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DOES REMITTANCE INFLOW GRANGER-CAUSE ECONOMIC GROWTH IN SOUTH AFRICA? A DYNAMIC MULTIVARIATE CAUSALITY TEST

Sheilla Nyasha[1] and Nicholas M. Odhiambo

Abstract

In this study we examine the dynamic causal relationship between remittances and economic growth in South Africa during the period from 1970 to 2017. Although South Africa is well known for being a source of cross-border remittances to various countries, especially in the African continent, remittance inflows to South Africa have grown in the recent past. The growth in remittances on the one hand, and the need to fight against poverty and inequality in South Africa and ultimately improve economic growth, on the other hand, prompted the need for this study. The study uses the autoregressive distributed lag (ARDL) approach within a multivariate Granger-causality setting to examine the remittance-growth causal link – in an effort to address the variable omission bias. The empirical findings of the study show that remittances and economic growth are not causally related in South Africa, irrespective of whether the estimations are done in the long run or in the short run. This finding, though contrary to the expectation, is not surprising, given the level of financial sector development South African.

Keywords: Remittances; Economic Growth; South Africa; Granger-Causality

1. Introduction

With globalisation, it has become a norm for people to move from one country to another in search of greener pastures, especially the young adults. In recent years, international migration for asylum purposes has also been on the rise. Those who migrate usually leave their family members behind, and are compelled to send them money for upkeep. Others send money for investment purposes. Whatever the purpose, the financial resources sent by emigrants to their country of origin are termed cross-border remittances.

Remittances can also be within a country, where migrants from other parts of the country, usually the rural areas, move to other parts of the country, usually the city or mining areas.

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These are termed domestic remittances. In this study, remittances refer to cross-border remittances. While remittances can be sent through formal and well-regulated channels, some migrants prefer informal remittances, sent through informal means because it is usually cheaper, and sometimes more convenient. This study focuses on formal cross-border remittances.

In recent years, the flow of remittances has been on the increase, in tandem with the increasing international migration trends. Economists and researchers have also over the years risen to the occasion and have begun to explore the potential remittances may have in the fight to increase economic growth and eradicate poverty, especially in high remittance-receiving countries (Meyer and Shera, 2017; Goschin, 2014; Fayissa and Nsiah, 2010).

Although there have been efforts to examine the relationship between remittances and economic growth in recent years, the area of study has not enjoyed modest coverage. The remittance-growth empirical evidence is still thin, and much focus has been on the impact of remittances on economic growth (Fayissa and Nsiah, 2010; Yaseen, 2012; Goschin, 2014; Matuzeviciute and Butkus, 2016; Meyer and Shera, 2017), leaving studies on the causality between remittances and economic growth scant (see Siddique et al., 2012; Olubiyi, 2014; Sharaf, 2014; Ali et al., 2018).

Furthermore, most studies that explored the causality between remittances and economic growth focused mostly on Asian countries, leaving African countries with little to no coverage. South Africa is one of the countries with no studies done on the causality between remittances and economic growth, to the best of our knowledge. Yet it is one of the countries with growing remittance inflows over the years, on the one hand, and high levels of inequality and poverty as well as consistently low levels of economic growth, on the other hand (Statistics South Africa "StatsSA", 2019). Therefore, the need for a study on the causality between remittances and economic growth in South Africa cannot be overstated. Further, the study will use time-series methods to cater for country-specific effects, unlike some previous studies done based on cross-sectional methodologies, whose results lack country-specific considerations.

Of the few studies on the causality between remittances and economic growth, the results are far from being conclusive (Meyer and Shera, 2017; Goschin, 2014; Siddique et al., 2012; Fayissa and Nsiah, 2010). Four groups of outcomes have emerged in literature. The first group of studies have found unidirectional causality from remittances to economic growth (Nyeadi and Atiga, 2014; Aboulezz, 2015; Munir et al., 2016), while the second group consists of studies that found unidirectional causality, but this time, from economic growth to remittances (see Ali et al., 2018). The third group consists of studies in support of the bidirectional causality between remittances and economic growth (see Kumar and Vu, 2014; Jouini, 2015; Ahmed and Hakim, 2017). Then, there is the fourth group, which consists of studies that have found no causality between the two variables (Siddique et al., 2012; Ahmed and Hakim, 2017). With this level of inconsistency across studies on the same subject – causality between remittances and economic growth – a revisit of the topic cannot be overemphasised.

