WHAT IS THE IMPACT OF GOVERNMENT HEALTH EXPENDITURE ON NATIONAL INCOME IN THE SADC REGION?

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ABSTRACT

There is no doubt; expenditure on health has gained large importance in the critical domain on public expenditure and public policy. No wonder why the public has always paid close attention to public health expenditure. Using panel data covering the period 2000 – 2017 for 16 Southern African Development Community (SADC) countries (that is, Angola, Botswana, Comoros, Democratic Republic of Congo (DRC), Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, South Africa, Seychelles, Tanzania, Zambia and Zimbabwe), this study applied the pooled regression, fixed effects and random effects models in an attempt to analyze the impact of Government Health Expenditure (GHE) on national income in the SADC region. Panel unit root tests indicated that the employed data was stationary in levels. Post-estimation diagnostic tests showed that the fixed effects model was the most appropriate model and that it was not suffering from serial correlation and cross-sectional dependence. The study established that GHE has a positive significant but weak impact on national income in the SADC region. Amongst other policy recommendations, the study suggests that governments of all SADC countries should prioritise GHE over non-productive expenditures such as expenditure on buying ammunitions and weapons. They ought to allocate a significant portion of their budgets towards health expenditure given its positive impact on national income. Indeed, expenditure on health is an investment in itself because a healthy nation is a productive nation.

Keywords: - *Government Health Expenditure, National Income, SADC*

1.0 INTRODUCTION

Health is a necessity (Ibukun & Osinubi, 2020) and is already recognized globally, as a key component of sustainable economic growth (Pritchett & Summers, 1996). This is the reason why, health expenditure, especially; government health expenditure has become a topic with intense public concern (Li *et al*., 2017). Thus, it can be said that the studies that focus on this topic are very important in economic development of these countries (Dincer & Yuksel, 2019). Ideally investing in the health of a country's population should have positive returns. Good health allows children to learn and adults to live long, be productive and generate income. The expectation is that increasing health expenditure will increase health capital and consequently human capital, leading to economic growth of the country (Shilongo, 2019). Therefore, the study of the impact of government health expenditure on national income appears more and more important and quantitative research on the nexus also has huge economic and social values. Previous theoretical and empirical works have actually shown the existence of a relationship between health expenditure and economic growth using various methodological approaches (for example; De Mendonca & Baca, 2017; Modibbo *et al.*, 2019). Furthermore, panel data studies on the impact of government health expenditure on national income in the Southern African Development Community (SADC) region; are, however; scanty, with the exception of Fayissa & Gutema (2005) and Aboubacar & Xu (2017) who investigated the nexus between health expenditure and economic growth in the Sub-Saharan Africa (SSA) region. It is, therefore; this information hiatus that we seek to fill. Moreso, the inadequate allocation of the national budget to the heath sector in African countries (Aboubacar & Xu, 2017), especially those in the SADC region, is increasingly becoming worrisome. Therefore, this study basically attempts to answer this main research question: what is the impact of government health expenditure and economic growth in the SADC region? The other contribution of this paper is to extend the SADC region-specific health economics literature and to provide policy directions.

2.0 LITERATURE REVIEW

2.1 Theoretical Literature Review

Keynes (1936) and Grossman (1972) theories remain the main backborne of the health-growth nexus in Health Economics literature. Keynes postulated that any expansion in government expenditure has a positive impact on economic growth; hence the level of government expenditure on health remains an essential determinant of economic growth. Consistently, Grossman (1972) put forward that health expenditure is an investment in health and is expected to impact positively on the economy. This study is hinged on the theoretical basis of the Keynesian approach to national income determination.

