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Savings, investment and economic growth in Lesotho: An empirical analysis

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This paper empirically examines the relationship among saving, investment and economic growth in Lesotho for the period 1970 to 2012, with a view to contributing to the body of literature on this topic and informing economic policy design in Lesotho. Using autoregressive distributed lag (ARDL) bounds testing approach to cointegration and vector error correction model (VECM) based Granger causality test; the paper finds the existence of cointegration among the variables and short-run causal flow from economic growth to saving. However, in the long-run, the paper provides evidence of Granger causality from saving to economic growth. Furthermore, the results indicate the existence of short-term and long-term Granger causality from saving to investment in addition to short-term and long-term causal flow from investment to economic growth. The findings not only suggest that saving precedes and drives short-term and long-term capital accumulation but also contributes to long-term economic growth in Lesotho. In addition, there is empirical evidence for investment-led growth. Therefore, increased capital accumulation is likely to contribute to enhancing sustainable economic growth.

Key words: Savings, investment, economic growth, ARDL bound testing, Lesotho, Granger causality.

INTRODUCTION

Economic growth is a key indicator of societal progress. In this regard, countries around the globe strive to achieve higher economic growth in order to provide higher standard of living for their citizens. Nevertheless, low saving rates have been identified as one of the major growth-inhibiting factors among countries in the world, especially in developing countries such as Lesotho. This is because as postulated by the classical economists, increased saving is likely to lead to increased investment, which is a key to promoting long-run economic growth. Therefore, a sound understanding of the interaction

among saving, investment and economic growth in a country's economy is important for the achievement of macroeconomic policy conducive to sustainable economic growth and hence higher standard of living of citizens.

There are numerous empirical studies in the literature that examine the direction of causality among saving, investment and economic growth. This is on account of the important policy implications that can be derived from this relationship regarding the course of action that can be done to accelerate economic growth since saving and

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investment are two key macroeconomic variables with micro foundations for achieving price stability, promoting employment and consequently contributing to economic growth (Hundie, 2014; Mehta and Rami, 2014). In spite of wide discussion in the literature, the issue of the linkage among these variables still remains ambiguous with some studies supporting the classical growth theory that saving promotes economic growth while others support Carroll-Weil hypothesis. However, in the context of Lesotho, there are very few empirical studies that relate saving, investment and economic growth, and those that do commonly over-rely on a bivariate Granger causality separately between saving and economic growth, or between saving and investment, which may suffer from the omission of variable bias.

The current study joins the debate into the inquiry of the direction of causality among saving, investment and economic growth in the context of Lesotho by using autoregressive distributed lag (ARDL) bounds testing approach to cointegration and the Granger causality framework based on a trivariate error correction model, with a view to contributing to the body of literature on this topic. In addition, knowledge about the relationship among these three variables is important in terms of guiding economic policy making in Lesotho. Lesotho provides a unique perspective on this issue, being a small less developed country with uncompetitive domestic financial markets and the low level of financial intermediation to channel saving into investment. In addition, the economy experienced relatively low growth rate averaging 4.4% p.a. growth in real Gross Domestic Product (GDP) for the ten years to 31st December 2012 and relies heavily on external sources of revenue such as Southern African Customs Union (SACU) revenue which contributes more than 50% of its total revenue, and royalties from transfer of water resources to South Africa (SA) as well as mineworkers' remittances from SA. On the other hand, investment promises to be the main pillar of the country's productivity as it averaged about 42 % of the nation's GDP from 1975 to 2011.

The rest of the paper is organized as follows: Section 2 briefly reviews the literature; section 3 describes the data and presents the analytical framework; section 4 discusses the empirical results and section 5 concludes.

