

Exploring Co-integration and Causality Relationships between Government Expenditure and Economic Performance in Namibia

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Abstract

One of the heated discussions among economists nowadays relates to the efficacy of government expenditure as a tool for stimulating growth in the national economy. This research paper contributes to the existing literature by investigating the possibility of a dynamic relationship between government expenditure and economic growth in Namibia through the use of the two-step Engle-Granger approach. Accordingly, the study examines interactions between total government expenditure and economic growth by also including health and education as potential predictors of economic growth. The annual time-series macroeconomic secondary data-set relied upon runs from the period 1990 to 2013. The dependent variable, that is, real gross domestic product serves as a proxy to economic growth; while total public expenditure, as well as, expenditures on education and health operated in the model as predictors of economic growth. First, the study found co-integration relationships among the variables used in the study. Second, a unidirectional causality relationship running from economic growth to the health sector was observed. Further, the study found that government spending and expenditures on education and health are all weak predictors of economic growth. The lesson arising from this study would be that simply pumping a lot of financial resources into particular sectors of the economy is not a guarantee for growth. Forthcoming studies should amongst others direct attention to the type of activities that public finance is mainly used for in the health and education sectors in respect of Namibia.

Keywords: Namibia, economic growth, Granger-causality, co-integration, government expenditure, Engle-Granger technique

INTRODUCTION

Indisputably, one of the highly debated issues among economic scholars nowadays, concerns the relationship between government expenditure and economic growth. Indeed, various conflicting opinions concerning this issue are widely documented in the existing literature. A particular viewpoint in the literature shares the notion that sustained increase in government expenditure on physical and socio-economic infrastructures, as well as, human capital will help in catalysing the process of economic growth, especially in the long-run. This is so, since such investments are expected to potentially lead to a general improvement in the capacity, capabilities and the general efficiency of its workforce, and consequently increase the growth of national output. Concomitantly, such expenditures could also lead to a general improvement in infrastructures like roads, energy supplies, communications, with a possibility of encouraging more investments in the private sector, which will in turn have a positive multiplier effect on a nation's economic growth. The works of (Abdullah, 2000; Al-Yousif, 2000 and Homes & Hutton, 1990) supports this standpoint. On the contrary, the study by (Sharma, 2012) found a negative relationship between government expenditure and economic growth based on macro-economic data-sets collated from Nepal. The third viewpoint in the literature is that of finding no link between government expenditure and economic growth (Ram, 1986).

In consideration of the research background, the driving objective of this study is to empirically assess the relationship between government expenditure and economic growth in Namibia through co-integration and causality procedures. The reason informing this choice are as outlined below: Firstly, using Namibia alone will provide an opportunity for the researcher to probe deeply into the issue under investigation. Secondly, despite the huge government expenditure in its domestic economy, economic growth is still sluggish and in some instances illusive. Thirdly, and more fundamentally, the results obtained from this kind of study would potentially provide some useful ideas to policy-makers, when it comes to stimulating the national economy through government expenditures. Fourthly, it is also anticipated that this study will contribute to the existing literature concerning government expenditure and economic growth in some ways. Further, to date the researcher is not aware of any econometric study concerning Namibia that has specifically examined the impact of government expenditure on economic growth using the two-step Engle-Granger approach.

The rest of the research paper is structured in the following way. Section 2 presents the empirical literature relevant to the study. The third section concerns itself with sources of data and model building. Section 4 discusses the econometric methodology embraced. The fifth section reports and interprets the estimated econometric results. Concluding comments constitutes the final section. In this study, the terms public

expenditure and government expenditure are used interchangeably.

EMPIRICAL LITERATURE REVIEW

The existing literature concerning the relationship between government expenditure and economic growth is huge and wide-ranging. Any attempt to review all of them will be a fruitless exercise. Therefore, in this section, an attempt is made to review existing literature in a selective manner bearing in mind the driving objective of the study. In addition, the reviewed literatures are presented in a chronological fashion.

Laudau (1983) assessed the impact of government expenditure on economic performance for a sample of ninety six countries through the use of econometric time-series procedures. The author found a negative relationship between government expenditure and the real growth rate of output for most of the countries that were considered in the study.

Also contributing to the literature (Ram, 1986) probed into the connection between government expenditure and economic growth for a group of one hundred and fifteen countries during the period 1950 to 1980 by employing co-integration procedures. The author combined cross-sectional with time-series data in carrying out the study. The results arising from this study confirmed that government expenditure could potentially stimulate economic growth.

