Validation of Wagner's Law in the context of the Bhutanese Economy

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Abstract

Over the years, the public spending, along with the GDP has been rising in Bhutan. For instance, the public expenditure in Bhutan rose to Nu. 56331.357 million in the Fiscal Year 2018/19 from Nu. 49,966.611 million in the previous year (AFS 2017-18). This paper attempts to validate Wagner's law against the Keynesian hypothesis in the context of the Bhutanese economy from 1991 to 2019. Wagner's law of government expenditure and real income is opposite to the Keynesian hypothesis. In Wagner's postulation, the causal relationship runs from real income to real government expenditure and it is reversed in the case of the Keynesian hypothesis. The two-way granger causality test result indicated that Wagner's law does not hold and the evidence supports the Keynesian proposition. This is because Bhutan is more of a public-led welfare state and with its sluggish private sector growth, the economy requires the substantial support of the government. To assess the association of government expenditure with other macroeconomic variables such as inflation and unemployment, correlation and regression tests was conducted. The result showed that both consumption and capital expenditure positively influence inflation. The rising consumption expenditure has a positive relationship with unemployment; however, the capital expenditure can reduce unemployment.

Keywords: expenditure, Wagner's law, unemployment, inflation

Introduction

Over the decades, there has always been a debate on whether government plays a vital role in the macroeconomic outlook of the countries in the world or just as the classical economist suggests about the free market and its natural balance. Keynesian economics emerged after the Great Depression in 1929/30, while most theories of classical theories failed to explain the situation during the depression. Keynesian economics stresses government's contribution to the macroeconomic parameters of the country. The government stimulates the economy through different instruments to influence macroeconomic parameters. Wagner's law is a widely used model for determining public spending, and the relationship between the public expenditure and real national income is used in many policy actions by the countries.

Wagner's law stands contrary to the Keynesian Hypothesis. These are the two significant stands on the government expenditure and real income in the country. According to Adolf Wagner, government activities as a means of government spending rise due to economic growth. In contrast to Wagner's law, the Keynesian Hypothesis says that, with the increase in the government expenditure, there will be a multiplier effect that would lead the real income growth. Public expenditure is a critical instrument under the fiscal policy to influence the country's economic growth. Wagner's law was primarily tested post the Second World War because, after the Second World War, the public consumption dropped down in many countries where the private consumption was rising faster.

Wagner has supported his law for the three primary reasons: (1) during industrialization, the real income of the country increases, and it will require more expenditure for administrative and regulatory functions of the state. (2) the increased growth of the economy would require more expenditure for the providing increased culture and welfare services to the people, and (3) as the country becomes more industrialized, it would need a massive budget to finance the large projects in terms of technology procurement and capital funds since the private sector lacks in such capacity.

Significance of the Study

There are different studies done on this hypothesis and tested in several economies across the globe. However, there is no exact relationship established between the variables. This paper attempts to add to the general body of knowledge with an empirical test from a small developing country like Bhutan. As Bhutan has embarked lately on research and development, there is limited literature in the context of the Bhutanese economy. Such studies would enable learners to better understand the economy and related theories.

This study ascertains the causal relationship between government expenditure and income. More specifically, the paper also provides evidence of how government expenditure in turn influences other macroeconomic variables. This is because government expenditure is often used as a policy tool in many countries to accelerate overall economic growth and solve unemployment issues. However, unchecked government expenditure can lead to larger fiscal deficits. The fiscal deficit of Bhutan in the fiscal year 2019-20 was Nu. 6, 578.110 million, which was 3.04 percent of GDP (MoF, 2019).

Literature Review

The Kingdom of Bhutan is a small country located in the eastern Himalayas. It has a population of 735,553 people and 38,394 km² of total land area. The altitude ranges from 160 meters to 7000 meters above sea level. The urban and rural population composition is 62.2% and 37.8%, respectively. Bhutanese economy is a largely rural and agrarian economy. The agriculture sector employs 49.9% of the total labour force (Labour Force Survey Report, 2010), while only 3% of the whole land is cultivated (GNHC, 2018).

