Journal of Agriculture and Social Research, Vol. 15, No. 2, 2015

CASUAL RELATIONSHIP BETWEEN GROSS DOMESTIC SAVING AND ECONOMIC GROWTH IN EAST AFRICA: EVIDENCE FROM ETHIOPIA, UGANDA AND KENYA

SAMUEL ELIAS AND ABEBE WORKU
Department of Agricultural Economics,
College of Agriculture and Natural Sciences, Dilla University, Ethiopia
Email: eliboy2013@gmail.com

ABSTRACT
The paper aimed to analyze the causal relationship between economic growth and savings in East Africa (1981-2014) using Vector Error Correction (VEC) method and Johnson's approach. All statistical data used throughout this paper came from World Bank database. The empirical study confirmed that a significant relationship between domestic savings and economic growth in the case of Ethiopia and Uganda. However, there is no significant relationship obtained in the case of Kenya over the study period by Johnson co-integration approach. The results of Granger Causality between economic growth (GDP) and gross domestic savings indicated the presence of unidirectional causality between economic growth and gross domestic savings in the case of Ethiopia and Uganda. Gross domestic product does Granger cause gross domestic savings; this means that economic growth accelerates gross domestic savings in the case of Ethiopia and Uganda. It is recommended that the countries needs to design a policy which enhances higher economic growth through increasing total factor productivity and, which ultimately increases the country domestic saving level. Moreover, to achieve sustainable growth the government needs to embark on policy measures, which increase saving and investment into the country due to its dual effect.

Key words: Causation, Domestic Savings, Economic Growth and East Africa

INTRODUCTION
The relationship between the saving and economic growth has received greater attention from a different researcher in the world. Economic growth is important for one country to achieve a higher living standard for citizens. Among many factors, impacting economic growth in a given society is the level of domestic savings. According to (Saltz, 1999), (Bacha, 1990), (DeGregorio, 1992) and (Stern, 1991) have explained that increases in savings will facilitate more rapid expansion of the capital stock and; therefore, higher rates of investment that should lead to higher rates of economic growth. Moreover, ample empirical studies indicated that economic growth would contribute to growth in the personal income as the result per capita consumption expenditure and saving rate also increase. According to the theory of marginal propensity to save, the rate of saving expands from the increasing of income. As a result, it can be plainly understood that when there is economic growth, the amount of savings also increase.

Tinaromm (2005) studied the relationship between savings and economic growth in North Africa using a Vector Error Correction Model for 1946-1992. He concluded that private saving has both direct and indirect effects on economic growth. In his view, the direct effect of savings is through private investment. He also showed that economic growth has a positive effect on the private savings rate. Dipendra (2009) studied the relation between savings and economic growth in India. The goal of this study was to check the long-run relationship between GDP and savings. An Engel-Granger Co-Integrated method was used, and the results showed that gross savings of the private sector have a bigger impact on GDP than gross domestic savings. And another study by Sothan (2014) analyzed the relationship between domestic Saving and economic growth in Cambodia and the study found that domestic saving does not Granger cause economic growth. This finding is contrary to the conventional wisdom that causality runs from saving to economic growth. Sothan concluded that domestic saving and economic growth are independent of each other in Cambodia.

Needless to say, every nation is trying to achieve sustainable economic growth aiming to the betterment of its citizen's standard of living. This can be achieved by sustainable economic growth through increasing the rate of investment which is a function of increased saving rate. To this end, every government may implement various kinds of policy strategies such as encourage saving, stimulating investment and productivity in their countries.

The magnitude of economic growth in any country is dependent upon the level of investment. The rate of investment, on the other hand, is highly dependent upon the level of gross domestic savings of a country. It is believed that increased saving will increase the national capacity for investment and production, while a serious constraint to sustainable economic growth can result from the low rate of saving. According to World Bank's study on average savings, East Asia saves more than 30 percent of Gross National Disposable Income (GNDI), while Sub-Saharan Africa saves less than 15 percent (World Bank, 2000).

