IS WAGNER'S THEORY RELEVANT IN EXPLAINING HEALTH EXPENDITURE DYNAMICS IN BOTSWANA?

Kunofiwa Tsaurai *

Abstract

This study tests the relevance of the Wagner's theory in explaining the health expenditure in Botswana. There is no consensus yet when it comes to the causality relationship between health expenditure and economy. At the moment, there are four dominant schools of thought explaining the causality relationship between health expenditure and economy. The first school of thought is that health expenditure spurs the economy whilst the second school of thought says that the economy drives health expenditure. The third school of thought maintains that there is a feedback effect between health expenditure and the economy whilst the fourth mentions that there is no causality at all between the two variables. However, this study found out that there is no causality relationship between health expenditure and GDP in Botswana thereby dismissing the relevance of the Wagner's theory.

Keywords: Botswana, Health Expenditure, GDP

** Department of Finance, Risk Management and Banking, University of South Africa, P.O. Box 392, UNISA, 0003, Pretoria, South Africa*
E-mail: tsaurk@unisa.ac.za, kunofiwa.tsaurai@gmail.com

1. Introduction

There is no consensus yet with regard to the relationship between health expenditure and the economy. Empirical research done so far show findings that can be grouped into four main categories which is a clear indication that the topic is very far from being resolved.

The first category of empirical research findings supports the health expenditure-led growth perspective (Keynes, 1936 view). The second category supports the growth-led health expenditure perspective (Wagner, 1890) view, whilst the third category resonates with the feedback or bi-directional view which says that both health expenditure and the economy affect one another. The fourth category says that there is no relationship between the two variables.

Uni-directional causality relationship running from health expenditure to GDP was revealed from a study carried out by Rahman (2011). The same study though suggested the existence of a feedback effect between education spending and GDP and also between education and health expenditure. According to Elmi and Sadeghi (2012), economic growth was found to have been positively influenced by an increase in investment in health infrastructure in developing countries in the long run only. The same study could not find results that support the health-led growth hypothesis in the short run in developing countries.

Using panel unit root tests and panel co-integration approach, Mehrara and Musai (2011b) revealed the existence of a very strong causality relationship running from oil revenues and economic growth to government spending on health in oil exporting countries. The same study discovered no causality relationship at all between health expenditure and economic growth both in the short and long run. Goel and Garg (2011) found results that are consistent with the Wagner's Law whereby health infrastructure related expenditure was Granger caused by economic growth in the state of Haryana without any feedback effect.

According to Ogungbenle et al (2013), an increase in health expenditure initially pushed up economic growth and the improved economic prospects ended up enabling the government of Nigeria to spend more on health infrastructure. In other words, Ogungbenle et al (2013) discovered results that were consistent with the feedback view that both health spending and economic growth positively influence each other.

