Analysis of the causality between economic growth and government spending: Wagner's law versus Keynes hypothesis

Yasmin [a,1,*], Willa Fatika Sari [b,2]

[a] Faculty of Economics and Business, Universitas Gadjah Mada, Indonesia
[b] Faculty of Economics and Business, Universitas Andalas, Indonesia
[1] yasmin@mail.ugm.ac.id*; [2] willafatika98@gmail.com

* corresponding author

ABSTRACT

The relationship between economic growth and government spending has been extremely ambiguous over the last few years. In this matter, both Wagner and Keynes expressed their views. However, several research with varying results on those hypotheses. The Keynesian hypothesis, Indonesia's Wagner's law, and the relationship between economic growth and government spending were thus all investigated by the researchers in this study. The Granger causality test and the Engle-Granger cointegration test were used in order to determine the direction with which both variables are linked, as well as a longer-term association. The outcome demonstrated that economic growth and government spending do not have a long-term relationship. In contrast, the causality test revealed a one-way correlation between government spending and economic growth, implying that Wagner's law was applicable in Indonesia. Accordingly, the government must reconsider government spending that is perceived to be less efficient in encouraging economic growth, such as subsidy programs and public goods procurement. Additionally, the government ought to consider reducing government spending and expanding private sector participation in economic development given that Wagner's law has been demonstrated to be applicable in Indonesia.

1. Introduction

Economic growth and development remain important policy issues for most countries in the world as a marked problem for developing countries. Consequently, a secular increase of government spending development worldwide was demonstrated by the 20th century experience. As a result, the existence of government spending contributes to the ongoing debate about long-term economic growth among global economists (Albatel, 2002). Based on these facts, analyzing economics growth and government spending relationship is very relevant to see the implications of a policy, especially when identifying fiscal policies adopted by every country in the world over time (Babatunde, 2011; Kumar & Cao, 2020). Its relationship has become a topic that is often researched and discussed in the economic and public finance literature, both theoretically and empirically (Srinivasan, 2013). In order to see the balance between public deficits, their relationship must also be established so that a theoretical and empirical framework can be developed for the government's success in achieving its budgetary objectives (Paparas & Richter, 2019).

Wagner and Keynes, commonly known as Wagner's Law and Keynes Hypothesis, proposed some theoretical explanations for economic growth and government spending relationship (Babatunde,

2011). According to Wagner (1890) public spending tends to rise about national income over time as a nation's real per capita income rises during industrialization. So, Wagner's Law uncovers that administration consumption is expanding quicker than economic growth (Narayan et al., 2008). This happens because along with the increase in wealth of a society about the disposable income of the nation, it causes an increase in public spending which is caused by the demands of the complex citizens' consistency by their needs (Barra et al., 2015).

The Keynesian hypothesis, put out by Keynes, clarifies the link between government spending and economic growth. Keynes disagreed with Wagner's hypothesis that increased government spending was a result of rising national revenue. He argued that the rise in government spending was what caused the expansion in the national income (Singh & Sahni, 1984; Narayan et al., 2008). As a result, the ideas of Wagner and Keynes offer two different explanations for the connection between government spending and national revenue. The Keynesian approach contends that the path of causality runs opposite from that of the Wagner approach, which holds that economic development leads to government spending (Oktayer & Oktayer, 2013). Researchers from a wide range of nations have looked at the connection between government spending and economic growth, but their findings have been conflicting or ambiguous. The conclusions of the results of the study are grouped into three: there is no correlation with each other, having a negative direction influence, and government spending and economic growth correlate positively (Widiastuti & Saleh, 2020).

