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Interest rate reforms and economic growth: the savings and investment channel

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Abstract

The 2008/2009 global financial crisis has re-ignited the debate around financial reforms with contrasting views with regards to the impact of financial reforms on economic growth. This study examines the impact of interest rate reforms on economic growth through savings and investments in SADC countries for the period 1990-2015. Three specifications are used for the analysis; the first one determines the influence of interest rate reforms on savings, the second one analyses the effect of savings on investments while the third one examines whether investments have a positive impact on economic growth. The Pooled Mean Group (PMG) estimation technique is employed for analysis. Furthermore, the ARDL bounds tests are conducted for the individual countries to test for cointegration. The results show that cointegration is detected in most countries for each one of the three specifications. Also, interest rate reforms have a positive impact on economic growth through savings and investments. The study therefore recommends that market forces should be allowed to determine real interest rates and furthermore, real interest rates maintained at artificially low levels may harm economic growth.

Key words: Interest rate reforms, economic growth, SADC, savings, investments, PMG

JEL classification: C50, E20, E62

Introduction

The global financial crisis of 2008/2009 has re-ignited the debate around the growth effects of financial reforms. Authorities worldwide have reduced interest rates to low levels in an attempt to boost aggregate demand and economic growth. Lower interest rates are also purported to increase investment levels by reducing borrowing costs. The recovery from the global financial crisis has been slow despite the lowering of interest rates as investments and economic growth rates continue to be at low levels in most parts of the world. According to the advocates of the Austrian school, like Kates (2010) and Templeman (2012), maintaining low interest rates during a crisis slows the recovery process.

The pioneers of the financial liberalization hypothesis, McKinnon (1973) and Shaw (1973) argued that financial reforms promote economic growth by encouraging savings and investments. Therefore, policies that keep interest rates at artificially low levels may have a negative impact on savings and

investments which are one of the major determinants of long-term economic growth as suggested by growth models of Harrod (1948), Domar (1948), Solow (1956), Swan (1956) and Romer (1986). Critics of the financial liberalisation hypothesis suggest that savings may not be responsive to higher interest rates and the rise in borrowing costs caused by interest rate reforms have a negative effect on investments (see Warman & Thirwall 1994, De Melo & Tybout 1986). Furthermore, financial reforms increase the likelihood of financial crises (Ang & McKibbin, 2007).

The purpose of this study is to examine the long-term impact of interest rate reforms on economic growth through savings and investments in SADC countries. The analysis involves estimating three specifications, the first of which analyses the impact of interest rate reforms on savings. The second specification investigates the link between savings and investments while the third surveys the effect of investments on economic growth. The period of the study is 1990-2015 and is selected to capture the period when most SADC countries had initiated financial reforms. The Pooled Mean Group (PMG) estimator proposed by Pesaran, Shin and Smith (1999) is used for the empirical analysis. Most studies on financial reforms and growth in African countries (see Odhiambo & Akinboade 2009, Odhiambo 2010, Akinboade & Kinfack 2013) focus on the link between interest rate reforms and financial development while a few studies examine the impact of interest rate liberalization on growth through savings and investments. Furthermore, the studies utilise time series techniques which are associated with issues of collinearity and simultaneity.

The outline of the study is as follows: Section two provides an overview of interest rate reforms in SADC countries as well as the trends in savings and investments. Section three discusses the existing literature while section four outlines the methodology of the study. Section five presents the empirical results and lastly, section six concludes the study.

2 Overview of interest rate reforms in SADC countries

Most of the countries in the SADC began a process of liberalising their financial sectors during the late 1980s and early '90s in line with the proposals of McKinnon and Shaw, so as to boost investment and economic growth levels (Mowatt, 2001). The liberalisation dates for selected SADC countries are shown on table 1. Prior to this liberalisation, most of these countries had repressed financial sectors with interest rates kept at negative rates by the state, exchange controls being employed, and financial institutions subject to portfolio restrictions (Nyawata & Bird 2004). Financial liberalisation in SADC involved increasing real interest rates to positive levels, allowing the market to allocate credit, strengthening prudential regulation and the supervision and restructuring of state-owned banks.