REVIEW OF THE LITERATURE

The role of saving and investment in promoting economic growth has been widely discussed in the literature. According to classical economists such as Lewis (1955), increased saving is a necessary and sufficient condition for investment since it avails more funds for investment, which in turn accelerates growth. Regarding investment, the Harrod-Domar growth model identifies this as the key to promoting growth of any economy. Further, the neoclassical Solow (1956) model argues that an increase

in the saving rate boosts steady-state output by more than its direct impact on investment because the induced rise in income raises saving, leading to a further rise in investment (Jangili, 2011; Verma, 2007; Hundie, 2014). The higher investment, through the multiplier effect, drives higher aggregate demand, which in turn accelerates economic growth. This view is somehow supported by endogenous growth models, which predicts that an increase in savings rate increases economic growth through its positive impact on investment and capital accumulation (Barro and Sala-i-Martin, 1995). In addition, Ramsey's Optimal Growth model postulates that increased saving leads an increase in national income and consequently accelerates investment process. However, increases in investment can only induce growth in the short-run while in the long-run there may be little or no impact on economic growth (Romer, 2006). Other studies such as Bacha (1990) and Japelli and Pagano (1994) also support the view that saving makes funds available for financing investment, which in turn leads to GDP growth in the short-term.

In contrast with the conventional hypothesis of saving led growth postulated by classical growth models, Carroll-Weil hypothesis (Carroll and Weil, 1994) argues that saving typically follows, rather than precedes, economic growth. On the other side, the new growth theories starting in the 1980s, such as Barro (1990), Lucas (1988) and Romer (1986, 1990), reaffirm that capital accumulation, as a component of aggregate demand and vehicle for creation of productive capacity, is a key driver of long-run economic growth and high saving and investment are crucial in determining growth due to their strong positive correlation with GDP growth rates.

A considerable number of empirical studies have been conducted on the causality between saving, investment and economic growth around the world. This is due to continuing divergence in saving and investment rates in developing countries, the growing concern over declining saving rates in the majority of Organization for Economic Cooperation and Development (OECD) countries as well as the growing emphasis of the importance of capital accumulation in the literature on economic growth (Hundie, 2014; Verma and Wilson, 2005).

Empirical studies examining the direction of causality among saving, investment and economic growth yield differing results. The study conducted by Verma and Wilson (2005) used annual time series for the period 1950-2001 to examine this issue in India and found no evidence in support of Solow and endogenous growth policy of encouraging higher saving and investment in order to increase economic growth. In another study Verma (2007) employed ARDL bounds testing approach to cointegration and VECM based Granger causality test to examine the same issue in India for the period 1950/51 - 2003/04. The findings provided evidence in support of Carroll-Weil hypothesis and that saving unambiguously determines investment both in the short and long-run. In

addition, there was no evidence in support of the commonly accepted models in India, that investment is the engine of economic growth.

However, Jangili (2011) examines the direction of causality among saving, investment and economic growth in India for the period 1950/51- 2007/08. Using Johansen-Juselius cointegration test and Granger causality test based on VECM, the results support the traditional view that saving and investment Granger cause economic growth collectively as well as individually and not vice versa. Therefore, this suggests that higher saving and investment lead to higher economic growth in India. Similar results were obtained in India by Mishra and Jain (2012) and Mehta and Rami (2014) using the same methodology and time series data spanning the periods 1950 - 2008 and 1951-2012, respectively. Applying Johansen-Juselius maximum likelihood cointegration test and ECM approach to determine the interaction among these three variables, Obi et al. (2012) also found that saving is an important macroeconomic variable, which impacts on capital accumulation, productivity and economic growth in Nigeria. Furthermore, the authors conclude that increase in capital stock generates more saving and enhances productivity as well as economic growth.

Budha (2012) employs ARDL bounds testing procedure to cointegration and VECM based Granger causality test to study the direction of causality among saving, investment and economic growth in Nepal. Using data for the period 1974/75-2009/10, the results reveal the existence of feedback causality between investment and GDP and between gross domestic saving and investment. In addition, there is no evidence of Granger causality between gross domestic saving and GDP. Hudie (2014) also obtained similar results in the case of Ethiopia using ARDL bounds testing and Yamada and Toda (1998); Dolado and Lutkepohl (1996) (TYDL) and Innovation Accounting Techniques (impulse responses and variance decomposition). However, the only difference is that Granger causality from investment to saving is stronger than Granger causality from economic growth to saving. Agrawal (2000) used instrumental variable methods to analyze the determinants of saving and investment ratios in South Asian countries. Amongst others, the results provided evidence that higher saving rates cause higher growth rates of real Gross National Product (GNP) in two countries (Bangladesh and Pakistan) and that higher growth rates Granger cause higher saving rates in the other two countries (India and Sri Lanka). In addition, the results for Nepal fail to reject non-causality in either direction. Therefore, these results sharply contrast with the previous empirical findings (mostly based on data from East Asian countries, which have among the highest saving rates in the world) that saving rates do not cause growth but are determined by it. In another study, Agrawal (2001) investigates the direction of causality among saving and growth in seven Asian countries by