Likewise, a study by (Kibet et al., 2009) found that saving rate in Africa has perpetually been the lowest compared to other regions. It also faces serious credit constraints; and this, coupled with low income could greatly reduce any little incentive to save. Development economists have been concerned for decades about the crucial role of domestic saving mobilization in the sustenance and reinforcement of the saving investment-growth chain in developing economies (Nwachukwu & Egwaikhide, 2007). Increased savings rates are therefore, of crucial importance for achieving sustainable development and poverty-reducing growth in African countries. (Keho, 2011)

Generally, it is possible to accept that increasing gross savings contribute to higher investment, and this leads to the higher GDP growth in the short run. It means that the higher saving rate leads to less consumption, which could also result in the larger amount of capital investment and finally a higher rate of economic growth. Despite the fact that, the issue of causality between saving and growth is unsettled because of the wide variation in results among the studies conducted on causality. The direction of causality between saving and growth may vary because of differences in the methodology used.

Another reason could be the choice of variable specifications for causality analysis, and the definition of the variables used. The causal relationship may also vary from country to country and between periods of time. Therefore, this study intended to analyze the causal relationship between domestic saving and economic growth in east Africa (i.e. Ethiopia, Kenya and Uganda) with the objectives of determining empirically the existence of long run relationship between gross domestic savings and economic growth in East Africa and to provide empirical evidence whether causal relationship exists between gross domestic savings and economic growth and the particular direction of causality between them.

METHODOLOGY

Sample Data and Data Sources

A time series data on gross domestic savings and per capita real GDP as a measure of economic growth in east Africa in the case of Ethiopia, Uganda, and Kenya for the period 1981 to 2014 are used for this study. All data from 1981 to 2014 are from World Development Indicators of the World Bank. All computations are performed using the Eviews8 software.

Unit Root Test

The first and for most issues in the testing procedure is to determine whether the data contain unit roots indicating that data is non-stationary or not. Most commonly used type test employed in this study was the Augmented Dickey–Fuller (ADF) test which has developed by Dickey and Fuller. The test is used for checking whether variables such that GDP growth rate, Gross Saving growth rate have a unit root or not. If parameter α is equal to Zero, it means the variable contains unit root which means the data is nonstationary.

The Augmented Duckey-Fuller test is in two forms: one with only intercept and another with intercept and trend. The one that is chosen depends on the nature of the curvature of the variable being tested for a unit root. If the curvature of a time series variable exhibit trend, then the Augmented Dickey-Fuller test is conducted with intercept and trend. On the other hand, if the curvature of a variable exhibits no trend, then the ADF Test is performed with the only intercept.

The ADF test equation is stated as:

$$\Delta x_t = \varphi_0 + \beta_1 x_{t-1} + \delta t + \sum_{i=1}^{n} \theta_i \Delta x_{t-1} + \varepsilon \text{---------- 1}$$

The target of this study is to test existing of the relationship between economic growth and savings in East Africa. If this kind of relationship exists, the next is to test the direction of causality between these countries.

After careful analysis for stationary, the next step is to examine co-integration analysis (Johnson, 1988) for each of the two variables at the first difference I (1) in East Africa evidence from Ethiopia, Kenya, and Uganda. To estimate the co-integration rank and vector, the following and statistics test are used where

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{n} \ln (1 - \lambda i) \text{---------- 2}$$

$\lambda_{max}(r, r+1) = -Tln(1-\lambda_{r+1})$---------- 3

For the λ_{trace}statistics, the null hypothesis is that the number of co-integrating vectors is less than or equal to r against r =1, 2, 3, 4…, while in case of λ_{max}statistics, the null hypothesis is that the number of co-integrating vectors is less than or equal to r against r = r + 1.

The presence of a co-integrating relation forms the basis of the VEC (Vector Error Correction) specification. Additionally, standard Granger or Sims tests may provide invalid causal information due to the omission of error correction terms from the tests (Doyle, 2001).

$y_t = \alpha_1 + \sum_{i=1}^{n} \beta \Delta ln_i x_{t-1} + \sum_{j=1}^{m} \gamma_j \Delta lny_{t-j} + \rho_i ECT_{t-1} + \epsilon_t$---------- 4

$x_t = \alpha_2 + \sum_{i=1}^{n} \theta_i \Delta lnx_{t-1} + \sum_{j=1}^{m} \delta_j \Delta lny_{t-j} + \mu_i ECT_{t-1} + \epsilon_t$---------- 5

The finding that much macro time series may contain a unit root has spurred the development of the theory of non-stationary time series analysis. Empirical studies have shown that the existence of non-stationary in the time series considered can lead to spurious regression results and invalidate the conclusions reached using Granger Causality. (Toda and Phillips, 1993) have led the methods to deal with Granger causality in I (1) systems of variables. A causal long run relationship between non-stationary time series when they are co-integrated could be inferred. Therefore, if co-integration analysis is omitted, causality tests present evidence of simultaneous correlations rather than causal relations between variables. The presence of a co-integrating relation forms the basis of the VEC (Vector Error Correction) specification. Additionally, standard Granger or Sims tests may provide invalid causal information due to the omission of error correction terms from the tests (Doyle, 2001).

