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THE CAUSAL RELATIONSHIP BETWEEN REMITTANCE AND POVERTY IN SOUTH AFRICA: A MULTIVARIATE APPROACH

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1. **Introduction**

The South African government joined hands with other nations on the fight against poverty and signed the Millennium Development Goals (MDGs) in 2000 (United Nations 'UN', 2000). This was a step to show commitment on the eradication of poverty in South Africa. Although South Africa achieved some of the Millennium Development Goals' targets, the country is still battling with poverty and inequality (Republic of South Africa, 2015: 19). This has also seen South Africa being part of the Sustainable Development Goals (SDG), a successor policy to the MDGs that ended in 2015 (United Nations, 2018). The overarching objective of the two programmes, spearheaded by the United Nations, is inclusive economic development. This policy focus is strongly linked to ability of nations to harness resources at national level and international level through channels like foreign direct investment and most recently remittance inflows. The growing importance of remittance as a source of funds to economic development, and to poverty alleviation in particular, is also captured in SGD 10.7 (United Nations, 2017). Although the United Nations pointed to the important role that remittance can play in poverty alleviation, there is limited empirical evidence on the relationship between remittances and poverty in general and in South Africa specifically.

According to Ratha *et al.* (2018), remittance inflows in low and middle income countries has increased significantly in the recent past and was projected to reach a $528 million mark in 2018. This is a growth of 10.8% from 2017 remittance inflows (Ratha *et al*., 2018). Thus, remittance has grown to be an important source of external funding for low-and-middle income countries competing with other external income flows like foreign direct investment. According to Ratha *et*

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Abstract

The main objective of this study is to investigate the causality between remittance and poverty in South Africa using time series data from 1980 to 2017. The study was motivated by the increasing role of remittance in poverty reduction and human development on the one hand, and the burgeoning inflow of remittance on the other hand. Since 1998, South Africa remittance inflow has shown a more or less upward trend. For example, in 1998 the country recorded an increase in remittance inflow by 18.5% and later maintained a steady increase in remittance inflows with an average increase of 25.3% during the period 1999 and 2017. Using the ECM-based Granger-causality approach in a multivariate framework, our results show that there is a unidirectional causality from poverty to remittance in the short run when infant mortality rate is used as a proxy for poverty. However, when household consumption is used as a proxy, no causality is found to prevail in both the short run and the long run. Policy implications are discussed.

Key Words: Remittance; poverty; ECM-based causality testing; household consumption expenditure; infant mortality rate; South Africa

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al. (2018), remittance inflows have grown to be three times greater than official development assistance (ODA) and larger than foreign direct investment when China is excluded in low-and middle-income countries. More importantly, remittance has direct positive effects at household level and indirect benefits at national level. Given the surge in remittance inflows, another study exploring the causal relationship between remittances and poverty in South Africa will assist policy makers to make informed policy options that harness remittance in the fight against poverty.

Vast literature is available on the impact of remittance on economic growth (see Goschin, 2014; Atanda, 2014; Meyer and Shera, 2017; Makun, 2018). However, a paltry amount of literature is available on the impact of remittance on poverty (see, Adam Jr. and Page, 2005; Gupta *et al*., 2009; Adam Jr. and Cuecuecha, 2013; Azam *et al*., 2016; Vacaflores, 2018; Tsaurai, 2018; Wangle and Devkota, 2018). The results from these studies are inconclusive, varying from one study to the other or poverty proxy used. Although literature is rich with studies on the impact of remittance on poverty reduction, the causality between remittance and poverty remains a dark area despite its importance in policy prioritisation for the government (see, for example, Abdulnasser and Salah, 2014; Gaaliche and Gaaliche, 2014; Muhammad *et al*., 2016). Given the increasing pressure on the South African government to reduce poverty on the one hand, and the increasing inflow of remittance on the other hand, a study on the causality between poverty and remittance gives an insight to policy makers on the macroeconomic variable(s) to target in order to obtain the desired result on poverty alleviation.