2.2 Empirical Literature Review

The impact of health expenditure on the economy (economic growth/ national income) has been evaluated by many studies in literature. Some selected studies are demonstrated in the table below:

Table 1: Selected Studies for Review

Author/s (Year)	Scope	Method	Main Findings
Leidl (1998)	European Countries	Granger Causality Analysis	Health care expenditure and economic growth affect each other significantly
Scheffler (2004)	US	Descriptive Statistics	Government health care expenditure leads to economic growth
Fayissa & Gutema (2005)	SSA Countries	GMM technique	Provision of health services while excluding other socio-economic and environmental aspects may do little to improve the current health status of the region
Chang & Ying	15 OECD	Descriptive	There is a positive correlation between

(2006)	Countries	Statistics	economic development and health care expenditure
Ghanbari & Basakha (2008)	Iran	OLS Model	Government health expenditure in Iran positively affects economic growth
Emadzadeh *et al*. (2011)	Developing Countries	GMM technique	Health care expenditure has a positive effect on economic growth
Wang (2011)	31 Different Countries	Panel VECM Model	Healthcare expenditure has a positive effect on economic development
Odior (2011)	Nigeria	Simulation Analysis	Government health expenditure leads to economic growth
Luo (2011)	China	Data Envelopment Analysis	Government health expenditure has a positive impact on economic improvement
Odubunmi *et al*. (2012)	Nigeria	FMOLS & VECM	Government health care expenditure fosters economic growth in Nigeria
Naidu & Chand (2013)	Pacific Island Countries	GMM approach	Healthcare expenditure is a vital factor for economic growth
Ganyaupfu (2014)	Southern Africa region	GMM approach	Health has significant positive impacts on economic growth
De Mendonca & Baca (2017)	75 Developing Countries	GMM method	Government health expenditure positively affects economic growth
Piabuo & Tieguhong (2017)	African Countries	GMM approach	Health care expenditure leads to economic growth
Aboubacar & Xu (2017)	SSA Countries	GMM technique	Health expenditure has a significant impact on economic growth of the region
Modibbo *et al*. (2019)	West African Countries	Pedroni Panel Co-integration Analysis	Health expenditure leads to economic growth

3.0 METHODOLOGY

In order to determine the impact of Government Health Expenditure (GHE) on national income in the SADC region, the researchers use data on Gross Domestic Product (GDP), Private Consumption (CO), Gross Domestic Capital Formation (IN), GHE, Government Other Expenditure (GOV), Exports (X) and Imports (M) for all 16 SADC member countries over the period 2000 to 2017. These variables are expressed in their natural logarithms. This data was obtained from the World Bank Database. The 16 SADC member countries include Angola, Botswana, Comoros, Democratic Republic of Congo, Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, South Africa, Seychelles, Tanzania, Zambia and Zimbabwe.

Variables

To determine the impact of GHE on national income (GDP) variables; CO, IN, GOV, X and M are used as control.

National income (GDP)

This refers to the final value of all goods and services produced within the national boundaries of a country.

CO- Private Consumption

This refers to expenditure by private economic agents on both durable and non-durable goods. The effect of C on national income is expected to be positive since increases in private expenditure tend to stimulate production due to increases in aggregate demand.

IN- Investment

This includes increases in gross domestic capital formation, stocks of finished and semi-finished goods. It positively affects national income through increases in aggregate demand.

GHE- Government Health Expenditure

This is expenditure by the government on current health facilities. It should have a positive impact on national income because it increases aggregate demand. Expenditure on health will ensure a healthy work force which increases the level of production

OGV-Other Government Expenditure

This includes other government expenditure besides health expenditure. It includes expenditures on other recurrent expenditures such as payment of wages and salaries, public works, expenditures on education etc. GOE is expected to have a positive impact on national income since they increase aggregate demand.

X- Exports

Exports are goods sold to other countries after being locally produced. Increased demand for exports by foreigners implies increased aggregate demand hence national income increases. They are an injection to the circular flow of income.

M-Imports

Imports are a leakage to the circular flow since they signify outflow of foreign currency from the country. Increases in imports imply a fall in aggregate expenditure hence national income falls hence they are expected to have a negative impact on national income.