Government has critical roles in the economy besides its function as an administrative body. The economic developmental activities are accompanied by substantial government expenditures, which are expected to generate national income through the multiplier effect. Government expenditures and taxes are used as policy tools by the government to influence the economy. Unlike the other economies, owing to the size of the economy and the consumer's purchasing power, the Bhutanese Economy could not take off on its own. The growth is triggered by the exploitation of natural resources and the government expenditure to generate consumer demand. The Gross Domestic Product (GDP) is USD 2.5 billion in 2019, an average growth rate of 6.75% in the last decade. The major contributing sectors to the GDP are tourism, hydropower, and construction (NSB, 2020).

Public spending has been rising over the last decades in Bhutan. For instance, the public expenditure in Bhutan rose to Nu. 56,331.357 million in the Fiscal Year 2017/18 from Nu. 49,966.611 million in the previous year (AFS 2017-18). Such a rise in public expenditure can be explained by the growth in developmental activities in the country. As the countries advance with increased income, the demand of people becomes complex and enormous. The rising income and purchasing power of the people have led to the demand for better and advanced public utilities such as roads, bridges, and other recreational facilities simultaneously.

This correlation between government expenditure and national income was first observed by Adolf Wagner, a German Political Economist in the 19th Century. According to his law, economic progression brings expansion in the public sector (Wagner & Weber, 1977). Wagner's law has been tested in many economies using the cointegration test and the granger causality test; however, the results vary across the economies. For instance, a study in Odisha has concluded a long-run

relationship between total expenditure and total revenue expenditure (Ceft, 2015). Nevertheless, a study on the Greek economy found no long-run relationship between government expenditure and national income in Greece (Ogbonna, 2015).

Further, a past study on the Indian economy supports Wagner's law. It has considered the structural breakdown. The results showed that there is a long-run relationship between the government expenditure and the GDP. The study also observed that public spending is growing more rapidly than the income in the economy. It was concluded that the increased share of public expenditure to GDP was a result of the increased and continuous growth of public expenditure (Verma & Arora, 2010). However, the relationship between government expenditure and income was established for the Indian economy using the data from 1970 to 1999. The Error Correction Model (ECM) has revealed the bi-directional causality in absolute terms. This means it has supported both Wagner's law and the Keynesian hypothesis (Sahoo, 2001).

Wagner's law of government expenditure and real income is opposite to that of the Keynesian hypothesis. Government expenditure can be treated as an endogenous variable or an outcome, or in the latter case, the Keynesian proposition treats government expenditure as an exogenous factor that influences the national income. To study the causality of the two variables, causality runs from national income to public expenditure in Wagner's Law whereas, causality runs from public expenditure via domestic demand to national income in the Keynesian hypothesis (Afonso & Furceri, 2008 as cited in Ogbonna, 2015).

A similar study was also conducted in the Nigerian agriculture sector. Cointegration and Granger causality tests were used, and the result showed that there is a long-run relationship between various items of agriculture expenditure and the agricultural contribution to the Gross Domestic Product. Therefore, the granger causality test confirmed the validity of Wagner's law in the Nigerian agriculture sector whereas, the Keynesian hypothesis of government spending as a policy instrument was not supported (Bassey & Ibok, 2014).

A study done in Pakistan to validate Wagner's law found that the elasticity of public expenditure to real income was found to be greater than 1 which is clear evidence of the existence of Wagner's hypothesis in Pakistan's economy (Cheema & Iqbal, 2017). Further, Wagner's law was also examined in US and German states. The

study provided strong evidence to support the law in US but was not supported in German states. The study also indicated that some of the balanced budget requirements weaken the validity of Wagner's law in the US (Yoshito & Hiraga, 2016). Wagner's law has been tested in many developed and developing countries.

Methodology
Data and Model Selection

To examine the relationship between real government expenditure and the growth in real income, this paper adopts Peacock and Wiseman's (1961) version of the functional form of Wagner's law which examines the relationship between government expenditure and real income. This can be written in linear regression form

$$GE = a_1 + b_1 GDP + u_{1t}$$

Where: a_1 is the constant term, b_1 is the elasticity, GE is the real government expenditure, GDP is the real GDP and the u_i is the stochastic error representation. If the coefficient of real income is positive and the elasticity of government expenditure concerning real income exceeds unity, Wagner's hypothesis holds.

