THE LINKAGE BETWEEN GOVERNMENT EXPENDITURE AND NATIONAL INCOME: THE CASE OF BANGLADESH

Akrama Khanom1
Joynal Uddin2
Mohammed Jashim Uddin3
Mohammad Mamunur Rashid4

ABSTRACT

Objective: This study examines the applicability of Keynesian and Wagner’s law in terms of gross national expenditure (GNE) and gross national income (GNI) in Bangladesh.

Theoretical Framework: According to Wagner’s Law, a country's government spending rises in tandem with its national income. The opposite is true, according to the Keynesian Law, which claims that government spending increases GDP.

Methodology: This study is a quantitative and secondary data based analysis. It makes use of time series data spanning the years 1981 to 2020. All variables’ data were gathered from the World Bank's compilation of global development indicators. In order to exclude years with outlier data, the current study did not include variables’ data from 1971 to 1980 (The abnormality occurred in 1971 for the war of liberty; in 1974 for the Famine and in 1975 for the political violence). Once the sequence of integration with ADF had been determined; the ARDL bounds testing technique and Granger causality test were used.

Results and Discussion: According to the findings of the ARDL bounds test, there is a long-term correlation between government spending and gross domestic product. Government spending likely contributes significantly to the causes of national income, according to the slope coefficients from long-run equations. Granger causality findings show that government spending and national income have a one-way causal link but not the other way around.

Research Implications: One possible explanation for this result is that recent government spending on development projects boost up the national income.

Originality/Value: We contribute to the literature in two important ways. The first contribution is that we focus on more robust estimation methodologies. Unlike previous studies of Bangladesh context, we apply ARDL bounds test approach to co-integration. In addition to having advantageous small sample characteristics, the ARDL limits testing approach does not necessitate the same order of integration in the variables. With these considerations, this technique suits better in case of Bangladesh given that data would be of a small span. And second, we examined both of the Wagner’s Law and Keynesian Law for Bangladesh with two separate equations, unlike the previous studies on Bangladesh who investigated the Wagner’s equation only.

Keywords: ARDL, Causality, Government Expenditure, National Income, Keynesian Law, Wagner’s Law.

1 Department of Business Administration, International Islamic University Chittagong. E-mail: akramakhanam@gmail.com Orcid: https://orcid.org/0009-0007-6616-7152
2 Department of Economics and Banking. International Islamic University Chittagong. E-mail: joynal.econ@gmail.com Orcid: https://orcid.org/0000-0003-3770-1428
3 Department of Economics and Banking. International Islamic University Chittagong. E-mail: mjashimtu19@gmail.com Orcid: https://orcid.org/0000-0002-7954-1226
4 Department of Economics and Banking. International Islamic University Chittagong. E-mail: mamunurrashid9864@gmail.com Orcid: https://orcid.org/0009-0009-0312-7721
A LIGAÇÃO ENTRE A DESPESA PÚBLICA E A RECEITA NACIONAL: O CASO DE BANGLADESH

RESUMO

Objetivo: Este estudo analisa a aplicabilidade da lei keynesiana e Wagner em termos de despesa nacional bruta (GNE) e renda nacional bruta (RNB) em Bangladesh.

Estrutura Teórica: De acordo com a Lei de Wagner, os gastos do governo de um país aumentam em paralelo com a sua renda nacional. O oposto é verdade, de acordo com a Lei Keynesiana, que afirma que a despesa do governo aumenta o PIB.

Metodologia: Trata-se de uma análise quantitativa e secundária baseada em dados. Utiliza dados de séries cronológicas que abrangem os anos de 1981 a 2020. Os dados de todas as variáveis foram coletados a partir da compilação de indicadores de desenvolvimento global do Banco Mundial. A fim de excluir anos com dados de exceções, o estudo atual não incluiu dados de variáveis de 1971 a 1980 (A anormalidade ocorreu em 1971 para a guerra da liberdade; em 1974 para a Fome e em 1975 para a violência política). Uma vez que a sequência de integração com ADF foi determinada, a técnica de teste de limites ARDL e teste de causalidade Granger foram usados.

Resultados e Discussão: De acordo com as conclusões do teste de limites da ARDL, há uma correlação de longo prazo entre os gastos do governo e o produto interno bruto. Os gastos do governo provavelmente contribuem significativamente para as causas da renda nacional, de acordo com os coeficientes de inclinação das equações de longo prazo. Os resultados de causalidade mais avassaladora mostram que a despesa pública e o rendimento nacional têm um nexo de causalidade unidirecional, mas não o contrário.

Implicações na pesquisa: Uma possível explicação para esse resultado é que os recentes gastos do governo em projetos de desenvolvimento alavancam a renda nacional.