The simple Granger's causality test becomes inappropriate when co-integrating vectors are obtained in the series. According to Granger's representation theorem (1988), the results of co-integration imply that series have the following error-correction representations. These are necessary to augment the simple Granger causality test with the ECM (Error Correction Mechanism), derived from the residuals of the appropriate co-integration relationship to test for causality:

Where, Y and X= are the variables under consideration, ρ_i=the adjustment coefficient while ECTt-1 expresses the error correction term of growth equation, Δ =indicates the first difference operator. In equation (4), X Granger causes Y if γ_j and $\rho_i$are significantly different from zero. In equation (5), Y Granger causes X if $\delta_j$and $\mu_i$are significantly different from zero. F-statistic is used to test the joint null hypothesis of γ_j, δ_j = 0 and t-test is employed to estimate the significance of the error coefficient.

RESULTS AND DISCUSSIONS

Summary of Augmented Duckey -Fuller (ADF) Unit Root Test

The first concern of co-integration and causality analysis is to test stationary of the variables. And for this purpose commonly used, ADF test has been used. As indicated in Table 1, both LNGDP and LNGDS series have unit roots in the level data at 1% and 5% level of significance for all countries, the statistics except a null hypothesis which strongly suggests that both series at levels contain a unit root in case all countries as indicated in Table 1. After the variable transformed into their first differences and running the ADF test again, the variables become stationary. In both cases when the intercept and a trend have been included for ADF model analysis; the variables are stationary. From this, it can be generalized that the variables are integrated of order one i.e. I (1) for all countries. In most causality and co-integration analysis the variable become stationary after first difference, non-stationary variables were further tested to ascertain whether they were co-integrated and causation. In this case, one should proceed to test for the direction of causation of the variables. Of course, this is after proving the existence of the co-integration relationship between its variables. In other words, the null hypotheses were tested about the rank of the co-integrating relationships that existed among the variables.

Table 1: Summary of Augmented Dicker-Fuller (ADF) Unit Root Test

Countries	**Variables**	**Levels**		**1st difference**		
		Intercept	intercept +trend	Intercept	Intercept +trend	Conclusion
Ethiopia	LnGDP	0.424710	-0.687243	-3.31806	-3.708328	**I(1)**
	(p-value)	(0.9810)	(0.9656)	(0.0223)	(0.0363)	
	LnGDS	0.080117	-0.036102	-	-8.01100	**I(1)**
	(p-value)	(0.9593)	(0.9938)	7.450719	(0.0000)	
				(0.0000)		
Kenya	LnGDP	1.243255	-1.664205	-	-4.374571	**I(1)**
	(p-value)	(0.9978)	(0.7444)	4.164889	(0.0078)	
				(0.0027)		
	LnGDS	-	-2.373555	-	-6.930477	**I(1)**
	(p-value)	1.457958	(0.3856)	7.057744	(0.0000)	
		(0.5420)		(0.0000)		
Uganda	LnGDP	-	-1.992273	-	-3.252290	**I(1)**
	(p-value)	0.146273	(0.5833)	3.272799	(0.0944)	
		(0.9348)		(0.0257)		
	LnGDS	-	-6.288135	-	-5.965519	**I(1)**
	(p-value)	1.117081	(0.0004)	7.105338	(0.0008)	
		(0.6878)		(0.0000)		

Note: *r indicates the number of co-integrating relationships. The optimal lag structure of the VAR was selected by minimizing the AIC criterion. Critical values are taken from (Johansen and Juselius, 1990). ** indicates rejection at the 95% critical values.*

According to Johansen test procedure**,** both the Trace statistic criterion and the Maximum Eigen value criterion were used to reject the null hypothesis and to draw conclusions about the hypotheses of the rank of the co-integrating relationships. The decision criterion is that when the Trace Statistic is greater than the 5% critical value, the null hypothesis is rejected and it is concluded that there is a co-integrating relationship. The testing was continued in an iterative manner until the null hypotheses were no longer rejected to indicate no co-integrating relationship.