using VECM (Engle and Granger) and vector autoregressive (VAR) model. The results show Granger causal flow from growth (or income) to saving, although in some countries, there is also evidence of a feedback effect from saving to growth. The author, therefore, concludes that development policy should focus less on promoting high saving rates but instead concentrate more on promoting high growth rates. Furthermore, estimation of the saving functions based on Engle and Granger's static ordinary least squares (OLS) and Stock and Watson's dynamic OLS (DOLS) also provided evidence that the high saving rates in Asia are due to the high rate of growth of income per capita, declining shares of dependent population, and some special institutional features, such as the high central provident fund rates in Singapore. In addition, interest rates are found to have little impact on savings.

In the context of Lesotho, there are very few studies that examined dynamics of the relation among saving, investment and economic growth. Ijeoma et al. (2011) investigated the interaction among financial development, private saving and economic growth in Lesotho. Using Johansen-Juselius cointegration and VECM based Granger causality tests, firstly the results showed that financial development does not Granger cause economic growth and that neither economic growth nor private saving Granger cause financial development. In addition, there is evidence of Granger causality between financial development and private saving. In another study, Kalebe (2015) investigated the short and long-run causal relationship between saving and economic growth in Lesotho using the ARDL bounds testing approach to cointegration and VECM based Granger causality test. Granger causality test results indicate that saving Granger causes economic growth, both in the short-run and long-run, without any feedback in the opposite direction. Therefore, the study concludes that policies aimed at enhancing economic growth should stimulate and spur meaningful saving levels in Lesotho.

In light of this empirical literature, it is evident that the discussion on the causal relationships among saving, investment and economic growth as theorized by different schools of thought is inconclusive. This is in part on account of the dynamics and nature of causality among the variables. Nevertheless, the majority of studies do agree that saving and investment play a pivotal role in explaining growth in the economy. Therefore, the paper attempts to establish the causal relationships among the three variables in the specific context of Lesotho using trivariate framework.

ANALYTICAL TECHNIQUES

Cointegration

The paper employs ARDL bounds testing technique

initiated by Pesaran and Shin(1999) and later extended by Pesaran et al (2001) to examine the long-run relationship between saving, investment and economic activity in Lesotho. The ARDL bounds testing framework is expressed as follows:

$$\Delta GDS_t = \alpha_0 + \sum_{i=1}^p \alpha_{1i} \Delta GDS_{t-i} + \sum_{i=0}^p \alpha_{2i} \Delta GDI_{t-i} + \sum_{i=0}^p \alpha_{3i} \Delta GDP_{t-i} + \alpha_4 GDS_{t-1} + \alpha_5 GDI_{t-1} + \alpha_6 GDP_{t-1} + \varepsilon_t \quad (1)$$

$$\Delta GDI_t = \varphi_0 + \sum_{i=1}^p \varphi_{1i} \Delta GDI_{t-i} + \sum_{i=0}^p \varphi_{2i} \Delta GDS_{t-i} + \sum_{i=0}^p \varphi_{3i} \Delta GDP_{t-i} + \varphi_4 GDI_{t-1} + \varphi_5 GDS_{t-1} + \varphi_6 GDP_{t-1} + v_t + \varphi_6 GDP_{t-1} + v_t \quad (2)$$

$$\Delta GDP_t = \beta_0 + \sum_{i=1}^p \beta_{1i} \Delta GDP_{t-i} + \sum_{i=0}^p \beta_{2i} \Delta GDS_{t-i} + \sum_{i=0}^p \beta_{3i} \Delta GDI_{t-i} + \beta_4 GDP_{t-1} + \beta_5 GDS_{t-1} + \beta_6 GDI_{t-1} + \mu_t \quad (3)$$

where Δ is the first difference operator, GDS is gross domestic saving, GDI is gross domestic investment while GDP is gross domestic product, p is the lag length, α 's, φ 's and β 's are the parameters to be estimated, and ε_t are white noise error terms.

