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CAUSAL RELATIONS BETWEEN ECONOMIC GROWTH, GROSS DOMESTIC SAVINGS AND FOREIGN DIRECT INVESTMENT IN BOTSWANA

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Abstract: The study investigates the causal relation between gross domestic saving andforeign direct investment with economic growth using time series data from 1980 to 2015. The study employs a granger causality analysis framework which applies an error correction mechanism. First, Augmented Dickey-Fuller and Phillips Perron unit root tests were used to test for unit root in variables. The findings show thatfor all variables the order of integration wasI(0). Thereafter, the Bounds Test for co-integration was conducted and this indicated 2 co-integrated equations. The vector error correction method (VECM) was applied to capture short and long-run causalities. The results reveal that domestic savings cause economic growth both in the short run and long run and vice versa. However, no causal relations are found between foreign direct investment with gross domestic saving and economic growth in Botswana. From a policy perspective, there needs to be a two-pronged approach to achieving economic growth in Botswana. Incorporating measures to accelerate domestic saving to ûnance domestic investment and promote higher growth on the one hand, and adopting growth enhancing measures that strengthen the capacity to save, in turn reinforcing accelerated growth on the other. The study concludes thatthe absence of a well-functioning investment climate has meant thatforeign direct investment in Botswanahas not generated positive spill over effects necessary to drive economic growth.

JEL classification: E6, E2, O4

Keywords: Economic growth, gross domestic savings, foreign direct investment, Co-integration, Short-term, Long-term, Granger Causality.

1. INTRODUCTION

The Botswana economy is heavily dependant on the mineral sector. The sector contributes more to growth in Botswana than any other sector which makes Botswana vulnerable to shocks from changes in the price of the main mineral commodity, diamonds. Moreover, while Botswana was in the past reputable for a good track record of economic growth, more recent years have been characterised by sluggish economic growth. It is therefore imprerative for Botswana to diversify its economy and look at investing in other sectors of the economy. However, to do this requires capital. Where will this capital come from? Gross domestic savings (GDS) and foreign savings in the form of foreign direct investment (FDI) present two probable sources. According to the traditional growth models, savings are used in capital creation which is used to invest in productive activities that lead to the growth of the economy. In addition, FDI stimulates technological spillovers, aids capital formation and creates a competitive environment and enhances enterprise development, all of which yield economic growth. FDI also influences growth by raising total factor productivity and increasing resource efficiency in the host contry.

This paper therefore examines the relationship between domestic savings and economic growth, as well as foreign direct investment and economic growth in Botswana. Wepostulate that savings cause economic growth through increasing investment. Furthermore, domestic savings are also augmented by foreign savings which come in the form of foreign direct investment into an open economy. Thus by supplementing domestic savings, foreign direct investment may also help acccelarate the level of economic growth. Using an interaction term between GDS and FDI, the paper investigates whether foreign savings in the form of FDI play a role in the savings-growth relationship.

2. LITERATURE REVIEW

The savings-growth relationship is one that has been the subject of much debate. Nevertheless, findings on the direction of causality in the saving-growth nexus is not unanimous. On one hand are those who favour the traditional growth models which specify a uni-directional relationship between savings and growth running from saving to growth. They assert that savings lead to growth in that savings lead to capital accumulation and this capital is invested in production resulting in growth especially in developing countries that are assumed to have a shortage in supply of loanable funds for investment. Applying a bounds testing approach of cointegration to an annual time series data from 1980 to 2008 for Botswana, Kafayar and Moyo (2013) found a significant and positive relationshiprunning from saving to growth. Jagadeesh (2015) report a similar finding for Botswana.

On the other hand are those who favouran alternate view that higher growth rates boost the rate of savings.According to Sinha & Sinha (1998), growth of GDP granger causes growth of private and public savings but there is no evidence of reverse causality. Saltz (1999) also looked at the savings-growth relationship in Latin American and East Asian developing countries. The study found no evidence to support the hypothesis that greater growth rates of savings cause higher growth rates in real GDP, but rather the opposite is true.

