Budget Allocations on Economic Sectors to Optimize the Economic Growth: a Case Study of Indonesia's Southeast Sulawesi Province

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Abstract: *Different economic sectors have certain economic characteristics. Accordingly, they provide distinct effects on economic growth or gross domestic product (GDP). In this paper we attempt to find optimum allocations of limited budget in order to optimize the GDP. Through regression model we calculated the expected contribution of each sector to the GDP and, then, we got the proportion of each sector to allocate. Accordingly, the amount of budget to spend in each economic sector is based on these proportions. The results have shown that,by applying these proportions to dictate the allocation of government spending, the GDP would have beenseven times of the current actual GDP.*

Keywords: *economic growth, gross domestic product (GDP), optimum proportion, budget allocations, regression model*

I. Introduction

Every country in the world has the same objective that is to achieve rapidly sustainable economic growth.The economic growth is mostly indicated by the gross domestic product (GDP). The GDP has been the subject of macroeconomics policy in order to increase the economic growth. There are some factors affecting the GDP, such as inflation rate, currency, and government spending. Many authors have been investigating the factors affecting economic growth. Some of them focused on government spending to economic growth or GDP. Seghir et al (2015)studied the effect of spending in tourism on economic growth, while Olayungbo & Olayemi (2018) as well as D'Agostino at al (2016) investigated the relationship between government spending and economic growth. Atems (2019), Facchini & Seghezza (2017), also conducted their work on government spending in an economic sectoron economic growth.

From the works of those authors, it is implied that the government spending affects the economic growth.All of their works, however, investigated the government spending on a sectorpartially. None of them discussed nor compared the spending allocation on one sector to another. We know that the effect of an economic sector on economic growth of a country or a province may vary from one to another. Due to the limitation of budget to spend on economic sectors, the government should allocate the spending smartly in an effective way to reach an optimum growth. As a result, the information about the characteristics of sectors on economic growth is needed before allocating the limited government spending. In this paper, we attempt to derive the proportions of government spending to be allocated on economic sectors. By applying these proportions to government spending allocations, it is expected that the economic growth would achieve an optimum level.

II. Material and Method

Dataset

The data is obtained from the Department of Regional Planning and Development, Provincial Government of Southeast Sulawesi, Indonesia. It reports annual budget allocation on 16 economic sectors and their growths during 2010 – 2018.

Method

Many authors have applied regression model to explain the effects of investment or government spending on economic growth that is indicated by GDP. Among them are M.K. Ardakani, S.M. Sayedaliakbar (2019), I.A. Kirshin et al (2014), Alfada (2019), N.P. Goridko, R.M. Nizhegorodtsev. (2016), M.N. Eris, B. Ulasan. 2013.B-N. Huang, M.J. Hwang, C.W. Yang. 2008. A. Minasyan, J. Zenker, S. Klasen, S. Vollmer. 2019. They have demonstrated how useful the regression models are. In this paper, we also built our models based on regression

models. Since we modeled the economic growth separately in each sector instead of using multiple-regression for the all sectors, we employed simple linear regression. The regression model can be written as:

$y_i = \beta_0 + \beta_1 x_i + \varepsilon_i \, i = 1, 2, \ldots, n$

where, y_i be the GDP, x_i be sectoral government spending, β_0 be the unknown parameter of model intercept, β_1 be the slope or marginal propensity to spending, and ε_i be the error term.

Through regression model for each sector, it is easy for us to see how the sectoral government spending affects the GDP by looking at the parameters of the model. The higher the parameter value is, the more effective the government spending is.

III. Results and Discussions

As it has been mentioned in the previous section, we built a simple regression model based on government spending allocation and the GDP in each sector. The models consist of two parameters or coefficients, namely β_0 and β_1. The β_0 is the intercept of model, while β_1 is the slope. The parameters of models are shown in Table 1. All the parameters are significant, so statistically we can rely on these models. We can see from the table that each sector is to have distinct characteristic as indicated by the regression coefficients and this will affect the GDP growth in each sector differently. Based on these coefficients of regression model, we derived the proportion of the government spending to be allocated on each sector.

Table 1. Regression models for economic sectors on GDP.