Table 2: Results of Johansen's test for multiple co integration vectors of Ethiopia, Uganda, and Kenya

Countries	Hypothesized co integrating	No. of relationships	Test statistics		Critical values (95%)	
	H: 0	*H:*1	Max. eigenvalue	Trace	Max. eigenvalue	Trace
Ethiopia	r = 0	r >0	16.54351**	16.54352**	14.26460	15.49471
	r =1	r > 1	0.0000004	0.000012	0.000012	3.841466
Uganda	r = 0	r >0	20.60044**	20.60044**	15.49471	14.26460
	r =1	r > 1	0.068556	0.068556	3.841466	3.841466
Kenya	r = 0	r >0	3.563465	3.495975	15.49471	14.26460
	r =1	r > 1	0.067490	0.067490	3.841466	3.841466

Note: *r indicates the number of co-integrating relationships. The optimal lag structure of the VAR was selected by minimizing the AIC criterion. Critical values are taken from (Johansen and Juselius, 1990). ** indicates rejection at the 95% critical values.*

Table 2 presents the results of Johansen's test for multiple co integration vectors of Ethiopia, Uganda, and Kenya. According to both maximal Eigen value and trace statistic tests, the results indicate the existence of one co-integration vector in the case of Ethiopia and Uganda in a range of study periods. Thus, the Johansen co-integration test suggests that there is a long-run relationship between domestic savings and economic growth in Ethiopia and Uganda. But, in the case of Kenya, there is no evidence indicating any long run relationship between domestic saving and economic growth in the study period. Therefore, the null hypothesis no co-integration at the 1% level in case of Kenya is accepted by rejecting the alternative hypothesis. The same result found by (Sothan, 2014) where domestic saving and economic growth is independent of each other in case of

Cambodia. The long-run relationship between economic growth and savings is found to be positive in each co-integration vector in the case of Ethiopia and Uganda. This suggests the existence of causality in at least one direction.

Granger Causality test

Granger causality test is conducted to know the direction of the causality. In Table 3. the results of Pair-wise Granger Causality between economic growth (GDP) and gross domestic saving indicated the presence of unidirectional causality between economic growth and gross domestic saving in the case of Ethiopia and Uganda. The study revealed that for the null hypothesis of "LNGDS does not Granger Cause LNGDP", it is not possible to reject the null hypothesis since the F-statistics value is small and the probability is value is high. Therefore, we accept the null hypothesis and conclude that LNGDS does not Granger Cause LNGDP, but for the null hypothesis of "LNGDP does not Granger Cause LNGDS," it is possible to reject the null hypothesis and conclude that LNGDP does Granger Cause LNGDS. This means that economic growth accelerates and augments gross domestic saving in Ethiopia and Uganda. Moreover, a study revealed that existence of unidirectional causality (causality runs from economic growth to gross domestic saving) in the case of Uganda and Ethiopia.

The conversional view of theoretical economics is that higher savings leads to higher investment and higher economic growth is not supported by East African countries case. Instead, the result of this study indicated that, the causality is from economic growth rate to gross domestic saving. This result is supported with many studies (Salz, 999), and (Baharumshah et al., 2003).

Table 3: Granger Causality test

	Ethiopia			Uganda		
Null Hypothesis	F-statistics	P-Value	Decision	F-statistics	P-Value	Decision
GDS does not Granger Cause GDP	0.43858	0.7275	Accept	1.25809	0.3039	Accept
GDP does not Granger Cause GDS	5.01332	0.0077	Reject	4.69622	0.0200	Reject

CONCLUSIONS AND RECOMMENDATIONS

The co-integration test confirmed that economic growth and domestic gross savings are co integrated into the case of Ethiopia and Uganda, indicating an existence of a long-run relationship between the two as confirmed by the Johansen co integration test results. Although many theoretical and empirical studies confirm the positive impact of saving on economic growth, results of the present study do not found any long-run relationship between domestic saving and economic growth in case of Kenya as confirmed by Johnson co-integration test. However, the Granger causality test finally confirmed the presence of unidirectional causality, which runs from economic growth to gross domestic saving in case of Ethiopia and Uganda. Based on the empirical result of the study