Table 1: Summary of liberalisation dates in SADC countries

Country	Interest rate liberalisation date	Financial liberalisation date
Botswana	1989	1989
Lesotho	1993	1988
Madagascar	1998	1994
Malawi	1988	1988
Mauritius	1981	1981
Namibia	1989	1991
Seychelles	1993	1993
South Africa	1980	1980
Swaziland	1996	1982
Tanzania	1992	1986
Zambia	1992	1992

According to World Bank (2016), real interest rates rose into positive territory in most SADC countries despite the obstacles of high inflation. In most countries savings and investments increased after the period of reforms as indicated which indicates that there could be a link between interest rate reforms and investments. The rise in savings and investments had a positive outcome on economic growth in most countries and in particular, Botswana and Mauritius. Due to a market-oriented economy, savings and investments have been high in Botswana, which has had a positive effect in increasing economic growth and propelling the country into middle-income territory with a high standard of living. Financial reforms initiated in Mauritius had a positive effect on real interest rates, savings, investments and economic growth, so the economy had the highest GDP per capita in the SADC region for the period 2000-'09 (Gorlach & Le Roux, 2015).

3 Literature review

The earlier empirical studies that tested the McKinnon and Shaw hypothesis such as Fry (1978) and Boskin (1978) concluded that interest rate liberalisation has a positive effect on savings and economic growth. On the other hand, Giovannini (1983) found that interest rates have an insignificant impact on savings. Studies by Gupta (1986, 1987), Athukorala and Rajapatirana (1993) and Athukorala (1998) suggested that higher interest rate enhance savings in Asian countries. According to De Melo and Tybout (1986) and Warman and Thirlwall (1994), in Latin American countries there is an insignificant relationship between interest rates and savings. Khan and Hassan (1998) as well as Laumas (1980) suggest that the positive impact of interest rates on savings outweighs the negative impact of a rise in borrowing costs. Achy (2003) suggests that interest rates have a positive impact on savings, investments and growth in MENA countries.

The more recent studies also imply that the effect of interest rates on savings, investments and growth is still inconclusive. Romero-Ávila (2009) concluded that the growth effects of interest rate liberalisation are 0.3% per year in EU-15 countries. Shrestha and Chowdhury (2007), Kargbo (2010)

and Mottelle and Masenyetse (2012) found evidence supporting the McKinnon and Shaw hypothesis in Nepal, Sierra Leone and Lesotho respectively. Bouzid (2012) found that McKinnon's complementary hypothesis holds for Algeria and not Morocco and Tunisia. Boadi, Li and Lartey (2015) and Opoku and Ackah (2015) found that savings are responsive to interest rates in Ghana in both the short-run and the long-run. In contrast, Owusu and Odhiambo (2015) concluded that financial reforms have an insignificant impact on economic growth in Ghana, however, capital accumulation is positively associated with economic growth.

Orji, Ogbuabor and Anthony-Orji (2015) as well as Obamuyi and Olaeranfemi (2011) concluded that financial reforms including interest rate liberalisation have a positive impact on economic growth in Nigeria. However, Obamuyi and Olaeranfemi (2011) suggest that savings have a negative impact on growth, implying that the positive influence of interest rate liberalisation on growth is through another channel. Orji, Eigbirenmolen and Ogbuabor (2014) found that the real interest rate and savings have a positive impact on investments in Nigeria. Hye & Wizarat (2013) reported that the real interest rate together with financial liberalisation have a negative effect on economic growth in a study of the effect of financial liberalisation on economic growth in Pakistan. The results also suggest that investments have a positive effect on economic growth.

4 Data and methodology

A description of all the variables used in the study is provided on table 2. The data on the variables is obtained from the World Bank's world development indicators and the International Monetary Fund (IMF). The data covers the period 1990-2015 and 11¹ of the 15 SADC countries were selected due to the unavailability of data for Angola, DRC, Mozambique and Zimbabwe.

4.1 Descriptive statistics

Table 3 presents the descriptive statistics. Savings and investment ratios average 20.46% and 24.86% respectively, which are lower than the targets set by the SADC region. Savings and investments are crucial for higher economic growth and job creation and, as such, targets of 35% for savings and 30% for investments have been set. The averages for the savings and investment ratio in the SADC region are lower than in other emerging countries. According to the IMF (2016), the savings ratio averaged close to 37% in emerging and developing countries in Asia, 28% in the ASEAN Five countries and just over 31% in the Middle East and North African countries between 1990 and 2015. The investment ratio in emerging and developing Asian countries averages close to 36%, while those in ASEAN and the

¹ Botswana, Lesotho, Madagascar, Malawi, Mauritius, Namibia, Seychelles, South Africa, Swaziland, Tanzania and Zambia

Middle East and North African countries are 29% and 26% respectively. The GDP growth rate averages just below 4%, which is lower than the target of 7%.