In a study based on Saudi Arabia, (Abdullah, 2000) investigated the possibility of a relationship between government expenditure and economic growth using co-integration and error correction techniques. The researcher reported that government spending is very fundamental to the performance of the national economy. This is, especially true if such expenditures are directed at infrastructures, social and economic activities that will potentially have a positive multiplier effect on the national economy. The researcher also recommended that the government should strongly support private sector initiatives in various ways in order to speed-up the process of economic growth.

Abu-Bader & Abu-Qarn (2003) utilised a multivariate co-integration and variance decomposition framework to test the possibility of a causal relationship between government expenditures and economic growth for Egypt, Israel and Syria. The result confirms bi-directional and long-run negative relationships between government spending and economic growth. Further, it was observed that military spending had a dampening effect on economic growth in the three countries used in the study, while government expenditures that are meant to promote the civil society was found to have a positive effect on economic growth for only Israel and Egypt.

Loizides & Vamvoukas (2005) carried out causality tests, in order to ascertain the nature of the empirical relationship between government expenditure and economic growth, using macroeconomic time-series data-set based on Greece, the United Kingdom and Ireland. The authors found that government expenditure Granger causes economic growth in all the countries used in the study, at least, in the short-run. For Ireland and the United Kingdom this finding is true both in the long-run and short run periods as well. Further, economic growth was found to Granger-cause public expenditure for Greece and United Kingdom, when inflation is included in the estimated model used in the study.

Akpan (2005) through the application of econometric time-series techniques and disaggregated public expenditure data sets (that include capital, recurrent, administrative, economic service, social and community service, and transfers) for Nigeria explore the possibility of a relationship between public expenditure and economic growth. Almost all the disaggregated components obtained from public expenditure tested negative in relation to economic growth. By implication, economic growth process occurring for the period under investigation in Nigeria could not be explained by changes in government expenditure patterns. This allowed the researcher to infer that policy-makers cannot rely on stimulating economic growth in Nigeria just by simply manipulating the public spending configurations.

Komain & Brahmastre (2007) also contributing to the existing literature employed co-integration and causality test procedures to estimate the relationship between government expenditures and economic growth by using Thailand as a test centre. The authors found that government expenditures and economic growth are not co-integrated, implying the absence of a long-run relationship between the two variables. In addition, the results indicated a unidirectional relationship running from government expenditures to growth. Further, the results found that government spending can have a positive multiplier effect on economic growth in the short-run. It can, therefore, be inferred from these results that government expenditures can serve as a potent tool for stimulating the national economy.

Olugbenga & Owoye (2007) empirically tested government expenditure and economic growth relationships for a group of 30 OECD countries during the period stretching from 1997 to 2005. The regression results indicated the existence of a long-run relationship between government expenditure and economic growth for all the 30 OECD countries under consideration. Further, the researchers observed a unidirectional causality running from government expenditure to growth for 16 of the selected countries, while 10 of the countries used in the study presented opposing results. Also, results obtained from this study confirmed the existence of

feedback relationships between government expenditure and economic growth for a number of countries that were investigated.

Also, contributing to the existing literature, (Ranjan & Sharma, 2008) made use of macroeconomic time-series data and employed co-integration procedures to analyse the impact of government development expenditure on economic growth for the period, 1950 to 2007 for the Indian economy. The authors found that government expenditure had a positive effect on economic growth during the period under consideration. In addition, the authors also reported the existence of co-integration relationships amongst the variables used in the study.

Liu, Hsu & Younis (2008) assessed the possibility of a causal relationship between economic growth and public expenditure by utilizing the United States of America macro-economic data-set during the period 1947 to 2002. The study found a unidirectional relationship running from government expenditure to economic growth. Contemporaneously, the study also alluded to the fact that, public expenditure in USA yielded positive results in terms of generally promoting economic activities in its economy during the period under study.

Cooray (2009) in a cross-sectional study involving 71 countries attempted to econometrically measure the relationship between the size of the government, the quality of service provided by the government and economic growth. In specific terms, the author used the size of the government, as well as, the quality of government service to explain perturbations in economic growth. The author found that the two independent variables used for the study, indeed, did reasonably explain changes in economic growth for all the 71 countries that were investigated.

Onakoya & Somoye (2013) probed into the impact of government capital expenditure on economic growth in Nigeria through the application of three-stage least squares (3SLS) technique. The study confirmed that public capital expenditure contributes positively to Nigeria's economic growth. Further, the study also indicates that public capital expenditure directly promotes oil and infrastructure development. In addition, the study suggests the need for the government to make privatization a cornerstone of its economic policy.

Maysam & Mohsen (2014) tested the relationship between government size and economic growth by employing Bayesian Model Averaging method and macro-economic data for the period stretching from 1996 to 2008 for a number of countries in the Middle East. The results could not provide any strong prima facie evidence to support the connection between government size and economic growth.