Originalidade/valor: contribuímos para a literatura de duas maneiras importantes. A primeira é que nos concentramos em metodologias de estimativa mais robustas. Ao contrário de estudos anteriores do contexto de Bangladesh, aplicamos a abordagem de teste de limites ARDL para a cointegração. Além de ter características vantajosas de amostras pequenas, a abordagem de teste de limites de ARDL não necessita da mesma ordem de integração nas variáveis. Tendo em conta a precedente, esta técnica adequa-se melhor no caso de Bangladesh, uma vez que os dados seriam de uma pequena dimensão. E segundo, examinamos tanto a Lei de Wagner quanto a Lei keynesiana de Bangladesh com duas equações separadas, ao contrário dos estudos anteriores sobre Bangladesh, que investigaram somente a equação de Wagner.


EL VÍNCULO ENTRE EL GASTO PÚBLICO Y LA RENTA NACIONAL: EL CASO DE BANGLADESH

RESUMEN

Objetivo: Este estudio examina la aplicabilidad de la ley keynesiana y de Wagner en términos de gasto nacional bruto (PNB) e ingreso nacional bruto (PIB) en Bangladesh.

Marco teórico: Según la Ley de Wagner, el gasto del gobierno de un país aumenta en tándem con su ingreso nacional. Lo contrario es cierto, según la Ley Keynesiana, que afirma que el gasto del gobierno aumenta el PIB.

Metodología: Este estudio es un análisis cuantitativo y secundario basado en datos. Utiliza datos de series temporales que abarcan los años 1981 a 2020. Todos los datos de las variables se recopilaron a partir de la compilación de indicadores mundiales de desarrollo del Banco Mundial. Para excluir años con datos atípicos, el estudio actual no incluyó datos de variables de 1971 a 1980 (La anormalidad ocurrió en 1971 para la guerra de libertad; en 1974 para la Hambruna y en 1975 para la violencia política). Una vez determinada la secuencia de integración con ADF, se utilizó la técnica de pruebas de límites ARDL y la prueba de causalidad de Granger.

Resultados y discusión: De acuerdo con los hallazgos de la prueba de límites ARDL, existe una correlación a largo plazo entre el gasto público y el producto interno bruto. Es probable que el gasto público contribuya
significativamente a las causas del ingreso nacional, según los coeficientes de pendiente de las ecuaciones de largo plazo. Los hallazgos de causalidad de Granger muestran que el gasto del gobierno y el ingreso nacional tienen un vínculo causal unidireccional, pero no al revés.

Implicaciones de la investigación: Una posible explicación para este resultado es que el gasto gubernamental reciente en proyectos de desarrollo aumenta el ingreso nacional.

Originalidad/Valor: Contribuimos a la literatura de dos maneras importantes. La primera contribución es que nos centramos en metodologías de estimación más robustas. A diferencia de estudios anteriores sobre el contexto de Bangladesh, aplicamos el enfoque de prueba de límites ARDL a la cointegración. Además de tener características de muestra pequeñas ventajosas, el enfoque de prueba de límites ARDL no requiere el mismo orden de integración en las variables. Con estas consideraciones, esta técnica se adapta mejor en el caso de Bangladesh, dado que los datos serían de un pequeño alcance. Y en segundo lugar, examinamos tanto la Ley de Wagner como la Ley Keynesiana para Bangladesh con dos ecuaciones separadas, a diferencia de los estudios anteriores sobre Bangladesh, que solo investigaron la ecuación de Wagner.

Palabras clave: ARDL, Causalidad, Gasto Público, Renta Nacional, Ley Keynesiana, Ley de Wagner.

1 INTRODUCTION

One of the fundamental characteristics of the modern world, particularly after the World War II, has been the rise in the relative size of the public sector, regardless of the size and nature of government (irbas Safa, 2010). As a result, the public expenditure has drawn considerable attention in modern economic literature the two questions have been put forward: (i) Does public expenditure have any relationship with national income? (ii) If there is a relation which one are the cause and which one is the effect? While the majority of the researchers seem to conceive the existence of relation, the second question became an important point of debate in public economics.

There are two major opposing views in this regard. The Wagnerian school of thinking provided the initial viewpoint on this. The Wagnerian school of thinking contends that national income is an exogenous quantity that can be used as a tool for policy since there is a causal relationship between national income and government spending. This theory is known as Wagner's Law of Increasing State Activity (or simply Wagner's Law). According to the second perspective, there is a single line of causality connecting government spending and economic growth, indicating that government spending is an exogenous quantity and a tool for policymaking. This view is popularly known as Keynesian Law.

Given the recent steep increase in government spending and the high demand for infrastructure, numerous policy-related concerns affecting the Bangladeshi economy depend on
the link between government spending and total national output. But from what we've looked at, there aren't many works out there. The most prominent piece was created by Kalam and Aziz in 2009. Using the Engle-Granger two-step procedure and data spanning the years 1976 and 2007, they examined the Wagner's law for Bangladesh. The findings provide data that supports Wagner's law's applicability to Bangladesh. The other papers are those of Amin and Jannat (2017), who were unable to locate any evidence for either of the two laws, and Rana (2014), who discovered Wagner's Law to be true.