Similarly, Muyambiri & Chabaefe (2017) tested the dynamic causal relationship between financial development, savings investment and economic growth in Botswana from 1976- 2014 by employing a multivariate Granger causality model. The study found that economic growth Granger-causes investment and savings both in the short-run and long run, but the reverse does not hold true. Similarly, Odhiambo (2008) looked at savings, foreign capital inflows and eonomic growth for South Africa. The study found that a bidirectional causality between savings and economic growth prevails in the short run, while unidirectional relationship running from economic growth to savings was found in the long run. The study also found that foreign capital inflows and savings Granger cause each other while economic growth Granger causes foreign capital inflows.

Using annual data for Nigeriafrom 1970 to 2006, Oladipo (2010) investigated the causal relationship between savings and economic growth and further considered the role of FDI.The study found that there exists unidirectional causality between savings and economic growthrunning from savings to growth and also established a complementary role for FDI in the relationship. Employing annual data for Mexicofrom 1970 to 2000, Alguacil, Cuadros, & Orts (2002) found a causal relation between FDI and growth running from FDI to growth. Additionally the study found evidence of saving-FDI linkage which provides confirmation of the importance of foreign investment in stimulating growth.

What is clear from the literature is that these diverging views mean that there exists no common consensus on the relationship between saving and economic growth. Moreover, even though its has been shown that FDI could potentially boost domestic saving in turn stimulating economic growth, this has never been empirically tested for Botswana.In light of this, our paper makes a contribution to the existing literature by testing for the followingcausal relationships: economic growth and domestic savings,economic growth and FDI, as well as domestic savingsand FDI.

3. METHODOLOGY AND DATA

The theoretical foundations of this study stem from the Solow growth model and Harrod Domar model of economic growth. The Harrod-Domar model specifies a positive relationship between growth of total output (G_y) and savings rate (s) and a negative relationship between growth and the capital coefficient (c) specified as follows:

$$G_w = \frac{S}{C} \quad (1)$$

And Solow's model specified Output (Y) as a function of capital (K) and labour (L) where capital was a function of savings as savings are used in capital formation. The model specified as;

$$Y = f(K, L) \quad (2)$$

Based on this theoretical formulation, we adopt a causality analysis framework which applies an error correction mechanismto annual time series data for Botswana overthe period 1980 to 2015.The data is obtained from the World Bank, Bank of Botswana annual reports and Statistics Botswana. The estimated model includes output (GDP) as the dependent variable, domestic savings (GDS), foreign capital inflows (FDI) and the interaction term between GDS and FDI(FS) as independent variables.

The model is specified as follows:

$$GDP = \alpha_0 + \alpha_1 GDS + \alpha_2 FDI + FS + e_t \quad (3)$$

Where α_0, α_1 are parameters and ε_t is the error term.

After taking the natural log of equation 3to reduce variations in the data, we specify equation 4 as follows:

$$\ln GDP = \alpha_0 + \alpha_1 \ln GDS + \alpha_2 \ln FDI + FS + e_t \quad (4)$$

To capture both the short and long run relationshipsbetween the dependent and independent variables, the study applies the Autoregressive Distributed Lag (ARDL) approach to cointegration. This approach has advantages of performing better for small samples and being applicable regardless of whether the series are stationary in level I(0) or stationary in first difference I(1) or a combination of the two. An ARDL model to be subjected to error correction mechanism will therefore be estimated as follows;

$$\Delta GDP = a_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta GDP_{t-i} + \sum_{i=1}^{n} \alpha_{2i} \Delta GDS_{t-i} + \gamma_1 GDP_{t-1} + \gamma_2 GDS_{t-1} + u_{1t} \quad (5)$$

$$\Delta GDS = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta GDS_{t-i} + \sum_{i=1}^{n} \beta_{2i} \Delta GDP_{t-i} + \gamma_3 GDS_{t-1} + \gamma_4 GDP_{t-1} + u_{2t} \quad (6)$$

$$\Delta FDI = \rho_0 + \sum_{i=1}^{n} \rho_{1i} \Delta FDI_{t-i} + \sum_{i=1}^{n} \rho_{2i} \Delta GDP_{t-i} + \gamma_5 FDI_{t-1} + \gamma_6 GDP_{t-1} + u_{3t} \quad (7)$$

$$\Delta FS = \sigma_0 + \sum_{i=1}^{n} \sigma_{1i} \Delta FS_{t-i} + \sum_{i=1}^{n} \sigma_{2i} \Delta GDP_{t-i} + \gamma_7 FS_{t-1} + \gamma_8 GDP_{t-1} + u_{4t} \quad (8)$$

Where Δ is the difference operator, α_0, β_0, ρ_0, σ_0 are the intercepts. γ_1 to γ_8 are long run coefficients. α_1 to α_{2i}, β_{1i} to β_{2i} ρ_{1i} to ρ_{2i}, σ_{1i} to σ_{2i} are short run coefficients and u_{1t} to u_{4t} are the error terms. The rest of the variables are as defined in equation 3 above.

