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The development economic growth for sustainable development with augmented dickey fuller (empirical study for neoclassical economic growth from solow and swan)

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Abstract

This study analyzes the influence of government spending and several variables related to economic growth such as exports, imports, population, inflation, and labor wages and many more. This study uses data analysis consisting of the years 2011-2020. The data used has been tested for stationarity using the Augmented Dickey Fuller (ADF) – Fisher test for panel data recommended by Madalla and Wu (1999). As a result, the data is stationary at the first difference level. This research shows that the real government expenditure coefficient is significantly positive. This means that government spending has an important role in increasing economic growth in Indonesia. This study analyzes the effect of aggregate government spending.

Keywords: *government expenditure, economic growth, unit root test. Augmented Dickey Fuller*

1. Introduction

Economic growth as a process of increasing output from time to time is an important indicator for measuring the success of a country's development (Todaro, 2005). Therefore the identification of various factors that influence it, including the role of the government, becomes interesting for deeper study. According to the basic theory of Neoclassical economic growth from Solow and Swan (1956) there is no effect of the government's role on growth either in the form of expenditure or taxes (Kneller et al., 1999). Economic growth is only influenced by capital stock, labor and technology which are exogenous. The government can influence population growth which will affect the availability of labor but has no impact on economic growth.

Endogenous growth theory explains that investment in physical capital and human capital plays a role in determining long-term economic growth. The government's contribution to economic growth can be explained through its influence in changing consumption or spending for public investment and revenue from taxes. This theory group also considers the existence of infrastructure, laws and regulations, political stability, government policies, bureaucracy, and international exchange bases as important factors that also affect economic growth.

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Government spending as a concrete form of government intervention in the economy has become an important object to study. Research on countries in Asia, among others, was conducted by Cheng (1997). With the Vector Autoregressive (VAR) approach, Cheng proves that there is a significant positive influence between government spending on economic growth in South Korea. Other research which also shows that the expansion of government spending has a positive effect on economic growth, among others, was found by Singh and Sahni (1984). On the other hand, there is also research that shows the significance of the relationship between the two variables but with a relationship pattern that tends to be negative. Among others, this research was conducted by Landau (1986).

In Indonesia the government sector has played a major role in the history of the economy. This role is outlined by the government in the form of implementing fiscal policy to achieve the main goals of development in the form of high economic growth, reducing unemployment and controlling inflation. The fiscal policy implemented by the Indonesian government has two main instruments, namely taxation and spending.

Government spending as an important instrument of fiscal policy is expected to be able to stimulate economic activity and increase economic growth. The government optimizes this role by increasing spending (share) on Gross Domestic Product (GDP). In real terms government spending also increased in line with the increase in Gross Domestic Product (GDP). The government's role in the economy is indicated by spending on the economic sector as a percentage of total expenditure which tends to increase.

Government spending as an instrument of fiscal policy is a source of economic growth. Some of the research questions to be answered are whether the previous period's economic growth significantly affected the next period's economic growth? Does the provincial government's spending affect the provincial economic growth significantly? Has openness significantly affected the province's economic growth? Does population affect the province's economic growth significantly?. This study aims to analyze the effect of government spending and other variables (budget deficit, openness, inflation, and population) on economic growth. Meanwhile, the benefits of this research are expected to be able to add to the literature in the field of public economics and as a reference for further research, as well as provide input and information for the government as policy makers and all parties interested in studying the influence of government budgets, especially spending on economic growth.

2. The Literature Review

Economic growth is one indicator of successful development in an economy. Welfare and progress of an economy is determined by the amount of growth shown by changes in national output (Kuzior et al., 2023). Any change in output in the economy is a short-term economic analysis.

According to Adam Smith, the government has three main functions in supporting the economy, namely (1) maintaining domestic security and defence; (2) administering justice; and (3) providing goods that are not provided by the private sector, such as infrastructure and public facilities. The government needs a budget to carry out its functions properly and the mechanism for implementing this budget is through fiscal policy. Fiscal policy reflects the size, growth, and structure of the government budget adopted by a country.

According to Todaro (2003), in the economic growth of a nation there are three main determining components, namely: (i) capital accumulation which includes all forms or types of new investments invested in land, physical equipment, and human resources; (ii) population growth which increases the number of labor force in the coming years; (iii) technological progress. According to Kuznets, economic growth is an increase in the long-term capacity of a country to provide various economic goods to its population. The increase in capacity itself occurs due to progress or technological, institutional and ideological adjustments to the various demands of the existing conditions.