The studies that validate the Keynesian hypothesis include Halicioglu et al. (2003) for Turkey, Dependra (2007) for Thailand, Ghosha and Gregariou (2008), Gupta and Gangal (2015) for India. Dogan and Tang (2006) attempted to investigate the casual direction for Indonesia, Malaysia, the Philippines, Singapore, and Thailand. The Keynesian hypothesis was supported in the Philippines only. The results from other countries, however, validate neither the Wagner's nor the Keynesian perspectives. The empirical pieces of evidence for the support of Keynesian law are very few relative to those supporting the Wagner’s law.

Regarding the direction of the causality between economic growth and government spending, there is no agreement in the research. The researches done in the same country also provide different conclusions. There have been two main reasons put forward to explain the conflicts in empirical results. First, there are many versions of model specifications, about six specifications, to investigate the Wagner’s hypothesis. Different model specifications yield different results. Second, differences in econometric tools of estimation could be the reasons for these heterogeneous results.

1.1 RESEARCH OBJECTIVES

This study's main goal is to examine the applicability of Keynesian and Wagner's law in Bangladesh. To accomplish this objective following hypotheses will be tested.

H0: In Bangladesh, there is no long-term correlation between government spending and gross domestic product.

H1: A long-run relationship exists.

And again following hypotheses about causality will be tested.

H1: Government spending and national revenue are causally related in a single direction (Wagner’s hypothesis)

H2: Government spending and national income are causally related in a single direction (Keynesian hypothesis).
H3: No causality runs from either of the direction (Neither Wagner’s or Keynesian hypothesis)

H4: Bidirectional causality runs between them. (Both of the Wagner’s and Keynesian hypothesis)

We contribute to the literature in two important ways. The first contribution is that we focus on more robust estimation methodologies. Unlike previous studies of Bangladesh context, we apply ARDL bounds test approach to cointegration. In addition to having advantageous small sample characteristics, the ARDL limits testing approach does not necessitate the same order of integration in the variables. With these considerations, this technique suits better in case of Bangladesh given that data would be of a small span. And second, we examined both of the Wagner’s Law and Keynesian Law for Bangladesh with two separate equations, unlike the previous studies on Bangladesh who investigated the Wagner’s equation only.

The structure of this essay is as follows. The economy of Bangladesh and government spending in Bangladesh are briefly described in the next section. The literature survey in Section 3 is covered. The study's goals are covered in Section 4, which is followed by a discussion of the methodology and findings in Section 5. Section 6 brings this study to a close.

1.2 OVERVIEW ON ECONOMIC GROWTH AND GOVERNMENT EXPENDITURE OF BANGLADESH

Although the average growth rate of Bangladesh after its independence is 4.17%, it has experienced a higher growth rate in last two decades. Bangladesh was in second place among the south Asian countries in growth rate in 2015. The growth rate of Bangladesh in 2016 was also second in rank, including the second rank again in 2017 with the growth rate of 7.3%. The progress in reducing poverty by Bangladesh is remarkable. Bangladesh could reduce poverty from 44.2% in 1991 to 13.8% in 2016 (World Bank). It has been experiencing a sustained level of growth rate in recent years. Although Bangladesh achieved high growth rates in last decade, it still could not graduate from UN’s Least Developed Countries. Its 22 million people still living below the poverty line (World Bank). It is expected to be graduated from UN’s Least Developed Countries by 2024. Moreover, Bangladesh is expected to achieve middle-income status in 2021, on its 50th birthday. However, If not managed, inefficient planning, complex business regulations, political unrest and lack of infrastructure will be the daunting impediments to achieve the middle-income status.
The Linkage Between Government Expenditure and National Income: the Case of Bangladesh

Figure 1

*Growth of GDP and Government Expenditure*

![Growth of Government Expenditure vs GDP Growth](source: WDI (World Development Indicators) by World Bank)

Figure 1 depicts the trends in GNI and government expenditure in Bangladesh for the period 1980-2020. By simple visual inspection, we can learn that GDP and government expenditure are increasing over time. The sharp increase, however, started at the late 1990s. The average share of government expenditure to GDP was 4.58% of GDP from 1997 until 2000. The share of government expenditure increased moderately in recent years. The average share of government expenditure to GDP reached 5.21 percent in 2001-2020. Government expenditure rose to 8658.83 in 2016. The trend line shows that government has increased sharply after 1997.