This study departs from other studies that have employed one poverty proxy, and in the majority of cases, income poverty alone, by employing two poverty proxies, namely: household consumption expenditure – is an income measure and infant mortality rate – a non-income measure of poverty. Firstly, the selection of the two proxies improves the robustness of the results, especially given the debate that is still raging on the most comprehensive measure of poverty. Secondly, unavailability of time series data for other poverty measures like poverty headcount and human development index (HDI) has contributed to the selection of the poverty proxies. Ravallion (2001) and Rehman and Shahbaz (2014) have also employed household consumption expenditure as a proxy for poverty, while Abosedra *et al*. (2016) used infant mortality rate as a poverty proxy.

To the best of our knowledge, no study has been done employing a time series analysis in general – and ECM-based causality in particular – to analyse the causality between remittance and poverty in South Africa. The contribution of another study that establishes the causality between poverty and remittance employing recently developed causality testing gives an insight into policy in South Africa.

Although South Africa has experienced a surge in remittance, like other low- and middle-income countries, the country remains a major source of outward remittance in Africa and in the SADC region in particular. The question that needs an empirical instigation is which of the two variables causes the other. The direction of causality gives the government important information on which variable to influence first to realise desired results. The main objective of this study, therefore, is

to investigate the causality between poverty and remittance in South Africa. This study will inform policy makers in devising measures that can be taken to harness remittances in order to reduce poverty.

The rest of the study is structured as follows: Section 2 discusses the literature review; section 3 outlines estimation techniques; section 4 presents and discusses the results; and section 5 concludes the study.

2. Empirical Literature Review

2.1 Remittance and Poverty Dynamics in South Africa

Unlike a strong government support on macroeconomic variables like foreign direct investment as a driver of economic development, remittance has received little attention as it relates to the same cause. The growing number of South Africans migrating to other countries makes a relook at the impact of remittance on poverty important. In recent years, the number of South Africans looking for greener pastures in other countries has increased, though the numbers are still depressed compared to other countries such as India and Brazil (United Nations Conference on Trade and Development 'UNCTAD', 2018). The top destinations for these South African migrants are Australia, the United Kingdom, the United States and New Zealand (Businesstech, 2018). South Africa receives a sizeable number of emigrants, mostly from African countries. Consequently, government has put in place policies that are more tilted to regulation of remittance outflows.

The inflow of remittance into South Africa has gradually picked over the years from 1980, although the numbers remain thin (UNCTAD, 2018). In 1980, South Africa registered remittance of 3% of GDP before the inflows increased marginally to 3.5% of GDP in 1984 (UNCTAD, 2018). A significant increase was only registered from 1989 with an inflow of 6.5% (UNCTAD, 2018). Although the trend was sustained until 1992 with an inflow of 6.7% of GDP, South Africa experienced a slump between 1993 and 1996 (UNCTAD, 2018). A surge was recorded in 1998 of 18.5% and a steady increase was maintained with an average of 25.3% registered between 1999 and 2017 (UNCTAD, 2018). The highest remittance inflows were also received during the same period, at 29.1% in 2009 (UNCTAD, 2018).

South Africa has made a concerted effort to roll out policies that alleviate poverty where both the government and the private sector play an important role. The poverty alleviation drive is enshrined in the country's national economic policy, National Development Plan 2030. The thrust of the national policy among other policy advancements is poverty alleviation and reducing inequality among the South African population. The country's approach to poverty alleviation is three-pronged. First are policies that focus on direct intervention through the social safety net, where social grants are given to different categories of the population, social insurance and public works programme. Second are policies that aim to economically empower the poor, as a long-term sustainable measure to avoid reliance on government financial support. Programmes rolled out in support of this poverty drive are financial assistance to those who want to venture into business, black economic empowerment, technical support and training, mentoring of small business owners, training to improve success rates of business, marketing of products, copyright and

intellectual property rights in support of innovation, international exposure to business, and export opportunities. Third is expansion and improvement in access to social services, such as health, housing, sanitation and education among the South African population.

