

Does Tax Effort Moderate the Effect of Government Expenditure on Regional Economic Growth? A Dynamic Panel Data Evidence from Indonesia

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Abstract. Our research study aims to analyze the effect of government expenditure on goods and services and capital toward regional economic growth in Indonesia. We position local tax effort as a moderating variable between economic growth and government expenditures. Using a panel data set of 24 provinces in Indonesia from 2006 to 2015, a dynamic model of GMM was applied to estimate the effect of public expenditure on growth. The research study provides empirical evidence that the two kinds of public spending positively and significantly affect economic growth. Conversely, local tax efforts negatively affect economic growth. Besides, local tax efforts also reduce the positive impact of capital expenditure on economic growth. In other words, local tax efforts negatively moderate the influence of government expenditure on the output growth of the regional economy.

Keywords: Economic growth, local tax effort, government expenditure, GMM estimation.

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1. Introduction

The government's efforts in economic development use public spending as the main instrument. Government spending is a means of public policy tailored to the funding needs of development programs (Macek, 2015). A descriptive summary of local government spending in Indonesia shows that public expenditure pertains to six categories, namely personnel spending, goods and services, capital expenditure, grant and social aid spending, and others, including cash transfers and subsidies (Indonesian Central Bureau of Statistics, 2020). By 2013, the local government in Indonesia allocate most of the public spending on goods and services and capital spending. Therefore, our study focused on goods and services expenditure and capital expenditure.

Goods and services expenditures are part of the current spending component to provide goods and services whose benefit is less than one year and aimed to provide public services. Furthermore, capital expenditures refer to public spending allocated to the provisions of tangible fixed assets. Public expenditure on road infrastructure, bridges, water networks, and other public infrastructure is the functional component of capital spending (Kazungu & Cheyo, 2014). In the context of the local government budget in Indonesia, the realization of public spending on goods and services and capital expenditure continues to increase. But economic growth in some regions is relatively slow (Hasyim et al., 2019). Therefore, it is interesting to investigate how these spending components could promote regional economics.

So far, the linkage between government spending and economic growth has long been the focus of economic researchers (Olaoye et al., 2019; Haini & Wei Loon, 2021). However, their findings regarding the relationship between the two variables are still confusing and do not give a fixed conclusion. In other words, the direction and significance of the relationship between the two variables are still controversial (Radulescu et al., 2019; Waweru, 2021). In addition to discovering controversial results, the researcher neglects to consider that when the government allocates public expenditure for economic development, at the same time, the government also collects local taxes as the primary source of local government revenue.

Tax revenue reflects the intensity of tax efforts undertaken by the government (Mahfoudh & Gmach, 2021). An increase in tax revenue through an increase in tax rates indicates an increase in tax collection efforts. In other words, the higher the local tax revenue the higher the tax efforts of the local government. So far, many studies have proven that tax efforts impact people's economic activities (Oravsky et al., 2020) and affect economic growth (Gonzalez Aguirre & Del Villar, 2022). Even a recent study by Chen et al. (2020) in the case of the Vanuatu economy revealed that government spending adversely affects economic growth when financed by tax revenues. Previously, a research study conducted by Amri et al. (2019) also discovered that, in the long term, there is a negative relationship between tax revenue and economic growth.

Empirical findings regarding the economic impact of taxation as described above provide an attractive analytical space on the effect of government spending on regional economic growth. We suppose that local economic growth may vary according to local government tax collection efforts. Hence, a study on the tax collection effect on the func-

tional relationship between economic growth and government expenditure is interesting to investigate more deeply. Therefore, in contrast to previous researchers, our study not only analyzes the influence of government expenditure on economic growth but also attempts to detect and analyze the moderating effect of tax collection efforts in the relationship between these two variables. We apply an econometrical model of the generalized method of moments (GMM) as a data analysis model and then modify the model by adding the interaction between spending and tax effort as a predictor variable. In addition to providing information about the main effect of expenditure and tax revenue on growth, our study also provides empirical evidence about the marginal impact of public spending at various levels of tax revenue. In the end, our study can contribute to the sharpening of the literature on the role of tax efforts in moderating the growth impact of government expenditure.

Systematically, this article consists of five main sections. The second section is a literature review that presents the empirical relationship between government spending and economic growth and the existence of tax efforts in the relationship between these two variables. The third section describes the types and sources of data and the econometric model used in estimating the relationship between variables. The fourth section describes the research results and discussion. The last section is the conclusions, recommendations for policymakers, and research implications for the forthcoming study.

2. Literature review

2.1. The link between government expenditure and economic growth

So far, studies on the relationship between government expenditure and economic growth have been the focus of many researchers (Maulid et al., 2021; Waweru, 2021). However, their findings regarding the direction and significance of the relationship between these variables are still inconclusive. Public spending has a mixed effect on economic growth. Some components of government expenditure have a negative, while others have a positive effect on economic growth (Abubakar, 2016). In this study, the spending focused on goods and services and capital spending.

Government expenditure to provide goods and services to support public services is part of the current expenditures. Until now, the impact of this spending on economic growth is still an open question. Some researchers found that government expenditure on goods and services favors economic growth, while others revealed the opposite results. For example, Matthew & Udom's (2015) study discovered that the current expenditure significantly promotes economic growth. The results of other empirical studies, such as those conducted by Selvanathan et al. (2021), also pointed out that current spending enhances economic growth. However, contrary to the two researchers, a study by Onifade et al. (2020) concluded that the current expenditures have significant and opposite effects on economic growth.

Regarding the growth impact of capital expenditure, the effect of capital expenditure on economic growth is still inconclusive. Capital spending positively impacts economic growth in the long run but negatively in the short run (Matthew & Udom, 2015). A research study conducted by Modebe et al. (2012) on the impact of government spending

on the Nigerian economy revealed that capital expenditure has a positive and insignificant effect on economic growth. Raising government capital expenditure to finance public infrastructure provides a relatively small growth effect on community income. Another empirical finding, such as Morozumi & Veiga's (2016) study using a sample of 80 countries, concluded that public capital expenditure significantly boosted economic growth.