Against this backdrop, the objective of this study is to examine the causality between remittances and economic growth in South Africa during the 1970-2017 period. South Africa makes an interesting case because it is one of the countries fighting poverty and inequality in an environment characterised by high levels of unemployment and low levels of economic growth. On the other hand, the country has experienced a significant and consistent growth in remittances since 1998 when remittances to South Africa began their ascension, as more and more South Africans emigrated. According to the World Bank (2019), they increased from US$258.6 million, equivalent to 0.2% of GDP, in 1998 to an all-time high of US$1.2 billion, equating to 3% of GDP, 2011; and thereafter declined. Following a gradual deterioration to US$755.4 million in 2016, remittances to South Africa recovered somewhat to US$873.2 million in 2017 (World Bank, 2019). Despite the minor volatilities over the years, the overall remittance trend for South Africa was increasing steadily from 1970 to 2017.

Although remittances to South Africa have been on the increase in recent years, this increase has always been eclipsed by remittances flowing out of South Africa. As a result, remittance focus in South Africa – from regulation to financial consumer awareness – has mostly been on domestic remittances or remittance outflows. This has left a huge unexplored gap in remittances flows to South Africa, and their link to economic growth, which this study seeks to bridge. According to the AfrAsia Bank (2017), South Africa is the most developed country

in the African continent, with better and more opportunities than other African countries. Despite its advanced economy in general and its financial sector in particular, there is a possibility that the country may still benefit from harnessing remittances for economic growth and development.

The South African economy has been finding it increasingly difficult to sustain a modest economic growth levels. The economy has not wholly improved following the global financial crisis of 2008 and its aftermath – as evidenced by economic growth rates that have been consistently low, while the unemployment rate has been consistently high for a prolonged period of time – currently at 1.4% and 27.1%, respectively, quarter-on-quarter, in the last quarter of 2018 (StatsSA, 2019). Following initial recovery from the global financial crisis, GDP growth grew from -1.5% in 2009 to 3% in 2010, before peaking at 3.3 in 2011 (StatsSA, 2019). Since then economic growth rate has been deteriorating, reaching a trough at 0.6% in 2016 – only to recover mildly to 1.3% in 2017. In 2018, a GDP growth of 0.8% was posted by South Africa (StatsSA, 2019).

The rest of the study is organised as follows: Section 2 reviews literature on the remittances and economic growth causal nexus, while section 3 discusses the methodology employed to test the causal relationship. Section 4 provides the results of the study, and section 5 offers the conclusion of the study.

2. Literature Review

Although a number of studies have been carried-out on the relationship between remittances and economic growth, most of them focused on the impact of remittances on economic growth, leaving the causality between the variables with thin coverage. A further review of remittance-growth literature reveals that of the studies that focused on the causality aspect of the remittance-growth nexus, the outcome was far from being conclusive. Four possible outcomes are evident in the literature. The first group of studies found unidirectional Granger-causality running from remittances to economic growth while the other group of studies found evidence in favour of unidirectional causality flowing from economic growth to remittances. The third group of studies found a two-way causal relationship between remittances and economic growth; while the fourth group of the studies found no causality between remittances and economic growth.

Siddique *et al.* (2012) examined the casual link between remittances and economic growth in three countries, namely Bangladesh, India and Sri Lanka, based on time-series data stretching over 25 years. Using the Granger-causality test under a Vector Autoregression (VAR) framework, the results revealed that growth in remittances Granger-caused economic growth in Bangladesh.

Jawaid and Raza (2012) also put the causal relationship between workers' remittances and economic growth to the test in China and Korea, employing annual time series data, over the period from 1980 to 2009. Based on the Johansen and Juselius cointegration technique, error correction model, and sensitivity analysis, the results of the causality analysis provided evidence of unidirectional causality running from workers' remittances to economic growth, in both China and Korea.

Olubiyi (2014) examined the causal relationships among GDP, export, imports and remittances in Nigeria during the 1980-2012 period. Employing a VECM Granger-causality test, the study established that in Nigeria, there is unidirectional causality from remittances to economic growth, implying that remittances propel economic growth.