In general, economic growth theory can be grouped into two, namely classical economic growth theory and modern economic growth theory. In classical economic growth theory, the analysis is based on the belief in the effectiveness of the free market mechanism. Classical economic theory is a theory that was coined by economists who lived in the 18th to early 20th centuries (Konzelmann, 2023). These classical economists included Adam Smith, David Ricardo and WA Lewis.

Another theory that explains economic growth is the theory of modern economic growth. The general characteristics of this theory recognize the important role of government in the economy to overcome the failure of the free market system. This group tends not to recognize the effectiveness of the free market system without government intervention. Harrord-Domar's economic growth theory is one of the modern growth theories. Harrod-Domar is a direct development from short-term Keynesian macro theory to long-term macro theory. According to these two economists, investment spending (I) not only has an influence on aggregate demand (AD) but also on aggregate supply (AS) through its effect on production capacity (Thomas, 2023). In this longer perspective, investment adds to the capital stock (K). Harrod-Domar said that every addition to the community's capital stock increases the community's ability to produce output. The intended output is the potential output that can be produced with the existing capital stock. Meanwhile, the realized output is not necessarily the same as the potential output, this depends on the amount of aggregate demand.

Fiscal policy is government policy with respect to levels of government purchases, transfers and tax structures (Salari et al., 2023). Fiscal policy can also be understood as an economic policy carried out by the government by changing (increasing or decreasing) state revenue and/or state expenditure in order to achieve certain goals. The scope of the policy is in the sector of government spending and tax revenue so that it is also known as budget policy. In general, the objectives of fiscal policy to be achieved include: increasing national income, increasing job opportunities, reducing the inflation rate, reducing the trade balance deficit, reducing the international balance of payments deficit

Fiscal policy has 3 main functions, namely: a) the function of allocation in the form of the provision of social goods or the process of distributing all resources to be used as personal goods and social goods and how the composition of social goods is determined, b) the function of distribution, namely adjustment to the distribution income and wealth to ensure the fulfillment of what society perceives as a condition of fair and equitable distribution, and c) the stabilization function as a means of maintaining high levels of employment, an appropriate level of stability, and an appropriate rate of growth taking into account impact on trade and the balance of payments.

The amount of government spending that has a positive influence on economic growth has certain limits. Government spending will support economic growth if the government is able

to create conditions in which the share of government spending to the entire output level can be used to provide public goods that are used as competitive production inputs.

Wagner sparked a general hypothesis regarding a positive long-term relationship between government spending and economic development based on observations in European countries, the US and Japan. The hypothesis explains that economic growth is a fundamental factor that determines the growth of the public sector, including government spending and consumption. His statement is called the law of expanding state activity or Wagner's law (Nayak & Hazarika, 2023).

The relationship between government spending and economic growth is a complex matter. From the research results that have existed so far, at least some acceptable theories and econometric techniques are needed so that the research results are not ambiguous (spurious). This requirement makes the study and proof of the relationship between these two variables continue to grow, followed by the use of the latest econometric techniques so that the results are closer to reality and can be used for forecasting.

Research on the impact of fiscal policy, especially government spending on economic growth, has always been an interesting issue in every period of time and has generated debate. On the one hand, there is research which concludes that the impact of government spending on economic growth is positive. Ram (1986) in Pradha (2023) using time series and cross-country data from 115 countries found that high government consumption contributed to economic growth. Other research shows that there is a negative impact of government spending on economic growth as found by Folster and Henrekson (1999) in Peter & Jacques (2003).

Research by Sjoberg (2003) in Sweden shows that too much government spending will hinder economic growth. By using the endogenous growth model and the Ordinary Least Square (OLS) technique, this study examines the existence of a significant relationship between government spending in the form of investment, consumption and government transfers with economic growth. The same research was also conducted by Sinha (2000) in Malaysia which examined the relationship between government spending and economic growth. Sinha found insignificant results.

Meanwhile, several studies on fiscal policy and economic growth using panel data techniques have shown almost the same results. Bania, Gray and Stone (2007) tried to measure the nonlinearity of the impact of using taxes to finance productive government spending such as health on economic growth. This study shows that the impact of increasing taxes used to finance government spending is non-monotonic, that is, it is initially positive but at one point it has decreased. This decrease occurred due to the crowding out of private capital due to the tax burden which reduced the net return of private capital.