The secondary data was used for this study. The data on the government expenditure which is a composite of consumer and capital expenditure, GDP, and other macroeconomic variables were extracted from the national statistical yearbooks published annually by National Statistical Bureau.

Unit Root Test

The variables considered are put into a unit root test to check for the stationarity of the variables. This is because, data points are often non-stationary or data have trends, random walks, and cycles present in them. Any analysis done on the non-stationary data will lead to bias estimation (Granger & Newbold, 1974) or spurious results. Therefore, a unit root test was conducted on the variables using Augmented-Dickey-Fuller (ADF). The ADF test is one of the commonly used statistical tests to check whether the time series data are stationary or not.

Granger Causality Test

This study mainly deals with two variables, which are public expenditure and Gross Domestic Product (GDP). The bivariate Granger causality test is used to establish the long-run causal relationship between the two variables. Granger causality is a

statistical hypothesis of causality that is based on prediction or determining whether a time series is useful for forecasting another. If the probability value is less than alpha, the hypothesis would be rejected at that level.

According to Granger causality, if GDP Granger-cause or G-cause a Government Expenditure, the past values of GDP should contain information that helps predict Government Expenditure beyond. Its mathematical formulation is based on linear regression modelling of stochastic processes (Granger, 1969).

To quantify Granger's prediction, we employ the univariate Autoregressive model and the Bivariate Autoregressive model. Firstly, the GDP is regressed on its past values excluding GE in the regressors. This is called the restricted regression from which the restricted sum of squared residuals is obtained and this is expressed in Model A. Secondly, a regression is run including the lagged GE. This is called the unrestricted regression from which the unrestricted sum of squared residuals is obtained as shown by model B. This is done to compare the variance of the two models.

The same procedure is applied to test the reverse Granger-causality test which is also testing the Keynesian hypothesis. This test helps us to break down and study the relationship in one-way pairs. Mathematically, it can be expressed as follows:

$$GE = \sum_{n=1}^{k}(a_n GE_{t-n} + e_t) \text{ Model A}$$

$$GE = \sum_{n=1}^{k}(a_n GE_{t-n} + b_n GDP_{t-n} + \varepsilon_t) \text{ Model B}$$

Studying the variance of the error term e_t and ε_t from the autoregressive model, we quantify the Granger's causality (GC) as follows:

$$GC = Log\left(\frac{Var[e_t]}{Var[\varepsilon_t]}\right)$$

If the variances are identical, the resulted log 1 which equals 0, will mean that the variable GDP does not Graner cause government expenditure.

Results and Discussion
Unit Root Test
The results of the unit root test in the Augmented Dickey-Fuller test indicated that the data is non-stationary. The non-stationary data are then converted into stationary through the differencing method. The variable GDP and GE were

converted into stationary after the first order differencing with the p-value of 0.05 and 0.01 respectively.
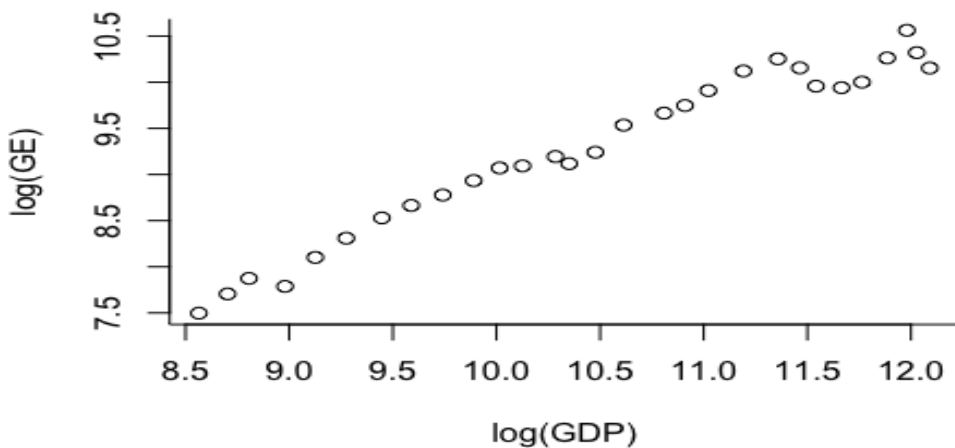
Table 1

