

Which comes first – savings or growth? Time series evidence from ECOWAS countries

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Abstract. *This study examines the direction of causality between domestic savings and economic growth in twelve West African countries during the period 1981-2014. It uses the autoregressive distributed lag (ARDL) approach to cointegration and the Granger causality test. The results show that economic growth causes domestic savings in Guinea-Bissau and Nigeria, while the reverse causality running from savings to economic growth holds in Benin, Gambia, Mali, Niger, and Senegal. A two-way causality prevails in Ghana. However, no evidence of causality in either direction was recorded for Burkina Faso, Cote d'Ivoire, Sierra Leone and Togo. These findings show that the direction of causality between savings and growth is country-specific among the West African Countries.*

Keywords: savings, economic growth, causality, ECOWAS.

JEL Classification: C32, E21, O11, O55.

1. Introduction

The causal relationship between savings and economic growth has received a great deal of research attention in development economics. However the debate whether economic growth causes savings or savings causes economic growth still remains an unresolved issue in both theory and empirics. With regard to the theoretical literature, there are two main competing views of the savings-growth nexus. The famous neoclassical model developed by Solow (1956) highlighted the importance of savings in the process of economic development. This model showed that higher saving rates lead to higher level of per capita output and economic growth rate by increasing domestic capital stock in the economy. However, this is only valid in the short term. Increases in the saving rates do not affect long-term growth rates. The endogenous growth models developed by Romer (1986) and Lucas (1988) also established a close connection between higher savings and economic growth by emphasizing the conventional belief that higher savings rate leads to higher economic growth rate. Contrary to this view, the standard Keynesian model advocated that saving depends upon the level of current income, and the savings rate increases as per capita income increases. All other things being equal, economic growth precedes higher savings and not the opposite.

There is a great deal of empirical literature that has tested the savings-growth nexus for many specific countries or country groups. So far, there is no general consensus on the causal relationship between the two variables. The empirical findings vary cross countries, methodologies and variables specifications. Some empirical studies found that economic growth leads to higher savings (Sinha and Sinha, 1998; Saltz, 1999; Attanasio et al., 2000; Agrawal, 2001; Anoruo and Ahmad, 2001; Mohan, 2006; Odhiambo, 2008; Abu, 2010), however others reported that savings lead to economic growth through capital formation (Sinha, 1999; Alguacil et al., 2004; Masih, and Peters, 2010; Bankole and Fatai, 2013; Patra et al., 2017; Pickson et al., 2017; Siaw et al., 2017). Evidence of bidirectional causal link has been reported in the literature (Romm, 2005; Lean and Song, 2009; Odhiambo, 2009; Singh, 2009; Tang and Chua, 2012; Adeleke, 2014; Najarzadeh et al., 2014; Tang and Tan, 2014). Other studies failed to identify any significant relationship between savings and growth (Mavrotas and Kelly, 2001; Baharumshah et al., 2003; Hundie, 2014; Sothan, 2014).

The analysis of the causal relation between savings and economic growth has important policy implications for developing countries (Alguacil et al., 2004). If saving is a precondition for economic growth, then governments need to design and implement policies that promote savings for higher economic growth. Conversely, if economic growth causes savings, then efforts would be directed towards accelerating economic growth. Despite these implications there is very scanty evidence from Sub-Saharan African countries. The aim of this study is to empirically investigate the direction of causality between savings and economic growth in the member countries of the Economic Community of West African States (ECOWAS) using time series data from 1981-2014.

The rest of the paper is organized as follows. Section 2 describes the data and the econometric methodology employed for testing causality. Section 3 presents the empirical results of the study. Section 4 concludes the study and provides some policy recommendations.

2. Data, model and methodology

The study uses annual time series data for a sample of twelve member countries of the Economic Community of West African States (ECOWAS), namely: Benin, Burkina Faso, Cote d'Ivoire, Gambia, Ghana, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo. The countries were selected based on data availability. The variables considered are real gross domestic product (hereafter GDP) as a proxy for economic growth and real gross domestic savings (hereafter GDS). The data set comes from the World Development Indicators of the World Bank and spans the period of 1981-2014. All the data used are in constant local currency units and converted into natural logarithms in the econometric analysis. We use gross domestic savings as our focus is on the total amount of resources available in the economy for investment.