Several previous studies have investigated the relationship between government expenditure and economic growth in various countries. A recent study by Pasaribu & Septriani (2021) examined the long-term relationship between government expenditure and economic growth. The research findings indicated a positive and statistically significant long-term impact of economic growth on government expenditure, aligning with Wagner's Law in Indonesia. Another study conducted by Connolly & Li (2016) explored the influence of government consumption expenditure, public social expenditure, and public investment on economic growth across 34 OECD countries. This study revealed that an increase in public social spending had a significant negative effect on subsequent economic growth, while government consumption expenditure and public investment did not exhibit a significant influence on economic growth. On the contrary, a study by Bose et al (2007) found a positive impact of government expenditure on economic growth in developing countries. Furthermore, the results of the research by Wahyuningrum & Juliprijanto (2022) indicated that government expenditure on education had a positive and significant effect on long-term economic growth. However, government spending on infrastructure showed a significant negative impact on economic growth. Additionally study from Wahyudi (2020) discovered that government expenditure on infrastructure in the long term could enhance economic growth and provide a multiplier effect for the welfare improvement of society. Based on these studies, the relationship between government expenditure and economic growth remains ambiguous. Therefore, further research is needed to gain a deeper understanding of the intricate dynamics between government expenditure and economic growth.

Although many studies have reviewed and compared the hypotheses of Wagner and Keynes, this article tries to prove again which hypothesis is able to explain the correlation between those variables in Indonesia as a case study. According to Paparas & Richter (2019) fiscal authorities are able to reduce government spending if Wagner's law applies. As a result, the deficit in the budget will shrink and the private sector's contribution to the economy can grow. Highly unlikely that if Keynes' hypothesis is applied, fiscal authorities and policymakers will recognize the significant role that spending plays in accelerating economic growth and make policies in accordance with its findings. Therefore, the benefits of this study are not only for scientific development in the field of public economics but can be a reference for competent authorities when developing the policy, particularly those about economic growth and government spending. In addition, this study is also expected to contribute to the existing literature by enriching the literature on the relationship between economic growth and government spending. This study is one of the many studies that examine the relationship between these two variables. However, this study has the advantage of using a fairly long period of data, from 1990-2021. This allows researchers to see the causal relationship in more detail, especially the long-term relationship. This article consists of five main discussions, the first part is the background that represents the reasons and motivations for writing this article. The second part discusses a literature review consisting of the theoretical basis and some of the literature used. The third section comprehensively describes the methodology. Meanwhile, the fourth section presents an empirical result and discussion. Furthermore, the last part presents the conclusion along with practical and empirical suggestions for policymakers and future researchers.

2. Method

This research was conducted by time series data, a quantitative approach was used in this study. Population, government consumption spending, and gross domestic product were among the data used in this study. Badan Pusat Statistik (BPS), Bank Indonesia (BI), and World Bank provided all the data that were gathered. In formulating their hypotheses, neither Wagner nor Keynes did not provide a mathematical formula to explain the economic growth and government spending relationship. However, Gross Domestic Product (GDP) and economic developments were commonly used in a lot of literature to determine the size of a government (Solikin, 2018). Huang (2006) argued that there are at least five equations of Wagner's law that can be mathematically expressed using linear logs in their functional form. Nevertheless, this study only used one of the equations proposed by Michas (1975). The equation is as follows:

$$\frac{RGE}{N} = f\left(\frac{RGDP}{N}\right) \tag{1}$$

Where $\frac{RGDP}{N}$ is equal to the real gross domestic product per capita and $\frac{RGE}{N}$ is real government expenditure per capita. Engle & Granger (1987) proposed the Engle-Granger cointegration test was the estimation technique used in this study. Estimates of the government spending and GDP relationship over time were made using the Ordinary Least Squared (OLS) method. In the meantime, the short-term relationship was estimated using Error Correction Model (ECM). However, before making these two estimates, the first thing that needs to be done is to test all the time series data that are in possession to determine whether or not the data are stationary. Using the Dickey–Fuller Augmented test data is considered stationary if the estimated results reject the null hypothesis and stationery otherwise. It is hoped that the results of this time series data will remain stationary at the first difference and subsequent orders rather than at the level stage. The second step, which was taken to estimate the relationship over time, followed this confirmation. The OLS method was used to estimate this stage. Using this method, the specifications are as follows:

$$\log \frac{RGE}{N_t} = \beta_0 + \beta_1 \log \frac{RGDP}{N_t} + \varepsilon_t \tag{2}$$