In response to these policy initiatives, South Africa has experienced a gradual reduction in poverty, although the figures are still high and fluctuate from one period to the other (World Bank, 2019). In 1993 a poverty headcount and poverty gap of 29.3% and 9.5% respectively were registered before a surge to 33.8% for poverty headcount and 12.9% for poverty gap in 1996 (World Bank, 2019). A sustained decline in poverty was recorded from 2000 to 2010 in both the poverty headcount and the poverty gap (World Bank, 2019). In 2014 poverty headcount registered 18.9% an increase of 2.4% from 2010 (World Bank, 2019). Poverty gap also registered a surge from 4.9 % in 2010 to 6.2% in 2014 (World Bank, 2019). Overall, there was a fall in poverty in South Africa, although characterised by fluctuation from one period to the other (World Bank, 2019). The human development index (HDI) also improved by 0.081 from 0.618 recorded in 1990 to 0.699 registered in 2017 (United Nations Development Programme "UNDP", 2018). This was a great achievement compared to HDI figures of 0.39 and 0.537 for 1990 and 2017 respectively for Sub-Saharan Africa (UNDP, 2018).

2.2 A Review of Related Literature

The United Nations identified remittance as an important source of finance for development in the move towards inclusive development – Sustainable Development Goals (SDGs). This resulted in

remittance being among the list of Sustainable Development Goals section 10 (United Nations, 2018), where emphasis is placed on creating policies that support remittance between countries. Remittance is defined as a transaction that is initiated by an emigrant to their families back in their home countries (United Nation, 2018). There are different propositions on why migrants would be willing to send some of their earnings back home. According to Lucas and Stark (1985), emigrants remit for the following reasons: altruism, coinsurance and savings. The altruism motive is centred on the empathy with those left behind and the need to assist financially; coinsurance rests on the need to invest back home so that if anything happens to them whilst in the foreign country, they can return home; the savings motive is based on the drive by the emigrants to send money as a way of saving for future investment or bad times when income flow slows or comes to an end in the foreign country. Remittance can be in cash or in kind (Hagen-Zanker and Himmelstine, 2016). Remittance has a direct impact on consumption (see Adam Jr. and Page, 2005; Bui *et al*., 2015) and investment – real estate and small businesses (see Ratha, 2007).

The indirect impact of remittance is realised through the multiplier effect the consumption and investment has on the economy. Thus, the indirect impact of remittance on poverty is felt at the national level as it takes the economy output to a higher level. Further, the countercyclical nature of remittances make them a good shock-absorber during times such as natural disasters and wars (Kapur, 2004). The benefits of remittances can be summarised as poverty mitigating, spurring economic growth, savings, sectorial growth stimulation and investment (De Vries, 2011).

Unlike the theoretical literature where the benefits of remittance on welfare are unquestionable, the findings from the empirical literature are inconclusive. Studies on causal relationship between poverty and remittance are still scant though growing. The majority of studies that examined the relationship between poverty and remittance focused on the impact of remittance on poverty. Studies on the impact of remittance on poverty are also split between those that found a positive impact (Adam Jr. and Page, 2005; Gupta *et al*., 2009; Tsaurai, 2018) and those that found the relationship to be sensitive depending on the poverty proxy used (Azam *et al*., 2016; Wangle and Devkota, 2018). Overall, the findings on the studies that investigated the impact of remittance on poverty are in support of the poverty-mitigating effect. Among the few studies that examined the causality between poverty and remittance, the studies are divided between those that found a bidirectional causality (Abdulnasser and Salah, 2014; Gaaliche and Gaaliche, 2014; Muhammad *et al*., 2016; Sanchez-Loor and Zambrano-Monserrate, 2015); unidirectional causality (Sanchez-Loor and Zambrano-Monserrate., 2015); and no causality (Muhammad *et al*., 2016; Sanchez-Loor and Zambrano-Monserrate, 2015).