Table 2: Description of the data

Variable	description
GDP	annual percentage growth rate of GDP at market prices
SAV	GDP less consumption expenditure as a percentage of GDP
INVS	gross fixed capital formation as a percentage of GDP
RINT	lending rate minus inflation (real interest rate)
RDEP	deposit rate minus inflation (real deposit rate)
CRED	domestic credit to the private sector as a percentage of GDP
GDPC	GDP per capita growth
TRA	sum of exports and imports as a percentage of GDP
GOV	current government purchases of goods and services as a percentage of GDP
AGE	ratio of people younger than 15 and older than 64 as a ratio of the working age population
INF	annual percentages of consumer prices
FDI	foreign direct investments net inflows as a percentage of GDP

Source: World Bank (2016), IMF (2016)

The mean for the real deposit rate is -0.82%, which could be one of the reasons for the low savings ratio. The major reason for the negative real deposit rate is the long history of high inflation in SADC countries. Inflation averaged 12.49% over the period under consideration – higher than the mean value of the deposit rate.

Table 3: Descriptive statistics

Variable	mean	maximum	minimum	std. dev.	observations
SAV	20.46	51.05	-3.14	11.40	286
INVS	24.86	69.03	4.56	10.84	286
RDEP	-0.82	15.54	-117.23	10.72	276
AGE	76.53	103.82	40.62	18.59	286
INF	12.59	183.31	-9.62	18.57	281
CRED	31.76	160.12	3.09	36.47	282
TRA	95.78	225.02	33.49	44.94	276
GOV	19.77	47.19	6.71	8.22	277
GDP	3.97	21.02	-12.67	3.61	285
GDPC	1.91	16.96	-15.28	3.60	285
RINT	7.99	52.10	-41.79	10.34	279
FDI	4.08	54.06	-6.90	5.84	285

Source: Researcher's own computations

Income growth as measured by GDP per capita growth averages a low 1.91%. Developing countries have had a history of low incomes, which is one of the reasons for low savings rates, as a large proportion of the income is used for subsistence consumption. The mean value for trade as percentage of GDP is close to 96%, indicating high levels of trade openness among SADC countries. Government expenditure and credit to the private sector as a percentage of GDP average 19.77% and 31.76% respectively. The mean values for the age dependency rate and the real interest rate are 76.53% and 7.99% respectively, while FDI inflows as a percentage of GDP average 4.08%.

4.2 Correlation analysis

The Spearman's rank order test is selected for correlation analysis in this study because it does not make assumptions with regard to the distribution of the variables (Hauke & Kossowski, 2011). Tables 4 to 6 show the results of the correlation analysis. According to table 4, savings are positively correlated with income growth and significant at the 1% level of significance. Age dependency is correlated negatively with savings, which is in line with theoretical expectations. The real deposit rate is correlated negatively with savings. However, the result is insignificant.

Table 4: Correlation analysis: interest rate liberalisation and savings

Variable	GDP	AGE	RDEP	SAV
GDP	1			
AGE	-0.11*	1		
RDEP	0.01	-0.27***	1	
SAV	0.35***	-0.23***	-0.002	1

Source: Researcher's own computations. Note: (*) , (**) and (*) indicate significance at 1% , 5% and 10% level of significance respectively**

According to table 5, investments are highly correlated with savings and significant at 1% level of significance which is in line with *a priori* expectations. Investments are correlated positively with credit to the private sector, which implies that financial development and investments are positively associated. Investments and the real interest rate are correlated negatively, although insignificantly. FDI and investments are correlated positively.

Table 5: Correlation analysis: savings and investment

Variable	INVS	SAV	CRED	RINT	FDI
INVS	1				
SAV	0.68***	1			
CRED	0.13**	0.18***	1		
RINT	-0.05	-0.13***	-0.22***	1	
FDI	0.36***	0.07	-0.15**	0.10*	1

Source: Researcher's own computations. Note: (*) , (**) and (*) indicate significance at 1% , 5% and 10% level of significance respectively.**

Table 6: Correlation analysis: investment and economic growth

Variable	GDPG	GOV	INF	INVS	TRADE
GDPG	1				
GOV	-0.02	1			
INF	-0.11*	-0.25***	1		
INVS	0.25***	0.51***	-0.27***	1	
TRA	-0.03	0.46***	-0.20***	0.45***	1

Source: Researcher's own computations. Note: (*) , (**) and (*) indicate significance at 1% , 5% and 10% level of significance respectively**

According to table 6 the growth rate of GDP is positively correlated with investments. This confirms *a priori* expectations, as investments are regarded as one of the major determinants of economic growth. Inflation and government expenditure are correlated negatively with GDP, with GDP significant at 10%. GDP is negatively correlated with trade, however, the result is insignificant. Tables 6 to 8 show no strong correlations between variables. The correlations are lower than 0.8, which implies that multicollinearity is not a problem, as suggested by Gujarati & Porter (2009).