3.1 Theoretical Model Setting

The empirical model undertaken by the researchers is built upon the Keynesian theoretical model of national income determination in which GDP depends on private consumption (C), investment (I), government expenditure (G), exports (X) and imports (M). According to Keynes, consumption investment, government expenditure and exports positively affects national income whilst imports have a negative impact. He emphasised the need for expansionary fiscal policy to boost economic growth. He gave the following model which will form the basis of the empirical model adopted in this study.

$$GDP = C + I + G + (X - M) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

An unbalanced panel data analysis was used because data on variables such as GHE and Investment was not readily available for some years for countries such as Seychelles and Zimbabwe. This study uses panel data regression because there is need to regress data of 16 different countries over a 17 years' time period. Panel data regression entails pooling of observations of different variables for different cross-sectional units over a specific time period. That is, it combines both time series and cross-sectional features of data. This implies that panel data regression is a hybrid data analysis tool since it is brings more degrees of freedom, increases variability, reduces the omitted variable bias, it is highly efficient and more informative than time series or cross-sectional regression. Therefore, panel data regression enhances an empirical analysis better than solely using time series or cross-sectional data.

3.2 Empirical Model Specification

Panel data regression basically involves three models which are the pooled Ordinary Least Squares (OLS), the Fixed Effects Model (FEM) and the Random Effects Model (REM). We give a brief generalised summary of all these models in the context of the impact of GHE on national income in the SADC region before deciding on the best model based on several econometric tests to be undertaken.

3.2.1 The Pooled OLS Model

This model assumes homogeneity among all the cross-sectional units and disregards the issue of time series (Gujarati 2004). It assumes a single constant intercept and slope coefficients which are both time and cross-sectional invariant. This model disregards differences in culture and technologies amongst SADC member countries.

The specific equation for the pooled OLS model on the impact of GHE on GD with CO, IN, OGV, X and M as control variables is given by equation 1 below:

$$lnGDP_{it} = \propto_0 + \propto_1 lnCO_{it} + \propto_2 lnIN_{it} + \propto_3 lnGHE_{it} + \propto_4 lOGV_{it} + \propto_5 lnX_{it} + \propto_6 lnM_{it} + U_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

with $i = 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15 \,\&16$ *for Angola, Botswana, Comoros, DRC, Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, South Africa, Seychells, Zambia & Zimbabwe respectively*

and $t = 2000, 2001, 2002, \ldots, 2017$, *where i stands for a SADC member country and t stands for the year*

This model's main advantage is its simplicity to undertake, however it has been criticised because of its lack of practicality by assuming that all cross-sectional units are homogenous and disregarding time dynamics.

3.2.2 Fixed Effects Model

This model allows for some heterogeneity and individuality among the cross-sectional units. It appreciates that cross sectional units are different in terms of culture, education and religion as well as the fact that differences in time dynamics due to technological and policy changes impacts on economic variables differently. These differences then lead to a unique coefficient for each cross-sectional unit which is however time invariant. These differences are then incorporated into economic functions through both cross sectional and time dummies. Equation 2 has a coefficient to show that each country has a unique coefficient due to various country differences mentioned above. Equation 3 is an expansion of equation 3 and has both state and time dummies.

Equation 2 & 3 below gives the model specification for the impact of GHE on national income in the SADC region assuming the FEM.

$$lnGDP_{it} = \propto_{0i} + \propto_1 lnCO_{it} + \propto_2 lnIN_{it} + \propto_3 lnGHE_{it} + \propto_4 lOGV_{it} + \propto_5 lnX_{it} + \propto_6 lnM_{it} + U_{it} \ldots (3)$$

$$lnGDP_{it} = \propto_0 + \propto_1 lnCO_{it} + \propto_2 lnIN_{it} + \propto_3 lnGHE_{it} + \propto_4 lOGV_{it} + \propto_5 lnX_{it} + \propto_6 lnM_{it} + \beta_2 D_{2i} + \beta_3 D_{3i} + \cdots + \beta_{16} D_{16i} + \delta_1 DUM_{01} + \cdots + \delta_{17} DUM_{17} + U_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