Gaaliche and Gaaliche (2014) investigated the causal relationship between remittances and poverty in 14 emerging and developing countries using data from 1980 to 2012. Bidirectional causality was confirmed between poverty and remittance. Abdulnasser and Salah (2014) also examined the causality between remittances and poverty in Bangladesh using data from 1976-2010. The findings from their study were in line with Gaaliche and Gaaliche (2014), where bidirectional causality was confirmed.

In the same vein, Muhammad *et al*. (2016) studied the causality between remittances and poverty in 39 countries from low middle, upper middle and high income countries using data from 1990-2014. Employing Engle-Granger 2-step test, they found a unidirectional causality running from foreign remittance to poverty in lower middle and upper-middle-income countries. However, no causality was found between poverty and foreign remittances in high-income countries. Sanchez-Loor and Zambrano-Monserrate (2015) investigated causality between remittance and poverty in Colombia, Ecuador and Mexico using data from 1980-2012. A bidirectional causal relationship was found in Colombia between remittance and poverty, a unidirectional causality was confirmed in Mexico and no causality was found in the case of Ecuador.

The findings from Muhammad *et al*. (2016) and Sanchez-Loor and Zambrano-Monserrate (2015) confirm inconsistent results and the sensitivity of the results to the country under study. It can be concluded from these studies that generalisation of results from one country to the other is inappropriate. Given inconclusive results, only an empirical study on the relationship between poverty and remittance in South Africa can provide more insight.

3. Estimation Techniques and Empirical Results

3.1 Estimation Techniques

This study is based on the ARDL-bounds test and the ECM-based causality test. The ARDL test has been selected for this study due to numerous advantages, such as, robustness in small samples (Solarin and Shahbaz, 2013). Unlike other approaches to cointegration, ARDL does not have a

restriction on the order of integration on variables included in the model. Some variables can be integrated of order zero and others integrated of order one (Pesaran *et al*., 2001); and ARDL approach also uses a reduced-form single equation, while other conventional cointegration methods employ a system of equations (Pesaran and Shin, 1999).

After confirming the existence of a long-run relation, the next step is establishing the direction of causality. The presence of cointegration only indicates the presence of a long-run relationship and the existence of causality in at least one direction (Narayan and Smyth, 2004). The causal relationship between poverty and remittance is investigated using the ECM-based approach within a multivariate framework. Apart from remittances and poverty, two other variables included in the model are real gross domestic product per capita (GDPC) and education (EDU). These two factors are important to remittance inflows and poverty. Given the weakness of bivariate framework that the model can suffer from omission of variable bias, inclusion of these two variables takes that into account (Odhiambo, 2008). A framework with more than two variables can improve the magnitude of the results (Odhiambo, 2009a).

A number of poverty proxies have been used, including household consumption expenditure, GDP per capita, infant mortality rate, and life expectancy, among other poverty proxies. Given limited time series data, this study employs household consumption expenditure (Pov1) and infant mortality rate (Pov2) as proxies for poverty that capture income and non-income dimensions of poverty, respectively. Two models are used, where Model 1 is expressed as Pov1|REM, GDPC, EDU; and Model 2 expressed as Pov2|REM, GDPC, EDU.

Definition of variables

Two poverty proxies are employed in this study, namely, household consumption expenditure and infant mortality rate. Household consumption expenditure is measured as a proportion of gross domestic product (GDP). A unidirectional causal relationship from poverty to remittance implies that high levels of household consumption expenditure cause more remittance inflow. The opposite is true if a unidirectional causal relationship flows from remittance to poverty. Thus, inflows of remittance increase household consumption expenditure and subsequently reduce poverty. Infant mortality rate is measured as number of infant deaths per 1000 live births. A unidirectional causality from poverty to remittance imply high infant mortality rate cause more remittance to flow, while a unidirectional causality from remittance to poverty implies that high remittance inflows are associated with low poverty levels.

Remittance is measured as a percentage of gross domestic product. This gives an advantage of taking the country size into account. Real GDP per capita measures economic development of a country, taking the population size into account. This gives a true picture of the living standards that are generally enjoyed by a country given the size of the population. The higher the per capita income, the better off are the people in the country, assuming there is income equality. Education is measured as gross enrolment at primary level. Given the limited data on secondary education enrolment figures from 1980, gross primary enrolment is used in this study to measure level of human capital. It is expected that high enrolment results in high quality labour that also commands a relatively high income. This income translates into high living standards, putting the poor in a better- off position.