The key message arising from the existing literature reviewed, so far, is that in a number of countries, government expenditure, indeed, contributed positively towards improving upon their economic performance in various ways. However, the extent to which government expenditure enhanced economic growth varies from country to country. Therefore, a fundamental question that will occupy the mind of any researcher following the literature reviewed so far should be: Will Namibia necessarily enjoys greater economic growth as a result of increased government spending? This is an empirical issue that needs further probing. To the best of the knowledge of the researcher, no existing study based on Namibia has specifically investigated the impact of government expenditure on economic growth through the use of modern econometric time series procedures, hence a further justification for this kind of research in Namibia.

SOURCES OF DATA AND MODEL BUILDING

The study engaged essentially time-series annual data-set for the period running from 1990 to 2013. The explanatory variables used in this study are government spending, health and education expenditures, while real gross domestic product serves as the dependent variable. The macro-economic data sets used in this study was sourced from the Bank of Namibia and the Namibia Statistical Agency Bulletin, various issues. The data sets used in the study are deflated to eliminate the influence of price disturbances. Contemporaneously, the data sets are transformed into their respective natural logarithms so as to facilitate the process of establishing reactions amongst the variables, as well as improving upon the results obtained from the estimation process.

In consideration of a priori knowledge and the existing literature that are reviewed, the empirical model for studying the relationship between public expenditure and economic growth for Namibia is parsimoniously specified in general terms in the following manner:

$$Ecog_t = (Pubex_t, Eduex_t, Htex_t)_t \quad (1)$$

The equation (1) can analogously be further decomposed into a more specific nomenclature as follow:

$$LnEcog_t = \alpha_0 + \alpha_1 LPubex_t + \alpha_2 LEduex_t + \alpha_3 LHtex_t + \mu_t \quad (2)$$

Where:

α_0 = numerical constant

α_1 , α_2 and α_3 = coefficients of the explanatory variables

$Ecog$ = dependent variable

t = time factor
 Ln = natural logarithm and
 μ = noise term

Further, Ecog represents economic growth. It is also the dependent variable in the model, while Pubex represents total government expenditure. Also, Eduex serves as expenditure in respect of education. Lastly, Htex represents government expenditure regarding health. Economic theory acknowledges that generally government expenditure, be it on health, education, housing, sanitation, manufacturing, infrastructure amongst others could potentially lead to economic growth in respect of the national economy. However, whether this is also applicable to Namibia or not is an empirical question that needs further probing, and hence the necessity of this study.

ECONOMETRIC METHODOLOGY

This study uses the popular two-step Engle-Granger approach in a single equation framework. Further, this approach requires the researcher to first estimate the residuals within a static OLS regression framework. The resulting residuals are then tested for the presence of a unit root. Afterwards, the presence of a long-run relationship amongst the variables used in the study is investigated. In this regard, the Johansen co-integration approach has been used. Therefore, in the context of this approach the following procedures are embraced in the course of the study as a matter of technical necessity (Ogbokor & Samahiya, 2014): Stationarity test, co-integration test, error correction model estimation, stability test and Granger-Causality tests. It is, however, pertinent to also caution at this juncture that, all the econometric time-series techniques found in the existing literature are opened to loopholes in various ways. The two-step Engle-Granger approach is not an exception to this. The main issue often raised by scholars and researchers with the use of this approach is that, it can be substantially biased in small samples, partly due to serial correlation in the residuals. The bias can, however, be reduced by allowing for some dynamics. Nevertheless, the use of this approach is still widespread, especially amongst researchers in the field of economics (Enders, 2010).

ESTIMATION AND DISCUSSION OF ECONOMETRIC RESULTS

Discussion concerning Stationarity Test Results

The Augmented-Dickey Fuller technique is used to test for the presence of unit roots in the model. The result of this test is displayed in Table 5.1 below. All the variables are non-stationary at levels. However, the dependent variable assumed a stationary status after 1st difference, while the three independent variables turned-out to be stationary after 2nd difference.

Table 5.1: Stationarity test

Variables	Levels		1 st Difference		2 nd Difference		Order of Integration
	Optimum lag	P-value	Optimum lag	P-value	Optimum lag	P-value	
Ecog	5	.9095	5	.0174	5	.0006	I(1)
Pubex	5	1.0000	5	.0723	5	.0339*	I(2)
Eduex	5	1.0000	5	.2666	5	.0036	I(2)
Htex	5	1.0000	5	.8770	5	.0024	I(2)

*No intercept or trend is included in this unit root test

Source: Author's Construct

Discussion concerning Co-integration Test results

Co-integration presupposes that there exists a long-run relationship amongst the variables under study (Ogbokor & Moses, 2014). Further, co-integration tests can ideally be effectively performed on stationary variables that are integrated of the same order (Harris & Sollis, 2003). Although the dependant and independent variables are stationary as reflected in Table 5.1; it is, however, observed that they are not integrated of the same order. Despite the difference in the order of integration, the study proceeded with co-integration test on all the variables by utilising the Johansen's co-integration technique for analytical purposes.