The econometric model used in this study theoretically follows the Solow and the Keynesian hypotheses. According to the Solow model, higher savings precede economic growth. As such, the empirical model specifies economic growth as a function of savings:

$$\ln GDP_t = \theta_0 + \theta_1 \ln GDS_t + \mu_{1t} \quad (1)$$

The coefficient θ_1 indicates the long-run impact of domestic savings on economic growth. A large and significant coefficient suggests that the financial market works efficiently so that savings lead to investment and economic growth.

On the other hand, the Keynesian model states that savings are a function of income. Thus, the empirical model to be estimated is specified as follows:

$$\ln GDS_t = \phi_0 + \phi_1 \ln GDP_t + \mu_{2t} \quad (2)$$

where the coefficient ϕ_1 indicates the long-run impact of economic growth on domestic savings.

We test for the presence of a long-run relationship between domestic savings and economic growth using the Autoregressive Distributed Lag (ARDL) bounds test developed by Pesaran et al. (2001). This approach has many advantages over other traditional alternative methods. It has been shown to have superior properties in small sample size. The bounds testing approach to cointegration is based on the following equation:

$$\begin{aligned} \Delta \ln GDP_t = & \gamma_0 + \gamma_1 \ln GDP_{t-1} + \gamma_2 \ln GDS_{t-1} + \sum_{i=1}^m \phi_{1i} \Delta \ln GDP_{t-i} + \\ & + \sum_{i=0}^n \phi_{2i} \Delta \ln GDS_{t-i} + e_t \end{aligned} \quad (3)$$

The presence of a long-run relationship is tested by restricting coefficients of lagged level variables equal to zero. That is, the null hypothesis of no long-run relationship is $H_0: \gamma_1 = \gamma_2 = 0$. This hypothesis is tested by the mean of an F -test. The asymptotic critical values are provided by Pesaran et al. (2001). The bounds testing procedure is sensitive to

the selection of the lag structure (m, n). In this study, the lag structure was selected using the Akaike Information Criterion (AIC) with maximum lag length on each variable set to five.

Cointegration test indicates only whether or not a long-run relationship exists between savings and growth. It does not indicate the direction of the causal relationship among them. Engle and Granger (1987) argued that as long as variables are cointegrated, causality must exist at least in one direction. Following their methodology the direction of causality between savings and economic growth can be detected by estimating the following Error Correction Models:

$$\Delta \ln GDP_t = \alpha_1 + \sum_{i=1}^p \gamma_{1i} \Delta \ln GDP_{t-i} + \sum_{i=1}^p \phi_{1i} \Delta \ln GDS_{t-i} + \lambda_1 ecm_{t-1} + e_{1t} \quad (4)$$

$$\Delta \ln GDS_t = \alpha_2 + \sum_{i=1}^p \gamma_{2i} \Delta \ln GDP_{t-i} + \sum_{i=1}^p \phi_{2i} \Delta \ln GDS_{t-i} + \lambda_2 ecm_{t-1} + e_{2t} \quad (5)$$

where ecm_{t-1} is the lagged residuals of the long-run relationship between savings and GDP. Here again, the lag length p is determined using the Akaike Information Criterion (AIC). The significance of the differenced explanatory variables indicates the short-run causality, whereas the significance of ecm_{t-1} confirms the long-run causal relationship. For example, savings do not cause GDP growth in the short-run if $\phi_{11} = \phi_{12} = \dots = \phi_{1p} = 0$. Similarly, GDP growth does not cause savings in the short-run if none of γ_{2i} is statistically different from zero.

3. Empirical results

Before we proceed with the estimation of the empirical models, we need to investigate the time-series properties of the variables using unit root tests. We apply the PP test of Phillips and Perron (1988) and the KPSS test of Kwiatkowski et al. (1992). These tests have been performed under the models with constant and trend for the level series and with constant for series in first difference. This step is necessary because the bounds test requires the dependent variable to be integrated of order one ($I(1)$) and the explanatory variables to be $I(0)$ or $I(1)$. The results presented in Table 1 reveal that both $\ln GDP$ and $\ln GDS$ series have unit roots in their level but become stationary after taking their first difference. This suggests that the variables under study are integrated of order one.