$D_{2i}, \ldots, D_{16i}$ *are SADC countries' dummies and* $DUM_{01}, \ldots, DUM_{17}$ *are time dummies for 2001 to 2017*

$$D_{ji} = \begin{cases} 1, & if\ i = j \\ 0, & otherwise \end{cases}, DUM_{01} = 1\ for\ observation\ in\ 2001\ \&\ 0\ otherwise$$

Dummies for country 1 and year 2000 (D_{1i} *and* D_{00}*) have been excluded to avoid a dummy trap*

The major strengths of this model are that it is more practical since it appreciates the heterogeneity or differences in individual cross-sectional units due to special characteristic features specific to each cross-sectional unit. However, this model has been criticised since increases in both cross sectional and time dummies used will cause losses in degrees of freedom and these summative and multiplicative dummies as well leads to dummy traps.

3.2.3 Random Effects Model

This model assumes that the intercepts for cross sectional units are randomly drawn from the population with a constant mean value that is the 16 SADC countries are drawn from a huge population and have a common mean for $\propto_0$. Differences in the cross-sectional values for each country are shown in the error term, w_i.

$$lnGDP_{it} = \propto_0 + \propto_1 lnCO_{it} + \propto_2 lnIN_{it} + \propto_3 lnGHE_{it} + \propto_4 lOGV_{it} + \propto_5 lnX_{it} + \propto_6 lnM_{it} + z_{it} \ldots (5)$$

where $z_{it} = w_i + u_{it}$, w_i *is the cross section error component with zero mean and var,* σ_w^2

u_{it} *is a combination of both cross sectional and time series error components*

The assumption is that there is a maximum number of N cross sectional units (16 SADC member countries) as well as T time periods (17 years from 2000 to 2017). Variables in the specific models above are:

lnGDP = natural logarithm of Gross Domestic Product

lnCO = natural logarithm of private consumption

lnIN = natural logarithm of Investment

lnGHE = natural logarithm of government health expenditure

lOGV = natural logarithm of other government expenditure

lnX = natural logarithm of exports

lnM = natural logarithm of imports.

4.0 RESULTS PRESENTATION & ANALYSIS

4.1 Descriptive Statistics

The descriptive statistics of all these variables are shown on table 2 below:

Table 2: Descriptive Statistics

Description	LNGDP	LNCO	LNIN	LNGHE	LOGV	LNX	LNM
Mean	22.97912	22.55431	21.47051	18.99517	21.02000	21.86057	22.12309
Median	23.03234	22.64403	21.47278	18.93243	20.96357	21.88168	22.03487
Maximum	26.75496	26.23688	25.13147	23.55120	24.90988	25.56623	25.53999
Minimum	19.67420	19.03114	17.96175	14.80870	17.38436	17.24790	18.36194
Std. Dev.	1.520113	1.467494	1.610419	1.708690	1.511456	1.639356	1.414862
Skewness	0.343075	0.246295	0.252551	0.235782	0.420359	-0.166983	0.090803
Kurtosis	3.101243	3.280395	2.677620	3.877855	3.593045	3.809381	3.467343
Jarque-Bera	5.171309	3.453621	3.859862	10.67479	11.37898	8.241285	2.702443
Probability	0.075347	0.177851	0.145158	0.004808	0.003381	0.016234	0.258924

The Jarque-Bera (JB) Statistic is a normality test made up of skewness and kurtosis measures. Generally, a variable with a JB value below 5.99 imply that it follows a normal distribution whilst a JB value in excess of 5.99 suggest non normal distribution. Skewness measures the distribution of the variable and has three aspects, symmetric (when skewness = zero), negatively skewed (when skewness < zero) and positively skewed (when skewness > zero). Kurtosis measures the extent to which the distribution is heaped. It also has three aspects which are mesokurtic (if kurtosis = 3), platykurtic (if kurtosis <3) and leptokurtic (if kurtosis >3). A normal distribution should be both symmetric and mesokurtic. Below is a summary of descriptive statistics for the variables under consideration.

