that found similar results. Those studies established that remittance has a positive impact on economic growth (World Bank, 2006; Ramirez & Sharma, 2008).

Moreover, Fayissa and Nsiah (2008) submitted in their study that remittance plays a significant role in countries where their financial system is not strong enough, and as such remittance serves as an alternative source for financing investment which increases economic growth. Javid, Arif, and Qayyum (2012) analyzed the relationship between remittance, poverty reduction and economic growth. The study found that remittance has a positive and significant influence on economic growth and poverty reduction. Similarly, Matuzeviciute & Butkus (2016) examined the long-run impact of remittance on economic growth using a panel study of 116 countries. The study found a long-run influence of remittance on economic growth. However, the study concluded that the degree of influence varies based on the level

of economic development of the countries, and the amount of remittance in the economy. Meyer & Shera (2017) analyzed the influence of remittance on economic growth of six high remittance receiving countries. The study found that remittance has a positive significant impact on economic growth. Meanwhile, some studies reported an insignificant or even negative influence of remittance on the receiving country's long-run economic growth (Jongwanich, 2007; Sufian, 2009; Siddique, 2010; Ravshanbek, 2011; Al-Khathlan, 2012).

Specifically to the MINT countries, Ramirez (2014) established that remittance flows to Mexico has a positive and significant impact on the country economic growth. This study was consistent with Mendoza Cota (2012), who did a similar study on the Mexican economy and found a positive impact of remittance on the Mexican economy. In reference to Indonesia, Nahar, Adhar, & Azizurrohman (2018) in their recent study on the implication of remittance on economic growth of Indonesia, where ordinary least square method was employed, and the study found that remittance has a positive influence on the Indonesia economic growth. As for Nigeria, some empirical studies on remittance and economic growth in the country reveals a positive influence of remittance on the economic growth of Nigeria (Akonji and Wakili, 2013). Akinpelu et al. (2013) found a long-run equilibrium relationship among the variables employed in their study and established a long-run causality from remittance to the gross domestic product (GDP). However, Ukeji and Obiechina (2013) found a strong positive causality of remittance on the economic growth. The study was corroborated by Oshota & Badejo (2015) who also established a positive impact of remittance on economic growth of Nigeria. The impact of remittance flows to Turkey on economic growth was examined by Karameliki & Bayar (2015), the study found a positive impact of remittance on economic growth. However, the result from Karameliki & Bayar study was in contrast to the study of Karagoz (2009) who did a similar study and found a statistically significant negative influence of remittance on the economic growth of Turkey.

Meanwhile, in as much literature abound on the remittance and economic growth, the study on the MINT countries have not been thoroughly researched, most especially that the new economies block is believed to be the new emerging economies in the world. This paper seeks to fill the gap that exists in the literature by examining both the long and short-run influence of the remittance on the economic growth of these emerging economies countries in the world.

3. DATA AND METHODOLOGY

3.1. DATA

The study aim to analyze the relationship between remittance and economic growth in Mexico, Indonesia, Nigeria, and Turkey (MINT). The data in this study were sourced from World Bank indicators (2019), and it covers the period of 1990 to 2017 of annually time series data. In line with the previous literature on remittance and growth such as Chami et al. (2005), and Imai et al. (2014), our model is an

extended version of neoclassical economic growth model and specified as follows;
 $GDP = f(REM, FDI, FCE, GCF, INF, TRA)$.

Therefore, the log-linear formulation of the model is thus:

$$\ln GDP = \beta_0 + \beta_1 \ln REM + \beta_2 FDI + \beta_3 \ln FCE + \beta_4 \ln GCF + \beta_5 \ln INF + \beta_6 \ln TRA + \mu_i \quad (1)$$

Where,

β_0 : Constant or Intercept

$\ln GDP$: Natural log of GDP per capita (Constant 2010 US\$)

$\ln REM$: Natural log of Personal remittances received (Current US\$)

FDI : Foreign Direct Investment

$\ln FCE$: Natural log of final consumption expenditure (Constant 2010 US\$)

$\ln GCF$: Natural log of Gross capital formation

$\ln INF$: Natural log of Inflation

$\ln TRA$: Natural log of openness to trade (% of GDP)

μ : Random error

3.2. METHODOLOGY

To analyze the parameters corresponding to variables of interest from the data under consideration, we employed ARDL bounds test for cointegration approach, which we found appropriate for the estimate of both long and short-run causal relationship between our dependent variable and independent variables in the study model. In line with Pesaran et al. (2001), ARDL model with bound test was employed, this approach is based on the ordinary least square (OLS) estimation of a conditional unrestricted error correction model for cointegration analysis. This is in pursuance to the aim of this paper that seeks to test for the existence of long-run relationship, and to make an estimation of long and short-run causality of the independent variables on the dependent variable.