Following Narayan and Smyth (2008), the ARDL-bounds specification for Models 1and 2 are given in Equations 1-4.

General Cointegration Model (Pov_m, REM, GDPC and EDU)

$$\Delta Pov_{mt} = \alpha_0 + \sum_{i=1}^{n} \alpha_1 \Delta Pov_{mt-i} + \sum_{t=0}^{n} \alpha_2 \Delta REM_{t-i} + \sum_{t=0}^{n} \alpha_3 \Delta GDP_{t-i} + \sum_{t=0}^{n} \alpha_4 \Delta EDU_{t-i} + \theta_1 Pov_{mt-1} + \theta_2 REM_{t-1} + \theta_3 EDU_{t-1} + \theta_4 GDP_{t-1} + \mu_{1t} \ldots\ldots\ldots\ldots\ldots (1)$$

$$\Delta REM_t = \alpha_0 + \sum_{i=0}^{n} \alpha_1 \Delta Pov_{mt-i} + \sum_{t=1}^{n} \alpha_2 \Delta REM_{t-i} + \sum_{t=0}^{n} \alpha_3 \Delta GDP_{t-i} + \sum_{t=0}^{n} \alpha_4 \Delta EDU_{t-i} + \theta_1 Pov_{mt-1} + \theta_2 REM_{t-1} + \theta_3 EDU_{t-1} + \theta_4 GDP_{t-1} + \mu_{1t} \ldots\ldots\ldots\ldots\ldots (2)$$

$$\Delta GDP_t = \alpha_0 + \sum_{i=0}^{n} \alpha_1 \Delta Pov_{mt-i} + \sum_{t=0}^{n} \alpha_2 \Delta REM_{t-i} + \sum_{t=1}^{n} \alpha_3 \Delta GDP_{t-i} + \sum_{t=0}^{n} \alpha_4 \Delta EDU_{t-i} + \theta_1 Pov_{mt-1} + \theta_2 REM_{t-1} + \theta_3 EDU_{t-1} + \theta_4 GDP_{t-1} + \mu_{1t} \ldots\ldots\ldots\ldots\ldots (3)$$

$$\Delta EDU_t = \alpha_0 + \sum_{i=0}^{n} \alpha_1 \Delta Pov_{mt-i} + \sum_{t=0}^{n} \alpha_2 \Delta REM_{t-i} + \sum_{t=0}^{n} \alpha_3 \Delta GDP_{t-i} + \sum_{t=1}^{n} \alpha_4 \Delta EDU_{t-i} + \theta_1 Pov_{mt-1} + \theta_2 REM_{t-1} + \theta_3 EDU + \theta_4 GDP_{t-1} + \mu_{1t} \ldots\ldots\ldots\ldots\ldots (4)$$

Where Pov_m assumes the position of Pov1 – household consumption expenditure in Model 1 when m = 1; and the position Pov2 – infant mortality rate in Model 2 when m = 2; and they enter in the equation one at a time, REM – remittance as a percentage of GDP; EDU – education, GDPC – real GDP per capita, α_1 is a constant, α_1 - α_4 and $\beta_1 - \beta_4$ are regression coefficients, and μ_{1t} is an error term.

Granger-Causality Model Specification

Following the cointegration test, the next step is testing for the direction of causality. This is done through the ECM-based Granger-causality model. The ECM-based causality models for Model 1 and Model 2 are given in Equation 5-8. The ECM-based causality test allows analysis of causality in the short run and in the long run. The short-run causality is tested using the F-statistic obtained from the variable deletion test, while the long run is obtained from the t-statistic on the lagged error correction term.