Table 1. Unit root test results

Country	PP test				KPSS test			
	$\ln GDP$	$\ln GDS$	$\Delta \ln GDP$	$\Delta \ln GDS$	$\ln GDP$	$\ln GDS$	$\Delta \ln GDP$	$\Delta \ln GDS$
Benin	-2.854	-3.920*	-5.890*	-8.978*	0.139**	0.095	0.308	0.167
Burkina	-1.641	2.196	-6.207*	-5.057*	0.191*	0.630*	0.343	0.362
Cote d'Ivoire	-1.493	-2.246	-3.297*	-5.679*	0.086	0.074	0.309	0.096
Gambia	-3.939*	-2.965*	-10.097*	-10.524*	0.098	0.204	0.179	0.440
Ghana	-2.292	-1.108	-5.117*	-7.055*	0.184*	0.131**	0.072	0.278
Guinea-Bissau	-2.335	-3.706*	-5.977*	-9.577*	0.104	0.095	0.123	0.108

Country	PP test				KPSS test			
	lnGDP	lnGDS	Δ lnGDP	Δ lnGDS	lnGDP	lnGDS	Δ lnGDP	Δ lnGDS
Mali	-1.346	-3.987*	-8.620*	-8.403*	0.204*	0.164*	0.211*	0.069
Niger	-1.616	-1.235	-7.331*	-12.124*	0.211*	0.201*	0.146	0.499*
Nigeria	-1.874	-3.892*	-4.920*	-15.925*	0.196*	0.175*	0.081	0.344
Senegal	-1.593	-2.871	-7.041*	-7.103*	0.187*	0.081	0.379	0.060
Sierra Leone	0.436	-3.427**	-6.285*	-6.154*	0.197*	0.069	0.137**	0.259
Togo	-2.517	-2.633**	-4.984*	-8.636*	0.102	0.136**	0.145	0.050

Note: * (**) denotes the rejection of the null hypothesis at the 5% (10%) level.

The results of the ARDL bounds test are displayed in Table 2. From this table we see that eight countries show significant existing long-run relationship between lnGDP and lnGDS.

Table 2. ARDL bounds test for cointegration

Country	F _{GDP}	F _{GDS}	Cointegration?
Benin	15.450*	3.127	Yes
Burkina	0.698	2.536	No
Cote d'Ivoire	4.398	4.715	No
Gambia	9.477*	5.110**	Yes
Ghana	5.464**	4.772	Yes
Guinea-Bissau	0.884	5.121**	Yes
Mali	8.909*	5.195**	Yes
Niger	4.106	7.592*	Yes
Nigeria	4.159	10.941*	Yes
Senegal	13.015*	6.756*	Yes
Sierra Leone	3.295	1.673	No
Togo	4.231	2.607	No

Note: * (**) denotes the rejection of the null hypothesis at the 5% (10%) level.

The results of the Granger-causality tests are presented in Table 3. The estimates of the error correction terms show that savings Granger-cause GDP in the long-run in Benin, Gambia, Ghana, Mali and Senegal. This suggests the need for these countries to encourage savings to promote sustainable growth. On the other hand, the evidence from Guinea-Bissau, Niger and Nigeria is consistent with the Keynesian model that postulated causality from economic growth to savings. In the short run, the traditional view that higher savings leads to higher economic growth holds in Benin, Mali, and Niger. The reverse causality running from economic growth rate to growth rate of savings holds only in Guinea-Bissau. A bi-directional causality between growth rate of savings and economic growth rate was found in Ghana, suggesting that savings are both a cause and a consequence of economic growth. Finally, there is no causal relationship between the two variables in Burkina Faso, Cote d'Ivoire, Sierra Leone and Togo. Our findings for Nigeria is consistent with Abu (2010) but contradict with Adeleke (2014) and Bankole and Fatai (2013). Our findings are also in agreement with Pickson et al. (2017) for Ghana. In the case of Cote d'Ivoire, our results contradict with Anorou and Ahmad (2001) who found bi-directional causality between savings and economic growth. The absence of causality for Burkina Faso, Cote d'Ivoire, and Togo is also in line with Konya (2005) but this author reported no causality between savings rate and per capita income in Benin, Ghana, Nigeria, and Senegal.