4.3 Unit root testing

Table 7: Unit root tests. Intercept only

Variable	LLC		IPS	
	levels	1st difference	levels	1st difference
CRED	-1.48*	-7.43**	-0.37	-7.24***
GDPG	-1.43*	-7.68***	-6.05***	-14.55***
AGE	-2.97***	-2.16**	1.30	-3.91***
SAV	-1.31*	-14.63***	-2.64***	-14.77***
TRA	-1.36*	-8.31***	-1.43*	-8.92***
GDP	-1.61*	-8.31***	-6.01***	-14.83***
INVS	-0.58	-4.16***	-0.43	-8.13***
GOV	-2.34***	-14.63***	-2.64***	-14.09***
INF	-5.96***	-16.15***	-4.82***	-15.32***
RDEP	-4.86***	-9.74***	-5.76***	-11.17***
FDI	-2.78***	-11.16***	-3.16***	-13.25***
RINT	-2.70***	-9.93***	-4.47***	-12.31***

Source: Researcher's own computations

Unit root tests are conducted in the study to determine whether there are any variables integrated of order two which are not ideal for ARDL estimations. The study utilises the Im, Pesaran & Shin (2003) (IPS) and the Levin, Lin & Chu (2002) (LLC) unit root tests. Tables 7 and 8 show the order of integration of the variables in the study. The results on table 7 include an individual intercept only,

while those on table 8 contain an individual intercept and trend. The variables are either stationary in levels or at first difference and, due to the different orders of integration, the PMG model is appropriate for the analysis. There are also no variables integrated of order two.

Table 8: Unit root tests. With trend and intercept

Variable	LLC		IPS	
	levels	1st difference	levels	1st difference
CRED	-3.13***	-6.84***	-1.21	-6.20***
GDP	0.40	-4.87***	-4.42	-12.78***
AGE	-0.48	-3.81***	0.47	-1.78**
SAV	0.13	-12.39***	-0.95	-13.00***
TRA	-0.25	-6.86***	-0.94	-7.44***
GDP	0.12	-5.66***	-4.92***	-13.08***
INVS	1.37	-2.14**	0.26	-6.18***
GOV	0.41	-1.80**	-1.47*	-10.43***
INF	-7.04***	-14.11***	-5.71***	-13.64***
RDEP	-4.21***	-7.02***	-4.40***	-9.07***
FDI	-3.04***	-9.01***	-4.63***	-11.29***
RINT	-3.36***	-7.52***	-4.03***	-10.26***

Source: Researcher's own computation

4.4 Methodology

The study examines the link between interest rate reforms, savings, investments and economic growth. The analysis follows an approach similar to that of Achy (2003) and Strestha & Chowdury (2007). In particular this study uses three specifications, where the first equation surveys the relationship between interest rate liberalisation and gross domestic savings. The effect of interest rate liberalisation on investments through savings is examined by the second equation, while the third equation observes the effect of interest rate liberalisation on economic growth through investments. The study employs the PMG estimator developed by Pesaran *et al* (1999). This technique involves pooling and averaging of individual estimates across groups so that the intercept and short-run slope coefficients and the error variance are assumed to differ across units while the long-run coefficients are constrained to be similar across groups.

The PMG estimator for a dynamic panel data model can be specified by extending the single time series ARDL model as follows:

$$y_{it} = \sum_{j=1}^p \lambda_j y_{i,t-j} + \sum_{j=0}^q x_{i,t-j} \delta_{ij} + \alpha_i + \varepsilon_{it}, \quad t = 1, 2, \dots, T, \quad i = 1, 2, \dots, N \quad (1)$$

where α_i represents the fixed effects, x_{it} is a vector of explanatory variables, λ_{ij} and δ_{ij} are vectors of parameters.

The error correction form of the above equation is:

$$\Delta y_{it} = \phi_i y_{i,t-1} + x_{it} \beta_i + \sum_{j=1}^{p-1} \lambda_{ij}^* \Delta y_{i,t-1} + \sum_{j=0}^{q-1} \Delta x_{i,t-j} \delta_{ij}^* + \mu_i + \varepsilon_{it} \quad (2)$$

where:

$$\phi_i = -(1 - \sum_{j=1}^p \lambda_{ij}) \text{ and } \beta_i = \sum_{j=0}^q \delta_{ij}$$

The long-run relationship between savings, real deposit rate, age dependency and GDP per capita is specified in the form:

$$SAV_{it} = \beta_{0i} + \beta_{1i} RDEP_{it} + \beta_{2i} AGE_{it} + \beta_{3i} GDP_{it} + \mu_i + \varepsilon_{it} \quad (3)$$

where: μ_i is the country-specific effect and ε_{it} is the error term

The GDP per capita growth captures the effect of income on savings. According to the life-cycle hypothesis, higher income levels enhance savings as individuals in the labour force increase savings relative to those out of the labour force (Kargbo, 2010). However, the effect of income on savings would be insignificant if income levels are low and people spend most of their incomes on necessities (Opoku & Ackah, 2015). Age dependency ratio represents the effect of demographics on the saving rate and is expected to be negatively correlated with savings (Ang & Sen, 2011). In countries where age dependency ratios are high, the effect of income on savings would mostly likely be insignificant (Khan & Hasan, 1998) (Achy 2003).