After confirmation of cointegration between economic growth, domestic savings and FDI, the causal relationships between economic growth and domestic savings, economic growth and FDI, and domestic savings and FDI are investigated with the aid of the error correction based Granger-causality approach. The causality models are estimated as follows:

$$\Delta GDP = a_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta GDP_{t-i} + \sum_{i=1}^{n} \alpha_{2i} \Delta GDS_{t-i} + \alpha_3 ECT_{t-1} + \mu_{1t} \quad (10)$$

$$\Delta GDS = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta GDS_{t-i} + \sum_{i=1}^{n} \beta_{2i} \Delta GDP_{t-i} + \beta_3 ECT_{t-1} + \mu_{2t} \quad (11)$$

$$\Delta FDI = \rho_0 + \sum_{i=1}^{n} \rho_{1i} \Delta FDI_{t-i} + \sum_{i=1}^{n} \rho_{2i} \Delta GDP_{t-i} + \rho_3 ECT_{t-1} + \mu_{3t} \quad (12)$$

$$\Delta FS = \sigma_0 + \sum_{i=1}^{n} \sigma_{1i} \Delta FS_{t-i} + \sum_{i=1}^{n} \sigma_{2i} \Delta GDP_{t-i} + \sigma_3 ECT_{t-1} + \mu_{4t} \quad (13)$$

Where: t-1 denotes one period lag, *ECT* is the error correction term which is only included if cointegration amongst the variables is detected.

4. EMPIRICAL FINDINGS

The variables employed were tested for stationarity beforecarrying with the modelestimations. Where the variables are not stationary in levels appropriate differencing is usually done until the variables become stationary.

4.1. Stationarity Tests

Unit root tests are performed using Augmented Dickey-Fuller and Phillips Perron unit root tests. Table 1 below presents the unit root test results from using the intercept only and the intercept and trend.

Table 1
Unit root test (intercept, no trend)

	AUGMENTED-DICKEY-FULLER (ADF)			*PHILLIPS-PERRON (PP)*		
Variable	*t-statistics*	*Probability*	*I(d)*	*t-statistics*	*Probability*	*I(d)*
GDP	-4.397	0.001	I(0)	-4.563	0.001	I(0)
GDS	-5.891	0.000	I(0)	-5.617	0.000	I(0)
FDI	-4.789	0.001	I(0)	-4.543	0.001	I(0)
FS	-4.533	0.001	I(0)	-4.280	0.002	I(0)
Unit root test (intercept and trend)						
	AUGMENTED-DICKEY FULLER (ADF)			*PHILLIPS-PERRON (PP)*		
Variable	*t-statistics*	*Probability*	*I(d)*	*t-statistics*	*Probability*	*I(d)*
GDP	-4.643	0.004	I(0)	-4.534	0.005	I(0)
GDS	-6.328	0.000	I(0)	-5.882	0.000	I(0)
FDI	-4.627	0.005	I(0)	-4.285	0.010	I(0)
FS	-4.487	0.007	I(0)	-4.129	0.015	I(0)

Table 1 shows that all variables are I(0) stationary at levels when using both the ADF and the PP methods. Therefore, the null hypothesis of non stationarity for all the variables is rejected.

4.2. Model Estimation

After confirming the order of integration to be I(0), we proceed with the ARDL model estimation. Estimates of the ARDL model are presented in Table 3.Diagnostic tests are also performed to find out if the assumptions of no auto correlation and homoscedasticity for the ARDL model are met. The results show that the modelspass a series of diagnostic tests. Indeed,the null hypothesis of no serial correlations is not rejected by the Breusch-Godfrey LM test for all the estimations. The Breusch-Pagan-Godfrey test for Heteroskedasticityalso leads us to accept the null hypothesis and conclude that the residuals are free from the problem ofheteroskedasticity.