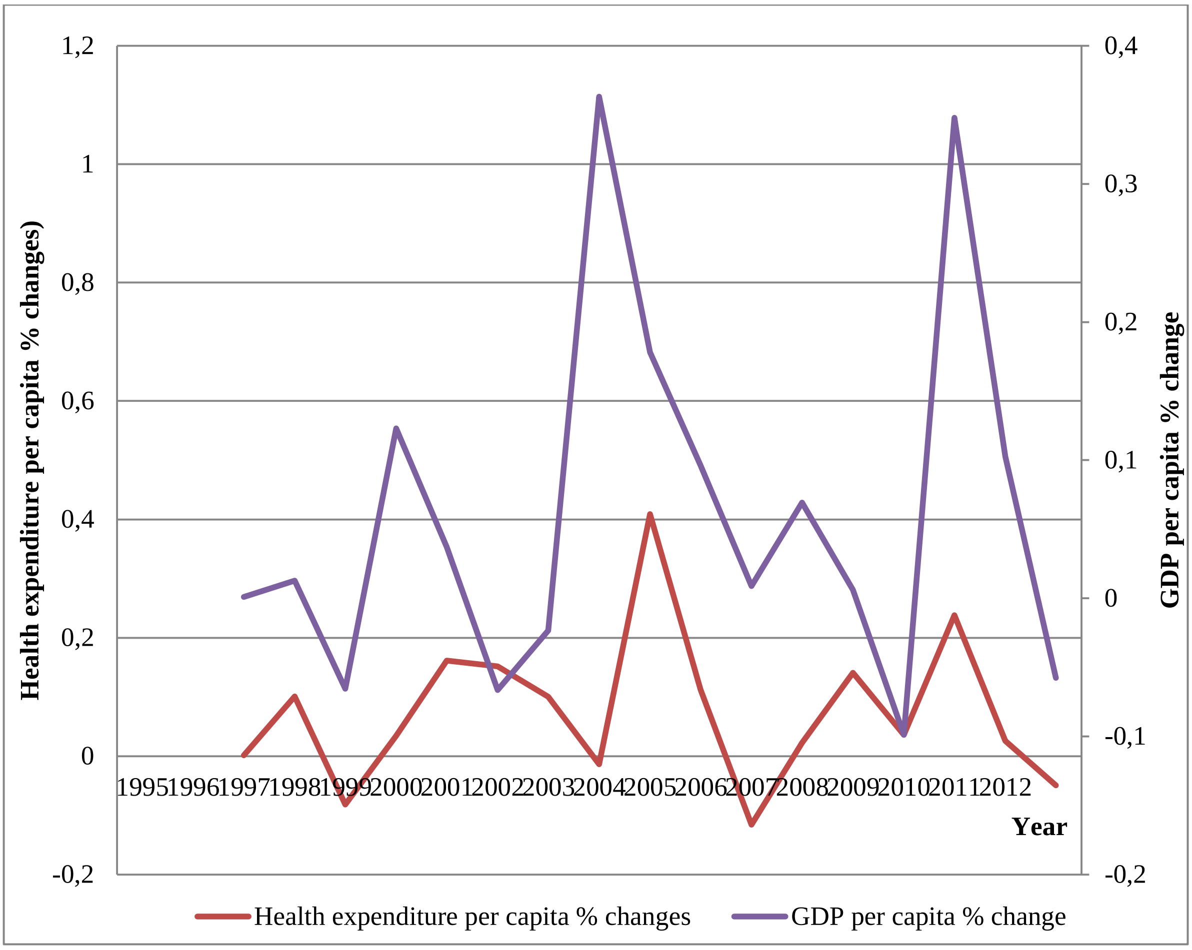
It is clear from these conflicting findings that the relationship between health expenditure and the economy is still far from being a resolved issue hence the reason behind this study using Botswana as a case study. Findings from a study of this nature will guide policy-makers in coming up with healthy expenditure policy that will not only ensure a healthy workforce boosts productivity but also ensures a balance is stricken for the benefit of all economic sectors in Botswana.

Part 2 discusses the total health expenditure and gross domestic product (GDP) trends in Botswana, part 3 looks at the review of related literature, part 4 explains the research methodology whilst part 5 concludes the study. Part 6 contains a list of references.

2. Total Health Expenditure and GDP Trends in Botswana

The health expenditure per capita % changes and the GDP per capita % changes were characterized by several fluctuations during the period 1995 to 2012 (see to Figure 1& 2).