An ARDL bound testing procedure has several advantages over other cointegration approaches. Firstly, this procedure can be applied regardless of whether the underlying regressors are integrated of order one [$I(1)$], order zero [$I(0)$] or mutually cointegrated. Secondly, the approach produces robust results even in cases of small sample sizes. It also has finite-sample critical values compared to other cointegration techniques for which the distribution of the test statistics may be unknown in finite-samples. In addition, this technique generally provides unbiased estimates of the long-run model and valid t -statistics even in the presence of endogenous regressors (Pesaran et al, 2001).

The existence of a long-run relationship between the variables within the ARDL bounds testing framework is assessed by testing for the joint significance of the estimated coefficients of the lagged levels of the variables in equations (1), (2) and (3) using the F -test(or Wald test). The F -statistic value derived from this test is compared with two sets of critical values (lower and upper bound values) for a given level of significance¹ reported in Pesaran et al. (2001) and Nayaran (2005) for large samples and small sample sizes, respectively.

According to this test, if the computed F -value is less than the lower bound, the null hypothesis of no cointegration cannot be rejected. Conversely, the null hypothesis of no cointegration is rejected if the computed F -statistic exceeds the upper bound. The test becomes inconclusive in cases where the computed F -statistic falls between the two bounds.

However, prior to testing for cointegration among the variables, the paper investigates the presence of unit roots among the variables using Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests (Dickey and Fuller, 1979; Dickey and Fuller, 1981). In addition, the Ng - Perron (2001) unit root test is also used to confirm the time series properties of the series since the traditional ADF and PP unit root tests are not reliable for small samples due to their poor size and power properties. These tests are prone to rejecting the null hypothesis when it is true and accepting it when it is false (DeJong et al., 1992; Harris and Sollis, 2003). Unit root testing is done to ensure that none of the variables is integrated of order two, $I(2)$ or higher since ARDL bounds testing framework is only applicable in case of $I(0)$, $I(1)$ variables or combinations of the two.

Granger Causality Test

According to Granger (1969 and 1988) cointegration among the variables may imply the existence of causality between the variables at least in one direction, therefore the paper employs Granger causality test to determine the short-run and long-run causal effects among saving, investment and economic activity². For this purpose, the paper employs the following error correction based Granger causality model in a trivariate setting. The trivariate setting is used in an attempt to avoid unreliable results on account of omission of variable bias inherent in the bivariate causality framework (Odhiambo, 2010; Shahbaz et al., 2012; Nindi and Odhiambo, 2015).

$$\Delta GDS_t = \alpha_0 + \sum_{i=1}^n \alpha_{1i} \Delta GDS_{t-i} + \sum_{i=0}^n \alpha_{2i} \Delta GDI_{t-i} + \sum_{i=0}^n \alpha_{3i} \Delta GDP_{t-i} + \alpha_4 ECT_{t-1} + \varepsilon_t \quad (4)$$

$$\Delta GDI_t = \varphi_0 + \sum_{i=1}^n \varphi_{1i} \Delta GDI_{t-i} + \sum_{i=0}^n \varphi_{2i} \Delta GDS_{t-i} + \sum_{i=0}^n \varphi_{3i} \Delta GDP_{t-i} + \varphi_4 ECT_{t-1} + v_t \quad (5)$$

¹ The lower bound values assume that all variables in ARDL model are $I(0)$ while the upper bound values assume that the variables are $I(1)$.

² Granger causality is preferred over other methods owing to its favorable response in both large and small samples.

Table 1. ADF and PP unit root test results.