Table 2
Diagnostic tests for Serial Correlation and Heteroskedasticity

	Breusch Godfrey Serial Correlation LM Test		*Heteroskedasticity Test: Breusch-Pagan Godfrey*	
	F-statistic	*Probability*	*F-statistic*	*Probability*
m1: GDP/GDS	0.640	0.535	0.255	0.776
m2: GDP/FDI	0.287	0.755	0.164	0.993
m3: GDP/FS	1.837	0.191	0.472	0.820
m4: GDS/FDI	0.191	0.827	0.869	0.497

Note: Where m1, m2, m3 and m4 are the estimated models between economic growth and domestic savings, economic growth and foreign direct investment, economic growth and the interaction term, domestic savings and the interaction term,respectively.

Table 3
Bounds Test for Cointegration

Dependent Variable		*FUNCTION*	*F-STATISTIC*	*COINTEGRATION STATUS*	
m1: GDP		f(GDP|GDS)	10.277	Cointegrated	
m2: GDP		f(GDP|FDI)	0.452	Not cointegrated	
m3:GDP		f(GDP|FS)	9.688	Cointegrated	
m4:GDS		f(GDS|FDI)	3.053	Not cointegrated	
Significance		1%	2.5%	5%	10%
Critical value bounds	I0 Bound	6.84	5.77	4.94	4.04
	I1 Bound	7.84	6.68	5.73	4.78

If the bounds test shows that the F-statistic is less than the critical value bounds we fail to reject the null hypothesis of no long run relationships and conclude that no long run relationship exists between variables. Since the F-statistic is greater than the critical value bounds for m1 and m3, we reject the null hypothesis and conclude that long run relationships exist. However, we accept the null hypothesis for m2 and m4.

For m1 and m3 where there exists a long run relationship, we continue with the Vector error correction (VEC) granger causality test. Where no cointegration is found in m2 and m4 we adopt theVector Autoregressive (VAR) approach to granger causality.

Table 4
Results of the Error Correction Model

Error Correction	*D(GDP)*	*D(GDS)*	*D(FS)*
ECM_{t-1}	0.326 [2.721]	1.120 [5.418]	-1.210 [-4.470]
D(GDP(-1))	-0.579 [-2.483]	-0.811 [-2.014]	3.419 [2.301]
D(GDS(-1))	0.392 [2.952]	0.702 [3.065]	
D(FS(-1))	0.041 [1.233]		0.236 [0.997]

Notes: t-statistics in [ ].
The ECM is reported only where cointegration exists.

The t-statistic on the coefficient of the lagged error correction term is used to assess the statistical significance of the long-run causal relationship among the variables.The causality test performed under VECM framework (Table 4) suggestthatdomestic savings causeeconomic growth both in the short run and long run and vice versa. Economic growth is also found to cause FS in the short run and long run, while FS causes GDP only in the short run.

4.3. Causality Tests

Given that a long run relationship exists for m1 and m3 therefore we continue with the Vector error correction (VEC) granger causality test. Since the test results shows no long run relationship for m2 and m4, we cannot use VEC model to examine the Granger causality between the variables. Instead, we use estimate a Vector Autoregressive (VAR) granger causality test. Table 5 below presents the VEC granger causality tests results for the variables that are cointegrated and a VAR granger causality tests results for the variables that are not cointegrated.

The results reported in Table 5 show that there exists a bidirectional causal relation between GDP and GDS in Botswana. Against apriori expectation, our results suggest that GDP does not cause FDI nor does FDI cause GDP in Botswana.Furthermore, there is a causal relation running from GDP to FS but FS is found to cause GDP. Lastly, FDI does not cause GDS but GDS are important for FDI.Our empirical findings therefore suggest a two pronged approach to achieving economic growth.