Figure 1. Health expenditure per capita % changes and GDP per capita % change trends for Botswana – 1995 to 2012

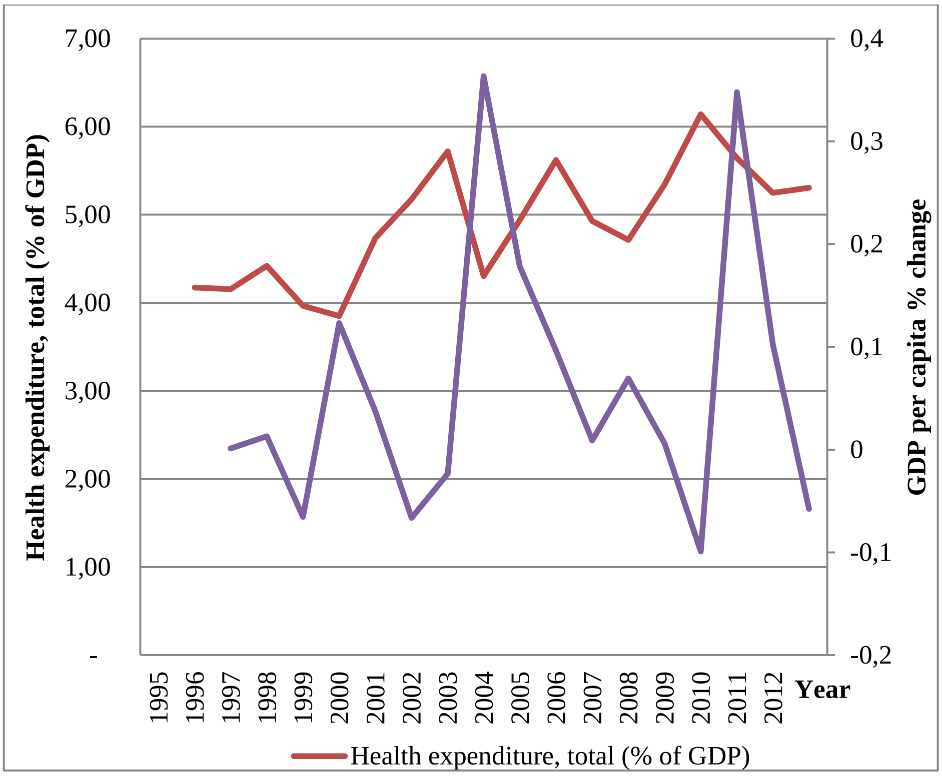


Source: World Bank (2013)

Health expenditure per capita (% change) went up by 0.16 percentage points, from 0% in 1996 to 0.16% in 2000 (World Bank, 2013) whilst GDP per capita (% change) increased by 0.04 percentage points during the same period. Moreover, health expenditure per capita (% change) in Botswana further increased from 0.16% in 2000 to 0.41% in 2004, representing a surge by 0.25 percentage points. On the other hand, GDP per capita (% change) was characterized by an increase by 0.14 percentage points, from 0.04% in 2000 to 0.18% in 2004 (see Figure 1& 2).