Nyeadi and Atiga (2014) investigated the link between remittances and economic growth in Ghana. Using the Granger-causality and cointegration tests under the Vector Autoregression (VAR) framework, they found unidirectional Granger-causality flowing from remittances to economic growth in Ghana.

Sharaf (2014) empirically examined the long-run causal link between remittances and output in Egypt for the period 1977-2012. The long-run causal link was examined using the ARDL bounds test for cointegration, along with a vector error-correction model to estimate the parameters of equilibrium dynamics. The ensuing results revealed that in the study country, it is remittance flow that Granger-causes economic growth, thus shedding light on the importance of remittances in promoting economic growth in Egypt.

Aboulezz (2015) assessed the causal relationship between international remittances and economic growth in Kenya for the period from 1993 to 2014. The study used Granger-causality estimation based on the ARDL procedure to investigate this causal link. The results showed that the international remittances Granger-cause economic growth in Kenya. It was,

therefore concluded that economic growth in Kenya is largely driven by international remittances.

Munir *et al*. (2016) examined the relationship between personal remittances and economic growth in Pakistan during the period from 1980 to 2014, using time series methods. The Granger-causality results confirmed that in Pakistan, it is personal remittance flow that causes economic growth.

Ali *et al*. (2018) examined the causal relationship between remittances and economic growth among the top ten highest remittance receiving countries in the world, based on the ratio of remittances to GDP, for the period from 1998 to 2014. These study countries were: Haiti, Honduras, the Kyrgyz Republic, Lebanon, Lesotho, Moldova, Nepal, Samoa, Tajikistan, and Tonga. Using Konya's (2006) Bootstrap panel Granger-causality test technique, the results showed that for Honduras, Kyrgyz Republic, Lebanon, and Moldova, there was unidirectional Granger-causality from remittances to economic growth.

Unlike the studies reviewed above that support unidirectional causality from remittances to economic growth, there are some studies, though very few, that lend support to the unidirectional causality from economic growth to remittances. Such studies include Ali *et al*. (2018), who examined the causal relationship between remittances and economic growth among the top ten highest remittance-receiving countries in the world, based on the ratio of remittances to GDP, for the period from 1998 to 2014. These study countries were: Haiti, Honduras, the Kyrgyz Republic, Lebanon, Lesotho, Moldova, Nepal, Samoa, Tajikistan, and Tonga. Using Konya's (2006) Bootstrap panel Granger-causality test technique, the result revealed that for Lesotho, Nepal, Samoa, and Tajikistan, there was unidirectional Granger-causality, but this time, running from economic growth to remittances.

Then, there is a third group of studies that support bidirectional causality between remittances and economic growth. Siddique *et al*. (2012) examined the casual link between remittances and economic growth in three countries, namely: Bangladesh, India and Sri Lanka, based on time-series data stretching over 25 years. Using Granger-causality test under a VAR framework, the results revealed that economic growth and remittances Granger-cause each other in Sri Lanka.

Kumar and Vu (2014) empirically explored the causal nexus between information and communications technology (ICT), remittances and output per worker in Vietnam from 1980 to 2012. They employed the ARDL bounds procedure and Granger-causality tests to examine the short-run and long-run effects and the direction of causality, between variables; and the results on causality showed that in Vietnam, remittances and economic growth, as measured by output per worker, are mutually causal.

Jouini (2015) sought to investigate the causal links between economic growth and remittances for Tunisia over the period from 1970 to 2010 through two transmission channels – the financial development channel and the investment channel. Using the autoregressive distributed lag approach, the results revealed the presence of a short-run bidirectional causal link between remittances and economic growth.

Mwangi and Mwenda (2015) carried out a study on Kenya with an objective of determining the effect of international remittances on the economic growth, as well as to establish the direction of causality between the two variables. The study period was from 1993 to 2013. The results of the study confirmed that in Kenya, remittances have a positive impact on economic growth. Further, the results also showed that the causality between remittances and economic growth was bidirectional.