2 THEORETICAL FRAMEWORK

Wagner’s Law and Keynesian law have been empirically examined over the years and across countries. The results are extremely inconsistent and diverse. According to some findings, there is a causal relationship between national income and government spending, demonstrating the validity of Wagner's Law. And some results show the opposite (i.e causality runs from government expenditure to national income) suggesting the validity of Keynesian Law. On the contrary, some studies did not find any empirical support for either of these two hypotheses. However, some studies found support for both hypotheses. Considering the reported findings, we can categorize empirical researches into four groups:
(1) Studies that validate Wagner’s law only, (2) Studies that validate Keynesian Law, (3) Studies that validate both and (4) Studies that validate neither of them. Wiseman and Peacock (1961), Musgrave (1969, 1988), Michas (1975), Mann (1980), Ram (1986, 1987), and Courakis (1993) are only a few of the early, well-known scholars who discovered the empirical data that supports the Wagner theory. Recent researchers have utilized the Granger Causality Test and Multivariate Co-integration to examine the relationship between public spending and economic growth for the Gulf Cooperation Council (GCC) nations, notably Al Faris (2001). He found a long-term correlation between national income, capital, current, and overall spending. Wagner's Law applied in the majority of the sample countries, although Keynesian theory did not. There haven't been many arguments made to support his conclusions. One is that, despite the fact that public spending is very high in Gulf nations due to the money created by oil, government spending doesn't stimulate the economy. As a result, the connection deviates from Keynesian theory. Abizadeh and Yousefi (1998) examined Wagner's Law in South Korea using annual data from 1961 to 1992. After conducting Granger-style causality tests, they estimated growth and public expenditure growth equations. The findings suggested that government spending increased as the economy grew, suggesting that South Korea is subject to Wagner's Law. The researchers who found the evidence for Keynesian hypothesis are also frequent in literature. For instance, Ansari (1997) examined the relationship between government spending and gross domestic product in South Africa, Kenya, and Ghana, three African nations. The analysis could not uncover any evidence to support either of the hypotheses using the annual data (1957–1999) and the Granger Standard Test and the Holmes-Hutton (1990) Causality Test. Singh and Sahni (1984) presented comparable findings in India. They found no evidence of a causal link between government spending and national income, proving that both hypotheses were disproved. Similar conclusions were reached from the study by Dogan and Tang (2006) in the cases of Indonesia, Malaysia, Singapore, and Thailand.

But numerous academics also found empirical proof that backed up both views. For instance, the relationship between Syria, Egypt, and Israel's national revenue and governmental spending was explored by Abu Bader and Abu Qran in 2003. For Israel and Syria, they discovered long-term bidirectional causality between the two variables. Based on their studies of 182 nations, Wu ET. Al (2010) and Odhiambo et al. (2015) demonstrated support for both side causality. Balamurali & Sivarajasingam (2010) used Sri Lankan data from 1977 to 2009 to evaluate the applicability of Wagner's law and Keynesian legislation. Keynesian theory and Wagnerian law in Sri Lanka's economy are supported by tests of cointegration, error correction
models, and Granger causation. Huang is one of the researchers who concurred with both viewpoints.

A rule known as Wagner’s Law of Increasing State Activity was established in memory of the German economist Adolph Wagner (1835–1917). Wagner observed that in progressive societies a rise in government expenditure is accompanied by the rise in aggregate income. With “progressive societies” Wagner meant the industrialized societies. Wagner proposed that national income plays vital roles in government activities. As national income raises government activities rises as well. In light of this, Wagner’s law states that government spending follows national income causally.

Wagner’s Law was not derived from logic but from historical evidence. In other words, his generalization was on the basis of a historical trend. However, he presented three explanations for the increased government expenditure. (1) “‘during industrialization, the administrative and regulatory functions of the state would substitute public for private activity’” Ogbonna B.C (2012). (2) As nation becomes richer there would be a higher demand for welfare and cultural activities. To meet this demand government would spend more money. (3) There would be a large scale demand for technology with the rise of industrialization. This would lead to a rise in government expenditure. Thus the cause for rising of government expenditure is the rise in national income.

Contrary to Wagner’s opinion, Keynesian hypothesis (Keynes, 1936) states that public spending is an exogenous factor that can be utilized as a tool for policy to encourage economic growth. There have been some reasons presented to justify the Keynesian view. First, the government reduces conflicts between the interest of private and interest of society (Courakis, 1993). For instance, government suppresses the monopoly to increase the total utility of society. Second, the government reduces the foreign exploitations by intervening in the market. For instance, government controls the exchange rate with various reserve policies and provides subsidies to the domestic firms to resist the exploitation of big international firms in domestic markets. Third, the communication infrastructure has a long-term impact on economic growth. Because of good infrastructures accelerate the private investment. Considering the mentioned reasons, Keynesian law proponents contend that government expenditure, not the other way around, is what drives economic growth. The direction of causality between government expenditure can be classified into 4 hypotheses and each of them has crucial policy implication. (Peacock and Scott, 2000)

(i) Neutrality hypothesis: public expenditure and aggregate national income are not related and they are independent of each other. The causality does not run from either of the
two variables. (ii) Wagner’s hypothesis: national income causes the public spending to grow. The direction of causality runs from national income to public spending—as national income rises public spending also rises. (iii) Keynesian hypothesis: a unidirectional causality runs from public spending to economic growth. (iv) Feedback hypothesis: a bidirectional causality displays between national income and public spending.