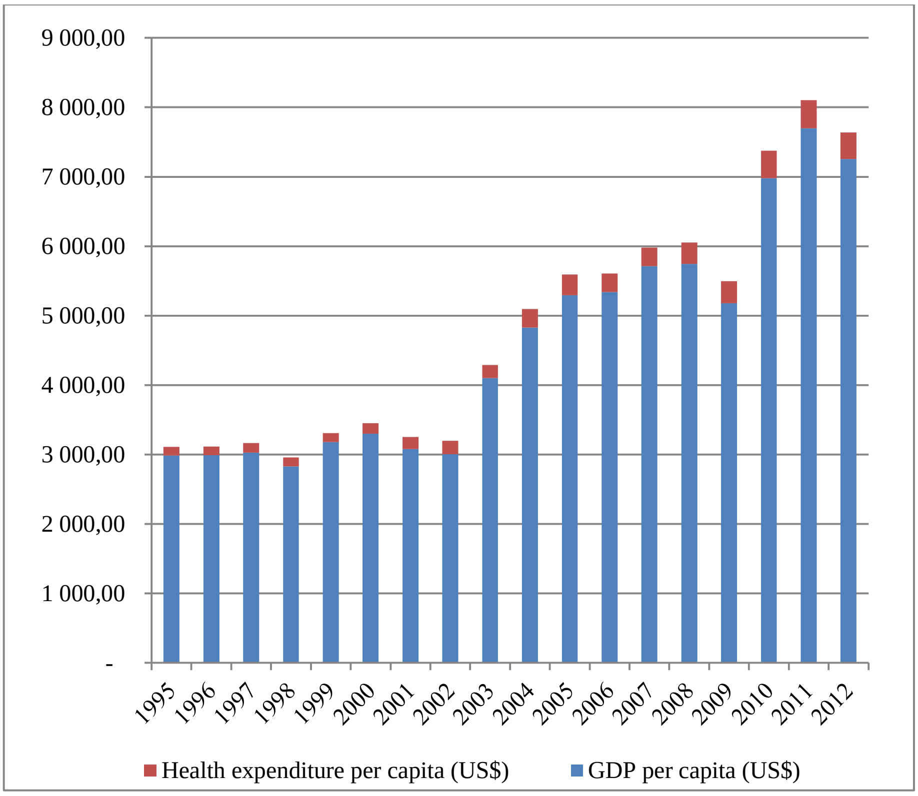
Both health expenditure per capita (% change) and GDP per capita (% change) took a plunge during the period between 2004 to 2008. Health expenditure per capita (% change) declined by 0.27 percentage points, from 0.41% in 2004 to 0.14% in 2008 whilst GDP per capita (% change) also went down by 0.17 percentage points during the same period. GDP per capita (% change) actually was 0.18% in 2004 and decreased to 0.01% in 2008 (see Figure 1 & 2). During the period 2008 to 2012, both health expenditure per capita (% change) and GDP per capita (% change) further declined. GDP per capita (% change) went down by 0.06 percentage points, from 0.01% in 2008 to -0.06% in 2012. On the other hand, health expenditure per capita (% change) declined by 0.19 percentage points, from 0.14% in 2008 to -0.05% in 2012.

Figure 2. Total health expenditure (% of GDP) and GDP per capita % change trends for Botswana – 1995 to 2012



Source: World Bank (2013)

Figure 3. Health expenditure per capita (US$) and GDP per capita (US$) trends in Botswana (1995 -2012)



Source: World Bank (2013)

World Bank (2013) statistics shows that health expenditure per capita (US$) in Botswana went up by 27.08%, from US$124.95 in 1995 to US$152.03 in 2000. During the same period, GDP per capita also increased by a massive 309.96%, from US$2 987.52 in 1995 to US$3 297.48 in 2000 (see Figure 3). Both health expenditure per capita and GDP per capita in Botswana continued on an upward trend during the period between 2000 and 2005. GDP per capita increased by a massive 1 996.90%, from US$3 297.48 in 2000 to US$5 294.38 in 2005 whilst health expenditure per capita also recorded an increase by 145.71% during the same period, from US$152.03 in 2000 to US$297.74 in 2005 (see Figure 3).

Health expenditure per capita in Botswana further went up by 96.14% during the period between 2005 and 2010 whilst GDP per capita increased by 1 685.98% during the same period. Health expenditure per capita actually increased from US$297.74 in 2005 to US$393.88 in 2010 and GDP per capita went up from US$5 294.38 in 2005 to US$6 980.36 in 2010. The period between 2010 and 2012 saw health expenditure per capita declining by 9.76% in Botswana whilst the same time period was characterised by 274.20% increase in GDP per capita. Health expenditure per capita decreased from US$393.88 in 2010 to US$384.12 in 2012. On the other hand, GDP per capita increased from US$6 980.36 in 2010 to US$7 254.56 in 2012 (refer to Figure 3).

3. Theoretical and Empirical Literature Review

There are four schools of thought explaining the causality relationship between health expenditure and the economy. The first school of thought resonates with the Keynesian perspective which says that health expenditure influence the economy. The second school of thought maintains that the economy has got an impact on health expenditure. This perspective resonates with the Wagnerian theory. The third school of thought is called the feedback or bi-directional view which says that both health expenditure and the economy affect one another. The fourth one says there is no causality relationship between the two variables.