Ahmed and Hakim (2017) investigated the relationship between remittances and economic growth in Togo using time-series data over a period of 42 years, stretching from 1974 to 2015. They employed the Johansen cointegration test methods, followed by three-step vector equilibrium correction mechanism for long-run causality and Wald test for short-run causality as well as a pairwise-Granger causality test. The results of the study confirmed the presence of bidirectional Granger-causality between remittances and economic growth in Togo, however, only in the long run.

Ali *et al*. (2018) examined the causal relationship between remittances and economic growth among the top ten highest remittance receiving countries in the world, based on the ratio of remittances to GDP, for the period from 1998 to 2014. These study countries were: Haiti, Honduras, Kyrgyz Republic, Lebanon, Lesotho, Moldova, Nepal, Samoa, Tajikistan, and

Tonga. Using Konya's (2006) Bootstrap panel Granger-causality test technique, the results showed that for Haiti, there was evidence of bidirectional causality, where remittances and economic growth propelled each other.

Besides empirical evidence in the three categories reviewed, there is the fourth group that sees remittances and economic growth as independent variables, which do not Granger-cause one another. Just as the second group, the volume of evidence is in this group is small. Siddique *et al*. (2012) examined the casual link between remittances and economic growth in three countries, namely: Bangladesh, India and Sri Lanka based on time-series data stretching over 25 years. Using Granger causality test under a VAR framework, the results revealed that in India, there is no causality between remittances and economic growth.

Ahmed and Hakim (2017) investigated the relationship between remittances and economic growth in Togo using time-series data over a period of 42 years, stretching from 1974 up until 2015. They employed the Johansen cointegration test methods, followed by three-step vector equilibrium correction mechanism for long-run causality and Wald test for short-run causality as well as pairwise-Granger causality test. The results of the study confirmed the absence of any causal relationship between remittances and economic growth in Togo, however, only in the short run.

Despite having found evidence in support of all four Granger-causality possibilities on the remittances and economic growth causal nexus, overwhelming empirical evidence is on the unidirectional Granger-causality from remittances to economic growth. Therefore, based on the empirical evidence, it can be safe to conclude that the causality between remittances and economic growth is not clear-cut, as it is time-, study country- and methodology-variant. However, the causal relationship is mostly unidirectional, from remittances to economic growth.

3. Methodology

In order to address the omission-of-variable bias associated with bivariate causality models (Nyasha and Odhiambo 2018; Pradhan, 2011; Odhiambo, 2009), this study utilises a multivariate Granger-causality model – which caters for the possibility of the dynamics involving other variables other than the key ones under consideration – to empirically examine the dynamic causal linkage between remittances and economic growth in South

Africa. The multivariate Granger-causality model is based on the error-correction model framework, as well as the autoregressive distributed lag (ARDL) bounds-testing approach, initially put forward by Pesaran and Shin (1999), and as later improved by Pesaran *et al*. (2001).

The ECM-based ARDL approach was found suitable for this study because of numerous advantages the approach has over the conservative estimation techniques such as the residual-based technique and the Full-Maximum Likelihood (FML) test. With this approach, variables integrated of order zero or one or a mixture of both can be used; endogeneity shortfalls are resolved automatically, and a small sample can still produce valid and reliable results due to the approach's superior small sample properties.

While a number of studies have used GDP and GDP per capita as measures of economic growth, in this study, the annual growth rate of real GDP is used as a proxy for economic growth (**y**). The growth rate of real GDP is a more stable measure and reflects economic performance, irrespective of the size of the economy. The measure has also been more preferred to other measures of economic growth in literature (see, among others, Shan and Jianhong, 2006; Majid, 2008; Nyasha and Odhiambo 2015). On the other hand, remittances (REM) are measured by the ratio of cross-border remittance inflows to GDP. This measure takes cognisance of a country size and is more stable than remittance inflows in US dollars or local currency (Meyer and Shera, 2017). Additionally, it is becoming a commonly used measure to proxy remittances.

Three additional variables have been incorporated into the model as intermittent variables to create a multivariate Granger-causality model. These are: financial development (FSD); domestic savings **(SAV);** and trade openness **(TRO)**. Both the theoretical and empirical literature underpins the choice of these three variables as intermittent variables in the causality model.