2.2. The role of tax effort on government expenditure–economic growth nexus

Local taxes are the primary source of regional revenue sourced from regions. Therefore, tax collection has become an extensive concern among local governments. Tax collection reflects the government's interest in domestic income mobilization to finance public goods and services and recognition of taxation's role in supporting development programs (Fjeldstad, 2014). Tax efforts through either increasing the number of tax objects or increasing tax rates have an impact on economic growth (Cutler et al., 2017). In theory, lower tax revenue has a mixture effect on growth because it creates more income that can be spent on investment but concurrently reduces funds for public goods (McClellan, 2018).

Empirical studies conducted by most researchers indicate a relationship between tax revenue and economic growth (Hanson, 2021; Adefolake & Omodero, 2022). However, the significance and direction of the relationship between these two variables are still empirically controversial. Nguyen's (2019) study using Vietnam's economic data proves that tax revenue positively relates to economic growth. Somewhat differently from Nguyen's research, the one conducted by Timuno & Eita (2022) using the Botswana case study revealed that tax revenue has a different impact on growth. Their findings show that service tax revenue positively affects the output growth of the primary sector but distorts the output growth of the secondary and tertiary sectors.

The results of other studies regarding the relationship between taxes and economic growth show an inconsistent relationship, where the impact of taxes on growth can be positive or negative. For instance, Loganathan et al. (2017) discovered that the inverted U-shape effect exists between taxes and output growth. Their findings explain that in the early stages of development, the tax increase promotes economic growth, but after reaching a given rate, the tax increase distorts economic growth. Similar results were also proved by Hang et al. (2020) in their research using data from ASEAN countries revealed that although tax revenue has a positive impact on economic growth, there is an optimal threshold of tax revenue of 15.33%. When tax revenue exceeds this optimal threshold, it will reduce economic growth. Regions with higher tax revenues experience slower growth than other regions; vice versa, regions with lower tax revenues experience faster growth.

3. Data and estimation strategy

3.1. Data

Our research uses a panel data set of 24 provinces in Indonesia from the period 2006–2015. The period was considered as an appropriate time series. Since early 2016, Indonesia has increased foreign loans, mainly used to construct public infrastructure in the sub-national

area. As a result, incorporating 2016 and later years into the analysis would cause estimation bias. The operationalized variables in this research consist of economic growth (as a dependent variable) and government spending (as an independent variable). Economic growth is measured by the growth rates of per capita regional domestic product (percent). Government spending is limited to goods and services and capital expenditures. The two kinds of government expenditures are measured as IDR000 per capita.

Furthermore, we also use three control variables. They are local tax efforts, domestic investment, and the unemployment rate. The local tax efforts are proxied by the ratio of per capita local tax revenue to per capita GRDP (percent). The use of the ratio as a measure of local tax effort refers to the academic view of Garg et al. (2017) which suggests that tax effort refers to the government's ability and willingness to collect revenue from its tax capacity. Actual tax revenue reflects the intensity of the government's efforts to collect taxes (Cyan et al., 2013). Therefore, a higher ratio of per capita local tax revenue to per capita GRDP indicates a higher tax effort. Conversely, a lower ratio reflects a lower tax effort. Furthermore, domestic investment is proxied by per capita domestic investment (IDR000 per capita), and the unemployment rate is the ratio of unemployed workers to the total labor force (percent). The conceptual reasoning of these two macroeconomic variables as control variables refers to theoretical and empirical basis. In growth theory, domestic investment is the main factor of economic growth (Sabir et al., 2020). Another factor that is a determinant of economic growth is unemployment. Several empirical studies pointed out the significant impact of unemployment on economic growth (Dayıoglu & Aydın, 2021). Finally, in summary, the description and measurement of each variable are shown in Table 1.

Table 1. Description and measurement of research variables

Variables		Description	Measurement
Dependent variable	Economic growth (EG)	The growth of per capita GRDP, based on constant price 2000	Percent
Independent variables	Goods and services expenditure (GSE)	The realization of the local government budget on goods and services expenditure	Per capita IDR000
	Capital expenditure (CE)	The realization of the local government budget on capital expenditure	Per capita IDR000
Control variables	Tax effort (TE)	The ratio of per capita tax revenue to per capita GRDP	Percent
	Domestic investment (DI)	The nominal value of a regional domestic investment	Per capita IDR000
	Unemployment rate (Unem)	The ratio of unemployed workers to the total labor force.	Percent

Sources: Author's conceptual point of views

As in Table 1 above, the main variables of our research study consist of economic growth, the realization of the local government budget on public goods and services, and capital spending as well as local tax effort. To illustrate the movement of these three var-

ables, we present data for each variable focused on three periods, which are 2006, 2010, and 2015. Graphical information on economic growth by the province is shown in Figure 1.

Figure 1 displays the variation in economic growth across sub-national areas in Indonesia. In 2006, on average, regional economic growth was 4.35 percent. The growth tends to increase to 4.63 percent by 2010. In 2015, there was a significant divergence in economic growth rates among provinces. Nusatenggara Barat and Sulawesi Tengah provinces, for example, recorded the highest growth and became the best-economic performing sub-national regions with the growth rate being 19.69 and 13.74 percent, respectively. This remarkable economic growth is due to a significant increase in mining product exports in the two provinces. Notwithstanding, during the same period, most other sub-nationals experienced low growth, resulting in an average economic growth rate of 4.08 percent in 2015.