Where $\log \frac{RGE}{N_t}$ is the logarithm of government expenditure per capita; $\log \frac{RGDP}{N_t}$ is the logarithm of GDP per capita; β_0 is the constanta; β_1 is the coefficients of the variable PDB per capita; ε_t is the error term. Engle & Granger (1987) developed Engle-Granger's cointegration test following the estimation of OLS, a cointegration test was carried out using the data, which was utilized in this study. In this step, the previous OLS results were used to test the residuals to see if they were stationary at the level. If it is stationary at the level, it can be ascertained that the variables used have a cointegration relationship. After ensuring that the variables used have a co-integration relationship, the final step involved using ECM to make short-term estimates and adjust quickly. The specifications of the model are as follows:

$$\Delta \log \frac{RGE}{N_t} = a_0 + \sum_{i=0}^{n} a_1 \Delta \log \frac{RGE}{N_{t-i}} + \sum_{i=0}^{n} a_2 \Delta \log \frac{RGDP}{N_{t-i}} + a_3 \hat{\varepsilon}_{t-1} + u_t \tag{3}$$

Where $\Delta \log \frac{RGE}{N_t}$ is a variable log change in government expenditure per capita, $\Delta \log \frac{RGDP}{N_{t-i}}$ is the represents the variable log change of GDP per capita, $\Delta \log \frac{RGE}{N_{t-i}}$ is a variable log change in government spending in the previous year, and $\hat{\varepsilon}_{t-1}$ is the speed of adjustment or variable speed of government expenditure per capita and GDP per capita return to their long-run relationship. The cointegration relationship between variables has been discussed in the preceding section; however, this information cannot be used to establish a causal relationship between variables. As a result, the Granger (1969) causality test was used to ascertain whether there was a connection between the variables. The following equations are used to investigate Granger's causality test:

$$\Delta \log \frac{RGE}{N_t} = a_0 + \sum_{i=0}^{n} a_1 \Delta \log \frac{RGE}{N_{t-i}} + \sum_{i=0}^{n} a_2 \Delta \log \frac{RGDP}{N_{t-i}} + u_t \tag{4}$$

$$\Delta log \frac{RGDP}{N_j} = a_0 + \sum_{i=0}^{n} a_1 \Delta log \frac{RGDP}{N_{t-i}} + \sum_{i=0}^{n} a_2 \Delta log \frac{RGE}{N_{t-i}} + u_j \quad (5)$$

Where between u_t in equation (4) and u_j in equation (5) do not correlate with each other.

3. Results and Discussion

Unit root testing was employed as the first stage in time series data processing to prevent spurious regression. When determining integration sequences, Phillips-Perron (PP) and Augmented Dickey-Fuller (ADF) tests for unit roots were widely used. The ADF test is more commonly used when the errors in the data are homoscedastic, meaning that the variance of the errors is constant over time. On the other hand, the PP test is preferred when the errors are heteroscedastic, meaning that the variance of the errors changes over time (Wooldridge, 2010). Additionally, the choice of the optimal lag sequence for each test was made using Schwarz Information Criterion (SC) and Akaike Information Criterion (AIC).