Table 5.2 below represents the outcome of the test for co-integration on all the variables. The Trace Test was used to check for co-integrating relationships amongst the variables, and indeed the results indicate 2 co-integrating equations. This also implies that there is a long-run relationship amongst the variables under scrutiny.

Table 5.2: Co-integration Test Results

Unrestricted Co-integration Rank Test (Trace Test Results/Statistics)

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.706393	54.86984	47.85613	0.0095
At most 1 *	0.648302	30.35960	29.79707	0.0430
At most 2	0.370412	9.459973	15.49471	0.3245
At most 3	0.010255	0.206168	3.841466	0.6498

Trace test indicates 2 co-integrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

Discussion concerning Error Correction Model Estimation

The presence of two co-integrating relationships provides a strong basis to estimate, the error correction model. The results obtained from this estimation are displayed in Table 5.3 below.

Dependent Variable DY

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.459105	0.168634	2.722495	0.0151
DDX1	2.99E-07	2.13E-07	1.405573	0.1790
DDX2	-7.59E-08	1.03E-06	-0.073832	0.9421
DDX3	-8.59E-07	9.21E-07	-0.932970	0.3647
U(-1)	0.259217	0.267158	0.970277	0.3463
R-squared	0.248227	Mean dependent var		0.476762
Adjusted R-squared	0.060284	S.D. dependent var		0.771714
S.E. of regression	0.748091	Akaike info criterion		2.461673
Sum squared resid	8.954244	Schwarz criterion		2.710369
Log likelihood	-20.84756	Hannan-Quinn criter.		2.515646
F-statistic	1.320758	Durbin-Watson stat		1.963628
Prob(F-statistic)	0.304618			