Thao & Hua (2016) cited Bannerjee et al. 1993 that ARDL model shows that a dynamic error correction model (ECM) follows a simple linear transformation where the ECM embedded the short-run dynamic with long-run equilibrium without having any information lost. In consistent with Pesaran and Pesaran (1997) and Pesaran and Shin (2001) cited in Thao & Hua (2016), the augmented ARDL (p, q1, q2 ... qk) model can be expressed in function form as follows:

$$\Delta Y_t = \delta_{0i} + \sum_{i=1}^k \alpha_i \Delta Y_{t-1} + \sum_{i=1}^k \alpha_i \Delta X_{t-1} + \delta_1 Y_{t-1} + \delta_2 X_{t-1} + \varepsilon_{it} \quad (2)$$

Where, Y_t is the dependent variable, X_{t-1} is the independent variable, $(\delta_1 - \delta_2)$ correspond to the long-run relationship, $(\alpha_1 - \alpha_2)$ represent the short-run dynamics

of the model, while k is the ARDL model maximum lag order. The unrestricted error correction model associated with the ARDL ($p, q_1, q_2 \dots q_k$) can be obtain rewriting equation 2 in terms of the lagged levels and the first difference of $Y_t \dots X_{it} \dots, X_{2t} \dots X_{kt}$ and w_t as follows:

$$\Delta Y_t = \delta_0 + \delta_{1t} + \pi_{yx} Z_{t-1} + \sum_{i=1}^{p-1} \alpha_i \Delta Y_{t-i} + \sum_{i=0}^{q-1} \alpha_i \Delta X_{t-i} + \gamma_i w_t + \varepsilon_t \quad (3)$$

Where Δ the first difference operator, t is the trend, the coefficient of α_i represent the short-run dynamics of the model, and π_{yx} and Z_{t-1} are long-run multipliers that shows the convergence of the model to equilibrium, while w_t is a vector of exogenous component.

Hence for this study, the model can be written as follows:

$$\begin{aligned} \Delta \ln GDP = & \beta_0 + \sum_{i=1}^{p-1} \beta_{1i} \Delta \ln GDP_{t-i} + \sum_{i=0}^{q-1} \beta_{2i} \Delta \ln REM_{t-i} + \sum_{i=0}^{q-1} \beta_{3i} \Delta \ln FDI_{t-i} + \\ & \sum_{i=0}^{q-1} \beta_{4i} \Delta \ln FCE_{t-i} + \sum_{i=0}^{q-1} \beta_{5i} \Delta \ln GCF_{t-i} + \sum_{i=0}^{q-1} \beta_{6i} \Delta \ln INF_{t-i} + \sum_{i=0}^{q-1} \beta_{7i} \Delta \ln TRA_{t-i} + \\ & \varphi ECT_{t-1} + \varepsilon_t \end{aligned} \quad (4)$$

The choice of ARDL as an estimator for this study is in reference to some of advantages of the model as highlighted by Pesaran and Pesaran (1997) cited in Odugbesan and Rjoub (2019) that it has many advantages as compared to other estimator in determining cointegration. ARDL allows for the variables to have different optimal lag, and also tolerate the variables to integrate on either order (0) or (1).

4. RESULTS AND DISCUSSION

4.1. DESCRIPTIVE STATISTICS

As reveals in table 1, Mexico has the highest expenditure among the four countries, follows by Turkey, Indonesia, and Nigeria respectively. Even though the Turkey population is less than the remaining three countries, but it spends more on consumption that Indonesia and Nigeria. As for the foreign direct investment (FDI), Mexico attracts more FDI, follows by Nigeria, then Turkey, and Indonesia. Nigeria recorded the least average gross capital formation (GCF) among the four countries, while Mexico has the highest. In respect of the GDP, the statistics as depicts in the table shows that even though Turkey is the least populated country among the four countries, during the period under consideration, Turkey has the highest mean average value for GDP, follows by Mexico. Turkey shows from the table to be more prone to inflation among the MINT countries, while the country also recorded the least remittance received during the period under observation. Lastly on the openness to trade among the MINT countries, the least openness is found in Nigeria with a value of (20.72), while Indonesia has the highest value of (96.19) as a percentage share of individual country's GDP.