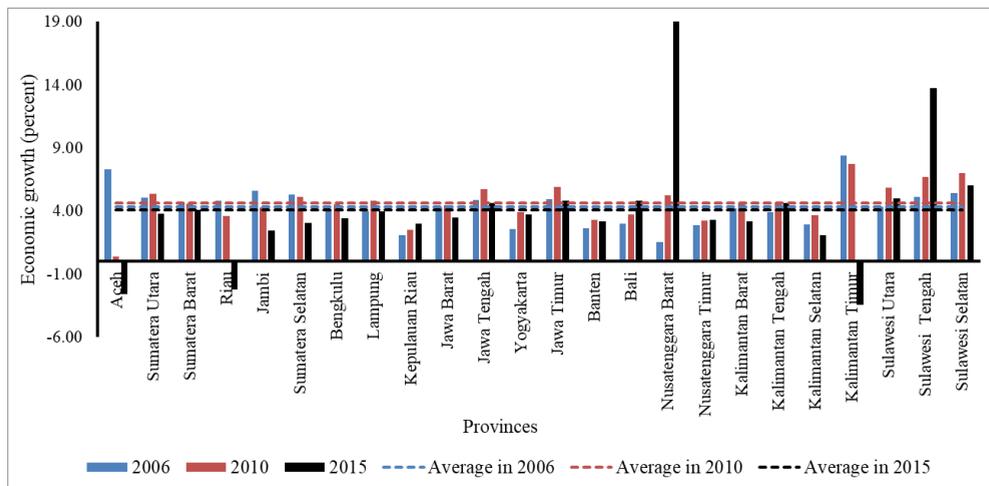


Figure 1. The dynamics of economic growth by provinces in Indonesia for the periods of 2006, 2010, and 2015.

Source: Author's compilation, Indonesian Central Bureau of Statistics.

Furthermore, local government spending consists of goods and services and capital expenditure. Both types of spending are measured by IDR000 per capita. The graphical information of the two kinds of public spending by province is shown in Figure 2 and Figure 3.

Figure 2 presents graphical information on the realization of local government budgets for goods and services spending. In 2006, on average, this public spending realization was IDR 65,170 per capita, which increased to IDR 112,680 in 2010. By 2015, government spending on goods and services had risen to IDR 234,690 per capita. The figure above also shows that the regions with the highest increases in spending include Aceh, Kepulauan Riau, and Kalimantan Timur provinces.

In line with the goods and services spending, the realization of the local government budget to finance capital expenditure has also increased. In 2006, on average, capital ex-

penditure per capita was IDR 97,830, increasing to IDR 143,216 in 2010 and amounting to IDR 190,279 in 2015. Referring to Figure 3 above, the sub-nationals with the highest capital expenditure are Aceh, Kalimantan Timur, and Kalimantan Tengah provinces. It respects due to the three sub-nationals having larger total budgets than other provinces.

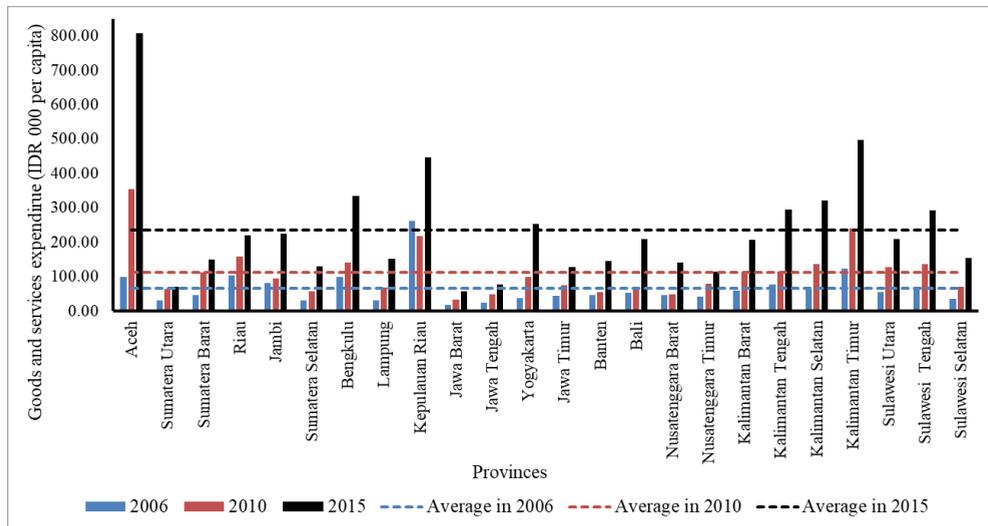


Figure 2. The dynamics of goods and services expenditure by provinces in Indonesia for the periods of 2006, 2010, and 2015

Source: Author’s compilation, Indonesian Central Bureau of Statistics.

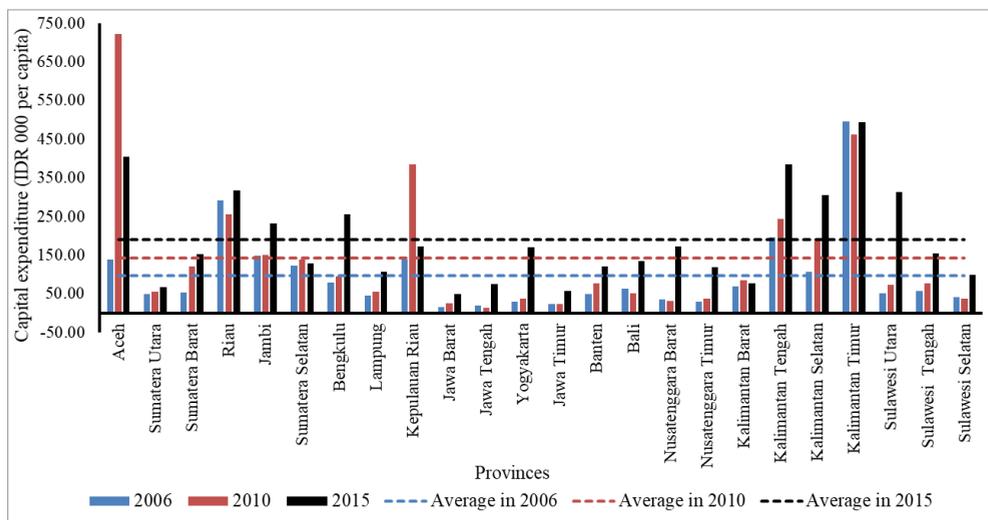


Figure 3. The dynamics of capital expenditure by provinces in Indonesia for the periods of 2006, 2010, and 2015

Source: Author’s compilation, Indonesian Central Bureau of Statistics.