Augmented Dicky Fuller Test

Variables	Augmented Dicky Fuller Test and the P-value First difference
GDP	0.05**
GE	0.01***

Signif. codes: 0.01 '*' 0.05 '**' 0.1 '*'

Granger Causality Test

Figure 1

Plots of the log(GDP)and log(GE)

The result of Granger causality is represented in the Table 2. To estimate the Peacock and Wiseman's version, the following equation 1 is estimated and to see the reverse causality the equation 2 is estimated.

$$GE = \sum_{n=1}^{k}(a_i GE_{t-n} + b_i GDP_{t-n} + \varepsilon_t) \ldots\ldots\ldots\ldots\ldots \text{(1)}$$

$$GDP = \sum_{n=1}^{k}(\alpha_i GDP_{t-n} + \beta_i GE_{t-n} + \epsilon_t) \ldots\ldots\ldots\ldots \text{(2)}$$

The values of F-statistics suggest that the real GDP does not granger-cause the real government expenditure (GE), and real GE does granger-cause the real GDP as indicated by the F statistics in the table below. Thus, it can be argued that the past values of GE can contribute in the prediction of the present and future value of GDP. Therefore, with these evidences we can argue and conclude that Wagner's law does not hold true to Bhutanese economy while Keynesian hypothesis does.

Table 2

Grander-causality Test

Equation	Lags	Obs.	F-stat	Prob.
1	2	28	0.72	0.50
2	2	28	5.57	0.03

Signif. codes: 0.01 '' 0.05 '**' 0.1 '*'*

Keynesian hypothesis is opposite of Wagner's law where it sees a causal relationship from government expenditure to GDP. Keynesian formulation considers government expenditure as an exogeneous variable and government expenditure is often a policy instrument to accelerate economic growth in the long run. Bhutan being a developing country and its economy characterized by agrarian economy, sluggish private sector development and low-income level, the role of government in the economy is inevitable. The government invests in the basic physical and social infrastructure in the country which escalates the government expenditure. In the last decade i.e. from the year 2009 to 2019 the average government expenditure inclusive of its consumption and investment was Nu. 28626.954 million which is approximately 22% of the average GDP in the last decade (NSB, 2020; NSB 2016; NSB, 2012). Therefore, the empirical test result is more consistent with the Keynesian hypothesis in context of Bhutanese economy.

The Relationship between Government Expenditure and other Macroeconomic Variables

The test result of Granger causality showed that government expenditure granger-cause the GDP. This has motivated the further analysis to the relationship between the government expenditure and other macroeconomic variables. Government expenditure is a composite of governments consumption expenditure which is the recurring expenditure; and the capital expenditure which is a composite of

expenditure on construction and expenditure on procurement of machines and equipment.

In the attempt to study the relationship between the government expenditure and the other macroeconomic variables such as unemployment, inflation and fiscal position in the country, the result showed the existence of association between the government expenditure and macroeconomic variables. For instance, there is positive correlation coefficient of 0.47 between the overall real government expenditure and unemployment.

Table 3

Regression

Variables	Inflation	Unemployment
Consumption Expenditure	2.552e-04	1.772e-04
	(2.079e-04)	(4.809e-05) ***
Capital Formation	5.645e-05	-1.756e-05
	(1.570e-04)	(3.632e-05)
Total Government Expenditure	1.212e-04	4.591e-05
	(1.368e-04)	(4.089e-05)
Observation	21	21

Note: Robust standard errors in parentheses, ***$p<0.01$, **$p<0.05$, *$p<0.1$

The regression analysis was applied to study the causal relationship among the variables. The regression results reported in Table 3 shows that only government's consumption expenditure and unemployment showed a positive and significant relationship at p-value less than .01. The government expenditure has positive relationship with unemployment, this might be because of the government expenditure not being able to translate into the employment generation opportunities. This finding is similar to the existing study in Sub-Saharan African Countries where the findings of the study revealed that an increase in government consumption expenditures results in an increase in unemployment whereas a rise in government investment expenditures results in a reduction in unemployment, holding all other variables constant (Fosu, 2019). Bhutan's consumption is import-oriented, where the consumer demand for food products and other capital goods

are imported from the neighboring states in India and countries other than India. Therefore, any rise in the consumption expenditure worsens the deficit trade balance in the external sector of the economy rather than creating demand for the domestically produced goods. These findings were consistent with the analysis done on public expenditure and economic growth in Sri Lanka (Kesavarajah, 2012).