3. Method

This research uses annual data from 26 provinces in Indonesia in the period 2011-2020. It is hoped that the use of panel data in this study can present more complete information and be able to show a more realistic relationship due to the larger number of observations. The model will be analyzed using panel data econometric regression method. The models used in this study are:

Log(PDRBPct) = a1 + a2Log(PDRBPct-1) + a3Log(EXct) + a4Log(DEFct) + a5Log(OPNct) + a6Log(INFct) + a7Log(POPct) + a8Dsda + a9Dlok + a10Ddes + ect.

Where

Log(PDRBPct)= regional domestic income real gross per capita
Log(PDRBPct-1) = regional domestic income real gross per capita of the previous year
log(exct) = real government spending
Log(DEFct) = real government budget deficit
Log(OPNct) = degree of openness real economy
log(INFct) = inflation
Logs(POPct) = population
Dsda residents = binary natural resources
Dlok = binary location
Ddes = dummy decentralization
ect = term error

The regression analysis used in this study is panel data analysis. Panel data or pooled data is a combination of time series data and cross-sectional data. Panel data includes two dimensions, namely the spatial dimension and the temporal dimension. The spatial dimension is a collection of latitude observation units for a particular variable, while the temporal dimension is a set of time series observation units.

4. Results and discussion

4.1 Result

The results of data analysis that began with the stationarity test for panel data recommended by Maddala and Wu (1999) was to use the Augmented Dickey Fuller-Fisher (ADF-Fisher) test with the results as described in Table 1

From Table 1 it can be seen that all variables are stationary at degree one (first difference) and significant at α = 1% (0.01).

Table 1. Variable Stationarity Test Results

PDRBP	**30,684**	**73,606**	**3,465**	**319,755*** **	**246.506*** **	**344.203*** **
	0.992	0.026**	1,000	0.000	0.000	0.000
PDRBP-1	348,079***	288,081***	370,994***	500,607***	411.388***	677,214***
	0.000	0.000	0.000	0.000	0.000	0.000
EX	32,898	42,167	11,581	309,471***	257,786***	445.231***
	0.982	0.833	1,000	0.000	0.000	0.000
DEF	210.348***	148,829***	206.169***	423.679***	363,772***	594,744***
	0.000	0.000	0.000	0.000	0.000	0.000
OPN	65,772*	111.336***	41,915	512,495***	425.404***	700,433***
	0.095	0.000	0.840	0.000	0.000	0.000
INF	300.159***	224,886***	216.588***	524.385***	416.495***	713,006***
	0.000	0.000	0.000	0.000	0.000	0.000
POPs	29.16	52.14	16.33	348.55***	287.90***	151.25***
	0.995	0.468	1,000	0.000	0.000	0.000

Note: *** = significant 1%, ** = significant 5%, * = significant 10%
From the table it can be seen that all variables are stationary at degree one (first difference) and significant at α = 1% (0.01).

Table 2. Estimation Results

C	**SECoe**	**3.015***0.276**
	t-stat	10,923
	Prob	0.000
Logs	Koe	0.238***
PDRBPct-1	SE	0.022
	t-stat	10,799
	Prob	0.000
EX logsct	Koe	0.227***
	SE	0.039
	t-stat	5,771
	Prob	0.000
DEF logsct	Koe	0.057***
	SE	0.016
	t-stat	3,541
	Prob	0.000
OPN logsct	Koe	0.127***
	SE	0.013
	t-stat	9,994
	Prob	0.000
INF logsct	Koe	-0.046
	SE	0.030
	t-stat	-1,540
	Prob	0.124
POP Logsct	Koe	-0.368***
	SE	0.034
	t-stat	-10,766
	Prob	0.000
DSDA	Koe	0.294***
	SE	0.054
	t-stat	5,399
	Prob	0.000
DDES	Koe	0.319***
	SE	0.044
	t-stat	7,238
	Prob	0.000
DLOK	Koe	0.139*
	SE	0.072
	t-stat	1919
	Prob	0.056
R2		0.767
Adj R2		0.762
F-statistics		161,979
F-stat prob		0.000
Durbin-Waston		0.479

Note: *** = significant 1%, ** = significant 5%,

* = significant 10%This estimate provides empirical support for the relationship between economic growth and government spending accompanied by several important variables in the economy such as inflation, openness and population. The estimate also includes control variables in the form of a crisis dummy, natural resources, decentralization, and location.