Another variable of our research study is local tax efforts. This variable is proxied by the per capita local tax revenue to GRDP ratio. For the analysis period, local tax efforts were relatively varied across provinces. In graphics, information on the local tax effort is in Figure 4.

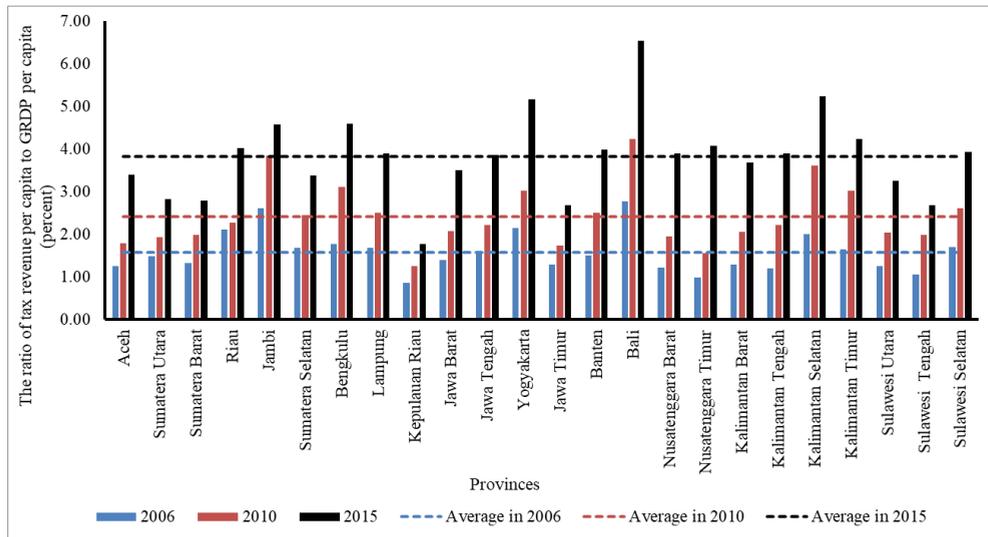


Figure 4. The dynamics of the ratio of local tax revenue per capita to GRDP per capita by provinces in Indonesia for the periods of 2006, 2010, and 2015

Source: Author's compilation, Indonesian Central Bureau of Statistics.

Figure 4 above displays that local tax efforts in Indonesia have increased in all provinces. In 2006, the average tax effort was 1.57 percent. This figure raised to 4.41 percent in 2010 and 3.82 percent in 2015. The difference in tax efforts is due to differences in tax potential and capacity in each region. In 2015, for example, the area with the highest tax effort was Bali (6.53 percent), followed by Kalimantan Selatan (5.24 percent) and Yogyakarta (5.16 percent). These three regions are tourist destinations, and as a result, tax and retribution revenues sourcing from the tourism sector contribute larger to total tax revenues. Besides, the governments in the three regions also have more active efforts to improve local government revenues.

3.2. Estimation strategy

In analyzing the relationship between macroeconomic variables by setting down economic growth as an endogenous variable, there is the potential that economic growth in a certain period is strongly related to its lagged values. Many studies have proven that economic growth in a certain period is related to economic growth in the previous year (Sultanuz-zaman et al., 2019). The dynamic model that places the lagged value as a predictor for endogenous variables is the generalized methods of moments (GMM) (Laverde-Rojas

& Correa, 2019). Therefore, our research applies the generalized methods of moments (GMM) to data analysis. Dynamic models of GMM are commonly applied to estimate panel data by economic researchers.

However, the appliance of GMM has a weakness related to the potential for endogeneity to emerge from omitted variables. Endogeneity bias can lead to inconsistent estimates (Ullah et al., 2018). In overcoming the endogeneity problem, it is necessary to have instrumental variables. The instrumental variable approach is essential for overcoming of endogeneity problem (Wooldridge, 2002). Arellano & Bond (1991) and Blundell & Bond (1998) suggest that lag values of the dependent variable are better instrumental variables than the external instrumental variables. The lag values satisfy the relevance and homogeneity conditions and therefore are valid instrumental variables (Li et al., 2021). Hence, the GMM model in this study uses the lag value of economic growth as an instrumental variable.

As explained earlier, we also position tax efforts as a moderating variable between government spending and economic growth. The setting down of tax effort as a moderator variable between the two macroeconomic variables implies that the analytical model used not only focuses on efforts to determine the growth impact of the government expenditure and tax efforts, but it also detects the interaction effect of both on economic growth. Therefore, the use of GMM in this study is operationalized in two models: a basic model and an interaction model. The basic model aimed to determine the main effect of government expenditure on economic growth by including tax effort and two other control variables as predictors. In econometrics, the basic model is as in Equation 1.

$$EG_{it} = \alpha EG_{i(t-1)} + \beta_1 \ln GSE_{it} + \beta_2 \ln CE_{it} + \beta_3 \ln TE_{it} + \beta_4 \ln DI_{it} + \beta_5 \ln Unem_{it} + \mu_1 \quad (1)$$

Here EG_{it} is the growth of per capita GRDP of the i -th province for the t -th period. $EG_{i(t-1)}$ is the lagged value of EG_{it} , $\ln GSE_{it}$ represents the logarithmic value of goods and services expenditure of the i -th province for the t -th period, $\ln CE_{it}$ denotes the logarithmic value of capital expenditure at the i -th province at the t -th period, and $\ln TE_{it}$ represents the logarithmic value of local tax effort of the i -th province at the t -th period. Further, $\ln DI_{it}$ is the logarithmic value of the domestic investment and $\ln Unem_{it}$ stands for the logarithmic value of the unemployment rate of the i -th province at the t -th period. These two variables act as control variables. Furthermore, α is the estimated coefficient of $EG_{i(t-1)}$, and β_1 , β_2 , β_3 , β_4 , and β_5 are the estimated coefficient of $\ln GSE_{it}$, $\ln CE_{it}$, $\ln TE_{it}$, $\ln DI_{it}$, and $\ln Unem_{it}$, respectively. Lastly, μ_1 is the error term.