The following are empirical studies that resonate with the Keynesian school of thought advanced by Keynes (1936). According to the American Diabetes Association (2002), health expenditure on people with diabetes is more than double those without diabetes. The same study revealed that diabetes places a substantial cost burden on the society. An increase on health expenditure targeted on improving the lives of people living with diabetes could significantly and positively influence the United States economy. According to White (2007), higher growth rate was experienced in the United States where health expenditure was much higher as compared to the Organisation for Economic Cooperation and Development (OECD) countries whose health expenditures were lower.

Using cross sectional data analysis, Gupta et al (2002) discovered that an increase in health expenditure reduced mortality rates for infants and children whilst at the same time boosting productivity. According to Wagstaff (2007), health shocks are more likely to negatively affect the income levels of urban dwellers as compared to the people staying in rural areas. The same study revealed that health shocks result in households significantly reducing food expenditure to focus more on budget items which include rental, water, and electricity among others. Liu et al (2003) revealed that an increase in medical expenditure reduced the level of poverty or increased GDP per capita in the rural areas of China in a significant way.

Zon and Muysken (2001) revealed that countries whose health expenditures is very low are associated with low productivity rates across all the sectors of the economy as well as stagnant or negative economic growth. The same study also found out that health expenditure compliments economic growth and any attempt to re-allocate health labour force to other sectors of the economy negatively hampers economy.

According to Abegunde et al (2007), if health expenditure was not increased to reduce the risk of chronic diseases, developing countries would lose an estimated figure of US$84 billion in form of economic decline between the period 2006 and 2015. Approximately US$8 billion would be saved and channeled towards boosting economic growth if health expenditure especially on chronic diseases is accelerated by the developing countries (Abegunde et al, 2007).

According to Boussalem et al (2014), health expenditure was found to have a significant impact on economic growth in the long term only and not in the short term in Algeria. Furthermore, a study by Rajeshkumar and Nalraj (2014) based on time series revealed that economic growth was Granger caused by public expenditure on health in all the four Indian States. Using Johansen co-integration procedure and error correction model (ECM), a study carried by Odior (2011) also revealed that an increased public spending on health infrastructure led to an increase in economic growth in Nigeria.

The economic growth associated benefits are widened and increased if more money is re-channelled towards health expenditure, revealed Adeniyi and Abiodun (2011). In concurrence, Bakare and Sanmi (2011) using ordinary least square (OLS) multiple regression suggested the existence of a uni-directional causality relationship running from health expenditure to economic growth in Nigeria. A study carried out by Mehrare and Musai (2011) found out a very weak causality relationship running from health expenditure to economic growth. Rengin (2012) however discovered the existence of a long term causality relationship running from health and education expenditure towards economic development whilst the same study discovered no relationship at all in the short run.

In addition, Babatunde (2014) revealed that economic growth was to a larger extent determined by gross capital formation, health spending and labour force productivity in Nigeria. The same study also suggested that lower life expectancy negatively impacted on economic prospects in Nigeria. The findings from a study done by Rico et al (2005) also resonate with the Keynesian view on public expenditure on health infrastructure. Erdil and Yetkiner (2009) revealed that economic growth was only Granger caused by expenditure on health related infrastructure in high income countries whilst the reverse causality was established for low to medium income countries.

Previous research whose findings support Wagner's theory advanced by Wagner's (1890) include Subramanian et al (2002), Dritsakis (2004), Narayan et al. (2008), Alhowaish (2014), Mehrare and Musai (2011a), Mehrara and Musai (2011b), Goel and Garg (2011), Erdil and Yetkiner (2009), Elmi and Sadeghi (2012) and Bala (11), among others. Subramanian et al (2002) revealed that the level of economic development played a bigger in determining health expenditure. Higher economic prosperity increases the capability of countries to purchase and build better health infrastructure, argued Subramanian et al (2002). The same study also discovered that higher poverty levels contributed to poor health of societies and among individuals. Moreover, the causality relationship between health expenditure and the economy is not linear as it depended on other factors such as national wealth distribution fairness (Subramanian et al, 2002).