The study utilised annual time series data, covering the period from 1970 to 2017; and the data was obtained from the World Bank DataBank, Economic Indicators Database (World Bank, 2019).

Before the estimation of Granger-causality between variables, the study tests the existence of a long-run equilibrium relationship among the variables in the study. The cointegration test adopted is based on the ARDL bounds testing procedure, following Pesaran *et al*. (2001); and the cointegration model for this study is expressed in the form of a set of five cointegration equations as:

$$\Delta y_t = \vartheta_0 + \sum_{i=1}^{n} \vartheta_{1i} \Delta y_{t-i} + \sum_{i=0}^{n} \vartheta_{2i} \Delta REM_{t-i} + \sum_{i=0}^{n} \vartheta_{3i} \Delta FSD_{t-i} + \sum_{i=0}^{n} \vartheta_{4i} \Delta SAV_{t-i} + \sum_{i=0}^{n} \vartheta_{5i} \Delta TRO_{t-i} + \vartheta_6 y_{t-1} + \vartheta_7 REM_{t-1} + \vartheta_8 FSD_{t-1} + \vartheta_9 SAV_{t-1} + \vartheta_{10} TRO_{t-1} + \mu_{1t} \dots \dots \dots (1)$$

$$\Delta REM_t = \alpha_0 + \sum_{i=0}^{n} \alpha_{1i} \Delta y_{t-i} + \sum_{i=1}^{n} \alpha_{2i} \Delta REM_{t-i} + \sum_{i=0}^{n} \alpha_{3i} \Delta FSD_{t-i} + \sum_{i=0}^{n} \alpha_{4i} \Delta SAV_{t-i} + \sum_{i=0}^{n} \alpha_{5i} \Delta TRO_{t-i} + \alpha_6 y_{t-1} + \alpha_7 REM_{t-1} + \alpha_8 FSD_{t-1} + \alpha_9 SAV_{t-1} + \alpha_{10} TRO_{t-1} + \mu_{2t} \dots \dots \dots (2)$$

$$\Delta FSD_t = \theta_0 + \sum_{i=0}^{n} \theta_{1i} \Delta y_{t-i} + \sum_{i=0}^{n} \theta_{2i} \Delta REM_{t-i} + \sum_{i=1}^{n} \theta_{3i} \Delta FSD_{t-i} + \sum_{i=0}^{n} \theta_{4i} \Delta SAV_{t-i} + \sum_{i=0}^{n} \theta_{5i} \Delta TRO_{t-i} + \theta_6 y_{t-1} + \theta_7 REM_{t-1} + \theta_8 FSD_{t-1} + \theta_9 SAV_{t-1} + \theta_{10} TRO_{t-1} + \mu_{3t} \dots \dots \dots (3)$$

$$\Delta SAV_t = \pi_0 + \sum_{i=0}^{n} \pi_{1i} \Delta y_{t-i} + \sum_{i=0}^{n} \pi_{2i} \Delta REM_{t-i} + \sum_{i=0}^{n} \pi_{3i} \Delta FSD_{t-i} + \sum_{i=1}^{n} \pi_{4i} \Delta SAV_{t-i} + \sum_{i=0}^{n} \pi_{5i} \Delta TRO_{t-i} + \pi_6 y_{t-1} + \pi_7 REM_{t-1} + \pi_8 FSD_{t-1} + \pi_9 SAV_{t-1} + \pi_{10} TRO_{t-1} + \mu_{4t} \dots \dots \dots (4)$$

$$\Delta TRO_t = \beta_0 + \sum_{i=0}^{n} \beta_{1i} \Delta y_{t-i} + \sum_{i=0}^{n} \beta_{2i} \Delta REM_{t-i} + \sum_{i=0}^{n} \beta_{3i} \Delta FSD_{t-i} + \sum_{i=0}^{n} \beta_{4i} \Delta SAV_{t-i} + \sum_{i=1}^{n} \beta_{5i} \Delta TRO_{t-i} + \beta_6 y_{t-1} + \beta_7 REM_{t-1} + \beta_8 FSD_{t-1} + \beta_9 SAV_{t-1} + \beta_{10} TRO_{t-1} + \mu_{5t} \dots\dots\dots (5)$$