Table 1. Descriptive statistics

Country	Statistics	Variables									
		FCE (In Billion)	FDI	GCF (In Billion)	GDP	INF	REM (In Billion)	TRA			
Mexico	Mean	725	2.44	212	8813.35	10.26	15.7	53.68			
	Median	748	2.46	205	8910.78	5.21	18.3	54.20			
	Max.	977	3.97	285	9942.87	35.0	32.3	77.54			
	Min.	485	0.88	129	7522.22	2.72	3.03	27.83			
	Std.Dev.	150	0.77	47.4	686.09	9.52	9.96	12.65			
	Obs	28	28	28	28	28	28	28			
Indonesia	Mean	394	1.18	123	2666.32	9.69	3.86	55.15			
	Median	361	1.37	283	2425.09	7.114	1.68	53.79			
	Max.	691	2.92	1050	4130.66	58.45	9.66	96.19			
	Min.	184	-2.76	-950	1707.60	3.53	0.13	37.44			
	Std.Dev.	148	1.43	529	703.18	10.20	3.45	11.31			
	Obs	28	28	28	28	28	28	28			
Nigeria	Mean	199	2.07	35.1	184.24	18.69	9.43	37.55			
	Median	162	1.89	20.2	1735.74	12.55	1.83	38.75			
	Max.	316	5.79	74.2	2563.09	72.84	22.0	53.28			
	Min.	72.4	0.63	13.4	1347.89	5.38	0.01	20.72			

	Std.Dev.	92.7	1.13	22.4	447.88	17.43	9.58	8.79
	Obs	28	28	28	28	28	28	28
Turkey	Mean	509	1.19	168	9638.56	38.11	2.46	45.23
	Median	456	0.93	138	8670.96	16.37	2.02	47.05
	Max.	892	3.65	342	14936.40	105.22	5.36	54.97
	Min.	289	0.31	71.3	6709.10	6.25	0.73	30.48
	Std.Dev.	180	0.92	82.5	2492.14	33.50	1.19	6.96
	Obs	28	28	28	28	28	28	28

FCE = Final consumption expenditure, FDI = Foreign direct investment, net inflows, GCF = Gross capital formation, GDP = Real GDP per capita, INF = Inflation, REM = Personal remittance received, TRA = Trade.
 Source: Author's own calculation

4.2. STATIONARITY TEST

To establish the stationarity of the variables included in the equation and to ascertain the order of integration of the variables employed in the study, we employed both the Augmented Dickey-Fuller (ADF), and the Philips-Peron (PP) test. The result is presented in table 2. The results shows that in Mexico, all the variables becomes stationary after first difference except FDI which is stationary at level. As for Indonesia, inflation (INF) is stationary at level, while other variables becomes stationary after first difference. Remittance (REM) is the only variable that is stationary in Nigeria at level, while others are integrated at order (1). In respect of Turkey, all the variables integrated at order (1).

Table 2. Stationary test

Country	Variables	ADF		PP		Order of Integration
		Level	1 st Difference	Level	1 st Difference	
Mexico	lnFCE	-1.08	-4.82*	-1.08	-4.82*	I(1)
	FDI	-3.53**	-	-3.46**	-	I(O)
	lnGCF	-1.50	-7.54*	-1.43	-7.36*	I(1)
	lnGDP	-1.16	-5.70*	-1.08	-5.93*	I(1)
	lnINF	-1.94	-4.37*	-1.90	-4.35*	I(1)
	lnREM	-1.27	-3.64**	-1.15	-3.70**	I(1)
	lnTRA	-0.88	-4.29*	-0.62	-6.84*	I(1)
Indonesia	lnFCE	-1.03	-4.23*	-0.99	-4.23*	I(1)
	FDI	-2.02	-4.60*	-2.02	-4.58*	I(1)
	lnGCF	-1.46	-4.77**	-1.85	-3.40**	I(1)
	lnGDP	0.10	-3.76**	-0.01	-3.74**	I(1)
	lnINF	-3.81**	-	-3.80**	-	I(O)
	lnREM	-1.67	-4.85*	-1.68	-4.86*	I(1)
	lnTRA	-2.08	-7.32*	-2.08	-8.45*	I(1)
Nigeria	lnFCE	-0.83	-6.59*	-0.80	-6.59*	I(1)
	FDI	-2.59	-5.65*	-2.63	-6.40*	I(1)
	lnGCF	-0.49	-1.97	0.06	-6.04*	I(1)
	lnGDP	-0.10	-3.80*	-0.11	-3.76**	I(1)
	lnINF	-2.64	-4.31*	-2.42	-4.27*	I(1)
	lnREM	-2.68***	-6.14*	-2.78***	-6.86*	I(1)
	lnTRA	-2.64	-6.12*	-2.64	-6.90*	I(1)