The general economic theory postulates the growth as a function of investment and saving. However, the Bhutanese economy shows a lower level of investment expenditure from both government and private sectors in comparison to consumption expenditure. The causal relationship test result showed that capital formation did not significantly influence unemployment and inflation.

Further, the association of government expenditure and inflation has been broken down into short run and long run. Results indicated that there is negative correlation in short run and the positive in the long run. However, the regression test results are not statistically significant. The positive coefficient indicates a tendency of government expenditure to exert pressure on the general price level in the short run, which is consistent with the Keynesian economic theory.

However, in the long run, the government expenditure and inflation exhibit inverse relationship with coefficient of -0.233. This may be because of the volatility in government spending (Nguyen, 2014). The reason why inflation did not rise with rising in government expenditure in long run may be due to the continuous fiscal deficit of the country. Deficit financing mechanisms such as the sale of T-bills and bonds raises interest rate and reduces the overall money supply in the economy. This has also a negative impact on the consumption and investment demand which in turn maintains low inflationary pressure in the economy.

Conclusion

The Granger-causality test to check the plausibility of Wagner's law showed that GDP does not Granger-cause government expenditure. However, the result was statistically significant on a reverse test and that draws the conclusion that the Keynesian hypothesis does hold true for the Bhutanese economy. This may be due to the fact that Bhutan is a developing country and the government has a significant role to play in the economy. The nature of the economy being agrarian with sluggish private sector growth would require a higher level of both government investment and private investment for the growth to take place.

The result indicated that the causal relation runs from government expenditure to GDP and this has motivated further analysis of government expenditure and other macroeconomic variables such as unemployment, inflation, and fiscal position in the country. The result indicated a positive causal relationship between government expenditure and unemployment. Although capital formation has a negative coefficient, it did not significantly reduce unemployment and inflation rate in the country. This may be due to the government expenditure not being able to generate employment opportunities and also the impact of expenditure on education and health is realized only in the long run.

References

Afonso, A., & Furceri, D. (2008). EMU enlargement, stabilization costs, and insurance mechanisms. *Journal of International Money and Finance*, *27*(2), 169-187.

Al-Khulaifi, A. S. (2012). The relationship between government revenue and expenditure in Qatar: A cointegration and causality investigation. *International Journal of Economics and Finance*, *4*(9), 142-148.

Sanchez-Juarez, I., García, R., & Barajas, H. (2016). The relationship between total production and public spending in Mexico: Keynes versus Wagner. *International Journal of Financial Research*, *7*(1), 109-120.

Atasoy, B. S., & Gür, T. H. (2016). Does the Wagner's hypothesis hold for China? Evidence from static and dynamic analyses. *Panoeconomicus*, *63*(1), 45-60.

Ibok, O. W., & Bassey, N. E. (2014). Wagner's law revisited: The case of Nigerian agricultural sector (1961–2012). *International Journal of Food and Agricultural Economics (IJFAEC)*, *2*(1128-2016-92045), 19-32.

Ceft. (2015). Evidence of Wagner's Law in Odisha, One pager. Xavier University, Bhubaneswar, India. Retrieved from: https://fred.stlouisfed.org/series/DEXINUSEconomic Research. Federal Reserve Bank of ST. Lois

Cheema, A. R., & Iqbal, M. (2017). Testing the validity of Wagner's Law in Pakistan: an application of ARDL cointegration technique. *Pakistan Business Review*, *19*(1), 89-113.

Lahirushan, K. P. K. S., & Gunasekara, W. G. V. (2015). The impact of government expenditure on economic growth: A study of Asian countries. *International Journal of Humanities and Social Sciences*, *9*(9), 3152-3160.

Funashima, Y., & Hiraga, K. (2017). Wagner's law, fiscal discipline, and intergovernmental transfer: empirical evidence at the US and German state levels. *International Tax and Public Finance*, *24*(4), 652-677.

Fosu, G. A. (2019). Government Expenditure and Unemployment: Empirical Investigation of Sub-Saharan African (SSA) Countries.