Table 1. Result of Stationery Test

| Variable | Augmented Dickey Fuller | | Philips-Perron | | Order of Integration | |
	Level	1st Diff	Level	1st Diff	ADF	PP
$log \dfrac{RGE}{N}$	-1.745	-5.298***	-1.739	-5.351***	I(1)	I(1)
$log \dfrac{RGDP}{N}$	-0.425	-4.172***	-0.469	-4.114***	I(1)	I(1)

Source: data procesed

Table 1 shows the most of the variables in the first derivative appear to be stationary for both ADF and PP test. This study not include the stationery for second difference, because should led to spurious regression (Kurniawan & Khasanah, 2023). Therefore, the model is qualified for estimation using the two step engle-granger cointegration test. To establish a lasting relationship between these variables, two-step cointegration tests by Engle & Granger (1987). The variables of models is 1 to 5 have been combined in order 1 Since the variables in models 1 through five were integrated into the order I (1), each model was initially estimated using OLS. The residual was then subjected to an ADF test to see if it remained stationary at the level, showing a link between the variables over time. After estimating the cointegration between the variables, the Error Correction Model (ECM) captures the short-term adjustment in the second step.

Table 2. Result of Engle-Granger Cointegration

Variable	Constant	Coefficient	Adjusted R-squared	ADF Residual Test Result
$log \dfrac{RGE}{N}$	-53.445***	3.988***	0.8485	-1.375

Source: data procesed

Table 2 presents the estimated results of the integration test between public spending per capita and GDP per capita in Indonesia. It is feasible to conclude from the table that the two variables are not integrated or have no long-term relationship. This is based on the ADF residual test results, where the T-statistic is only -1,319, which is less than all the ADF test's critical values. Furthermore, the values for constants, independent variable coefficients and R squared cannot be considered adequately because of their biased results. Table 2 shows the estimates of short-term relationship between the two variables using ECM is not possible because the requirement is not fulfilled, and the two variables must be cointegrated.

In this study, the Granger causality test has been applied to determine if there is a two-way or one-way link among variables such as GDP growth and government spending. In order to determine whether Wagner's law, Keynes' theory, or both apply in Indonesia, the test may also be used. Wagner's law and Keynes' theory present two opposite perceptions regarding the relationship between public expenditure and economic growth. According to Wagner's approach, causality runs from economic growth to government expenditure. In contrast, the Keynesian approach assumes that causality runs from government expenditure to economic growth. Wagner's law suggests that economic growth leads to an increase in the demand for public goods and services, which in turn leads to an increase in

government spending. This increase in government spending can lead to further economic growth through the multiplier effect (Bazán et al., 2022). On the other hand, Keynesian theory suggests that government spending can stimulate economic growth through fiscal policies such as increasing infrastructure spending and social programs. This increase in government spending can lead to an increase in aggregate demand, which in turn leads to an increase in economic growth (Öztaşkın & Kara, 2022). However, this view is still a subject of debate among economists. Some studies show that government spending has a positive causality with economic growth, while others show different results. Therefore, further research is needed to understand the relationship between government spending and economic growth more deeply.

Table 3. Result of Granger Causality Test

Null Hypothesis	Lags	F-statistics	Prob	Conclusion
$\frac{RGDP}{N}$ does not granger cause $\frac{RGE}{N}$	1	1.62988	0.2122	No Causality
$\frac{RGE}{N}$ does not granger cause $\frac{RGDP}{N}$	1	7.93972***	0.0088	There is Causality

Source: data processed

Table 3 shows The result of the Engle-Granger Cointegration shows that the increase in government expenditure is not only due to fiscal development. It shows that most government expenditures, such as the purchase of public facilities and subsidies, increase with output but are not related to output. Other important elements including urbanization, population expansion, market exploitation, and political activation instability can cause this. Some subsidy programs are also considered ineffective and poorly targeted as they often only help producers and are passed on to taxpayers and consumers, who may not benefit from these subsidies. Subsidies will not be able to accelerate economic growth in this way. In addition, ineffective and inefficient government spending can have a crowding-out effect, which reduces private investment and public consumption due to the increased burden of taxes and government debt. Improperly targeted government spending can also lead to income distribution problems and poverty. This study's findings are consistent with Abimanyu (2016) and Wahyudi (2020) in Indonesia, Babatunde (2011) in Africa, Huang (2006) in China and Taiwan and Ali & Munir (2016) in Pakistan, they all concluded that there is no long-term connection between government spending and economic growth. However, this study's findings differ from those of Indian studies by Srinivasan (2013) and Narayan et al (2008) in Fiji which discovered that government spending correlates with economic growth over time.