Turkey	lnFCE	0.73	-5.01*	1.24	-5.01*	I(1)
	FDI	-2.02	-4.58*	-2.02	-4.57*	I(1)
	lnGCF	-0.61	-7.36*	-0.30	-7.42*	I(1)
	lnGDP	0.60	-5.19*	0.66	-5.19*	I(1)
	lnINF	-0.84	-4.52*	-0.90	-4.56*	I(1)
	lnREM	-1.92	-3.48**	-1.60	-3.49**	I(1)
	lnTRA	-2.33	-3.96**	-2.38	-4.88*	I(1)

*, **, *** Denotes 1%, 5%, and 10% respectively.

Source: Author’s own calculation

4.3. COINTEGRATION TEST

For us to determine the existence of long-term relationship among the variables in the equation, the ARDL bounds test approach was executed and the results is summarized in table 3. The rule is that, once the f-statistic is greater than the upper bound critical value, we can reject the null hypothesis of no cointegration among the variables included in the equation (Pesaran et al. 2001). The results as summarized in table 3 shows that, the f-statistics in Mexico, Indonesia, and Nigeria are greater than the upper bound critical value for the three countries. Hence, the null hypothesis of no cointegration is rejected for the three countries and concludes that, there is long-run relationship among the variables included in the equation. Meanwhile, the f-statistics (1.55) for Turkey is lower than the lower bound (I(0)) critical value of 2.45 at 5% confidence level, therefore we failed to reject the null hypothesis of no cointegration among the variables and concludes that, there is no long-run relationship among the variables.

Table 3. The ARDL Bounds Testing for Cointegration

Country	F-statistics	I(0) Bound	I(1) Bound	Cointegration
Mexico	7.35	2.45	3.61	Yes
Indonesia	10.33	2.45	3.61	Yes
Nigeria	7.74	2.45	3.61	Yes
Turkey	1.55	2.45	3.61	No

4.4. LONG-RUN ESTIMATES

Subsequent to the cointegration test, we estimate equation (4), to determine the influence of the independent variables in the short and long-run on the dependent variable. The results are summarized in table 4. As depicts in table 4, the result for Mexico shows that there is positive and statistically significant long-run causal relationship between foreign direct investment (FDI) and economic growth. The result implies that a percentage change in FDI will increase Mexican economy at the long-run by 3% at 5% confidence level. The FDI shows no long-run relationship with other three countries. As for final consumption expenditure (FCE), the result as shown in table 4 reveals that FCE has a positive long-run causal relationship with Indonesia and Nigeria economic growth. While a percentage change in FCE will

cause about 0.83% to changes in Indonesia economic growth at the long-run, a percentage change in FCE will bring about 0.94% increase in Nigeria economic growth at the long-run. Meanwhile, the result for both countries is statistically significant at 1% and 5% confidence level respectively.

The result for gross capital formation (GCF) as reveals in table 4 shows that the variable has positive and statistically significant long-run causal relationship with economic growth of both Mexico and Indonesia. In other words, a percentage changes in GCF of Mexico will cause about 0.31% increase at the long-run in the economy growth at 1% confidence level. While a percentage change in GCF of Indonesia will bring about 0.003% change in the economic growth of Indonesia in the long-run and statistically significant at 1% confidence level. As for inflation (INF), it is only in Mexico that the result shows a long-run causal relationship with economic growth (table 4). The result implies that, a percentage changes in INF in Mexico, will cause about 0.004% increase in the economic growth of Mexico at the long-run at 1% confidence level. In respect of remittance (REM), only in Indonesia that remittance shows a long-run causal relationship with GDP. The result as shown in table 4 implies that, a percentage change in remittance, will increase the Indonesia economic growth by about 0.05% in the long-run at 1% confidence level.