Table 3. Results of Granger causality tests

Country	Short-run causality		Long-run causality $ECT_{t-1}=0$	
	GDS does not cause GDP	GDP does not cause GDS	GDP	GDS
Benin	23.383* (0.000)	2.934 (0.710)	-0.161* (-3.286)	0.265 (1.425)
Burkina Faso	0.414 (0.519)	0.001 (0.967)	-	-
Cote d'Ivoire	1.348(0.245)	0.005 (0.942)	-	-
Gambia	0.303 (0.581)	0.032 (0.856)	-0.980* (-4.511)	-0.130 (-0.048)
Ghana	20.804* (0.000)	7.539* (0.023)	-0.034* (-3.771)	0.088 (1.809)
Guinea-Bissau	0.324 (0.568)	3.201** (0.073)	0.024 (0.433)	-0.689* (-2.694)
Mali	8.717* (0.033)	0.662 (0.882)	-0.192* (-2.622)	0.176 (1.498)
Niger	9.979* (0.040)	2.878 (0.578)	0.009 (0.051)	-0.752* (-2.343)
Nigeria	0.893 (0.344)	0.011 (0.914)	-0.021 (-0.708)	-0.852* (-3.497)
Senegal	0.171 (0.678)	0.533 (0.465)	-0.031* (-3.775)	0.184 (0.876)
Sierra Leone	0.220 (0.638)	0.008 (0.928)	-	-
Togo	0.523 (0.469)	0.677 (0.410)	-	-

Note: GDP denotes Gross Domestic Product, GDS is Gross Domestic Savings. Statistics for Short-run causality are Chi-square statistics with *p-values* in parentheses. Statistics for long-run causality are coefficients on ECT_{t-1} with *t-statistics* in brackets. The asterisks * and ** denote statistical significance at the 5% and 10% levels, respectively.

4. Conclusion and policy recommendations

The objective of this study was to investigate the causal relationship between domestic savings and economic growth for twelve ECOWAS countries. Using time series annual data from 1981 to 2014, the ARDL bounds test for cointegration was first applied to discover the existence of a long-run relationship between the two variables. The results reveal that there is a positive long run relationship between the two variables in eight countries. Granger causality tests were then performed to depict the direction of causality between savings and economic growth. The results provide support to the Solow's model and the Keynesian prediction. It has been found that economic growth causes savings in Guinea-Bissau and Nigeria while the reverse causality running from savings to economic growth holds in Benin, Gambia, Mali, Niger, and Senegal. For Burkina Faso, Cote d'Ivoire, Sierra Leone and Togo there is no evidence of causality between savings and economic growth in either direction. Finally, a two-way causality prevailed in Ghana. It is clear from these results that policy makers in Benin, Gambia, Ghana, Mali, Niger, and Senegal are required to implement policies to stimulate savings in order to accelerate economic growth. For the remaining countries, efforts should be done to create appropriate conditions for better allocation of domestic resources to growth-led sectors.

References

- Abu, N., 2010. Saving-economic growth nexus in Nigeria, 1970-2007: Granger causality and co-integration analyses. *Review of Economic and Business Studies*, 3(1), pp. 93-104.
- Adeleke, A.M., 2014. Saving-growth nexus in an oil-rich exporting country: A Case of Nigeria. *Management. Science and Engineering*, 8(3), pp. 72-78.
- Agrawal, P., 2001. The relation between savings and growth: Cointegration and causality evidence from Asia. *Applied Economics*, 33(4), pp. 499-513.