where: y is economic growth, proxied by growth rate of real GDP; REM is remittances, measured by inward cross-border remittances as a percentage of GDP; FSD is financial development, estimated by domestic credit to the private sector by banks as a percentage of GDP; SAV is domestic savings, expressed as a ratio of GDP; TRO is trade openness, proxied by the sum of imports and exports as a ratio of GDP; $\vartheta_0, a_0, \theta_0, \pi_0$ and β_0 are respective constants; $\vartheta_1 - \vartheta_5$, $\alpha_1 - \alpha_5, \theta_1 - \theta_5$, $\pi_1 - \pi_5$, and $\beta_1 - \beta_5$ are respective short-run coefficients; $\vartheta_6 - \vartheta_{10}$, $\alpha_6 - \alpha_{10}, \theta_6 - \theta_{10}$, $\pi_6 - \pi_{10}$ and $\beta_6 - \beta_{10}$ are respective long-run coefficients; Δ is a difference operator; n is lag length; t is time period; and μ_{it} are white-noise error terms.

The associated ECM-based Granger-causality model consistent with the given cointegration model is specified as a system of five equations as well; and is expressed as:

$$\Delta y_t = \vartheta_0 + \sum_{i=1}^{n} \vartheta_{1i} \Delta y_{t-i} + \sum_{i=0}^{n} \vartheta_{2i} \Delta REM_{t-i} + \sum_{i=0}^{n} \vartheta_{3i} \Delta FSD_{t-i} + \sum_{i=0}^{n} \vartheta_{4i} \Delta SAV_{t-i} + \sum_{i=0}^{n} \vartheta_{5i} \Delta TRO_{t-i} + \vartheta_6 ECM_{t-1} + \mu_{1t} \dots\dots\dots (6)$$

$$\Delta REM_t = \alpha_0 + \sum_{i=0}^{n} \alpha_{1i} \Delta y_{t-i} + \sum_{i=1}^{n} \alpha_{2i} \Delta REM_{t-i} + \sum_{i=0}^{n} \alpha_{3i} \Delta FSD_{t-i} + \sum_{i=0}^{n} \alpha_{4i} \Delta SAV_{t-i} + \sum_{i=0}^{n} \alpha_{5i} \Delta TRO_{t-i} + \alpha_6 ECM_{t-1} + \mu_{2t} \dots\dots\dots (7)$$

$$\Delta FSD_t = \theta_0 + \sum_{i=0}^{n} \theta_{1i} \Delta y_{t-i} + \sum_{i=0}^{n} \theta_{2i} \Delta REM_{t-i} + \sum_{i=1}^{n} \theta_{3i} \Delta FSD_{t-i} + \sum_{i=0}^{n} \theta_{4i} \Delta SAV_{t-i} + \sum_{i=0}^{n} \theta_{5i} \Delta TRO_{t-i} + \theta_6 ECM_{t-1} + \mu_{3t} \dots\dots\dots (8)$$

$$\Delta SAV_t = \pi_0 + \sum_{i=0}^{n} \pi_{1i} \Delta y_{t-i} + \sum_{i=0}^{n} \pi_{2i} \Delta REM_{t-i} + \sum_{i=0}^{n} \pi_{3i} \Delta FSD_{t-i} + \sum_{i=1}^{n} \pi_{4i} \Delta SAV_{t-i} + \sum_{i=0}^{n} \pi_{5i} \Delta TRO_{t-i} + \pi_6 ECM_{t-1} + \mu_{4t} \dots\dots\dots (9)$$

$$\Delta TRO_t = \beta_0 + \sum_{i=0}^{n} \beta_{1i} \Delta y_{t-i} + \sum_{i=0}^{n} \beta_{2i} \Delta REM_{t-i} + \sum_{i=0}^{n} \beta_{3i} \Delta FSD_{t-i} + \sum_{i=0}^{n} \beta_{4i} \Delta SAV_{t-i} + \sum_{i=1}^{n} \beta_{5i} \Delta TRO_{t-i} + \beta_6 ECM_{t-1} + \mu_{5t} \dots\dots\dots (10)$$

where: ECM is an error-correction term; $\vartheta_{6,}a_6$,θ_6,π_6 and β_6 are respective coefficients for the error-correction terms; μ_{it} are mutually uncorrelated white-noise residuals; and all other variables and characters are as described in equations 1-5.