Table 5
Granger Causality Test Results

VEC Granger Causality				
NULL HYPOTHESES	*Chi-sq*	*Prob.*	*DECISION*	*Causal Relation*
Ho: GDS does not cause GDP	8.716	0.003	Reject the null hypothesis	Causality
Ho: GDP does not cause GDS	4.055	0.044	Reject the null hypothesis	Causality
Ho: FS does not cause GDP	1.520	0.218	Accept the null hypothesis	No Causality
Ho: GDP does not cause FS	5.295	0.021	Reject the null hypothesis	Causality
VAR Granger Causality				
NULL HYPOTHESES	*Chi-sq*	*Prob.*	*DECISION*	*Causal Relation*
Ho: FDI does not cause GDP	0.105	0.949	Accept the null hypothesis	No Causality
Ho: GDP does not cause FDI	3.251	0.197	Fail to reject the null hypothesis	No Causality
Ho: FDI does not cause GDS	0.737	0.692	Accept the null hypothesis	No Causality
Ho: GDS does not cause FDI	4.990	0.082	Reject the null hypothesis	Causality

Incorporating measures to accelerate domestic saving to ûnance domestic investment and promote higher growthon the one hand, and adopting growth enhancing measures that strengthen the capacity to save, in turn reinforcing accelerated growth on the other.

5. SUMMARY AND CONCLUSION

In this paper the causal relationship between savings, foreign direct investment and economic growth was empirically examined for the period of 1980 to 2016 for Botswana. Unlike previous studies done in Botswana which only report a unidirectional causality between saving and economic growth, our empirical results show a bidirectional causality both in the short run and long run. Saving is found to cause growth, bearing support to traditional growth models that savings are used in capital creation which is in turn used to invest in productive activities that lead to the growth of the economy. Growth is also found to cause saving bot in the short and long run.Our empirical findings therefore suggest that Botswana could benefit from adopting atwo pronged approach which incorporates measures to accelerate domestic saving, as well asgrowth enhancing measures that strengthen the capacity to save, in turn stimulating growth.

Our results found no evidence of the existence of causality between FDI and economic growth nor FDI and domestic savings in Botswana. The conclusion that we draw is that the Botswana government needs to embark on policies that can attract more and high-quality FDI. Furthermore, in order forforeign direct investment in Botswana to generate positive spill over effects necessary to drive economic growth, there needs to be in place a well-functioning investment climate such as improving the quality of laws, regulations and the efficiency of bureaucracy.

REFERENCES

Abdelhafidh, S. (2011). Saving, debt inflows, and growth nexus in Tunisia. Savings and Development-Vol. 35, No. 1 (2011), 29-53.

Alguacil, T. M., Cuadros, A., & Orts, V. (2002). Does Saving Really Matter for Growth? Mexico (1970-2000).

Bank of Botswana. (Various Years). Annual Reports. Bank of Botswana.

Bank of Botswana. (2017, December). Botswana Financial Statistics (BFS). Botswana Financial Statistics (BFS).

Domer, E. (1946). Capital Expansion, Rate of Profit and Employment. Econometrica, 14(2), 137-147.

Harrod, R. F. (1939). An Essay In Dynamic Theory. The Economic Journal Vol. 49 No. 139, 14-33.

Jagadeesh, D. (2015). The Impact of Savings in Economic Growth: An Empirical Study Based on Botswana. International Journal of Research in Business Studies and Management, 10-21.

Kafayat, A., & Moyo, B. (2013). Savings and Economic Growth in Botswana: An Analysis Using Bounds Testing Approach to Cointegration. Journal of Economics and Behavioral Studies Vol. 5, No. 4, 200-209.

Muyambiri, B., &Chabaefe, N. N. (2017, June). Financial development, savings, investment and economic growth in Botswana: a multivariate causal linkage. Business working paper series. Gaborone: BOCODOL.

Odhiambo, N. M. (2009). Savings and economic growth in South Africa: A multivariate causality test. Journal of Policy Modeling 31, 708-718.

OECD. (2002). Foreign Direct Investment For Development; Maximising Benefits and Minimising Costs. Paris: OECD Publications Service.

Oladipo, O. S. (2010). Does Saving Really Matter For Growth In Developing Countries? The Case of A Small Open Economy. The International Business & Economics Research Journal, 87-94.

Pesaran, M., Shin, Y., & Smith, R. (2001). Bounds testing approaches to the analysis of level relationship. Journal of applied econometrics.

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

Sinha, D., & Sinha, T. (1998). Cart before the horse? The saving-growth nexus in Mexico. Economics Letters , 43-47.

Solow, R. M. (1956). A Contribution to the Theory of Economic Growth. The Quarterly Journal of Economics, Vol.70, No. 1, 65-94.