The long-run relationship between investments, credit to the private sector, FDI and real lending rates and savings is specified as follows:

$$INV_{it} = \alpha_{0i} + \alpha_{1i} CRED_{it} + \alpha_{2i} RINT_{it} + \alpha_{3i} SAV_{it} + \alpha_{4i} FDI_{it} + \mu_i + \varepsilon_{it} \quad (4)$$

The real interest rate is expected to have a negative effect on investments due to higher borrowing costs that are associated with higher lending rates (Shrestha & Chowdhury, 2007). The availability of credit to the private sector encourages entrepreneurs to innovate and make investments that enable more production of goods and services (Bittencourt, 2010). Credit to the private sector is often used as an indicator of financial development. A developed financial sector has a positive effect on the quantity as well as the quality of investment (Levine, 2001).

The long-run relationship between interest rate liberalisation and economic growth is specified as follows:

$$GDPG_{it} = \gamma_{0i} + \gamma_{1i}GOV_{it} + \gamma_{2i}INV_{it} + \gamma_{3i}TR_{it} + \gamma_{4i}INF_{it} + \mu_i + \varepsilon_{it} \quad (5)$$

Government expenditures may crowd out private investments by increasing the interest rate (Bonfiglioli, 2005). However, government expenditures in the provision of public services to the economy can complement private investment and hence increase economic growth. So the variable can possess either a positive or a negative coefficient. The inflation rate is an indication of the level of macroeconomic instability in a country and is expected to be negatively related to economic growth (Misati & Nyamongo, 2012). Trade openness may improve efficiency in an economy by promoting product specialisation, as specified by the theory of comparative advantage (Bonfiglioli, 2005). Trade also provides a larger market for domestic output, increases competition and provides producers with access to a variety of capital goods which may enhance productivity. However, as postulated by Ahmed and Suardi (2009) trade liberalisation has a positive influence on economic growth if an economy's export structure is diversified. So the effect of trade openness on economic growth is ambiguous.

The PMG technique assumes that variables have long-run relationship. So prior to estimating a model using the estimator, tests of cointegration are required. The study uses the ARDL bounds testing approach developed by Pesaran, Shin & Smith (2001). The test can be used irrespective of whether variables are purely I(1), I(0) or a mixture of variables of different orders of integration. However, the technique cannot be used in the presence of I(2) variables. The null of no long-run relationship is tested against the alternative hypothesis using the Wald test (F-statistic). ARDL models are thus estimated for individual countries in the study prior to estimation by the PMG model an approach similar to that of Pesaran *et al* (1999). Diagnostic tests are performed on the ARDL bounds testing results for individual countries to determine the adequacy of the model. The tests include the Breusch (1978)-Godfrey (1978) LM test for autocorrelation, the Breusch & Pagan (1979) test of heteroscedasticity, as well as the Ramsey (1969) reset test for model stability.

5 Empirical results

This section discusses the empirical results of the study. The results are presented in three sections, one for each estimated model. The study uses a single lag, as proposed by Pesaran *et al* (1999), who argue that the coefficients of a model estimated by the PMG estimator are robust to the choice of lag order when T is large. In the individual ARDL models estimated, the null of no long-run relationship is rejected in most countries in panel. Furthermore, most of the individual ARDL models pass the diagnostic tests of serial correlation, heteroscedasticity and model misspecification, which signals that the analysis may proceed to estimating the PMG model. More detail is provided on these results in the appendix. In all the models estimated the Hausman tests suggests that the PMG model is the most

appropriate model and as a result forms the basis for the interpretations of the slope coefficients. Most of the short-run coefficients are insignificant and therefore, are omitted from the analysis. The MG and DFE models are shown for comparison purposes.

5.1 Interest rate reforms and savings

Table 9 reports the results of the PMG model together with those of the MG and DFE estimation techniques. The adjustment coefficients show the speed adjustment from the short run to the long run and, as expected, they are negative and statistically significant at the 1% level in all the models. The adjustment coefficients range from -0.36 in the DFE model to -0.52 in the MG model. So the results confirm *a priori* that the MG estimator error correction indicates faster adjustment compared with the PMG and DFE error correction estimates (Pesaran *et al*, 1999). The adjustment coefficient of the PMG model suggests that 42% of the disequilibrium in the short-run is corrected in the long-run.