- Alguacil, M., Cuadros, A. and Orts, V., 2004. Does saving really matter for growth? Mexico (1970-2000). *Journal of International Development*, 16(2), pp. 281-290.
- Anoruo, E. and Ahmad, Y., 2001. Causal relationship between domestic savings and economic growth: Evidence from seven African countries. *African Development Review*, 13(2), pp. 238-249.
- Attanasio, O.P., Picci, L. and Scorcu, A.E., 2000. Saving, growth, and investment: a macroeconomic analysis using a panel of countries. *The Review of Economics and Statistics*, 82(2), pp. 182-211.
- Baharumshah, A.Z., Thanoon, M.A. and Rashid, S., 2003. Savings dynamic in Asian countries. *Journal of Asian Economics*, 13(6), pp. 827-845.
- Bankole, A.S. and Fatai, B.O., 2013. Relationship between savings and economic growth in Nigeria. *The Social Sciences*, 8(3), pp. 224-230.
- Engle, R.F. and Granger, C.W.J., 1987. Cointegration and error correction: representation, estimation, and testing. *Econometrica*, 55(2), pp. 251-276.
- Hundie, S.K., 2014. Savings, investment and economic growth in Ethiopia: Evidence from ARDL approach to co-integration and TYDL Granger-causality tests. *Journal of Economics and International Finance*, 6(10), pp. 232-248.
- Konya, L., 2005. Saving and growth: Granger causality analysis with bootstrapping on panels of countries. *Journal of Economic Research*, 10(2), pp. 231-260.
- Kwiatkowski, D., Phillips, P.C.B., Schmidt, P. and Shin, Y., 1992. Testing the null hypothesis of stationarity against the alternative of a unit root. *Journal of Econometrics* 54 (1-3), pp. 159-178.
- Lean, H.H. and Song, Y., 2009. The domestic savings and economic growth relationship in China. *Journal of Chinese Economic and Foreign Trade Studies*, 2(1), pp. 5-17.
- Lucas, R. E., 1988. On the mechanics of economic development. *Journal of Monetary Economics*, 21(1), pp. 3-42.
- Masih, L. and Peters, M., 2010. A revisit of the savings-growth nexus in Mexico. *Economics Letters*, 107, pp. 318-320.
- Mavrotas, G. and Kelly, R., 2001. Old wine in new bottles: testing causality between savings and growth. *The Manchester School*, 69(1), pp. 97-105.
- Mohan, R., 2006. Causal relationship between savings and economic growth in countries with different income levels. *Economics Bulletin*, 5(3), pp. 1-12.
- Najarzadeh, R., Reed, M. and Tasan, M., 2014. Relationship between savings and economic growth: the case for Iran. *Journal of International Business and Economics*, 2(4), pp. 107-124.
- Odhiambo, N. M., 2008. Financial depth, savings and economic growth in Kenya: a dynamic causal linkage. *Economic Modelling*, 25(4), pp. 704-713.
- Odhiambo, N.M., 2009. Savings and economic growth in South Africa: a multivariate causality test. *Journal of Policy Modelling*, 31(5), pp. 708-718.
- Patra, S. K., Murthy, D.S., Kuruva, M. B. and Mohanty, A., 2017. Revisiting the causal nexus between savings and economic growth in India: an empirical analysis. *Economia*, 18(3), pp. 380-391.
- Pesaran, M.H., Shin, Y. and Smith, R., 2001. Bounds testing approach to the analysis of level relationships. *Journal of Applied Econometrics*, 16(3), pp. 289-326.
- Phillips, P.C.B. and Perron, P., 1988. Testing for a unit root in a time series regression. *Biometrika*, 75(2), pp. 335-346.
- Pickson, R.B., Enning, K.D. and Siaw, A., 2017. Savings-growth nexus in Ghana: cointegration and causal relationship analyses. *Theoretical Economics Letters*, 7, pp. 139-153.

- Romer, P., 1986. Increasing returns and long-run growth. *Journal of Political Economy*, 94(5), pp. 1002-1037.
- Romm, A.T., 2005. The relationship between savings and growth in South Africa: A time series analysis. *South African Journal of Economics*, 73(2), pp. 171-189.
- Saltz, I.S., 1999. An examination of the causal relationship between savings and growth in the third world. *Journal of Economics and Finance*, 23(1), pp. 90-98.
- Siaw, A., Enning, K. and Pickson, R., 2017. Revisiting domestic savings and economic growth analysis in Ghana. *Theoretical Economics Letters*, 7, pp. 1382-1397.
- Sinha, D., 1999. Saving and economic growth in Sri Lanka. *Indian Journal of Applied Economics*, 8(3), pp. 163-174.
- Singh, T., 2009. Does domestic saving cause economic growth? A time-series evidence from India. *Journal of Policy Modeling*, 32(2), pp. 231-253.
- Sinha, D. and Sinha, T., 1998. Cart before the horse? The savings-growth nexus in Mexico. *Economics Letters*, 61(1), pp. 43-47.
- Solow, R.M., 1956. A Contribution to the theory of economic growth. *Quarterly Journal of Economics*, 70(1), pp. 65-94.
- Sothan, S., 2014. Causal Relationship between domestic saving and economic growth: evidence from Cambodia. *International Journal of Economics and Finance*, 6(9), pp. 213-220.
- Tang, C.F. and Chua, Y., 2012. The savings growth nexus for the Malaysian economy: a view through rolling samples. *Applied Economics*, 44(32), pp. 4173-4185.
- Tang, C.F. and Tan, B.W., 2014. A revalidation of the savings-growth nexus in Pakistan. *Economic Modelling*, 36, pp. 370-377.