The average values for LNGDP, LNCO, LNIN, LNGHE, LOGV, LNX and LNM are 22.98, 22.55, 21.47, 19, 21.02, 21.86 and 22.12 respectively. Their respective maximum: minimum values are 26.75: 19.67; 26.24: 19.03; 25.13: 17.96; 23.55: 14.81; 24.91: 17.38; 25.57: 17.25; 25.54: 18.36. The ranges for all variables are less than 10 meaning that maximum and minimum values are closer to each other hence chances for the existence of outliers is minimised. There is evidence of low data variability in all variables since all variables have small standard deviations which are all below 1.8.

Evidence suggests that LNGDP, LNCO, LNIN and LNM have normal distributions since their respective JB values of 5.17, 3.45, 3.86 and 2.70 are all less than the JB value of 5.99. on the other hand, evidence suggest that LNGHE, LOGV and LNX do not follow the normal distribution since their respective JB values of 10.67, 11.38 and 8.24 exceeds the JB value of 5.99. LNGDP, LNCO, LNIN, LNGHE, LOGV and LNM are all positively, marginally skewed with their respective skewness of 0.34, 0.25, 0.25, 0.24, 0.42 and 0.09 whilst LNX has a negative skewness of -0.17.

LNGDP, LNCO, LNIN and LNM are all mesokurtic since all their respective kurtosis values of 3.10, 3.28, 2.68 and 3.47 are approximately equal to three. On the other hand, LNGHE, LOGV and LNX are all leptokurtic since all their respective kurtosis values of 3.88, 3.59 and 3.81 exceeds three.

4.2 Serial Correlation Tests

After estimating the model using pooled OLS, random effects and fixed effects methodologies in order to decide on the best fitting, efficient model, the researchers suspected the existence of serial correlation among residuals because of a very low Durbin-Watson (DW) value which was below 1 in all models. The researchers then regressed the current residuals on their lagged values to ascertain whether or not they are correlated. The results for the procedure are given on table 3 below.

Table 3: Serial Correlation Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.002466	0.003055	-0.807258	0.4203
RESID01(-1)	0.885076	0.029977	29.52501	0.0000

The results clearly show that past residuals are highly significant at 1% level in present residuals which confirms that there is a problem of serial correlation in our model. To get rid of this problem, the researchers then incorporated the lagged values of all variables under consideration and the problem was then solved as signified by a Durbin-Watson Statistic increasing to about 2.1 on the corrected model (see Table 11 below) and the insignificance of past residuals to present residuals after making the adjustments as shown below on Table 4:

Table 4: Serial Correlation Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001548	0.002279	0.679092	0.4978
RESID(-1)	-0.078638	0.067509	-1.164849	0.2454

Correlated Random Effects Hausman Test

The researchers use this test to identify or determine whether or not random effects are affecting the model results. The hypothesis to be tested and the decision rule are given on Table 5 below:

$H_0: random\ effects\ model\ is\ appropriate$

$H_1: fixed\ effects\ model\ is\ appropriate$

$reject\ H_0\ if\ the\ p-value\ < 0.05$

Table 5: The Hausman Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	60.930130	13	0.0000

Since the p-value is less than 0.05; we reject the null hypothesis and conclude that the random effects are not influencing our study results hence fixed effects model is more appropriate. This implies that fixed effects and not random effects are determining the impact of GHE on national income in the SADC region

4.3 The Redundant Fixed Effects Likelihood Ratio and the F-test

Having decided that fixed effects are appropriate in our model, it is important to determine whether both cross sectional and time fixed effects are necessarily influencing our study results by using the redundant fixed effects likelihood ratio hence a choice between the fixed effect model and the pooled OLS model will be made.