Table 9: Empirical results: PMG, MG and DFE. Dependent variable: Savings

Variable	PMG	MG	Hausman test	DFE
adjustment coefficient	-0.42*** (0.06)	-0.52*** (0.06)		-0.36*** (0.05)
long-run coefficients			2.18 [0.53]	
GDP	1.55*** (0.26)	1.28* (0.74)		1.50*** (0.41)
AGE	0.36*** (0.12)	0.09 (0.57)		0.12 (0.14)
RDEP	0.30*** (0.11)	-0.003 (0.26)		0.18 (0.19)

Source: Researcher's own computations. Note: (*), () and (***) indicate 10%, 5% and 1% significance level, respectively. Figures in parentheses () are standard errors, figures in parentheses [] are p-values.**

The long-run slope coefficients are all positive and significant at the 1% level. The real deposit rate has a positive effect on savings. The result lends support to the McKinnon and Shaw hypothesis and squares well with those of Strestha & Chowdury (2007), Boardi *et al* (2015), Opuku & Ackah (2015), Kargbo (2010) and Mottelle & Masenyetse (2012). Income captured by GDP per capita growth affects savings positively. The income coefficient is significant in all three models which confirms *a priori* expectations, as higher incomes are expected to increase savings. The result is in line with those of Bandiera *et al* (2000), Kargbo (2010) and Ang & Sen (2011). Age dependency has a positive effect on savings in SADC countries. This is against *a priori* expectations, as higher age dependency rates are

associated with lower savings rates (Achy, 2003; Ang & Sen, 2011). A close inspection of the data reveals that a number of countries achieved higher savings rates during the period when age dependency rates were at their highest. A study by Keho (2012) reported that age dependency has a positive and significant influence on savings in Cameroon, Zambia, Kenya, Sierra Leone and Niger. According to these results, income is the most important long-run determinant of savings in SADC countries.

5.2 Savings and investments

The long-run and short-run results of the relationship between interest rate liberalisation and investments are shown in Table 10. The adjustment coefficients range from -0.18 for the DFE model to -0.48 for the MG estimator. The real interest rate has a negative but insignificant effect on investments. The result is consistent in all three models and confirms the findings of Shrestha & Chowdhury (2007), who report an insignificant influence of the real lending rate on investments in Nepal. Savings have a positive and statistically significant effect on investments in all three models, which confirms theoretical expectations, as savings increase the availability of funds for investment purposes. The result is in line with the findings of Athukorala (1998), Shrestha & Chowdhury (2007) and Orji *et al* (2014), who found that savings play a crucial role in determining investments.

Table 10: Empirical results: PMG, MG and DFE. Dependent variable: investments

Variable	PMGE	MG	Hausman test	DFE
adjustment coefficient	-0.29 (-4.18)***	-0.48 (-4.58)***		-0.18 (-4.51)***
long-run coefficients			1.58 [0.81]	
SAV	0.31 (3.09)***	0.31 (1.80)*		0.60 (2.84)***
CRED	0.09 (3.38)***	0.60 (1.40)		0.08 (0.52)
RINT	-0.001 (-0.01)	1.18 (0.94)		-0.16 (-0.74)
FDI	0.01 (0.05)	-0.23 (-0.51)		0.18 (0.53)

Source: Researcher's own computations. Note: (*) and (**) indicate 1% and 5% significance level, respectively. Figures in parentheses () are T-statistics, figures in parentheses [] are p-values.**

The significant relationship between savings and investments provides further support for McKinnon's complementary hypothesis, as higher real interest rates (real deposit rates) have a positive effect on investments through higher savings. According to the results, the positive effect of higher deposit rates

outweighs the negative effect of higher real lending rates on investments, which supports the findings of Athukorala (1998) and Shrestha & Chowdhury (2007).

Financial development has a positive and statistically significant influence on investments in the long run, a result which confirms *a priori* expectations. According to McKinnon (1973) and Levine (1997, 2001) financial development is expected to have a positive effect on investments. FDI inflows have a positive but insignificant effect on investments in the long run, which suggests that foreign investments do not supplement domestic investments in the SADC region.

5.3 Investments and economic growth

Table 11 presents the results of the PMG, MG and DFE models. The long-run results suggest that investments have a positive effect on economic growth and the coefficient is significant at the 1% level. The result confirms *a priori* expectations, as investments are viewed as one of the main drivers of economic growth. The result provides support for the McKinnon and Shaw hypothesis, as higher real interest rates (real deposit rates) have a positive effect on savings, which in turn lead to higher investment levels. Higher investment levels are then translated to faster economic growth. The results are in line with those of Hye & Wizarat (2013) and Orji *et al* (2015).