Table 2 is the result of estimation with the dependent variable real per capita Gross Regional Domestic Product (Log PDRBPct) per province. The variable (Log GRDPct-1) represents the real GRDP per capita per province in the previous year used to show the speed of convergence between regions. This variable shows a significant positive relationship in all models. This means that a high convergence speed will encourage an increase in GRDP per capita per province in Indonesia.

The estimation model is carried out by including all fiscal variables, control variables and other important macro variables in the model. As a result, all fiscal variables show a positive and significant effect on per-capita GRDP growth. The provincial government budget deficit (Log DEFct) shows a significant positive effect which is in line with the hypothesis of this study. An increase in the government deficit by 1 percent will increase the GDP per capita by an average of 0.057 percent. Total government spending (Log EXct) also shows the same effect, which is significantly positive. The regression coefficient of this variable shows that if there is an increase in total government spending by 1 percent, it will increase the GDP per capita on average by 0.227 percent.

Each control variable shows the same result. The influence of ownership of natural resources (DSDA) has a positive impact, meaning that provinces with natural resources in the form of mining have a higher economic growth of 0.29 percent. The existence of decentralization (DDES) also caused the province's economic growth to be higher by 0.13 percent. The difference in locations on the island of Java and outside Java (DLOK) also showed significant positive results, meaning that provinces located on the island of Java had higher economic growth of 0.13 percent.

Other variables, namely inflation Log(INFct) and population Log(POPct) each show a significant negative effect. Meanwhile, the economic openness (OPNct) shows a significant positive effect of 0.127 percent.

The regression coefficient of each variable shows that if there is an increase in inflation by 1 percent, it will reduce the PDRBP by an average of 0.046 percent and if there is an increase in population by 1 percent, it will reduce the average PDRBP by 0.368 percent. The inflation variable has a negative effect on PDRBP growth, although it is not significant. High inflation mimics the real value of money.

Control variables tend to consistently have a positive influence on GRDP per capita growth. The binary variable for natural resources (DSDA) shows a significant positive relationship, meaning that the availability of natural resources in the form of mining in a province increases GRDP per capita. Provinces with abundant mining resources have a larger GRDP per capita. The existence of the decentralization policy that began in 2001 also affected the growth of GRDP per capita. The Dummy variable for decentralization (DDES) shows a positive and significant effect in each model.

The decentralization policy has provided opportunities and opportunities for each province to create policies that can improve people's welfare. A narrower jurisdiction and smaller population will make it easier for local governments to determine appropriate and effective policies in increasing the GDP per capita of their people.

Differences in the location of a province also affect the real per capita economic growth of a province. This is indicated by the binary variable for location (DLOK) which is positive although not significant. This indicates that provinces in Java tend to be more prosperous than

provinces outside Java. Unequal economic development during the New Order era created disparities in infrastructure and economic facilities between the two regions. In addition to physical factors, these differences are also due to the much better quality of human resources in Java, so that the people have a better ability to create works.

Conclusion

The conclusion obtained in this study is that the previous year's GRDP variable had a positive impact on economic growth. This shows that a high convergence speed will increase economic growth. Government spending has a positive impact on economic growth, as well as openness, natural resources, location, and decentralization variables have a positive impact on economic growth.

While the population variable has a negative impact on economic growth. This indicates that the non-labor force population is large enough to reduce the average productivity of the population that forms the labor force, which has a negative impact on economic growth. This also has a negative impact on the inflation variable. This shows that the government's role in controlling prices for the long term is not able to support economic growth, but instead On the other hand, it can hinder economic growth.

This research tries to provide input for policy makers to determine future policy decisions related to the role of government spending on economic growth. The significant positive result of the variable coefficient of government spending shows that the government still plays an important role in supporting economic growth in Indonesia. This needs to be addressed with seriousness from the government to allocate these expenditures to productive sectors and projects.

The results of this study are still aggregate and have not analyzed the relationship between the two variables in more detail. However, the results of this study are expected to be able to provide input for policy makers in designing government spending to support economic growth. It is hoped that there will be further studies, namely an analysis of the role of fiscal policy in economic growth that separates fiscal policy for productive interests such as public investment and unproductive interests such as routine consumption.

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