There are several policy-related concerns that depend on the direction of causality between government spending and national revenue. For instance, if the Keynesian perspective is correct, public spending can be utilized as a tool to spur economic expansion. Again, a reduction in public spending can cause a decrease in economic growth. On the contrary, if the Wagnerian view is valid then budget deficit-reducing policies will not hamper economic growth. Thus, according to the Wagnerian view, reduction in government spending to reduce budget deficit may be implemented without any negative effect on economic growth.

3 METHODOLOGY

3.1 DATA COLLECTION AND PROCEDURE

This study investigates the link between government spending as shown by gross national expenditure (GNE) and gross national income (GNI). This quantitative analysis makes use of time series data spanning the years 1981 to 2020. All variables' data were gathered from the World Bank's compilation of global development indicators. In order to exclude years with outlier data, the current study did not include variables' data from 1971 to 1980. [The abnormality occurred in 1971 for the war of liberty; in 1974 for the Famine and in 1975 for the political violence].

3.2 ECONOMETRIC TECHNIQUES

Using the ARDL Bounds Testing Technique for cointegration, it was determined whether two variables had a long-term relationship. To establish the causal connection between the variables, the Granger causality test was applied. To assess the reliability of the results, diagnostic tests such the unit root test, the RAMSEY test, the heteroskedasticity test, and the autocorrelation test were also carried out. These techniques were employed using EViews 9.
3.3 MODEL SPECIFICATION

In the Keynesian model, national income is a function of public expenditure. On the other hand, in the Wagner's model, public expenditure is a function of national income.

In case of Keynesian hypothesis: \( \text{GDP} = f(\text{GE}) \)

In case of Wagner’s hypothesis: \( \text{GE} = f(\text{GDP}) \)

Where GDP is gross national Product at 2010 constant price, GE is National Government Expenditure at 2010 constant price.

4 RESULTS AND DISCUSSION

4.1 TEST FOR STATIONARY: UNIT ROOT TEST (ADF)

The Augmented Dickey Fuller Test has been used (at level and first difference) to ascertain the order of integration of the variables. Dickey and Fuller (1979) developed the enhanced Dickey Fuller test of Unit Root. Table 1 displays the results of the variables' order of integration at levels and at First Differences.

Table 1

<table>
<thead>
<tr>
<th>Variables</th>
<th>ADF Test at Level I(0)</th>
<th>ADF test at 1st difference I(1)</th>
<th>ADF test at 2nd difference I(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GE</td>
<td>-1.79(1.00)</td>
<td>-4.828(0.002)</td>
<td>-4.20(0.002)</td>
</tr>
<tr>
<td>GDP</td>
<td>3.33(1.00)</td>
<td>-3.118(0.1166)</td>
<td>-5.010(0.002)</td>
</tr>
</tbody>
</table>

Note: Values in ( ) are p-values.

**Interpretation:** Since all of the variables' tabulated p-values above the level of significance at 5%, the results of the unit root tests indicate that all of the variables are non-stationary at level. Furthermore, the unit root test was applied to the first-differenced again. The results show that GE variable attained stationarity at first difference but GDP variable becomes stationarity at Second difference since tabulated probability values are less than the level of significance at 5%.

The long-run link between government spending and national revenue has been determined using the Autoregressive Distributed Lag method. The Keynesian Hypothesis is
initially the subject of our investigation, followed by Wagner's Law. The GNI and GNE have been log-transformed for use in the ARDL model.

4.2 ARDL BOUNDS TEST FOR THE KEYNESIAN EQUATION

The F test serves as the foundation for the ARDL Bounds test. A nonstandard distribution is included in the F test. When determining if variables are stationary at level or at the first difference, the ARDL bounds test can be used. Pesaran et al. (2001) created two critical bound values: an upper and lower level. Both the upper and lower bound critical values presumptively assume that all variables are stationary at the first difference and level, respectively. When the estimated F-statistic value exceeds the upper bound critical value, we reject H0 and accept H1, which demonstrates co-integration. We reject H1 in favor of H0, demonstrating no cointegration, when the estimated F-statistic is smaller than the lower bound. The outcomes are also ambiguous when the computed F-statistic falls in the range between the upper bound and lower bound. The outcomes of the bound test are displayed in Table 2. The findings indicate that the computed F-statistic, at a 5% level of significance, is 5.785, which is higher than the values of the lower limit (4.94) and upper bound (5.73). Based on these findings, this study rejects the null hypothesis in favor of the alternative hypothesis, which suggests that there is cointegration between government spending and national income at the 5% level of significance.