It is important to determine the model that better explains the relationship between GHE and national income in the SADC region. Several econometric procedures are therefore undertaken to make this decision. One of the procedures is performing the F-Test for the joint significance of all variables under consideration (Gujarati, 2004). F calculated is found by:

$$F = \frac{(R_{UR}^2 - R_R^2)/(n-1)}{(1-R_{UR}^2)/nT-n-K} \ldots\ldots\ldots (6)$$

H_0: *The efficient estimator is pooled least squares method*

H_1: *The efficient estimator is the unrestricted model*

reject H_0 *iff* $F_{calculated} > F_{critical}$ *or* $p_{value} < 0.05$

where UR is the unrestricted model with common effects whilst R is the poooled model

K is the number of estimated parameters in the common effects model, m is the total number of excluded parameters.

The Redundant Fixed Effect Likelihood Ratio

A hybrid test to determine the efficient estimator between the pooled least squares method and the fixed effects model called the Redundant Fixed Effect Test has been used. Consider Table 6 below:

Table 6: The Redundant Fixed Effects Test

Effects Test	Statistic	d.f.	Prob.
Cross-section F	3.935865	(15,196)	0.0000
Cross-section Chi-square	63.454765	15	0.0000
Period F	1.196373	(16,196)	0.2735
Period Chi-square	22.457220	16	0.1290
Cross-Section/Period F	2.637507	(31,196)	0.0000
Cross-Section/Period Chi-square	84.025278	31	0.0000

This test has been used to determine whether fixed effects are necessary or not in determining the impact of government health expenditure on national income in the SADC region. The F and Period chi-square statistics for the combined cross section and period effects are highly significant at 1% hence we reject the null hypothesis that fixed effects are redundant and conclude that the efficient estimator is the fixed effect (unrestricted) model.

After realising the need to determine whether both cross sectional and time period fixed effects influence our model results, the redundant fixed effect test has further been used.

Cross sectional fixed effects case

To determine whether cross sectional fixed effects are influencing our study results we carry out the redundant fixed effects test within a fixed cross-sectional scenario. Consider Table 6 below:

H_0: *there are no cross sectional fixed effects (cross sectional effects are redundant)*

H_1: *there are cross sectional fixed effects*

Reject the null hypothesis if p-value is less than 0.05

We reject the null hypothesis and conclude that cross sectional fixed effects are influencing our model results since the p-value is less than 0.05 and conclude that individual SADC member countries' specific characteristics does influence our study results.

Table 7: The Redundant fixed effect Test

Effects Test	Statistic	d.f.	Prob.
Cross-section F	4.113749	(15,212)	0.0000
Cross-section Chi-square	61.568058	15	0.0000

Period fixed effects case

To determine whether period fixed effects are influencing our study results we carry out the redundant fixed effects test within a fixed period scenario. Consider Table 8 below:

H_0: *there are no period fixed effects (period fixed effects are redundant)*

H_1: *there are period fixed effects*

Reject the null hypothesis if p-value is less than 0.05

Table 8: The Redundant fixed effect Test

Effects Test	Statistic	d.f.	Prob.
Period F	1.175052	(16,211)	0.2900
Period Chi-square	20.570512	16	0.1956

We fail to reject the null hypothesis that there are no period fixed effects influencing our model results since the p-values for both the F-Test (0.29) and chi-square (0.2) for period fixed test exceed 0.05 and conclude that various macro-economic conditions and events happening during specific years do not affect our study results.

4.4 Panel Unit Root Tests

A panel unit root test for variables under consideration was conducted. There is need for stationarity of variables so that OLS can produce unbiased results. The results in Table 9 below indicate that there is evidence to reject the null hypothesis of unit roots in favour of the alternative since all p-values for different tests are less than 0.05 hence they are stationary in levels.