The General ECM-based Granger-causality model specifications are given in Equations 5-8.

$$Pov_{mt} = \alpha_0 + \sum_{i=1}^{n} \alpha_1 \Delta Pov_{mt-i} + \sum_{t=1}^{n} \alpha_2 \Delta REM_{t-i} + \sum_{t=1}^{n} \alpha_3 \Delta EDU_{t-i} + \sum_{t=1}^{n} \alpha_4 \Delta GDP_{t-i} + \theta_1 ECM_{t-1} + \mu_{1t} \quad (5)$$

$$REM_t = \alpha_0 + \sum_{i=1}^{n} \alpha_1 \Delta Pov_{mt-i} + \sum_{t=1}^{n} \alpha_2 \Delta REM_{t-i} + \sum_{t=1}^{n} \alpha_3 \Delta EDU_{t-i} + \sum_{t=1}^{n} \alpha_4 \Delta GDP_{t-i} + \theta_1 ECM_{t-1} + \mu_{2t} \quad (6)$$

$$GDP_t = \alpha_0 + \sum_{i=1}^{n} \alpha_1 \Delta Pov_{mt-i} + \sum_{t=1}^{n} \alpha_2 \Delta REM_{t-i} + \sum_{t=1}^{n} \alpha_3 \Delta EDU_{t-i} + \sum_{t=1}^{n} \alpha_4 \Delta GDP_{t-i} + \theta_1 ECM_{t-1} + \mu_{3t} \quad (7)$$

$$EDU_t = \alpha_0 + \sum_{i=1}^{n} \alpha_1 \Delta Pov_{mt-i} + \sum_{t=1}^{n} \alpha_2 \Delta REM_{t-i} + \sum_{t=1}^{n} \alpha_3 \Delta EDU_{t-i} + \sum_{t=1}^{n} \alpha_4 \Delta GDP_{t-i} + \theta_1 ECM_{t-1} + \mu_{4t} \quad (8)$$

Where α_0 is a constant, α_1 - α_3 and $\theta_1 - \theta_4$ are regression coefficients, $\mu_{1t} - \mu_{4t}$ are the error terms and all the other variables are as described in equations 1-4.

Data Sources

The study uses time-series data from 1980 to 2017 to investigate the causal relationship between remittance and poverty. Time series data on education, poverty proxies – infant mortality rate and household consumption expenditure – and gross domestic product were extracted from the World Bank Development Indicators. Remittance data was extracted from United Nations Conference on Trade and Development (UNCTAD) database. The analysis of the data is done using Microfit 5.0.

3.2 Empirical Results

Unit Root Test

Unit root tests are done on Pov1, Pov2, remittance (REM), real gross domestic product per capita (GDPC) and education (EDU). Although pretesting is not required when using the ARDL bounds testing approach, the test was done to ascertain the variables are integrated of order [I (1)] or integrated of order zero [I(0)]. ARDL can only be employed when variable are either [I (0)] or [I (1)] or fractionarily integrated (Pesaran *et al.*, 2001). The results of Dickey-Fuller Generalised Least Square (DF-GLS) and PPURoot unit root tests are presented in Table 2.

Table 1: Unit Root Test Results

DF-GLS Test					**PPURoot Test**			
Variable	**Stationarity of Variable in Levels**		**Stationarity of Variable in First Difference**		**Stationarity of all Variables in Levels**		**Stationarity of all Variables in First Difference**	
	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend
Pov1	-1.6113*	-2.8900***	–	–	-5.8455**	-6.1583***	–	–
Pov2	-0.7869	-12255**	–	–	-3.3657	-3.2152	-5.3584**	-5.6282**
REM	-0.4459	-2.8724	-3.9378***	-3.9736***	-6.4715***	-6.1904***	–	–
EDU	-1.0469	-1.2385	-5.2803***	-5.3785***	-7.1622***	-7.1136***	–	–
GDPC	-0.1560	-1.7040	-3.5096***	-4.0021***	-4.0192	-3.4146	-5.8828**	-6.3588***

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

The results presented in Table 1 confirm that all the variables are stationary, although there is variation of the stationarity level with some variable being stationary in levels and others in first difference. The next step is to test for cointegration. The variables included in the cointegration function are Pov1, Pov2, REM, GDPC and EDU. In Model 1, Pov1 is employed as a proxy for poverty, while in Model 2, Pov2 is used as a proxy for poverty. The rest of the variables remain the same in the two models. The cointegration results are presented in Table 2.