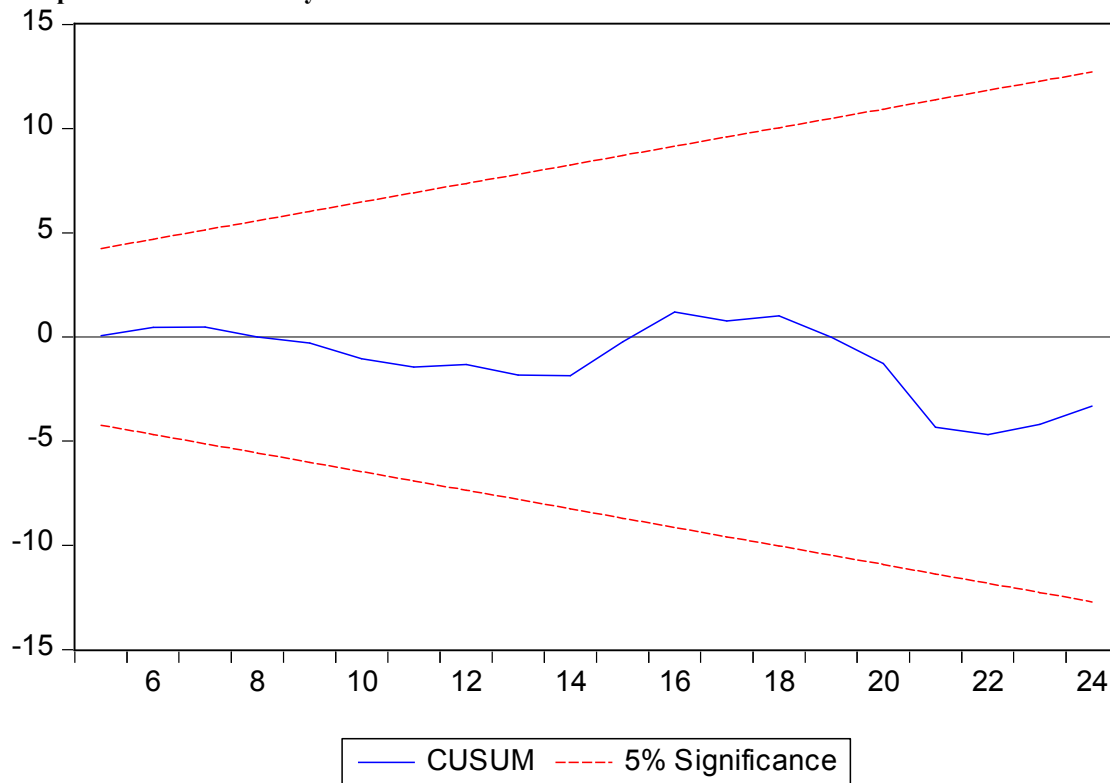
Source: Author's Construct

The results shown in Table 5.3 indicate that the error correction term (U) could not pass the significance test. However, the error correction model is judged to be generally significant and robust as reflected by the probability of the F-statistic of 0.304618, which is greater than the chosen level of significance of 0.05. This is further reinforced by the value of the adjusted coefficient of determination, which in this case is much less than the D-W statistic. The D-W statistic of 1.964 is very close to 2 and therefore, there is no reason to suspect the presence of serial correction in the estimated model. Surprisingly, the goodness-of-fit value is rather very low. More specifically, the adjusted coefficient of determination value of 0.060, indeed, do inform us that only about 6% of the systematic changes in economic growth in Namibia have been accounted for by the variables included in the error correction model. In Namibia, the health and education sectors have consistently been among the leading sectors since the country attained its independence in 1990, when it comes to government spending. This is because of the government strategy of promoting greater economic prosperity for its citizenry through emphasis on basic needs approach to development. However, the results from ECM estimation for Namibia found that these spending are not yielding positive results in terms of promoting economic growth.

Discussion concerning Stability Test Results

The study employed the Cumulative Sum of Recursive Residuals (CUSUM) procedure to test the stability of the model. The result of this test is displayed in Graph 5.1 below.

Graph 5.1: Model Stability test



Source: Author's Construct

A model or parameter is said to be stable if its CUSUM statistics are within the limits signifying the boundaries of the critical region. Should the line representing the CUSUM statistics (blue dotted line) alternates beyond the bounds of the critical region (red dotted lines), the model or parameter will be regarded as unstable. Given the above results, the model under consideration is certainly stable.

Discussion concerning Granger-Causality Test results

The results obtained by performing Granger-causality test on all the variables embedded in the model are presented in Table 5.4 below.

Table 5.4: Granger-Causality Test Results

Pairwise Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.
DDX1 does not Granger Cause DY DY does not Granger Cause DDX1	20	1.76321 2.16354	0.2052 0.1494
DDX2 does not Granger Cause DY DY does not Granger Cause DDX2	20	2.11137 0.82158	0.1556 0.4586
DDX3 does not Granger Cause DY DY does not Granger Cause DDX3	20	0.26831 7.57433	0.7683 0.0053
DDX2 does not Granger Cause DDX1 DDX1 does not Granger Cause DDX2	20	0.43610 0.23979	0.6545 0.7898
DDX3 does not Granger Cause DDX1 DDX1 does not Granger Cause DDX3	20	0.07915 0.61919	0.9243 0.5516
DDX3 does not Granger Cause DDX2 DDX2 does not Granger Cause DDX3	20	0.11196 0.19314	0.8948 0.8264

Source: Author's Construct

The above results allow the researcher to conclude that DY granger causes DDX3. No other causality relationship was found among the remaining variables that were tested. This implies that, the economy would generally need economic growth in order to boost activities in the health sector. This result also conforms to a priori expectations.

CONCLUDING OBSERVATIONS

This research article investigated the possibility of co-integration and causality relationships amongst economic growth (regressand) and three selected regressors, namely, government total expenditure, as well as, expenditures on education and health over a period stretching from 1990 to 2013. Firstly, the study found co-integration relationships amongst the variables that were considered in the study. Secondly, a bi-directional causality relationship running from economic growth to the health sector was observed. Concomitantly, the study found that government spending and expenditures on education and health are all weak predictors of economic growth. Indeed, these three explanatory variables, when combined together only accounted for approximately 6% of the systematic changes occurring with respect to economic growth. This result is, indeed, very shocking.

From a policy standpoint, the result arising from this study would imply that there is an extent to which government spending can be relied upon as a tool for stimulating economic growth in the national economy. Further, simply pumping a lot of financial resources into a particular sector is not a guarantee that this will automatically translate into economic growth.

It would be necessary for further studies to be undertaken in order to establish the connection between government expenditure and economic growth in Namibia by utilizing techniques that are different from those that have been used in this study. In this context, particular attention should be paid to causality issues. In addition, there is the need to explore the possibility of including more explanatory variables that would

potentially assist in explaining the growth process in Namibia. Another niche for further investigation would be to assess the type of activities that public finance is mainly used for in the health and education sectors in respect of Namibia.

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