Table 4. Long-run causality estimates

Country	Δ FDI	Δ lnFCE	Δ lnGCF	Δ lnINF	Δ lnREM	Δ lnTRA
Mexico	0.03** (0.01)	-0.22 (0.20)	0.31* (0.07)	0.04* (0.02)	-0.01 (0.02)	0.11 (0.07)
Indonesia	0.003 (0.01)	0.83* (0.06)	0.003* (0.001)	-0.01 (0.02)	0.05* (0.02)	-0.02 (0.06)
Nigeria	-0.03 (0.03)	0.94** (0.40)	-0.18 (0.20)	0.05 (0.05)	-0.07 (0.05)	0.24 (0.19)
Turkey	0.01 (0.04)	0.77 (0.50)	-0.02 (0.43)	0.03 (0.06)	-0.08 (0.10)	0.15 (0.38)

- a. Values in parentheses are standard error
- b. *, and ** denotes 1% and 5% significance level respectively

4.5. SHORT – RUN ESTIMATES

Short-run causality estimates as summarized in table 5 shows that FDI has a positive short-run causality on both Mexico and Turkey economic growth. In other words, a change in FDI will cause about 1% increase in the Mexican economy in short-run at 5% significance level, while it will cause an increase of 1% also in the short-run at 5% significance level on the Turkey economic growth. There is positive short-run causality running from final consumption expenditure to GDP in all the four countries, and the results are statistically significant at 1% confidence level. The results as shown in Table 5 implies that in Mexico, Indonesia, Nigeria, and Turkey, a percentage change in the FCE will cause 0.36%, 0.87%. 0.11% and 0.68% change respectively on the economic growth of the individual countries.

The result for gross capital formation (GCF) across the countries as depicted in the table 5 reveals that a percentage change in GCF will impact positively about 0.22% increase on the Mexican economy in the short-run at 1% confidence level. It causes about 0.002% increase on the Indonesia economy in the short-run at 5% confidence level, while it causes about 0.09% increase on Turkey economy in the short-run at a 1% confidence level. Inflation affects only Turkey economy in the short-run among the four countries. The result as presented in table 5, it shows that inflation will cause about 0.002% increase on the Turkey GDP in the short-run at 5% confidence level.

As for the remittance, while it shows a positive influence on both Mexico and Indonesia in the short-run, it has a negative influence on the Nigeria economy. The result as presented in table 5 reveals that in the short-run, remittance impact positively about 0.03% increase on Mexico economic growth at 10% confidence level. It causes about a 0.05% increase on Indonesia economy at 1% confidence level in the short-run, while it causes a decrease of about 0.02% on the Nigeria economic growth at 10% confidence level. Lastly, trade shows positive influence on Indonesia economy in the short-run at 10% confidence level (table 5).

Meanwhile, the error correction model for each of the country as presented in table 5 shows that the signs and intervals of ECTs are in line with theory. Implying that a negative ECT ranges between 0 and 1, and it will enable a stable error correction mechanism (Asongu et al. 2016). A positive ECT implies a deviation from the equilibrium, while a negative ECT is significant for the reversion to long-run equilibrium following an exogenous shock (Odugbesan & Rjoub, 2019). The ECT for Mexico shows that the reversion to long-run equilibrium is at an adjustment speed of 73% in the presence of an exogenous shock and it's significant at 1% confidence level. Similarly, Indonesia has an adjustment speed of 64% and significant at 1% confidence level, while Nigeria and Turkey has an adjustment speed of 23% and 15% respectively back to equilibrium in the presence of shock and both are statistically significant at 1% confidence level.

Table 5. Short-run causality estimates

Country	ΔFDI	$\Delta \ln FCE$	$\Delta \ln GCF$	$\Delta \ln INF$	$\Delta \ln REM$	$\Delta \ln TRA$	ECT(-1)
Mexico	0.01** (0.002)	0.36* (0.09)	0.22* (0.05)	0.01 (0.01)	0.03*** (0.01)	-0.03 (0.02)	-0.73*
Indonesia	0.002 (0.003)	0.87* (0.07)	0.002** (0.001)	-0.01 (0.01)	0.05* (0.01)	0.02*** (0.01)	-0.64*
Nigeria	-0.01 (0.01)	0.11* (0.03)	0.03 (0.02)	0.01 (0.01)	-0.02*** (0.01)	0.01 (0.01)	-0.23*
Turkey	0.01** (0.002)	0.68* (0.09)	0.09* (0.02)	0.02** (0.01)	0.01 (0.01)	0.02 (0.03)	-0.15*