In Equation 1, the estimated coefficients represent the main effect of the respective variable on economic growth. Testing the influence of a variable on growth refers to the significance of the estimated coefficient of the variables. For example, when $\beta_1 \neq 0$ (p-value < 0.05) statistically means that goods and services spending affect economic growth. The opposite interpretation will go on when $\beta_1 = 0$ (p-value > 0.05).

Furthermore, the interaction model is a modified form of the basic model as a consequence of the existing independent variable as a moderator in the relationship between variables (Afshartous & Preston, 2011). As previously explained, this study places tax

effort as a moderating variable in the functional relationship between economic growth and government expenditure. Therefore, the basic model is modified by including the government expenditure–tax efforts interaction as a predictor for economic growth. Because government spending consists of two types, namely goods and services expenditure and capital expenditure, the interaction model of applied GMM consists of two models, Equations 2a and 2b.

$$EG_{it} = \alpha EG_{i(t-1)} + \beta_1 \ln GSE_{s_{it}} + \beta_2 \ln CE_{s_{it}} + \beta_3 \ln TE_{it} + \lambda_1 \ln GSE_{s_{it}} * \ln TE_{it} + \beta_4 \ln DI_{it} + \beta_5 \ln Unem_{it} + \mu_2 \quad (2a)$$

$$EG_{it} = \alpha EG_{i(t-1)} + \beta_1 \ln GSE_{s_{it}} + \beta_2 \ln CE_{s_{it}} + \beta_3 \ln TE_{it} + \lambda_2 \ln CE_{s_{it}} * \ln TE_{it} + \beta_4 \ln DI_{it} + \beta_5 \ln Unem_{it} + \mu_3 \quad (2b)$$

where $\ln GSE_{s_{it}} * \ln TE_{it}$ is the first interaction variable, constituting the multiple results of the logarithmic value of goods and services expenditure and local tax effort, $\ln CE_{s_{it}} * \ln TE_{it}$ represents the second interaction variable. This interaction variable is the multiplication of logarithmic values of capital expenditure and local tax effort. Furthermore, λ_1 and λ_2 are the estimated coefficients of both interaction variables, respectively. Lastly, μ_2 and μ_3 are error terms for the respective equation.

Evaluation of the moderating effect of tax effort in the functional relationship between economic growth and government expenditure refers to the significance of the estimated coefficient. If the estimated coefficient of the interaction variable is significant at a 95% confidence level (p -value < 0.05), it indicates that local tax efforts moderate the effect of government expenditure on economic growth. The moderating effect of the moderator variable consists of three possibilities, strengthening, weakening, or changing the direction of the relationship between variables. On the other hand, if the estimated coefficient is not significant, there is no moderating effect (Amri et al., 2022).

When we find a moderating effect of tax effort on the functional relationship between economic growth and government expenditure, the next step is to evaluate the marginal effect of the government expenditure at the various levels of tax effort. Through the derivating process of Equations 2a and 2b, the marginal effect of the respective kinds of government expenditure on economic growth – at the various level of tax effort as a moderating variable – is presented in Equations 3a and 3b (Huynh & Tran, 2021).

$$\frac{\partial EG_{it}}{\partial \ln GSE_{s_{it}}} = \beta_1 + \lambda_1 \ln TE_{it} \quad 3a$$

$$\frac{\partial EG_{it}}{\partial \ln CE_{s_{it}}} = \beta_2 + \lambda_2 \ln TE_{it} \quad 3b$$

From Equation (3a), if β_1 and $\lambda_1 > 0$, it means that the effect of goods and services expenditure on economic growth is positive at various levels of tax effort value. In other words, the increased tax effort, the greater the positive effect of spending on goods and services on economic growth. On the other hand, if β_1 and λ_1 have different signs, reflecting

the existence of a threshold effect indicates that the economic growth impact of the goods and service expenditure differs at the various levels of tax efforts. For example, if $\beta_1 > 0$ and $\lambda_1 < 0$, the marginal impact of goods and services expenditure would be positive for low values of tax effort and negative for high values of tax effort.

4. Research results and discussion

4.1. The results of descriptive statistics

As explained previously, our research study operationalizes two main variables. The variables comprise economic growth and government spending. Apart from that, there are also three other economic variables as control variables. They are local tax effort, domestic investment, and unemployment rate. Using panel data from 24 provinces in Indonesia from 2006 to 2015, the descriptive statistics test shows that regional economic growth differs across sub-nationals. There are provinces with relatively high growth and vice versa with relatively low growth. This difference is that reflected by the various growth rates of per capita GRDP. The highest growth rate of per capita GRDP amounts to 19.691 percent, and otherwise, the lowest to -4.084 percent. On average, the growth of per capita GRDP amounts to 4.368 percent. In summary, the results of the descriptive statistics are seen in Table 2.

Table 2. The result of the descriptive statistics and correlation matrix

Descriptive statistics						
	EG (Percent)	GSE (IDR000 per capita)	CE (IDR000 per capita)	TE (percent)	DI (IDR000 per capita)	Unem (percent)
Mean	4.368	152.776	145.151	2.759	203.916	6.806
Median	4.318	106.851	95.717	2.534	74.492	6.200
Maximum	19.691	1,167.923	943.249	6.780	8,456.693	18.900
Minimum	-4.084	17.424	8.511	0.851	0,084.300	1.800
Std. Dev.	2.213	153.373	150.015	1.217	616.999	2.915
Obs	240	240	240	240	240	240
Correlation matrix						
EG	1.000					
GSE	-0.134	1.000				
CE	-0.165	0.388	1.000			
TE	0.023	0.425	0.315	1.000		
DI	0.041	0.141	0.257	0.163	1.000	
Unem	-0.056	-0.258	-0.042	-0.477	0.175	1.000

Sources: Author's computation by using *E-views* 10

Concerning public spending as a regional fiscal instrument, the realization of public expenditure on goods and services and capital expenditure differs among regions. Statistically, the differences are indicated by the maximum and minimum values of the respective spending, as shown in Table 2 above. On average, the realization of the local budgetary allocation on goods and services is IDR 152.776 thousand per capita. It is higher than the average capital expenditure of IDR 145.151 thousand. So, the results of this descriptive statistic illustrate that the allocation of regional spending for goods and services is more than for public infrastructure development.