The Granger causality estimates show that the two variables have a one-way relationship. In this case, the relationship moves in the opposite direction, from government spending to economic growth. This result also shows that Indonesia has applied Wagner's law, which states that economic growth determines the factors that cause an increase in government spending. Wagner also suggests reducing government spending, reducing the budget deficit, and expanding the economic contribution of the private sector and based on Paparas & Richter (2019) fiscal authorities are able to reduce government spending if Wagner's law applies. Contrary that Indonesia is a developing country that has high levels of poverty and inequality. This causes the government to increase spending on social programs, such as cash transfers, subsidies, and social protection. These programs aim to improve people's welfare and reduce poverty, thereby promoting economic growth. Indonesia also has challenges with infrastructure, such as transport, energy, telecommunications, and sanitation. Inadequate infrastructure can hamper mobility, productivity, and economic competitiveness. Therefore, the government needs to increase spending to build and improve infrastructure, to increase accessibility, efficiency, and quality of public services. In addition, Indonesia has potential in terms of human resources, which is an important factor in economic growth. However, the quality of Indonesia's human resources is still low, especially in terms of education, health, and skills. Therefore, the government needs to increase spending to improve the quality of human resources, such as through education, training, and public health. This finding is in line with the research results from Ghazy et al (2021) in Egypt, Rani & Kumar (2022) in India and Sagdic et al (2020) in Turkey. However, it contradicts the consequences of explorations conducted by Kumar & Cao (2020) in East Asian countries, Dogo et al (2013) in Nigeria and Liang & Mao (2013) in China that who found that Wagner's Law has no significant effect on these countries.

4. Conclusion

This study examines the relationship between economic growth and government spending in Indonesia and evaluates whether the Wagner law or Keynes hypothesis holds true in Indonesia. According to some earlier studies in Indonesia and a few other countries, the relationship between those variables remains unclear. The first phase of the study investigated whether economic growth and government spending were linked over time. After applying the cointegration test by Engle-Granger to both variables, the study found that there was no correlation between them. Urbanization, population growth, market exploitation, and other factors are likely to have a significant impact on these outcomes. In the absence of a long-term relationship between the two variables, certain government subsidy programs and the purchase of public goods that are not as efficient as intended can also play a determining role. Following that phase, the study sought to determine a causal link between factors that might show whether Wagner's law and Keynes' hypothesis were valid for Indonesia. This estimate was made by using the Granger causality test, and it has been established that there is a direct causal relationship between economic growth and public spending supporting Wagner's law in Indonesia.

Based on the findings of this study, several theoretical and practical implications need to be considered in formulating policies. First, the importance of the efficiency of government spending. If government spending does not directly drive growth, then the efficiency of its use becomes increasingly important. Further research is needed to understand how to maximize the positive impact of government spending on other aspects such as social welfare and poverty alleviation. Secondly, Fiscal Strategy Review, where the government needs to review its fiscal strategy and focus on optimizing expenditure allocation, ensuring funds are used productively and not just driven by factors such as political pressure or increases in national income. Lastly, the Importance of Productive Investment, where the government also needs to shift the focus of spending to sectors that can drive long-term economic growth, such as infrastructure, education, and research and development. the government is expected to examine government spending that is less effective at stimulating spending, such as public procurement and subsidy programs, in order to provide practical guidance. The discovery of the Wagner law in Indonesia may also lead the government to think about cutting back on spending and expanding the role of the private sector in the real sector. Second, researchers should use disaggregation data to determine which aspects of Indonesia's government spending are not as effective at stimulating economic growth.

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