a. Values in parentheses are standard error

b. *, **, and *** denotes 1%, 5%, and 10% significance level respectively

4.6. RESIDUAL DIAGNOSTIC TEST

The residual diagnostic test was carried out to ensure the robustness of the model. This was done by carrying out several diagnostic tests on the residual of the ECM model. This is necessary to ensure that our result is devoid of bias and fit for prediction and policy formulation. Thus, normality, the Breusch-Pagan Godfrey serial correlation LM test, Breusch-Pagan Godfrey heteroskedasticity test, and autoregressive conditional heteroskedasticity (ARCH) test were carried out and results presented in table 6. The results of the test as shown in the table reveals that our model for all the countries has no correlation, it's normally distributed, and free from heteroskedasticity problem as all the p-value for the tests are greater than 0.05 for the individual country. It is then safe to say that our research result has economic significance and reasonable because it passes all the reported diagnostic tests.

Table 6. Residual Diagnostics Test

Country		Normality	Serial Corr. LM Test	ARCH	Breusch-Pagan Godfrey
Mexico	F-statistics	1.40	0.25	1.60	0.49
	P-value	0.50	0.78	0.23	0.89
Indonesia	F-statistics	1.00	0.42	0.23	1.08
	P-value	0.61	0.67	0.80	0.44
Nigeria	F-statistics	0.12	0.06	0.08	1.69
	P-value	0.94	0.82	0.78	0.17
Turkey	F-statistics	5.39	1.49	0.003	0.67
	P-value	0.07	0.24	0.96	0.76

5. SUMMARY AND CONCLUSION

The study examine the relationship between economic growth and remittance, controlling for foreign direct investment, grow capital formation, final consumption expenditure, inflation, and trade in MINT countries for the period 1990 – 2017. ARDL bounds testing, error correction model (ECM) was employed for our analysis, and the residual was subjected to diagnostic test. The cointegration result reveals cointegration among the variables in Mexico, Indonesia, and Nigeria. The long-run causal relationship found between economic growth and remittance in Mexico is consistent with previous studies (Al-Khathlan, 2012; Mendoca Cota, 2012; Ramirez, 2014) who established positive relationship between remittance and economic growth in Mexico in their various studies. This result for Mexico implies that, the remittance received is being channeling into investment rather than consumption. The result for Indonesia is similar to that of Mexico, as the result

corroborate the study of Nahar, Adhar, & Azizurrohman (2018). Meanwhile, the result from Indonesia on the influence of remittance on Indonesia economy reveals that there is strong causality of remittance on the economic growth. This is as a result of both the short and long-run causal relationship that is found to be statistically significant.

However, a negative influence of remittance is found on Nigeria economic growth. This result is consistent with Jahjah et al. (2003), who found a similar negative result of remittance influence on economic growth. Moreover, the result is in contrast to the study of Akonji & Wakili (2013); Akinpelu et al. (2013); Oshola & Badejo, (2015); Ukeji & Obiechina, (2013), who found a positive impact of remittance on Nigeria economy. The negative short-run impact of remittance on Nigeria economic growth implies that most of the remittance receivers in Nigeria commits the money to consumption rather than investing it. The error correction term across the four countries shows that Turkey has the least speed of adjustment back to equilibrium in case of shock, followed by Nigeria, Indonesia, and Mexico. Consequently, the residual diagnostic test reveals that our result makes economic sense and it's reasonable because it passes all the diagnostic test conducted.

The implication of this study is that, though we found a positive strong causal relationship in Indonesia, and short-run causal relationship in Mexico, it should not be seen as a driver for economic growth and poverty reduction, because research has linked remittance with loss of productivity, and Dutch disease. Meanwhile, the policy makers in Mexico and Indonesia should put in place policies that will encourage the receivers to commit the remittances into physical and human capital investment, this will enable the country to harness the full potential of remittances flow. As for Nigeria, it shows that with the huge remittances flow into the country, the result indicate that most of the receivers spend the money on consumption. This is an indication with the negative short-run causality as reveals from the result. The country can harness the full potential of remittance flows into the country by ensuring an efficient and reliable channel, also put in place policies that will enable the receivers to commit the remittance received into human and physical investment, which will in the long-run impact on the country economy.

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