Along with differences in the growth of per capita GRDP, efforts to collect local taxes in Indonesia also differ by province. These differences refer to the ratio of per capita tax revenue to per capita GRDP among the sub-national areas. The results of descriptive statistics show that the highest ratio is 6.780 percent, and the lowest ratio is 0.851 percent. The different percentage points numerically reveal clear information that local governments in Indonesia have various efforts and intensities for collecting local taxes. Although tax revenue is related to the potential for local taxes, the ability of local governments to get into a reality of tax revenue differs across provinces.

Table 2 above also shows the correlation coefficient between variables. Economic growth is negatively related to spending on goods and services, capital spending, and unemployment rates, which pointed to the correlation coefficients -0.134, -0.165, and -0.056, respectively. In addition, the two kinds of government spending are positively related to tax efforts and domestic investment but negatively associated with the unemployment rate. Furthermore, the relationship between tax efforts and the unemployment rate is negative, with a correlation coefficient -0.477. It provides statistical evidence that the relationship between the independent variables is relatively weak.

4.2. The result of panel estimation

As explained earlier, to estimate the effect of government expenditure on economic growth, we apply a dynamic model of generalized methods of moments (GMM). The justification that the GMM is the best model has been based on statistical results showing that this model is free from autocorrelation symptoms and is statistically proven to meet the requirements of the validity and reliability of the measurement model. Thus, this model is declared to have good validity and produce accurate estimates. The dynamic model of GMM resulted in a Hansen p-value greater than 0.05. This statistical value indicates that GMM is reliable for predicting the relationship between variables. The Wald X^2 p-value is smaller than 0.05. This matter shows that the resulting estimate has high accuracy. Furthermore, the AR1 p-value and AR2 p-value generated by GMM are <0.05 and >0.05 , respectively, which means that a first-order correlation exists but that there is no second-order correlation (Arellano & Bond, 1991). These results satisfy the necessary conditions for ensuring the goodness of the dynamic panel model.

As seen in Model 1, the regional economic growth in a certain period significantly depends on the economic growth of the previous period. It is indicated by the estimated

coefficient ($\alpha = 0.385$, $p < 0.000$). The output value generated by the regional economy in a certain period significantly promotes an increase in output in the next period. This respect indicates that the ability of economic actors to produce goods and services in the economy has a relationship between periods. The production capacity reflected by the availability of capital goods utilized to improve economic activities affects the outputs generated throughout the production period. Even in practice, business actors are often motivated to innovate to improve their production capabilities. Sustainable innovation, in turn, promotes economic growth (Fernandes et al., 2021). This finding is consistent with the results of research by Abbas et al. (2021) using a panel data set of 106 countries from 1996 to 2015, which also provides empirical evidence that economic growth in a period of t also positively depends on growth in the previous year ($t-1$).

Government spending for goods and services has a positive and significant effect on regional economic growth, with a coefficient $\beta_1 = 1.264$ (p -value < 0.05). The positive sign of the coefficient statistically informs that increased government spending for goods and services in connection with public services leads to increased output in the sub-national economy. As seen in Equation 1 (see method section), economic growth is proxied by the growth rate of per capita GRDP (not in logarithmic form). Otherwise, goods and services expenditures are in logarithmic form. Therefore, the coefficient means that a one percent increase in goods and services spending leads to a per capita income growth of around 0.013 percent. In other words, the economic growth will increase by 0.013 percent for a one percent increase in spending on goods and services.

The positive impact of goods and services spending on economic growth indicates that the increase in spending has a positive effect on the business activities of the local community. Goods and services spending that is a part of current expenditure, such as the procurement of consumable materials and services in support of public services (Nazamuddin & Amri, 2020). A higher level of government's current spending reflects an increase in local government demand for goods and services. This regard will stimulate the community to increase the production of goods and services. Therefore, this expenditure provides positive benefits for the regional economy, not only being the trigger for increased production of goods and services but also encouraging economic growth from the demand side. This finding is consistent with Maulid et al.'s (2021) study on the relationship between government spending and economic growth which pointed out that spending on goods and services significantly increases economic growth.

As shown in Model 1, local government budget allocation for capital expenditure also positively and significantly affects regional economic growth, with an estimated coefficient $\beta_2 = 1.272$ ($p < 0.05$). The greater the realization of capital expenditure, the higher the economic outgrowth, and a decrease in capital expenditure significantly reduces growth. In this case, the effect of spending on economic growth also indicates that regions with relatively more capital expenditures experience higher economic growth than others with smaller capital expenditures. On the other hand, the smaller capital expenditure allocating province experienced lower economic growth than the larger capital expenditure province. Capital expenditure allocation usually aims to increase the availability of capital goods through public infrastructure development to meet the needs and increase economic activity (Beyer & Milivojevic, 2020).

Table 3. The result of GMM estimation

Constant & predictors	Endogenous variables: EG					
	Model 1		Model 2a		Model 2b	
	Estimate coefficient	p-value	Estimate coefficient	p-value	Estimate coefficient	p-value
EG(-1) (α)	0.385*** [30.176]	0.000	0.442*** [25.578]	0.000	0.398*** [30.254]	0.000
lnGSEs (β_1)	1.264*** [5.764]	0.000	4.017 [11.339]	0.000	1.367*** [4.787]	0.000
lnCEs (β_2)	1.272*** [5.642]	0.000	0.913*** [3.497]	0.000	1.534*** [6.377]	0.000
lnGSEs*lnTE (λ_1)			-2.655 [-13.063]	0.000		
lnCEs*lnTE (λ_2)					-0.482*** [-3.386]	0.000
Control variables						
lnTE (β_3)	-4.617*** [-11.874]	0.000	27.176 [11.672]	0.000	1.063*** [0.691]	0.490
lnDI (β_4)	0.429*** [19.603]	0.000	0.519 [11.579]	0.000	0.452*** [16.545]	0.000
lnUnem (β_5)	-1.367*** [-3.425]	0.000	0.462 [0.872]	0.384	-1.120*** [-2.408]	0.017
Effects Specification: Cross-section fixed (dummy variables)						
Mean depend. Var	-0.062		-0.062		-0.062	
S.E. of regression	2.678		2.762		2.695	
Hansen test						
J-statistic	22.249		21.808		21.923	
Prob(J-statistic)	0.221		0.192		0.188	
Arellano-Bond AR test						
AR(1)	-2.707 (0.007)		-2.737 (0.006)		-2.563 (0.010)	
AR(2)	-0.457 (0.647)		-0.029 (0.977)		-0.315 (0.753)	
Wald test						
F-statistic	1052.690 (0.000)		516.839 (0.000)		567.436 (0.000)	
Chi-square	6316.140 (0.000)		3617.87 (0.000)		3972.052 (0.000)	

Note: Numbers in [] are t-statistics, *, **, and *** indicate a significance at the confidence level of 90%, 95%, and 99%, respectively.