Table 9: Unit Root Test

Method	Statistic	Prob.**	Cross- sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-13.4523	0.0000	112	1773
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.59349	0.0048	112	1773
ADF - Fisher Chi-square	286.284	0.0031	112	1773
PP - Fisher Chi-square	351.912	0.0000	112	1821

4.5 Panel Cross Section Dependence Test

It is often assumed that there is always panel cross sectional independence among residuals when the number of cross-sectional units is large. Existence of cross-sectional dependence can have dire consequences to the model leading to high levels of inefficient estimators and invalid results. A test to determine residual panel cross sectional dependence in the model under consideration on table 10 below show that there is no sufficient evidence to reject the null hypothesis which states that there is no panel cross sectional dependence since the p-values for various tests are all greater than 0.05 hence we fail to reject the null hypothesis.

Table 10: Residual Cross-Section Dependence Test

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	135.4563	120	0.1586
Pesaran scaled LM	-0.035099		0.9720
Bias-corrected scaled LM	-0.568432		0.5697
Pesaran CD	0.092896		0.9260

4.6 The Fixed Effects Model

This then implies that the best fit model to determine the impact of GHE on national income in the SADC region is a fixed effect model which considers cross sectional fixed effects. Table 11 below gives estimated coefficients of variables under consideration assuming existence of fixed effects on the impact of GHE on national income in the SADC region.

Table 11: Fixed Effect Model of impact of GHE on GDP in the SADC region

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.904500	0.165175	5.475997	0.0000
LNGDP(-1)	0.553844	0.052212	10.60768	0.0000
LNIN	0.114508	0.015099	7.583931	0.0000
LNIN(-1)	-0.051859	0.018761	-2.764108	0.0062
LNCO	0.565984	0.025238	22.42553	0.0000
LNCO(-1)	-0.342157	0.041227	-8.299253	0.0000
LNGHE	0.032869	0.012441	2.642043	0.0089
LNGHE(-1)	-0.021239	0.012427	-1.709087	0.0889
LOGV	0.217016	0.020161	10.76401	0.0000
LOGV(-1)	-0.105133	0.020565	-5.112264	0.0000
LNX	0.304254	0.021441	14.19008	0.0000
LNX(-1)	-0.171467	0.027516	-6.231532	0.0000
LNM	-0.252743	0.026909	-9.392467	0.0000
LNM(-1)	0.138745	0.030878	4.493270	0.0000
Fixed Effects (Cross)				
ANG--C	0.054502			
BOTS--C	-0.003913			
COM--C	0.067858			
DRC--C	0.073219			
ESW--C	-0.055557			
LESO--C	-0.146174			
MAD--C	-0.001755			
MALA--C	0.009951			
MAU--C	-0.021954			
MOZ--C	-0.026261			
NAM--C	-0.056986			
SA--C	0.034247			
SYC--C	-0.093862			
TAN--C	0.069722			
ZAM--C	0.040799			
ZIM--C	0.016069			
	Effects Specification			
Cross-section fixed (dummy variables)				
R-squared	0.999506	Mean dependent var		23.02970
Adjusted R-squared	0.999441	S.D. dependent var		1.514306
S.E. of regression	0.035811	Akaike info criterion		-3.708686

Sum squared resid	0.271870	Schwarz criterion		-3.289354
Log likelihood	475.8967	Hannan-Quinn criter.		-3.539745
F-statistic	15319.34	Durbin-Watson stat		2.128003
Prob(F-statistic)	0.000000			

4.7 Results Analysis & Interpretation

GHE is significant at 5% level whilst LNCO, LNIN, LOGV, LNX and LNM are significant at 1% level. GHE exerts a positive impact on national income. A 1% increase in GHE causes national income in the SADC region to increase by 0.03%. This implies that GHE is significant but has a positive, weak impact on national income in the SADC region. This result is in tandem with Keynesian economic theory which postulates that increases in government expenditure in the provision of merit goods such as health care and education causes national income to increase. According to Keynes, increases in the provision of these goods increases GDP through the multiplier process in which expenditure by government on health products from the private sector through tenders tends to increase national income through an increase in demand for these products; hence producers respond by increasing their levels of production by employing more factors of production and national income continues to increase. On the other hand, Grossman (1972), together with supply side economists postulate that increases in GHE increases national income because a healthy workforce ensures a constant and uninterrupted production hence national output increases. These results are also consistent with a number of previous studies such as Leidl (1998), Scheffler (2004), Fayissa & Gutema (2005), Chang & Ying (2006), Ghanbari & Basakha (2008), Luo (2011), Odior (2011), Wang (2011), Emadzadeh *et al*. (2011), Odubunmi *et al*. (2012), Naidu & Chand (2013), Ganyaupfu (2014), Piabuo & Tieguhong (2017), De Mendonca & Baca (2017), Aboubacar & Xu (2017) and Modibbo *et al*. (2019)