Table 2
ARDL Bounds Test

<table>
<thead>
<tr>
<th>Test Statistic</th>
<th>Value</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td>F- Statistic</td>
<td>5.787</td>
<td>1</td>
</tr>
<tr>
<td>Critical values</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Significance</td>
<td>Lower Bound</td>
<td>Upper bound</td>
</tr>
<tr>
<td>10%</td>
<td>4.04</td>
<td>4.78</td>
</tr>
<tr>
<td>5%</td>
<td>4.94</td>
<td>5.73</td>
</tr>
</tbody>
</table>

4.3 OLS RESULTS FOR THE KEYNESIAN EQUATION

Keynesian Hypothesis Considers public expenditure as an exogenous variable that influences the national income. According to the Keynesian perspective, public spending leads directly to national income.
The Linkage Between Government Expenditure and National Income: the Case of Bangladesh

Table 3
Long run coefficients.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficients</th>
<th>Standard Error</th>
<th>t-Statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>GE</td>
<td>0.087</td>
<td>0.015</td>
<td>5.92</td>
<td>0.00</td>
</tr>
<tr>
<td>C</td>
<td>-1.70</td>
<td>0.32</td>
<td>5.23</td>
<td>0.00</td>
</tr>
<tr>
<td>d=2.13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Since the variables are cointegrated we can run OLS. The results are presented in table 3. The long-run coefficient in table 3 shows that GE has a significant and positive impact on GDP. More specifically, if government expenditure increases by 1 million, gross national income increases by 0.087 million in the long run. In addition, Durbin-Watson statistics is 2.13 which is close to 2.00. This indicates that our model has no autocorrelation since we know that Durbin-Watson statistics close to 2.00 refers to the no autocorrelation.

4.4 HETEROSCEDASTICITY TEST

Heteroscedasticity is a problem that refers to the unequal variance of the error term. Breusch-Pagan-Godfrey test has been conducted to check the existence of Heteroscedasticity. If Probability of observed R-squared or value of Chi-Square is greater than the significance level of 0.05, then the model has no Heteroscedasticity. Since in table 4 the probability of the Obs*R-squared is 0.5001, which is Greater than the significance level of 0.05, we can conclude that there is no Heteroscedasticity.

Table 4
Heteroskedasticity Test: Breusch-Pagan-Godfrey

<table>
<thead>
<tr>
<th>F-statistic</th>
<th>0.820</th>
<th>Prob. F(6,30)</th>
<th>0.545</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obs*R-squared</td>
<td>5.347353</td>
<td>Prob. Chi-Square(6)</td>
<td>0.5145</td>
</tr>
<tr>
<td>Scaled explained SS</td>
<td>3.066003</td>
<td>Prob. Chi-Square(6)</td>
<td>0.8005</td>
</tr>
</tbody>
</table>

4.5 RAMSEY RESET TEST

RESET (Regression specification error test), which Ramsey has developed, is a broad test of specification error. When the Fitted-square probability value exceeds the significance level of 0.05, a model has been successfully specified. We draw the conclusion that the model
is correctly stated because the probability of the F-test in our analysis (Table-5) is 0.8135, which is greater than 0.05.

Table 5

Ramsey RESET test results:

<table>
<thead>
<tr>
<th>Test Statistic</th>
<th>Value</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>F- Statistic</td>
<td>0.0566</td>
<td>0.8135</td>
</tr>
<tr>
<td>t- Statistic</td>
<td>0.2379</td>
<td>0.8135</td>
</tr>
</tbody>
</table>

4.6 TESTING ECM

Table 6

ARDL Co-integrating And Long Run Form

*Dependent Variable: LGNI*

*Selected Model: ARDL(1, 4)*

<table>
<thead>
<tr>
<th>Cointegrating Form</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>D(LGNE)</td>
<td>0.394928</td>
<td>0.130450</td>
<td>3.027425</td>
<td>0.0050</td>
</tr>
<tr>
<td>D(LGNE(-1))</td>
<td>0.244059</td>
<td>0.170720</td>
<td>1.429588</td>
<td>0.1632</td>
</tr>
<tr>
<td>D(LGNE(-2))</td>
<td>-0.486693</td>
<td>0.108150</td>
<td>-4.500149</td>
<td>0.0001</td>
</tr>
<tr>
<td>D(LGNE(-3))</td>
<td>0.285915</td>
<td>0.099589</td>
<td>2.870943</td>
<td>0.0074</td>
</tr>
<tr>
<td>CointEq(-1)</td>
<td>-0.435969</td>
<td>0.137806</td>
<td>-3.163648</td>
<td>0.0036</td>
</tr>
</tbody>
</table>

Error correction model (ECM) has been estimated after the bound test. Long-run relationships exist if the ECT (Error Correction Term) coefficient is negative and the p-value is statistically significant. The significance and negativity of the coefficient of ECT add strength to the bound test. Additionally, ECT coefficients reflect the rate of adjustment to the long-term equilibrium. For instance, in our case ECT coefficient is -0.436 (in table-6). It indicates that about 43.6% of total disequilibrium is corrected each year.
4.7 ARDL BOUNDS TEST FOR WAGNER’S EQUATION