Sources: Author's computation by using E-views 10

In contrast to the effect of goods and services and capital expenditure on economic growth, the local tax effort negatively and significantly affects economic growth, with estimated coefficient $\beta_3 = -4.617$ (p-value < 0.05). Increased tax effort is negatively related to output growth in the regional economy. It needs to note that tax effort is proxied from the per capita tax revenue to per capita GRDP ratio. An increase in this ratio indicates that tax efforts are increasing, meaning a share of per capita income for tax payment tends to be higher, and the portion for fulfilling consumption needs to be lower. Therefore, the raising in tax efforts can harmfully impact aggregate consumption in the sub-national context. In other words, increased tax collection efforts have a destructive impact on economic activity and business productivity in the regional economy. This finding indicates that the local government's efforts to realize fiscal revenues sourced from local taxes interfere with economic activities in the regions. This empirical result confirms the neoclassical growth theory view that high levels of tax collection hinder economic activity. An increase in tax effort reflected by higher tax revenues reduces consumption, savings, and investment, and in turn, it will negatively affect economic growth (Nguyen & Darsono, 2022). Conversely, a decrease in tax effort indirectly stimulates economic activity due to the higher disposable income.

As shown in Table 3, domestic investment as the control variable has a positive effect on economic growth, with an estimated coefficient $\beta_4 = 0.429$ (p-value < 0.05). This statistical evidence indicates that the more domestic investment, the higher the economic growth. The positive and significant relationship between these two variables reflects that investment is a primary factor for improving aggregate output in the regional economy. These findings confirm the classic growth theory taking place investment is one of the factors forming growth (Zhao, 2017). The role of investment as a determinant of economic growth is also straightforwardly stated in earlier development theories that considered output growth as a function of investment (Lee, 2020).

Unlike domestic investment, the unemployment rate has a negative and significant effect on economic growth by an estimated coefficient $\beta_5 = -1.367$ (p-value < 0.05). The higher the unemployment rate, the lower the economic growth. Conversely, a decrease in unemployment reflects an expansion of employment opportunities and will promote total output in the economy. In other words, the total production of goods and services will increase when employment opportunities increase. This respect did consequent an inverse relationship between the unemployment rate and economic growth. This finding confirms the research findings of Mohseni & Jouzaryan (2016) discovered that unemployment has a negative and significant effect on economic growth.

Model 2a and Model 2b, as in Table 3 above, are interaction models, adding the interaction of local taxes and government spending as predictors of variables for economic growth. Regarding the interaction effect of the goods and services expenditure and local tax revenue on economic growth, Model 2a pointed out an estimated coefficient $\lambda_1 -2.655$ (p-value < 0.05), indicating that local taxes effort significantly moderates the effect of GSEs on economic growth. Statistical evaluation of what extent of the moderating effect

also refers to the marginal effect of spending on economic growth. A partial derivation of Model 2a shows the marginal effect of goods and services expenditure in Equation 4a.

$$\frac{\partial EG_{it}}{\partial \ln GSEs_{it}} = 4.017 - 2.655 \ln TE_{it} \tag{4a}$$

Evaluation of the marginal effect of $GSEs_{it}$ refers to three levels of the logarithmic value of tax effort: mean, minimum, and maximum (see Appendix 1). At the mean logarithmic value of taxes effort, the marginal effect of this public expenditure is 2.759 percent. Furthermore, at the maximum and minimum values, the marginal effects amount to -1.066 and 4.444, respectively (see Appendix 2). These three marginal effects are significantly different from the main effect of $GSEs_{it}$ on the economic growth being 1.264 percent (Model 1). This statistical calculation is consistent with the interpretation of the estimated coefficient of interaction variables that the coefficient is significant at a 95 percent confidence level.

Model 2b shows that the estimated coefficient λ_2 of the interaction between capital expenditure and local tax effort is -0.482 (p-value < 0.05). This coefficient is also negative and significant; it statistically suggests that tax effort moderates the effect of capital expenditure on economic growth. In other words, the impact of capital expenditure on regional economic growth differs significantly at various levels of tax effort. Mathematically, the marginal effects of capital expenditure on economic growth are seen in Equation 4b.

$$\frac{\partial EG_{it}}{\partial \ln CE_{it}} = 1.534 - 0.482 \ln TE_{it} \tag{4b}$$

Evaluation of the marginal effect of capital expenditure refers to three levels of the logarithmic value of local tax effort: mean, minimum, and maximum (see Appendix 1). At the mean value of local taxes effort, the marginal effect of this expenditure is 1.090. Furthermore, at the maximum and minimum values, the marginal effects amount to 0.612 and 1.612, respectively (see Appendix 2). These three marginal effects are significantly different from the main effect of capital expenditure on the economic growth being 1.272 (Model 1). This statistical calculation is also consistent with the interpretation of the estimated coefficient of interaction variable, which statistically pointed out that the coefficient is significant at a 95 percent confidence.

Table 4. The main and marginal effect of government expenditure on economic growth

Direction of effects	Main effect	The marginal effect at the various values of tax effort (in the logarithmic value)		
		min	mean	max
Goods & services expenditures → economic growth	1.264	4.444	2.759	-1.066
Capital expenditures → economic growth	1.272	1.612	1.090	0.612

Sources: Author’s computation by using E-Views 10.