Sector	β_0	β_1
Agriculture, forestry, and fishery	82.24	23.48
Mining	3.22	321.94
Industry	23.77	57.76
Electricity and gas	-0.21	0.89
Water and waste management	1.07	17.80
Construction	31.09	13.05
Trading	-11.57	194.03
Transportation and warehousing	-29.26	76.16
Hotels and restaurants	2.60	14.64
Finance and insurance	7.74	14.18
Real estate	3.09	124.07
Companies	0.76	37.32
Government administration, defense, and social welfare	27.46	3.02
Educations	11.87	4.81
Health	2.99	1.04
Others	-10.64	24.19

After we got the model for each sector, we fitted the models using total allocation that provincial government spent in 2018 to obtain the predicted GDP in each sector. We then summed up the predicted GDP of all sectors. The proportion of each sector was calculated by taking the ratio of sectoral predicted GDP over the total predicted GDP and multiplied it by 100%. The proportion of each sector can be seen in Table 2. Because these proportions were derived from the performance of each sector, they could be used to indicate how the economy of Southeast Sulawesi is composed. As shown in the table, the biggest proportion is in mining sector. It occupies 34.50% of the total. It is no wonder, since mining sector is booming in Southeast Sulawesi, recently. Then, it is followed by trading (20.75%), real estate (13.30%), transportation and warehousing (8.05%), industry (6.28%), and companies (4.00%) sectors, respectively. The rests are less than 4.00% for each. These numbers are also indicating that Southeast Sulawesi Province has shifted its economy away from agricultural sector as used to be.

Table 2. Percentage of government spending to be allocated on economic sectors

Sector	Allocated proportion (%)
Agriculture, forestry, and fishery	2.82
Mining	34.50
Industry	6.28
Electricity and gas	0.09
Water and waste management	1.91
Construction	1.51
Trading	20.75
Transportation and warehousing	8.05
Hotels and restaurants	1.58
Finance and insurance	1.55
Real estate	13.30
Companies	4.00

Sector	Value
Government administration, defense, and social welfare	0.42
Educations	0.56
Health	0.12
Others	2.55
Total	100

Finally, we calculated the optimal government spending allocation and subsequently the optimal GDP based on the aggregate of government spending in 2018 for all sectors. These optimal spending and GDP are then compared to the actual. As presented in Table 3, when discussing about spending allocation, it can be seen that the gaps between actual and optimal allocations are definitely wide in more than half of the sectors. If the amount of actual spending is high, the optimal is in the opposite. It seems that the provincial government of Southeast Sulawesi invests on the sectors that have low impact more than in those of high impact to economic growth. Perhaps they thought that in the sectors in which the GDP are lower they have to invest more. In fact, based on regression model of each sector in order to increase the GDP drastically the government should invest more in high impact sectors.

The optimal GDPs were calculated with regard to regression model of each sector and optimal spending allocations as the inputs. As shown in Table 3, when optimal spending allocation in a sector jumps from a certain number of actual allocation to a very low one. In contrast, the GDP increases dramatically when spendingallocation is the optimal one.

Taking the aggregate of actual GDP and compared to the aggregate of optimal GDP, we can see how explosive the result. The optimal GDP is 6,348.29 billion (Indonesian Rupiah, IDR) compared to861.82 billion of the actual GDP. This optimal GDP is seven times more than the actual GDP. This is achieved by using the same amount of government spending in 2018.

Table 3. Actual and optimal allocation of government spending and GDP in 2018 (billion IDR)

Sector	Budget allocation		GDP	
	Actual	Optimal	Actual	Optimal
Agriculture, forestry, and fishery	5.2655	0.9630	205.5245	104.8490
Mining	0.5613	11.7968	186.0365	3,801.0835
Industry	0.4793	2.1456	53.9062	147.7077
Electricity and gas	0.7691	0.0323	0.4562	-0.1851*
Water and waste management	0.0313	0.6534	1.5898	12.7069
Construction	6.2867	0.5171	112.6242	37.8440
Trading	0.6540	7.0929	111.4365	1,364.6697
Transportation and warehousing	0.8871	2.7532	42.0356	180.4256
Hotels and restaurants	0.1720	0.5395	5.1002	10.4979
Finance and insurance	0.7218	0.5292	19.5122	15.2428
Real estate	0.0823	4.5487	13.3471	567.4475
Companies	0.0335	1.3679	1.9272	51.8101
Government administration, defense, and social welfare	5.8847	0.1449	45.3313	27.8920
Educations	6.4906	0.1909	41.8323	12.7865
Health	5.8709	0.0417	8.5467	3.0370
Others	0.9604	0.8729	12.6137	10.4763
Total	34.19	34.19	861.82	6,348.29

* The intercept is negative and allocation is very small, the model produces negative GDP

IV. Conclusion

We have shown that using simple linear regression to model the government spending allocation on the economic growth (GDP), we could derive the proportion of government spending to be allocated in each sector in order to achieve an optimum economic growth. We have also demonstrated that by allocating the government spending properly on each sector, we could multiply the overall economic growth by allocating more spending on highly impact sectors. In the case of regional GDP of Southeast Sulawesi Province of Indonesia, the optimal allocation could increase the GDP seven times more than the actual GDP.

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