The causality relationship from economic growth to government expenditure was found to be much stronger in low GDP per capita OECD countries. In a study on Greece and Turkey, Dritsakis (2004) discovered evidence that supports Wagner's law. According to Narayan et al. (2008), the sub-national data on China's central and Western provinces also supported Wagner's Law. In a study in four Southern Indian States, Bala (11) found out a uni-directional causality relationship running from economic growth to health expenditure in Andhra Pradesh province. The same study could not find any long run relationship between health expenditure and economic growth in the other Indian provinces of Karnataka, Kerala and Tamil Nadu during the period 1960 to 2009.

Alhowaish (2014) also discovered results that are consistent with Wagner's Law. A uni-directional causality relationship running from economic growth to healthcare spending in Saudi Arabia was revealed at one percent level of significance by a study carried out by Alhowaish (2014). The same study found out that healthcare spending had an insignificant impact on economic growth in Saudi Arabia. Mehrare and Musai (2011a) also revealed that health expenditure was Granger caused by GDP in Iran, results that are consistent with Wagner's Law. According to the same study by Mehrare and Musai (2011a), an increased public expenditure significantly contributed towards lowering poverty levels though the impact on economic growth was very minimal in Iran.

Erdil and Yetkiner (2009) discovered a uni-directional causality relationship running from economic growth to health expenditure only in low and medium income countries. However, in a study on Bangladesh, Rahman (2011) could not find results that reasonate with the Wagner's law. Elmi and Sadeghi (2012) discovered results that support Wagner's law in the short run only in developing countries whereas the same study could not confirm the health-led growth hypothesis in the short run.

The following empirical studies support the feedback perspective. A study by Nasiru and Usman (2012) using the Autoregressive Distributive Lag (ARDL) approach discovered the existence of a long term relationship between health expenditure and economic growth in at least one direction. The same study using Granger causality tests revealed that there is a bi-directional causality relationship between public health expenditure and economic growth.

Sghari and Hammami (2013) also found results that are consistent with the bi-directional causality relationship between health expenditure and economic growth in developed countries. A study by Erdil and Yetkiner (2009) revealed that the bi-directional causality relationship between health expenditure and economic growth was the most dominant view across low, medium and high income countries.

4. Research Methodology

This study used annual time series data that spans from 1995 to 2012. All the data was extracted from World Development Indicators. In addition, all data figures used for the purposes of this study is in United States Dollars unless told otherwise.

(a) Autocorrelation.

Both GDP per capita and health expenditure data sets was differenced once in order to remove the autocorrelation before unit root testing was done.

(b) Unit root tests.

The stationarity of a time series refers to its statistical features which include mean, variance and standard deviation over a given period of time. If both are constant over time, then the series is said to be stationary and if they are not constant, they are described as being non-stationary. The behavior of a time series can be determined by its stationarity. Put as model, p and q time series relationship as a simple Ordinary Least Squares (OLS) will give rise to the following equation assuming that p and q are non-stationary.

$$P_t = \alpha + \beta Q_t + \varepsilon_t \quad (1)$$

Where $P_t and\ Q_t$ represents individual time series.

Differencing a time series give rise to a set of observations such as first-differenced values, second-differenced values, third- differenced values and so on and so forth.

Level	Q_t	(2)
1st differenced value	$Q_t - Q_{t-1}$	(3)
2nd differenced value	$Q_t - Q_{t-2}$	(4)
3rd differenced value	$Q_t - Q_{t-3}$	(5)

A time series is referred to as integrated of order zero (0) or I (0) if it is found to be stationary without any differencing. A time series is referred to as integrated of order one (1) or I (1) if it is found to be stationary at first difference. On the other hand, a time series that is found to be stationary at second difference is referred to as integrated of order two(2) or I(2). For the purposes of this study, Augmented Dickey-Fuller suggested by Dickey and Fuller (1979) and the Phillips-Perron test by Phillips and Perron (1988) have been employed to test the stationarity of both health expenditure and economy data variables (see Table 1).