Variable	Variable in levels		Variable at first differences	
	ADF Statistic	PP Statistic	ADF Statistic	PP Statistic
GDS	2.795(0.207)	2.873(0.181)	6.165(0.000)***	6.160(0.000)***
GDI	0.341(0.909)	1.882(0.646)	4.556(0.001)***	4.701(0.003)***
GDP	0.779(0.999)	0.779(0.999)	-4.525(0.004)***	-5.615(0.000)***

Note: Values in parenthesis are p-values. *** indicates significance at 1 percent

$$\Delta GDP_t = \beta_0 + \sum_{i=1}^n \beta_{1i} \Delta GDP_{t-i} + \sum_{i=0}^n \beta_{2i} \Delta GDS_{t-i} + \sum_{i=0}^n \beta_{3i} \Delta GDI_{t-i} + \beta_4 ECT_{t-1} + u_t \tag{6}$$

where ECT_{t-1} is the lagged error correction term derived from the long-run cointegrating relationship, ε_t , v_t and u_t are mutually uncorrelated white noise residuals and α 's, ϕ 's and β 's are corresponding adjustment coefficients. In this test, the short-run causality is captured by the significance of the F –statistic (or Wald statistic) on the first differences of lagged independent variables. On the other hand, the long-run causality is captured by the significance of the t –statistic on the coefficient of the lagged error correction term. Nevertheless, if there is no cointegration between the variables, equations (4) and (5) and (6) are estimated without the error correction term and only short-run causality can be determined. However, when interpreting these results, it is necessary to bear in mind that Granger causality is not true causality; it is better understood as predictability. Predictability may indeed arise from causality between the variables in question, but it may arise for other reasons, such as the existence of a more complex relationship involving other variables.

DATA AND EMPIRICAL RESULTS

This paper uses annual data for Lesotho from 1970 to 2012 obtained from World Development Indicators (WDI) database. Saving is measured by gross domestic saving at constant prices while gross domestic investment is proxied by gross fixed capital formation (at constant prices). In addition, economic activity is represented by real GDP.

The standard ADF and PP unit root tests are used to test the order of integration of the variables. These tests results are presented in Table .1. The results show that all the variables used in the study are non-stationary in levels. However, they become stationary after differencing them once. For purposes of ensuring the reliability and robustness of the time series properties of the data employed in the study, the paper also uses Ng-Perron

(2001) unit root test, which can solve the problem of over-rejection of the null hypothesis and can be applied in the case of a small sample size. The results of this test, reported in Table I in the appendices, provide evidence that indeed all the variables are integrated of order one. Therefore, the paper proceeds to employ the ARDL bounds testing technique to examine the long-run relationship among the variables.

However, before this is done the paper determines the optimal lag lengths of the differenced variables in equations (1)–(3) using Schwarz information criterion (SIC). This criterion suggests a lag length of zero as optimal. Following this step, the paper proceeds to apply the ARDL bounds testing procedure to test for cointegration among the variables. Table 2 presents the results of ARDL bounds testing procedure to cointegration. The results indicate that the calculated F -statistic is greater than the upper bound critical value at 10 and 1 percent levels of significance when investment and economic activity are dependent variables, respectively. However, when saving is a dependent variable, the calculated F -statistic is less than the upper-bound critical value at all levels of significance. Therefore, these results confirm the existence of cointegration between the variables in the two equations namely, investment and economic activity equations, but not in the saving equation. For purposes of robustness of the results, the paper also performs Johansen multivariate cointegration test since the variables are integrated of the same order (see Johansen, 1988). The results of this test are presented in Table II in the appendices. These results also confirm the existence of stable long-run relationships among saving, investment and economic activity in Lesotho³.

The existence of cointegration among saving, investment and economic activity implies that there must be Granger causality among saving, investment and economic activity at least in one direction. However, it does not show the direction of causality among these variables. Therefore, the paper goes further to investigate the short-run and long-run Granger causality among

³ This finding is backed up by the trace test and the maximum eigenvalue test, which both reject the null hypothesis of no cointegration. However, they disagree on the number of cointegrating vectors relating the three variables; the trace test indicates that there are two, whereas the maximum eigenvalue test indicates that there is one.

Table 2. ARDL bounds testing to cointegration results.

Model	F-statistic		Inference			
F _{GDS} (GDS\GDI,GDP))	2.282		No Cointegration			
F _{GDI} (GDI\GDS,GDP)	3.788*		Cointegration			
F _{GDP} (GDP\GDS,GDI)	22.311***		Cointegration			
Critical value bounds of the F-statistic: restricted intercept and no trend (Nayaran, 2005)						
	99%		95%		90%	
k=2	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
	4.800	5.725	3.368	4.530	2.788	3.540

Note: 1) k is the number of regressors and values in parenthesis are Wald statistics, 2) ***, ** and * denote statistical significance at 1 percent, 5 percent and 10 percent levels of significance.