4. Data Analysis and Empirical Results

Results of Stationarity Tests

For unit root tests, the study utilised the Dickey-Fuller generalised least squares (DF-GLS) and the Phillips-Perron (PP) unit root tests, which are more reliable than the Dickey-Fuller and the Augmented Dickey-Fuller unit root tests. Table 1 summarises the results of the unit root tests carried out.

Table 1: Results of Unit Root Tests

	Dickey-Fuller Generalised Least Square (DF-GLS)		**Phillips-Perron (PP)**	
Variable	**Without Trend**		**Without Trend**	
	Variables in Levels	Variables in Levels	Variables in Levels	First Difference
y	-4.011***	-	-4.630***	-
REM	-1.035	-4.072***	-0.755	-4.221***
FSD	-1.080	-7.863***	-1.261	-7.821***
SAV	-0.867	-5.324***	-1.234	-5.943***
TRO	-1.847	-6.727***	-2.042	-7.661***

*Note: *** denotes stationarity at 1% significance level*

The results of the unit root tests displayed in Table 1 show that all the variables in this study are integrated of order one or zero. Economic growth is stationary in levels while the rest of the variables are stationary in first difference. These results confirm the suitability of the chosen ARDL procedure – as it can only be used if variables are integrated of order not more than one.

Results of Cointegration Tests

The ARDL bounds testing approach, as its name suggests, makes use of bounds to determine whether variables under consideration are cointegrated or not. The null hypothesis of no cointegration is tested against the alternative hypothesis of cointegration, annotated for equation 1 as:

H_0: $\vartheta_6 = \vartheta_7 = \vartheta_8 = \vartheta_9 = \vartheta_{10} = 0$

against

H_1: $\vartheta_6 \neq \vartheta_7 \neq \vartheta_8 \neq \vartheta_9 \neq \vartheta_{10} \neq 0$

The rest of the cointegration equations are expressed in a similar way.

Following the determination of the order of lags on the first differenced variables in the cointegration equations (1-5), an F-statistic is calculated for each equation. This is followed

by the application of the bounds F-test to equations (1-5), in order to establish whether a long-run relationship between the variables under study exists or not. The computed F-statistic is compared with Pesaran *et al*.'s (2001) critical values. Cointegration is found if the calculated F-statistic is above the upper bound level, leading to the rejection of the null hypothesis of no cointegration, and subsequent conclusion that there exists a long-run equilibrium relationship among the variables under consideration. Conversely, should the calculated F-statistic be less than the lower-bound level, the null hypothesis of no cointegration cannot be rejected; as the variables will not be cointegrated. However, in the event that the calculated F-statistic lies within the upper and the lower bounds, the cointegration results are deemed inconclusive. Table 2 displays a summary of the cointegration results for this study.

Table 2: Cointegration Results

Dependent variable	**Function**	**F-statistic**	**Cointegration status**
y	F(y|REM, FSD, SAV, TRO)	3.085	Not cointegrated
REM	F(REM|y, FSD, SAV, TRO)	4.240**	Cointegrated
FSD	F(FSD|y, REM, SAV, TRO)	2.639	Not cointegrated
SAV	F(SAV|y, FSD, REM, TRO)	0.503	Not cointegrated
TRO	F(TRO|y, REM, FSD, SAV)	2.018	Not cointegrated

Asymptotic critical values						
Pesaran *et al*. (2001), p.300 Table CI(iii) Case III	1%		5%		10%	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
	3.74	5.06	2.86	4.01	2.45	3.52

*Note ** denote statistical significance at 5% level*

The cointegration results in Table 2 show that there is one cointegrating vector, which is in the remittances function. The existence of a long-run equilibrium relationship between variables is only a suggestion that Granger-causality exists in at least one direction, but it does not reveal the direction of causal flow between the variables. While the short-run

causality is determined by the F-statistics on the explanatory variables, based on the Wald Test or the Variable Deletion Test, the long-run causality is confirmed by the sign and significance level of the coefficient of the error-correction term.