Unlike the conventional cointegration test by Engle Granger ARDL bound test can be performed irrespective of a stationary level of the variables. However, a variable integrated of order 2 is not allowed. In 2001, Pesaran et al. created two critical bound values: upper and lower level. All variables are presumed to be stationary at I(0) and I(1) for the lower limit critical values and upper bound critical values, respectively. When the estimated F-statistic value is higher than the upper bound critical value, H0 is rejected in favor of H1, which demonstrates co-integration. If the calculated F-statistic is below the lower bound, we reject H1 in favor of H0, demonstrating no cointegration. Furthermore, the results are unclear when the estimated F-statistic resides in the region between the upper bound and lower bound. Table 7 shows the findings of the bound test. The findings indicate that, at a 5% level of significance, the estimated F-statistic value of 8.6632 is higher than that of the lower bound (4.94) and upper bound (5.73). These findings lead us to reject the null hypothesis in favor of the alternative one. Thus the bound test results show that cointegration exists between government expenditure and national income whether we use Wagner's or Keynesian equation. The bound test results for Keynesian equation have been discussed earlier.

Table 7
ARDL Bounds Test

<table>
<thead>
<tr>
<th>Test Statistic</th>
<th>Value</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td>F- Statistic</td>
<td>8.663</td>
<td>1</td>
</tr>
</tbody>
</table>

Critical values

<table>
<thead>
<tr>
<th>Significance</th>
<th>Lower Bound</th>
<th>Upper bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>4.04</td>
<td>4.78</td>
</tr>
<tr>
<td>5%</td>
<td>4.94</td>
<td>5.73</td>
</tr>
</tbody>
</table>

4.8 OLS RESULTS FOR WAGNER’S EQUATION

In accordance with Wagner's theory, public spending is an endogenous variable that is influenced by GDP. The relationship between national revenue and public spending is established as causal. We can use OLS since the ARDL bounds test demonstrates that the variables have a cointegrating or long-run connection. In table 8, the OLS outcomes are shown.
GDP has a positive and noteworthy coefficient. This implies that if national income increases by 1 million in the long run, government expenditure increases by 0.084 million.

**Table 8**

*Long Run Coefficients*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficients</th>
<th>Standard Error</th>
<th>t-Statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP</td>
<td>0.084</td>
<td>0.015</td>
<td>5.44</td>
<td>0.00</td>
</tr>
<tr>
<td>C</td>
<td>-55.573</td>
<td>83.04</td>
<td>-0.67</td>
<td>0.51</td>
</tr>
<tr>
<td>d=2.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**4.9 HETEROSCEDASTICITY TEST**

Breusch-Pagan-Godfrey has been conducted to see if the errors are homoscedastic. The model has no heteroscedasticity if the probability of the observed R-squared or the value of the Chi-Square is larger than the significance level of 0.05. Table 9 displays the outcomes of the Breusch-Pagan-Godfrey test. Since the likelihood of the Obs*R-squared in our study (table-9) is 0.29, greater than the significance level of 0.05, we draw the conclusion that our model does not have a heteroscedasticity issue.

**Table 9**

*Outcomes of the Breusch-Pagan-Godfrey test*

<table>
<thead>
<tr>
<th>Test Statistic</th>
<th>Value</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>F- Statistic</td>
<td>1.235</td>
<td>0.3166</td>
</tr>
<tr>
<td>Chi-square- Statistic</td>
<td>7.33</td>
<td>0.29</td>
</tr>
</tbody>
</table>

**4.10 RAMSEY TEST**

Ramsey RESET (Regression specification error test) has been used in order to check any misspecification error in the model. When the probability value of the F-test exceeds the significance level of 0.05, a model has been successfully specified. According to the published results in table 10, the F-test's probability value is 0.3166, which is higher than 0.05. As a result, we draw the conclusion that the Model is properly specified.

**Table 10**

*published results*

<table>
<thead>
<tr>
<th>Test Statistic</th>
<th>Value</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>F- Statistic</td>
<td>0.320</td>
<td>0.7516</td>
</tr>
</tbody>
</table>
4.11 TESTING ECM

Error correction model (ECM) has been estimated after performing the bounds test. If the ECT (Error Correction Term) coefficient is negative and the p-value is statistically significant, cointegration is present. The significance and negativity of the coefficient of ECT are expected. If ECT is negative and significant then cointegration is said to be present. Thus, the sign of ECT reinforces the bounds test for cointegration. Additionally, ECT coefficients reflect the rate of adjustment to the long-term equilibrium. The ECT coefficient is -0.47. This implies that about 47% of disequilibrium is corrected each year to reach the equilibrium.