Table 1. Stationarity Tests of Variables in Levels

Variable	ADF /PP Test Statistic – Trend & Intercept	Critical Values
Stationarity Tests of Variables on levels - Augmented Dickey-Fuller - Test		
Ly/N	-0.090570	-3.886751* -3.052169**
LHEXP/GDP	-2.195472	-3.886751* -3.052169**
Stationarity Tests of Variables on levels – Phillips-Perron (PP) Test		
Ly/N	0.659597	-3.886751* -3.052169**
LHEXP/GDP	-2.024042	-3.886751* -3.052169**

Note:
1) * and ** denote 1% and 5% levels of significance, respectively.
2) * MacKinnon critical values for rejection of hypothesis of a unit root.
3) The truncation lag for the PP tests is based on Newey and West (1987) bandwidth.

As shown in Table 1, the null hypothesis of non-stationarity for both time series is accepted at levels as shown by the test statistic values that were higher than the critical values at 1% and 5% significance level. The two variables under study were then tested for stationarity on first difference (see results in Table 2).

Table 2. Stationarity Tests of Variables on first Difference

Variable	ADF /PP Test Statistic – Trend & Intercept	Critical Values
Stationarity Tests of Variables on first Difference - Augmented Dickey-Fuller - Test		
DLy/N	-3.791082	-2.717511* -1.964418**
DLHEXP/GDP	-4.187902	-4.004425* -3.098896**
Stationarity Tests of Variables on first Difference – Phillips-Perron (PP) Test		
DLy/N	-4.559782	-3.920350* -3.065585**
DLHEXP/GDP	-7.323510	-3.920350* -3.065585**

Note:
1) * and ** denote 1% and 5% levels of significance, respectively.
2) * MacKinnon critical values for rejection of hypothesis of a unit root.
3) The truncation lag for the PP tests is based on Newey and West (1987) bandwidth.
4) Critical values for Dickey-Fuller GLS test are based on Elliot-Rothenberg-Stock (1996, Table 1).

According to the results shown in Table 2, the null hypothesis of non-stationarity for both time series is rejected at first difference as the test statistic values that were lower than the critical values at 1% and 5% significance level. Both time series are integrated of order 1 or I (1).

4.1 Johansen and Juseliues Co-intergration Tests

Co-integration test investigates the existence of a long run relationship between the variables which are health expenditure and economic growth in this case.

This study employs the Johansen and Juselius (1990) approach which uses the Maximum Eigenvalue test and the Trace test statistic to determine the number of co-integration vectors. The former tests the null hypothesis of r co-integrating relations between the variables against the alternative of r-1 number of co-integrating relations for r = 0, 1, 2…n-1. This Maximum Eigenvalue test statistic is calculated as follows.

$$LR_{\text{maximum}}\ (r\,/\,n+1) = -T * \log(1-\lambda) \qquad (6)$$

Where λ stands for the Maximum Eigenvalue whilst T stands for the sample size and r =0,1,2, n-1.

The Trace statistic tests the null hypothesis of r co-integrating relations against the alternative n co-integrating relations. n is the number of variables in the system for r = 0, 1, 2…n-1. The equation for the Trace statistic is shown as follows.

$$LR_{trace} = -T * \sum_{i=r+1}^{n} \log(1-\lambda) \qquad (7)$$

Table 3. Unrestricted Co-integration Rank Test (Trace)

Number of CE equations	Eigenvalue	Trace Statistic	5% Critical Value	Probability**
None*	0.665593	27.37125	15.49471	0.0005
At most 1*	0.517779	10.94031	3.841466	0.0009

***** Denotes rejection of the hypothesis at the 5% levels.
*Trace test indicates 2 co-integrating equation at 5% level.
** MacKinnnon-HaugMichelis (1999) p-values.