Table 3. Granger non-causality test results.

Dependent Variable	Short-run (or weak) Granger causality			Long-run Granger causality	
	T-statistics on Regressors			F-statistic	Coefficient of ECT_{t-1}
	ΔGDS_t	ΔGDI_t	ΔGDP_t		
ΔGDS_t	-----	1.159(0.253)	2.037(0.049)**	4.286(0.021)**	-----
ΔGDI_t	2.263(0.029)**	-----	1.616(0.114)	5.010(0.012)**	-0.126(0.042)**
ΔGDP_t	0.029(0.976)	2.466(0.018)**	-----	9.099(0.001)***	-0.042(0.018)**

Note: Values in parenthesis are p-values. ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent, respectively.

saving, investment and economic activity. The Granger non-causality test results are presented in Table 3.

Since ARDL bounds testing procedure indicates that no long-run relationship exists among saving, investment and economic activity when saving is a dependent variable, the paper excludes the lagged error correction term in estimating equation (4) to test for causality. In this case, only short-run causality is established among the variables. In this respect, the results reported in Table 3 show the existence of a distinct causal flow from economic growth to saving only in the short-run. This is supported by the significance of the coefficient of economic growth (and F-statistic) when saving is a dependent variable. This result is consistent with Verma (2007) who found that economic growth contributes to saving and not saving to economic growth in India and Agrawal (2001) who established Granger causality in the same direction in India and Sri Lanka. Therefore, the level of saving in Lesotho is influenced by economic growth. This finding also supports the Carroll-Weil hypothesis (Carroll and Weil, 1994), which states that saving typically follows, rather than precedes, economic growth. However, in the long-run the negative and statistically significant coefficient of the lagged error correction term in the economic growth function provides evidence that saving Granger causes economic growth. This finding not only supports the central idea of Lewis's (1955) traditional theory that increasing saving would accelerate economic growth and the endogenous growth models' advocacy that higher saving boosts steady-state

output in the economy (Harrod, 1939; Solow, 1956) but it is also consistent with Kalebe (2015)⁴, who finds that saving precedes and drives some short-term and long-term economic growth in Lesotho. Therefore, policies aimed at enhancing economic growth in Lesotho should stimulate and spur meaningful saving levels. The direction of the Granger causality relationship is reversed in the short versus long run between saving and GDP growth. This can be explained by the fact that in the short-term households save more if their income temporarily increases (as per the permanent income hypothesis), whereas the effect of increased saving on productivity takes longer to be realized.

The results further reveal a distinct short-run and long-run causal flow from saving to investment, without feedback in the opposite direction. This is evident from statistically significant coefficient of saving (and F-test) and the coefficient of the lagged error correction term in the investment function. This empirical evidence supports the neoclassical growth model proposed by Solow (1956), which indicates that higher saving is critically important to maintain higher level of investment, which is a key determinant of economic growth. This is because higher saving increases availability of funds for investment and leads to production of more goods and services and

⁴ The main difference between this paper and Kalebe (2015) is that this paper includes investment as an intermittent variable. However, since the findings are broadly the same, this shows that the results of this paper are robust in spite of the difference in model specification.

consequently increase the level of output (Sothan, 2014). This finding is consistent with Seshaiyah and Sriyval (2005) and İyidoğan and Balıkcıoğlu (2010), who found dependency of investment on saving in India and Turkey, respectively. This result suggests that domestic saving is channeled to finance investment in Lesotho. Thus, financial sector policies aimed at accelerating domestic saving are critical in influencing higher investment. This analysis shows the link between saving and investment in Lesotho despite the fact that capital can be freely moved between Lesotho and SA.