All the other control variables are significant and they all bear the expected signs as dictated by the economic theory. LNCO, LNIN, LNOGE and LNX have a positive impact on national income whilst LNM have a negative effect as postulated by Keynesian economic theory. According to the results of the study, a 1% increase in each of private consumption, investment, other government expenditure and exports causes national income to increase by 0.57%, 0.11%, 0.22% and 0.3% respectively; whilst, a 1% increase in imports causes national income to fall by 0.25%. All these impacts are inelastic since larger percentage changes in the exogenous variables are causing smaller changes in the endogenous variable, that is; national income is not highly sensitive to changes in private consumption, investment, government health expenditure, other government expenditure, exports and imports in the SADC region. LNIN, LOGV and LNX are expected to have a positive impact on national income, because; according to the Keynesian theory, they are the injections to the circular flow of income whilst imports on the other hand are the leakages. All lagged values of variables under consideration are significant but they all have a weak impact on national income. All other lagged variables have a negative impact on national income in the SADC region except the lagged values of LNM and LNGDP.

The results above show an average common intercept for all SADC member countries, c, with a value of 0.9. There are also country specific intercepts for all SADC member countries arising from the fact that these countries are heterogeneous and each has its own unique special characteristics (cross sectional fixed effects). Country specific intercepts are given as deviations from the average common intercept. A very high adjusted R^2 of 0.999 shows that 99.9% of the variation in national income can be explained by all exogenous variables under consideration.

5.0 CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

The aim of the study was to examine the impact of government health expenditure on national income in the SADC region over the period 2000 to 2017 using panel data analysis. Variables under consideration were converted into their natural logarithms to minimise variability. Consumption, investment, other government expenditure, exports and imports were used as control variables. Data used exhibited evidence of serial correlation which led to the regression of present residual values on their lagged values which confirmed serial correlation. Lagged values of all variables under consideration were incorporated into the model to get rid of this problem. The Hausman test was employed to decide on the efficient model to use between the FEM and the REM. The FEM was selected; the fixed effect redundant test was employed to choose between the pooled OLS model and the FEM and also to determine whether both cross sectional and period fixed effects are necessary. The best of fit model was the FEM with cross sectional fixed effects only. The unit root and cross-sectional dependence tests were carried out and the results revealed that the panel variables are stationary and there is no cross-sectional dependence. The results of the study show that GHE has a positive, significant but weak impact on national income in the SADC region.

5.2 Recommendations

Governments of all SADC countries should prioritise GHE over non-productive expenditures such as expenditure on buying ammunitions and weapons. They should allocate a significant portion of their budgets towards health expenditure given its positive impact on national income. Expenditure on health is an investment in itself because a healthy nation is a productive nation. Governments should also partner with the private sector in coming up with more advanced, efficient and effective health products which can be accessed by anyone. They can do this through providing funding to private companies that are capable of being innovative in the health industry. Subsidised health care systems will minimise untimely deaths and sicknesses hence national income will increase. The SADC bloc should come up with packages that incentivise their member countries to prioritise health expenditure so that the whole region may benefit. This might take the form of setting a target, for instance; rewarding any country that allocates 20% of its budget to health expenditure. All governments should endeavour to increase their health expenditures because; in the region, health is a necessity not a luxury and there are economic benefits associated with these increased expenditures.

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