Table 11: Empirical results: PMG, MG and DFE. Dependent variable: GDP growth

Variable	PMG	MG	Hausman test	DFE
adjustment coefficient	-0.80*** (0.10)	-1.09*** (0.08)		-1.05*** (0.06)
long-run coefficients			1.75 [0.78]	
INVS	0.14*** (0.02)	0.09 (0.07)		0.07*** (0.03)
TRA	-0.02*** (0.01)	0.02 (0.03)		0.0008 (0.01)
GOV	-0.17*** (0.05)	-0.32*** (0.10)		-0.08 (0.07)
INF	-0.02* (0.01)	-0.10 (0.07)		-0.05*** (0.01)

Source: Researcher's own computations. Note: (*), () and (***) indicate 10%, 5% and 1% significance level, respectively. Figures in parentheses () are T-statistics, figures in parentheses [] are p-values.**

Trade has a negative long-run effect on economic growth and the coefficient is significant at the 1% level. The results square well with those of Moyo and Khobai (2018), Ahmed (2013) and Yanikkaya

(2003), who report that trade openness is detrimental to economic growth in developing countries. According to Ahmed & Suardi (2009), trade has a positive effect on economic growth if the export structure is diversified. However, most SADC countries export mostly primary products and fewer manufactured goods (Hausman, Hwang & Rodrik, 2006).

Government expenditure has a negative and significant influence on economic growth. The results are in line with the findings of Misati & Nyamongo (2012), Gorchach & Le Roux (2015) and Le Roux & Moyo (2015). Government expenditures could crowd out investments, one of the main drivers of economic growth. Inflation has a negative effect on economic growth, as expected, and the coefficient is significant at 10% level. The result squares well with those of Ahmed (2013), Misati & Nyamongo (2012) and Owusu & Odhiambo (2015). SADC countries have had a history of high inflation, which has often hindered economic growth.

6 Conclusion and policy recommendations

The chapter provided an empirical analysis of the effect of interest rate liberalisation on economic growth in SADC countries for the period 1990-2015. The analysis sought to determine whether the effect of interest rate on economic growth is through savings and investments. The PMG was used for the analysis, involving three specifications. The chapter first examined the effect of higher real deposit rates on savings. This was followed by the analysis of the relationship between savings and investments, and lastly the effect of investments on economic growth.

The results reveal that higher real deposit rates have a positive and significant effect on savings, in line with the proposition by McKinnon (1973) and Shaw (1973). Savings are crucial for investments in both the long and short run while the real interest rate has an insignificant effect on investments in both the long and short run, signalling that the rise in borrowing costs does not play much of a role in determining investments. The result suggests that the effect of higher deposit rates outweighs the negative effect of higher borrowing costs. Investments are positively related correlated with economic growth in the long run, which confirms theoretical expectations that investments are one of the main drivers of economic growth. Inflation, government expenditure and trade openness have a negative effect on economic growth. The results therefore imply that interest rate liberalisation has a positive effect on economic growth through savings and investments. Lower interest rates used to boost economic growth result in a decrease in savings and investments, which are the main drivers of long-term growth.

The conclusions drawn from the study have policy implications for the SADC region. The main driver of economic growth in the long run is investments, so policies that boost investments like savings are a necessity. High savings rates would also minimise the dependence of the region on the foreign capital inflows that are required alleviate the shortage of funds for investment purposes. Measures should be introduced to reduce inflation rates which are detrimental to economic growth. Government expenditure

has to be confined to areas that will boost economic growth, for instance investment in infrastructure, instead of wasteful activities that reduce economic growth. Diversifying the export structure should be one of the goals of policy-makers. Trade openness has a positive effect on economic growth in economies with a diversified export structure. Furthermore, trade openness might be hurting domestic industries in the region, and so having a negative influence on economic growth.

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Appendix

ARDL bounds testing results. Dependent variable: Savings

Country	F-stat	critical values					
		1%		5%		10%	
		I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
Botswana	11.52****	4.29	5.61	3.23	4.35	2.72	3.77
Lesotho	8.94****	4.29	5.61	3.23	4.35	2.72	3.77
Madagascar	6.61***	4.29	5.61	3.23	4.35	2.72	3.77
Malawi	5.13**	4.29	5.61	3.23	4.35	2.72	3.77
Mauritius	2.11	4.29	5.61	3.23	4.35	2.72	3.77
Namibia	5.37****	4.29	5.61	3.23	4.35	2.72	3.77
Seychelles	5.14**	4.29	5.61	3.23	4.35	2.72	3.77
South Africa	7.16****	4.29	5.61	3.23	4.35	2.72	3.77
Swaziland	4.12*	4.29	5.61	3.23	4.35	2.72	3.77
Tanzania	2.23	4.29	5.61	3.23	4.35	2.72	3.77
Zambia	8.67****	4.29	5.61	3.23	4.35	2.72	3.77