Table 4. Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

Number of CE equations	Eigenvalue	Max-Eigen Statistic	5% Critical Value	Probability**
None*	0.665593	16.43095	14.26460	0.0224
At most 1*	0.517779	10.94031	3.841466	0.0009

***** Denotes rejection of the hypothesis at the 5% levels.
* Max-eigenvalue test indicates 2 co-integrating equation at 5% level.
** MacKinnnon-HaugMichelis (1999) p-values.

The trace statistic either rejects the null hypothesis of no co-integration among the variables or does not reject the null hypothesis that there is one co-integration relation between the variables. From Table 2 and 3; the null hypothesis is rejected at 5% critical level because Eigen value is lower than the critical values. The results therefore indicate the existence of a long run relationship between the two variables under study.

4.2 Granger Causality Test

Once the two variables are found to have a long run relationship, the next investigation is the direction of causality of that relationship. This is done through a Granger causality test (see Table 5 for results).

The Granger causality test can be expressed in a bi-variate (Q, P) format as follows.

$$P_t = \alpha M + \alpha_1 P_{t-1} + \ldots + \alpha_i P_{t-i} + \beta_1 Q_{t-1} + \ldots \beta_i Q_{t-i} + \mu \qquad (8)$$

$$Qt = \alpha M + \alpha_1 Q_{t-1} + \ldots + \alpha_i Q_{t-i} + \beta_1 P_{t-1} + \ldots \beta_i P_{t-i} + \mu \qquad (9)$$

Where M stands for a constant growth rate of P in the equation (8) and Q in the equation (9), μ is a white noise error whilst subscripts $_t$ and $_{t-i}$ represents time periods.

The first Granger causality test investigates the null hypothesis that Q does not Granger-cause P whilst the second Granger causality test investigates another null hypothesis that P does not Granger-cause Q. According to Gul and Ekinc (2006), if the former null hypothesis is not rejected and the latter hypothesis is rejected, the conclusion is that P Granger causes Q. Uni-directional causality relationship between economic growth and health expenditure occur if one of the null hypothesis is rejected whilst a bi-directional causality relationship exist if both the null hypothesis are rejected. However, according to Duasa (2007), absence of Granger causality arises if both null hypotheses are not rejected.

Table 5. Granger Causality Tests

Null Hypothesis:	F-Statistic	Probability
Health expenditure does not Granger cause GDP per capita	0.22756	0.8005
GDP per capita does not Granger cause health expenditure	0.07467	0.9286

Table 5 shows that this study cannot reject the null hypotheses which say (i) health expenditure does not Granger cause GDP per capita and (ii) GDP per capita does not Granger cause health expenditure. This is confirmed by the ($p>0.05$) and the F-statistic<4. This research reveals that there is no causality relationship between health expenditure and GDP in Botswana.

Conclusion

Empirical studies so far have clearly produced conflicting findings with regard to the relationship between GDP and health expenditure which can be grouped into four different categories. The first is the health-led growth hypothesis where an increase in health infrastructure spending promotes the economy. This view is consistent with the Keynesian perspective. The second view is the growth-led health expenditure which argues that if the economy is doing well, people and the government will have more financial resources to invest in health infrastructure. This view supports Wagner's law. The third dominant view is the feedback effect in which both health expenditure and he economic prospects affect each other. This view is sometimes known as the bi-directional perspective. However, this study found out that there is no causality relationship between health expenditure and GDP in Botswana.

The author recommends further research on the nature of the long run relationship between GDP and health expenditure in Botswana. In particular, future research should investigate the non-linearity causality relationship between the two variables and examination of factors that could be responsible in shaping the long run relationship between health expenditure and GDP in Botswana. The number of observations must also be increased in order to improve on the accuracy of the results in any future research.

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