Granger causality test the study favored the hypothesis which suggests that the causality is from economic growth rate to growth rate of domestic saving in the country in the range of study period. However, the gross domestic saving growth does not Granger Cause GDP per capita growth. The result of the empirical test clearly points toward a positive impact of economic growth on saving, or it can say that income of the country does play an important role to lead the saving in case of Ethiopia and Uganda. It is recommended that the countries needs to design a policy which enhances higher economic growth through increasing total factor productivity and which ultimately increases the country domestic saving level. Moreover, if domestic savings are invested efficiently and are therefore an important factor of economic growth, the main objective of national economic policy should be to encourage the people to save by using different mobilization techniques.

REFERENCES

Alomar, I. (2013). Economic Growth and Savings in GCC: A Co-integration and Causal Relationship Analysis, International Journal of Humanities and Social Science, 3(9).

Bacha, E.L. (1990). A Three-Gap Model of Foreign Transfers and the GDP Growth Rate in Developing Countries", Journal of Development Economics, 32: 279-96.

Baharumshah et al., (2003).Savings Dynamic in Asian Countries. Journal of Asian Economics, 13, 827-845.

DeGregorio, J. (1992). Economic Growth in Latin America, Journal of Development Economics, 39: 59-84.

Domer, E.D. (1946). Capital Expansion, Rate of Growth, and Employment, Econometrica, 14:137-47.

Doyle, E. (2001). Export-output causality and the role of exports in Irish growth: 1950-1997, International Economic Journal, 15(2): 147-161.

Harrod, R. (1939). An Essay in Dynamic Theory, Economic Journal, 49:14-33.

Houthakker, H.S. (1965). On Some Determinants of Saving in Developed and Underdeveloped Countries, in E.A.G. Robinson, (ed.). Problems in Economic Development, London: Macmillan.

Jappelli, T., and Pagano, M. (1994). The Determinants of Saving: Lessons from Italy, Paper presented at the Inter-America Development Bank Conference on Determinants of Domestic Savings in Latin America, Bogota, Colombia.

Johansen, S. (1988). Statistical Analysis of Co-integrating Vectors, J Econ. Dyn. Control 12(2):231 254.

Johansen, S., and Juselius, K. (1990). Maximum Likelihood Estimation and Inference on Co-integration with Applications to the Demand for Money, Oxford Bulletin of Economics and Statistics, 52:169-210.

Kibet, L. K., Mutai, B. K., Ouma, D. E., Ouma, S. A. and Owuor, G. (2009). Determinants of household saving: Case study of smallholder farmers, entrepreneurs and teachers in rural areas of Kenya, Journal of Development and Agricultural Economics, 1:137-143.

Krieckhaus, J. (2002). Re conceptualizing the Development state: Public Savings and Economic Growth, World Development, 30(10):1697-1712.

Levine,R. E. and David, R. (1992). A Sensitivity Analysis of Cross-Country Growth Regressions, American Economic Review, 82:942–963.

Lewis,W. A. (1955). The Theory of Economic Growth, Homewood, III: Irvin.

Nwachukwu, T.E. and Egwaikhide, F.O. (2007). An Error-Correction Model of the Determinants of Private Saving in Nigeria, A Paper presented at the African Economic Society (AES) Conference, Cape Town, South Africa.

Olajide, S. (2010). Does Saving Really Matter For Growth In Developing Countries? The Case of A Small Open Economy", International Business & Economics Research Journal, 9(4).

Romer, P. (1987). Growth Based on Increasing Returns to Specialization, The American Economic Review, 77(2):56-62.

Saltz, I.S. (1999). An Examination of the Causal Relationship between Savings and Growth in the Third World, Journal of Economics and Finance, 23:90-98.

Solow, R. M. (1956). A Contribution to the Theory of Economic Growth", The Quarterly Journal of Economics, 70:65-94.

Sothan, S. (2014). Causal Relationship between Domestic Saving and Economic Growth: Evidence from Cambodia, International Journal of Economics and Finance; 6(9).

Stern, N. (1991). The Determinants of Growth, Economic Journal, 101:122-133.

World Bank (2000). Saving in Developing Countries: An Overview, The World Bank economic review, 14: 393–414.