It is also important to note that although the error-correction term has been included in all the Granger-causality equations (equations 6-10), an error-correction term in only included in those equations where null hypothesis of no cointegration is rejected (see Odhiambo, 2009, and Nyasha *et al*., 2017, among others). Therefore, in this study, an ECM is included only in the regression of the remittances function (equation 7).

ECM-Based Granger-Causality Results

The presence of a long-run equilibrium relationship between variables in the Granger-causality model allows the study to proceed with the estimation of causality between variables in the model. The ARDL approach was utilised for the estimation. While causality was estimated with an error-correction term for the remittances function (equation 7), it was estimated without the error-correction term for the rest of the functions (equations 6 and 8-10). Table 3 reports the results of the Granger-causality test.

Table 3: Granger-Causality Results

Dependent variable	**F-statistics [probability]**					**ECT_{t-1} [t-statistics]**
	Δy_t	ΔREM_t	ΔFSD_t	ΔSAV_t	ΔTRO_t	
Δy_t	-	1.464 [0.234]	4.858** [0.034]	3.887* [0.056]	8.304*** [0.001]	-
ΔREM_t	2.664 [0.111]	-	5.889** [0.020]	3.553* [0.067]	0.362 [0.551]	-0.2778*** [-4.1063]
ΔFSD_t	3.116* [0.085]	2.456 [0.125]	-	2.860* [0.099]	0.0731 [0.788]	-
ΔSAV_t	6.991** [0.012]	0.764 [0.387]	0.034 [0.855]	-	3.062* [0.088]	-
ΔTRO_t	7.506*** [0.002]	0.076 [0.784]	9.887*** [0.003]	5.956** [0.019]	-	-

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

As reported in Table 3, the empirical results of the study show that in South Africa, there is no Granger-causality between remittances and economic growth. These results apply irrespective of whether estimation is in the short run or in the long run. Although these results are not as expected, they are not unusual (see, among others, Siddique *et al*., 2012; Ahmed and Hakim, 2017).

These results may be explained by the fact that South Africa experiences more cross-border remittances outflows, rather than inflows. Hence remittance inflows form an insignificant part of economic resources at the disposal of the country. Further, it could be possible that most of the remittances to South Africa are used for household consumption, and not for investment purposes. hence their link to economic growth is limited, especially when the consumption is of non-durable goods. Barajas *et al*. (2009) also offer another explanation, which is relevant in this case. According to Barajas *et al*. (2009), the more highly developed the domestic financial system is, and the more highly integrated an economy is with the world financial markets, just as in the case of South Africa, the less likely it is that remittance receipts will stimulate investment by relaxing credit constraints.

The Granger-causality results in the study further reveal that while there is no causal flow from remittances to any of the variables in the causality model, remittance flows into South Africa benefit from savings and financial development. This is evidenced by Granger causality from savings and financial development to remittances, which is confirmed both in the long run and in the short run.

Other results of the study show that in South Africa, there is short-run bidirectional causality between financial sector development and economic growth; savings and economic growth; savings and trade openness; and trade openness and economic growth. Unidirectional Granger-causality was also confirmed, though only in the short run, flowing from financial sector development to trade openness as well as from savings to financial sector development.

5. Conclusion

In this study, we have explored the dynamic causal relationship between remittances and economic growth in South Africa during the period from 1970 to 2017. Although South Africa is well known for being a source of cross-border remittances to various countries, especially in the African continent, remittance inflows to South Africa have grown in the recent past. The growth in remittances on the one hand, and the need to fight against poverty and inequality in South Africa and ultimately improve economic growth, on the other hand, prompted the need for this study. An examination of the causal relationship between remittances and economic growth in Africa would help guide the national growth agenda and policy. The use of three intermittent variables, namely: financial sector development, savings and trade openness, to create a multivariate Granger-causality model that addresses the omission-of-variable bias is what makes this study fundamentally different from the majority of previous studies on the causality between remittances and economic growth. The results of this study reveal that in South Africa, remittances and economic growth are not causally related, irrespective of whether the regression is done in the long run or in the short run. The results are not unusual as South Africa is characterised by a well-developed financial sector which is well integrated with the world's biggest and most sophisticated markets – making remittances seem an insignificant force of economic growth.

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