Lastly, the empirical results indicate short-run and long-run causal flow from investment to economic growth, which feeds back into investment in the long-run. The short-run and long-run causality from investment to economic growth is supported by the statistically significant coefficient of investment (and F-statistic) and the statistically significant coefficient of the lagged error correction term in the economic growth function. This finding is consistent with the results of Jangili (2011) and Mehta and Rami (2014) for India and provides evidence of investment-led growth. It supports the Harrod-Domar models and new growth theories, which reconfirm the view that investment is an engine of long-run economic growth (see Barro, 1990; Lucas, 1988; Romer, 1986; 1990). This is due to the fact that investment creates and enhances productive capacity, stimulates economic activities, reduces trade and transaction costs and thereby enhances the country's competitiveness in addition to providing employment opportunities (Sahoo et al., 2010). Therefore, policymakers should formulate macroeconomic policies aimed at enhancing investment in Lesotho in order to achieve higher and sustainable economic growth (Obi et al., 2012). The long-run feedback causality between investment and economic growth is backed up by the coefficients of lagged error correction terms in the investment and economic growth functions, which are both negative and statistically significant at the 5 percent level of significance. This result implies that in the long-run investment and economic growth mutually influences each other, which suggests that a higher level of investment leads to economic growth and vice versa. This may be due to the fact that higher economic activity can support more investment in the long-run.

CONCLUSION

This paper studies the direction of causality among saving, investment and economic growth in Lesotho using annual time series data from 1970 to 2012. Many studies in the literature have examined the relationship between saving, investment and economic growth in the context of bivariate cointegration and Granger causality separately between saving and economic growth, or between investment and economic growth in spite of the omission

of variable bias inherent in this technique. However, this paper employs ARDL bounds testing to test for cointegration and the Granger causality framework based on a trivariate error correction model to examine the direction of causality between saving, investment and economic growth.

The empirical results indicate the existence of a long-run relationship among saving, investment and economic growth in Lesotho. In connection with this, the paper also finds evidence of short-run Granger causality running from economic growth to saving. This supports the Carroll-Weil hypothesis and implies that in the short-run the level of saving in Lesotho is determined by economic growth. However, in the long-run the results provide evidence that saving Granger causes economic growth. This not only supports the central idea of Lewis's (1955) traditional theory and the endogenous growth models' advocacy that increasing saving would accelerate economic growth, but also implies that saving precedes and drives some long-term economic growth in Lesotho. The Granger causality relationship is reversed in the short versus long run between saving and GDP growth because in the short-term people save more if their income temporarily increases, while the effect of increased saving on productivity takes longer to be realized. The existence of a unidirectional short-run and long-run causal flow from saving to investment supports the neoclassical growth model and implies that the level of saving is crucial for investment in the economy. This analysis indicates the link between saving and investment in Lesotho in spite of the fact that economic agents in Lesotho are free to move their savings to SA.

In addition, evidence of short-run and long-run Granger causality from investment to GDP supports the Harrod-Domar models and new growth theories which hold that investment is the key to promoting economic growth. Therefore, the Government of Lesotho (GoL) should facilitate capital accumulation to spur economic growth in the economy. On the other hand, the existence of feedback causality between GDP and investment in the long-run may suggest that economic growth can also lead to greater long-term investment in Lesotho.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interest.

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APPENDICES

Table I. Results of Ng-Perron Unit Root Test.

Variable	<i>MZa</i>	<i>MZt</i>	<i>MSB</i>	<i>MPT</i>
Level				
GDS	-3.317	-1.245	0375	26.609
GDI	-6.421	-1.762	0.274	14.191
GDP	-2.811	-0.732	0.261	21.128
First Difference				
GDS	-19.779***	-3.058***	0.155	1.543
GDI	-19.167***	-2.917***	0.152	1.902
GDP	-25.053***	-3.462***	0.138	4.094

Note: The asterisks *** indicates 1 percent level of significance.

Table II. Johansen maximum likelihood cointegration test results.

Trace test			Maximum eigenvalue test		
Null	Statistics	95% critical value	Null	Statistics	95% critical value
Cointegration between <i>LGDS</i>, <i>LGDI</i>, and <i>LGDP</i>					
$r = 0$	53.869	35.193	$r = 0$	33.184	22.299
$r \leq 1$	20.685	20.262	$r \leq 1$	12.569	15.892
$r \leq 2$	8.116	9.164	$r \leq 2$	8.116	9.165

Note: 1) r stands for the number of cointegrating vectors and 2) the lag length of VAR is selected by SBI