Table 2: ARDL Bound Test to Cointegration Results for Model 1 and 2

Dependent Variable	Function		F-Statistic		Cointegration Status	
Panel A: Model 1						
Pov1	F(Pov1|REM, GDPC,EDU)		5.7586***		Cointegrated	
REM	F(REM|Pov1,GDPC, EDU)		3.5764		Not Cointegrated	
GDPC	F(GDPC|Pov1,REM, EDU)		3.5924		Not Cointegrated	
EDU	F(EDU|Pov1, REM, GDPC)		3.7112		Not Cointegrated	
Panel B: Model 2						
Pov2	F(Pov2|REM, GDPC, EDU)		4.1092*		Cointegrated	
REM	F(REM|Pov2,GDPC, EDU)		1.7465		Not Cointegrated	
GDPC	F(GDPC|Pov2, REM, EDU)		2.0729		Not Cointegrated	
EDU	F(EDU|Pov2, REM, GDPC)		4.2242*		Cointegrated	
Asymptotic Critical Values (unrestricted intercept and no trend)						
Pesaran *et al*.(2001:300) critical values(Table CI(iii) Case III	1%		5%		10%	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
	4.29	5.61	3.23	4.35	2.72	3.77

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

The results in Table 2 confirm cointegration in some of the functions in Model 1 and Model 2. The calculated F-statistics are compared to critical values provided by Pesaran *et al.* (2001) critical values. If the calculated F-statistic is greater than the upper bound critical values, cointegration is confirmed, while if the F-statistic is below lower bound critical value, no cointegration is confirmed. The test is inconclusive when the F-statistics falls between the low bound and the upper bound provided by Pesaran *et al*. (2001). In Model 1, the presence of cointegration is confirmed only in the Pov1 function, while in Model 2, cointegration is confirmed in Pov2 and EDU functions. Cointegration is confirmed in the following functions: Model 1, F (Pov1|REM, GDPC, EDU; and Model 2, F (Pov2|REM, GDPC, EDU) and F (EDU|REM, GDPC, Pov2). The presence of cointegration shows causality at least in one direction (see Narayan and Smyth, 2008). To

determine the direction of causality the ECM-based causality test is employed. The results of the ECM-based causality test are reported in Table 3.

Table 3: ECM-Based Causality Results

	Panel A : Model 1				
Dependent Variable	**F-Statistics [Probability]**				**ECM t-statistics**
	ΔPov1	ΔREM	ΔGDPC	ΔEDU	
ΔPov1	-	0.2719[0.6060]	0.1984[0.6590]	3.7276*[0.0630]	-0.5906***[-4.3139]
ΔREM	1.1626[0.2910]	-	3.6941*[0.0660)	0.6394[0.4310]	-
ΔGDPC	0.05339[0.8190]	5.7840**[0.0220]	-	3.0017*[0.093]	-
ΔEDU	3.0273**[0.0390]	3.4905*[0.075]	0.0013[0.9720]	-	-
	Panel B: Mode1 2				
Dependent Variable	**F-Statistics**				**ECM t-statistics**
	ΔPov2	ΔREM	ΔGDPC	ΔEDU	
ΔPov2	-	0.1429[0.7090]	4.7429**[0.0390]	0.0071[0.9330]	-0.1375***[-4.1539]
ΔREM	5.6618**[0.025]	-	2.9177*[0.099]	1.1124[0.301]	-
ΔGDPC	3.9436*[0.0570]	0.03160[0.8600]	-	3.9100*[0.0580]	-
ΔEDU	7.4919**[0.0110]	0.2000[0.6580]	4.1469*[0.0510]	-	-0.6298**[-.1711]