Source: Researcher's own computations

Diagnostic tests. Dependent variable: savings

Country	serial correlation	heteroscedasticity	Ramsey's reset test
Botswana	0.01	4.39**	0.22
Lesotho	0.02	0.33	0.14
Madagascar	1.42	1.02	3.37*
Malawi	0.004	3.64*	7.93****
Mauritius	1.72	1.90	0.05
Namibia	7.50****	0.04	0.46
Seychelles	6.40****	0.11	0.73
South Africa	1.40	0.33	0.12
Swaziland	1.65	0.08	1.58
Tanzania	0.27	0.14	2.28
Zambia	2.23*	1.97	16.51****

Source: Researcher's own computations. Note: (****), (**) and (*) indicate significance at 1%, 5% and 10% levels of significance respectively.

ARDL bounds testing results: Dependent variable: investments

Country	F-stat	critical values					
		1%		5%		10%	
		I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
Botswana	7.80***	3.74	5.06	2.86	4.01	2.45	3.52
Lesotho	4.39**	3.74	5.06	2.86	4.01	2.45	3.52
Madagascar	13.22***	3.74	5.06	2.86	4.01	2.45	3.52
Malawi	0.78	3.74	5.06	2.86	4.01	2.45	3.52
Mauritius	4.55**	3.74	5.06	2.86	4.01	2.45	3.52
Namibia	0.83	3.74	5.06	2.86	4.01	2.45	3.52
Seychelles	5.31***	3.74	5.06	2.86	4.01	2.45	3.52
South Africa	4.50**	3.74	5.06	2.86	4.01	2.45	3.52
Swaziland	0.36	3.74	5.06	2.86	4.01	2.45	3.52
Tanzania	5.72***	3.74	5.06	2.86	4.01	2.45	3.52
Zambia	4.23**	3.74	5.06	2.86	4.01	2.45	3.52

Source: Researcher's own computations

Diagnostic tests: Dependent variable: investments

Country	serial correlation test	heteroscedasticity test	Ramsey's reset test
Botswana	2.56	0.01	1.36
Lesotho	13.30***	1.79	0.71
Madagascar	1.62	4.54**	5.93***
Malawi	2.60	0.07	1.51
Mauritius	1.09	0.92	4.19**
Namibia	2.41	1.65	0.66
Seychelles	0.58	0.47	0.47
South Africa	2.65	0.53	1.52
Swaziland	9.98***	0.10	2.62*
Tanzania	3.25*	0.16	1.49
Zambia	0.33	1.85	1.61

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels of significance respectively.

ARDL bounds testing result. Dependent variable: GDP growth

Country	F-stat	critical values					
		1%		5%		10%	
		I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
Botswana	9.00***	3.74	5.06	2.86	4.01	2.45	3.52
Lesotho	4.66**	3.74	5.06	2.86	4.01	2.45	3.52
Madagascar	6.64***	3.74	5.06	2.86	4.01	2.45	3.52
Malawi	22.74***	3.74	5.06	2.86	4.01	2.45	3.52
Mauritius	8.62***	3.74	5.06	2.86	4.01	2.45	3.52
Namibia	6.14***	3.74	5.06	2.86	4.01	2.45	3.52
Seychelles	5.01**	3.74	5.06	2.86	4.01	2.45	3.52
South Africa	4.21**	3.74	5.06	2.86	4.01	2.45	3.52
Swaziland	4.38**	3.74	5.06	2.86	4.01	2.45	3.52
Tanzania	15.08***	3.74	5.06	2.86	4.01	2.45	3.52
Zambia	11.22***	3.74	5.06	2.86	4.01	2.45	3.52

Source: Researcher's own computations

Diagnostic tests. Dependent variable: GDP growth

Country	serial correlation	heteroscedasticity	reset test
Botswana	0.56	0.52	2.90*
Lesotho	1.83	0.53	2.59
Madagascar	0.04	3.00	15.41***
Malawi	1.50	0.07	0.18
Mauritius	7.64**	7.06**	0.01
Namibia	1.96	0.20	0.73
Seychelles	0.19	1.11	0.76
South Africa	0.05	0.79	0.74
Swaziland	1.66	0.02	1.76
Tanzania	2.72*	0.00	0.83
Zambia	0.89	0.06	1.58

Source: Researcher's own computations. Note: (***), (**) and (*) indicate significance at 1%, 5% and 10% levels of significance respectively.