Table 4 points out that the marginal effect of spending on goods and services on economic growth is significantly different at the various values of the logarithm of tax effort. In addition, the main effect of government expenditure on economic growth also differs from the marginal effect. The results of this mathematical calculation indicate that the local tax effort significantly moderates the effect of goods and services expenditure on economic growth. At the minimum level of tax effort, the marginal effect of goods and services spending on economic growth amounts to 4.444. The marginal effect decreases to 2.759 at the mean value of tax effort and is of negative sign (-1.066) at the maximum level of tax effort. The results of this statistical calculation inform that an increase in tax effort reduces the positive effect of spending on goods and services on economic growth. At the lowest level of tax effort, for example, an increase in spending on goods and services by 1 percent increases economic growth by 0.044 percent. Furthermore, at the mean level of tax effort, this figure decreased to 0.027 percent. Conversely, at the highest level of tax effort, increases in spending on goods and services no longer stimulate economic growth.

Similar to goods and services expenditure, the marginal effect of capital expenditure on growth tends to decrease along with increased local tax efforts. As shown in Table 4 above, the main effect of capital expenditure on economic growth amounts to 1.272, meaning that a one percent increase in capital expenditure will increase economic growth by 0.0127 percent. At the highest level of tax revenue, this effect decreases to 0.006 percent. This statistical information indicates that local government efforts to collect local taxes distort the capital expenditure effect on growth. In other words, an increase in tax revenue significantly reduces the positive impact of public expenditure on economic growth.

5. Conclusions

The study of the effect of public spending and taxation on economic growth has long been the focus of attention among academics, practitioners of public policy, and those interested in fiscal policy studies. Most of them conducted in-depth research on the extent of the economic growth impact of government spending and tax revenues. However, until now, no researcher has revealed the leverage of taxes effort on the relationship between economic growth and government spending. Even though, referring to the growth theory, the existence of taxes in the economy reduces people's income and becomes one of the factors hampering economic growth. Through this study, we identified tax collection efforts as both a control variable and a moderating variable in analyzing the effect of local government spending on economic growth. Using annual panel data sets from 24 provinces in Indonesia from 2006 to 2015, the dynamic model of GMM is used to examine functional relationships between variables. In addition, we also position domestic investment and unemployment rates as control variables.

Our statistical evidence and analysis reveal that the realization of public budgetary allocations on goods and services and capital expenditures has boosted regional economic growth. Of these two groups of public budgets, spending on capital has a more dominant

influence than on goods and services. In other words, the economic growth-raising impact of capital spending is relatively more than of goods and services. Local budget allocation for capital expenditure focuses on improving public infrastructures such as roads, transport infrastructures, and irrigation networks in rural areas, for example, the impact of these expenditures on increasing communities' incomes is relatively more significant than other expenditures.

Local government tax efforts have a negative and significant impact on economic growth. Regarding the relationship between these two variables, statistical evidence suggests that the dynamics of local tax revenues fluctuate in the opposite direction of the movement of people's incomes. The greater the local tax effort, the lower the growth in per capita income. Conversely, a decrease in local tax efforts causes an increase in the growth rate of per capita income. This fact provides an empirical conclusion that, in the context of local government in Indonesia, tax collection efforts interfere with the output growth of the regional economy. In other words, the government's efforts to collect local taxes to increase fiscal revenues had a destructive effect on the economic activities of communities in sub-national areas. Even tax collection efforts negatively and significantly moderate the functional relationship between economic growth and expenditure on goods and services and capital spending.

Our findings have practical implications for those local governments in Indonesia that have an unfavorable opportunity to increase local tax efforts. So far, the local tax effort has interfered with economic activities. Concerns about the adverse effects of tax collection on the economy have become a reality in an empirical context. Therefore, local governments in Indonesia had no beneficial opportunity to increase their efforts to receive local taxes more broadly. In addition, our findings also have theoretical implications for upcoming researchers who wish to investigate the impact of local tax efforts on the relationship between economic growth and government spending. This study uses the ratio of per capita local tax revenue to per capita income as a measure of tax effort by placing total local tax revenue as the basis for calculating this ratio. Therefore, future researchers should use disaggregated tax data when conducting a similar research study. This matter is important because the impact of local tax collection on economic activities may differ among the various economic sectors.

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Appendix 1

Logarithmic value of tax effort, goods and services expenditure, capital expenditure, domestic investment and unemployment rate

	lnGSE	lnCE	lnTE	lnDI	lnUnem
Mean	11.607	11.458	0.922	11.033	1.828
Median	11.579	11.469	0.930	11.218	1.825
Maximum	13.971	13.757	1.914	15.950	2.939
Minimum	9.766	9.049	-0.161	4.434	0.588
Std. Dev.	0.784	0.940	0.434	1.716	0.431
Obs	240	240	240	240	240

Appendix 2

The marginal effect of goods and services expenditure

At the minimum value of the logarithm of tax effort

$$\frac{\partial EG_{it}}{\partial \ln GSE_{it}} = 4.01662 - 2.65519(-0.161) = 4.444$$

At the mean value of the logarithm of tax effort

$$\frac{\partial EG_{it}}{\partial \ln GSE_{it}} = 4.01662 - 2.65519(0.922) = 2.759$$

At the maximum value of the logarithm of tax effort

$$\frac{\partial EG_{it}}{\partial \ln GSE_{it}} = 4.01662 - 2.65519(1.914) = -1.066$$

The marginal effect of capital expenditure

At the minimum value of the logarithm of tax effort

$$\frac{\partial EG_{it}}{\partial \ln CE_{it}} = 1.534028 - 0.48178(-0.161) = 1.612$$

At the mean value of the logarithm of tax effort

$$\frac{\partial EG_{it}}{\partial \ln CE_{it}} = 1.534028 - 0.48178(0.922) = 1.090$$

At the maximum value of the logarithm of tax effort

$$\frac{\partial EG_{it}}{\partial \ln CE_{it}} = 1.534028 - 0.48178(1.914) = 0.612$$