ECT is presented in table 11. It indicates that the coefficient of ECT is negative as well as the probability value from its significance test is 0.0113 which is less than significant level of 0.05. Thus, we draw the conclusion that government spending and national income have a long-term relationship.

Table 11

*ECM and ECT*

**ARDL Cointegrating And Long Run Form**

Dependent Variable: LGE

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>D(GE(-1))</td>
<td>0.127377</td>
<td>0.173024</td>
<td>0.736182</td>
<td>0.4672</td>
</tr>
<tr>
<td>D(GE(-2))</td>
<td>0.163538</td>
<td>0.151735</td>
<td>1.077786</td>
<td>0.2894</td>
</tr>
<tr>
<td>D(GE(-3))</td>
<td>-0.176540</td>
<td>0.095710</td>
<td>-1.844524</td>
<td>0.0747</td>
</tr>
<tr>
<td>D(GDP)</td>
<td>0.456864</td>
<td>0.160645</td>
<td>2.843932</td>
<td>0.0078</td>
</tr>
<tr>
<td>CointEq(-1)</td>
<td>-0.472228</td>
<td>0.175223</td>
<td>-2.695009</td>
<td>0.0113</td>
</tr>
</tbody>
</table>
4.12 GRANGER CAUSALITY TEST

According to the analyses previously covered, government spending (GNE) and national income (GNI) in Bangladesh appear to have a long-term relationship. But in order to determine which variable causes the other, Granger causality test was used. To test the causality following equations are formulated. Since all variables are stationary at first difference, they have been transformed into their first differences to make them stationary.

**Figure 2**

_Equations_

\[ y_t = \sum_{i=1}^{n} a_i X_{t-i} + \sum_{j=1}^{n} \beta_j y_{t-j} + u_{1t} \]  \hspace{1cm} (9)

\[ X_t = \sum_{i=1}^{n} \lambda_i X_{t-i} + \sum_{j=1}^{n} \delta_j y_{t-j} + u_{2t} \]  \hspace{1cm} (10)

Where:

- it is presumptive that the disturbances \( u_{1t} \) and \( u_{2t} \) are unrelated; and \( Y, X \) denotes the GDP and GE Respectively.

4 different cases arise based on the significance of the coefficients.

(i) If the estimated coefficients of the \( X \) in equation (9) are statistically significant but the estimated coefficients of the lagged \( y \) are not statistically significant, then it is claimed that there is unidirectional causality from \( X \) to \( y \).

(ii) If the estimated coefficients of the \( y \) in equation (10) are statistically significant and the estimated coefficients of lagged \( X \) are not statistically significant, then there is a one-way causal relationship from \( y \) to \( x \).

(iii) If the sets of \( X \) and \( Y \) coefficients in both regressions are statistically different from zero, there is bidirectional causality.

(iv) The absence of statistical significance in any of the regressions for the sets of \( X \) and \( y \) coefficients denotes independence or no causality.

The Granger causality test results are presented in table-12.
Table 12

Granger Causality Tests results

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>Observation</th>
<th>F-test</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government expenditure does not Granger cause GDP</td>
<td>36</td>
<td>11.6296</td>
<td>0.000</td>
</tr>
<tr>
<td>GDP does not Granger cause Government expenditure</td>
<td>36</td>
<td>1.88075</td>
<td>0.1428</td>
</tr>
</tbody>
</table>

The results from Granger causality test are reported with lag 4 in table 12. We conclude that the causality findings confirm the validity of the Keynesian hypothesis in Bangladesh and that the null hypothesis of no causality from GE to GDP is rejected at the 1% level of significance.

5 CONCLUSION AND POLICY RECOMMENDATION

This study investigates the two hypotheses, namely, Wagner’s hypothesis and Keynesian hypothesis using Bangladesh data from 1981 to 2020. At the first stage, the order of integration of the variables has been determined by using the ADF unit root test. After confirming that both variables are stationary at different order, ARDL bounds testing approach has been used in order to check whether the variables are co-integrated or not. The outcomes of the long-run equation under ARDL imply that government spending has an impact on national income and that national income has an impact on government spending. That is, they are cause and consequence of each other. This partly suggests that both hypotheses are valid in Bangladesh. Various diagnostic tests confirm the robustness of the models from Heteroscedasticity, serial correlation, non-normality of residuals and model misspecification. Although ARDL regression partly supports both hypotheses, the results from Granger causality favor the validity of the Keynesian law only. These findings from causality test are against the result of the previous studies in Bangladesh such as Kalam and Aziz (2009) and Rana (2014) who found the validity of only Wagner’s law in Bangladesh. One possible explanation for this result is that recent government spending on development projects boost up the national income.

REFERENCES


The Linkage Between Government Expenditure and National Income: the Case of Bangladesh


Srinivasan, P. (n.d.). *Causality between Public Expenditure and Economic Growth: The Indian Case*