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

The results presented in Table 3 confirm a unidirectional causality running from Pov1 (infant mortality rate) to remittance in the short run. This is confirmed by the F-statistics for the short-run causality which are significant at 10%. These results reveal that high infant mortality rate cause remittance to flow into South Africa. The possible explanation of this relationship in South Africa is the compelling effect that migrants have to help their families back home, especially when they are poor. The more the families are struggling, the more the migrants are likely to remit back home to relieve the financial challenges, according to the altruism and co-insurance motives for remitting money (Lucas and Stark, 1985:94; Depoo, 2014:203).These findings suggest a key role

that poverty levels play in harnessing remittances. When household consumption expenditure is used as proxy, no causality is confirmed in both the short run and the long run. Thus, the causality between poverty and remittance is sensitive to the proxy under consideration. The findings from this study compare favourably with other studies such as Muhammad *et al*. (2016) and Sanchez-Loor and Zambrano-Monserrate (2015).

Other empirical results presented in Table 3 Panel A reveal that in South Africa there is: (i) a unidirectional causality from education to real Gross domestic product per capita (GDPC) in the short run. This could be attributed to the high chances of an educated individual being highly productive and innovative, which positively impacts on GDP; (ii) there is bidirectional causality between education and Pov1 (household consumption expenditure) in the short run and a unidirectional causality from education to household consumption expenditure in the long run. These results are confirmed by the F-Statistics and the t-statistic on the lagged ECM respectively. The more individuals are educated, the higher are the chances of getting better paying jobs, which consequently increase income and positively affect consumption; (iii) bidirectional causality between GDPC and remittance in the short run; (iv) no causality household consumption expenditure (HHC) and GDPC in the short run and in the long run; (v) unidirectional causal relationship from remittance to education in the short run. This finding is supported in the theoretical proposition that remittance lead to increase in consumption and investment – in education and assets (see, Adam Jr and Page, 2005; Ratha, 2007; Bui *et al*., 2015).

Empirical results presented in Table 3, Panel B reveal that in South Africa there is: (i) no causality between remittance and education in the short run and the long run; (ii) GDPC cause remittance

in the short run as confirmed by the F-statistics that is significant at 10%; (iii) a bidirectional causality between GDPC and Pov1 (infant mortality rate) in the short run and a unidirectional causality from GDPC to infant mortality rate in the long run. The results are consistent with findings from Odhiambo (2009b) and Pradhan (2010) where economic growth was found to cause poverty reduction; (iv) bidirectional causality between GDPC and education in the short run and a unidirectional causality from GDPC to education in the long run; (v) unidirectional causality from Pov2 (infant mortality rate) to education in the short run and in the long run. These results suggest that with a high infant mortality rate, individuals are forced to get more education in order to reduce the deaths. A summary of the Granger-causality results is given in Table 4.

Table 4: Summary of Granger-Causality Results

	Causality	
	SR	**LR**
Model 1 (Pov1)	No causality	No causality
Model 2 (Pov2)	Pov2→REM	No causality

Notes: Pov1= household consumption expenditure; Pov2 = infant mortality rate

5. Conclusion and Recommendations

This study investigated the causal relationship between remittance inflows and poverty reduction in South Africa using data from 1980 to 2017. The study was motivated by the increasing role of remittance in poverty reduction and human development on the one hand, and the burgeoning inflow of remittance on the other hand. The study employed the ECM-based Granger-causality model to examine this linkage. In order to avoid the omission of variable bias, which has been found in some of the previous studies, real GDP and education variables have been used as control variables, thereby leading to a multivariate Granger causality mode. To improve robustness of the results, two poverty proxies have been employed; namely household consumption expenditure and infant mortality rate. The results from the study showed that when infant mortality rate was used as a proxy for poverty reduction, poverty was found to Granger-cause remittance inflows in the short run. However, when household consumption expenditure was used as a proxy, no causality was found to exist between poverty and remittance in South Africa. This applied irrespective of whether the estimation was conducted in the short run or in the long run. The study, therefore, concluded that the causal relationship between remittances and poverty in South Africa is sensitive to poverty proxy used to measure the level of poverty.

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