Granger, C. W. (1969). Investigating causal relations by econometric models and cross-spectral methods. *Econometrica: journal of the Econometric Society*, 424-438.

Granger, C. W., & Newbold, P. (1974). Spurious regressions in econometrics. *Journal of econometrics*, *2*(2), 111-120.

Gross National Happiness Commission. (2018). Population and Development Situation Analysis Bhutan. https://www.gnhc.gov.bt/en/wp-content/uploads/2019/03/PSA-GNHC-2018_v3-1.pdf

Kesavarajah, M. (2012). Wagner's law in Sri Lanka: An econometric analysis. *International Scholarly Research Notices*, *2012*.

Magazzino, C., Giolli, L., & Mele, M. (2015). Wagner's Law and Peacock and Wiseman's displacement effect in European Union countries: A panel data study. *International Journal of Economics and Financial Issues*, *5*(3), 812-819.

Ministry of Finance. (2019). Annual Financial Statement. https://www.mof.gov.bt/wp content/uploads/2020/06/AFS_FY_2018-2019_English.pdf

National Statistics Bureau, Royal Government of Bhutan. (2020). National Accounts Statistics. https://nsb.gov.bt/wp-content/uploads/dlm_uploads/2020/11/National-Accounts-Report 2020.pdf

Nguyen, T. D. (2016). Impact of Government Spending on Inflation in Asian Emerging Economics: Evidence from India, China, and Indonesia. The Singapore Economic Review, 64(05), 1171–1200.https://doi.org/10.1142/s0217590816500338

Peacock, A. T., & Wiseman, J. (1961). Front matter, the growth of public expenditure in the United Kingdom. In *The growth of public expenditure in the United Kingdom* (pp. 32-0). Princeton University Press.

Sahoo, P. (2001). Wagner hypothesis: Further empirical evidence from India. *Journal of Indian School of Political Economy*, *13*(1), 45-53.

Verma, S., & Arora, R. (2010). Does the Indian economy support Wagner s Law? An econometric analysis. *Eurasian Journal of Business and Economics*, *3*(5), 77-91.

Wagner, R. E., & Weber, W. E. (1977). Wagner's law, fiscal institutions, and the growth of government. *National Tax Journal*, *30*(1), 59-68.

Annexure
Table A1
Data extracted from the Statistical Yearbooks published by National Statistical Bureau (NSB)

Year	GDP	GE	Population	PCI	PCGE
1991	5242.0	1802.9	534600	9805.46	3372.43
1992	6020.4	2221.8	534500	11263.61	4156.78
1993	6675.2	2627.8	532600	12533.23	4933.91
1994	7943.9	2410.4	531900	14934.95	4531.68
1995	9192.6	3298.4	534600	17195.29	6169.85
1996	10672.6	4062.6	541500	19709.33	7502.49
1997	12674.4	5060.7	551700	22973.36	9172.92
1998	14599.9	5790.6	564400	25868.00	10259.74
1999	17001.4	6484.9	577900	29419.28	11221.49
2000	19735.77	7579.8	591000	33393.86	12825.38
2001	22373.0	8699.3	603600	37065.94	14412.36
2002	24981.7	8889.7	616000	40554.71	14431.33
2003	29269.1	9839	627800	46621.69	15672.19
2004	31284.7	9112.8	638800	48974.17	14265.50
2005	35496.9	10308.6	648700	54720.06	15891.17
2006	40673.5	13833.78	657400	61870.25	21043.17
2007	49456.6	15757.21	664900	74382.01	23698.62
2008	54713.01	17101.75	671600	81466.66	25464.19
2009	61223.48	20120.3	678300	90260.18	29662.83
2010	72496.64	24861.15	685500	105757.32	36267.18
2011	85580.58	28363.6	693300	123439.46	40911.01
2012	95186.52	25719.85	701600	135670.64	36658.85
2013	102909.95	21091.28	710200	144902.77	29697.66
2014	116388.56	20750.6	719100	161853.09	28856.35
2015	128534.63	22040.75	727900	176582.81	30279.91
2016	145072.86	28650.62	736700	196922.57	38890.48
2017	159571.7	38644.51	745600	214017.84	51830.08
2018	167339.97	30346.75	754400	221818.62	40226.34
2019	178201.81	25680.13	763100	233523.54	33652.38