Efficiency Evaluation of Local Government Expenditures Towards The Human Development Index

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Abstract

This study aimed to analyze the efficiency of government expenditure based on the Human Development Index (HDI)'s achievement in Indonesia using Data Envelopment Analysis (DEA) and Tobit Regression. The DEA method is used to measure the efficiency of a government entity by using multi-input and multi-output. DEA results can also be used to identify which input or output must be evaluated so that Decision Making Unit (DMU) can increase efficiency. While the Tobit model was conducted to investigate the connection of the efficiency result to some variables such as population, size, and differences between Java and non-java provinces. The result from this research showed that Yogyakarta, Jakarta, Central Java, and East Kalimantan were the most efficient provinces in 2015-2018, while East Java was the most inefficient. This research also indicates that the education sector was the main source of inefficiency both in input and output variables. Tobit's analysis showed that all independent variables used in this study had a significant effect on efficiency. Population and size variables had a negative significant effect on the efficiency. Otherwise, dummy variables of Java and non-Java had a positive significant effect on efficiency achievement.

Keywords: Public Expenditure Efficiency; HDI; DEA; Tobit

JEI Classification : D24, H72, H75

A. INTRODUCTION

In the Indonesian reform era, there has been a paradigm shift in national development from the growth paradigm to an equitable distribution of sustainable development paradigm (Pamula, 2012). This new paradigm demands added success indicators of national development, which is not only about the growth rate of Gross Domestic Product (GDP) but also an increase in the Human Development Index (HDI). This chance was realized through a policy of regional autonomy and central-regional financial balance which began on January 1, 2001 (RI Financial Note, 2002).

The implementation of regional autonomy policy begins with the ratification of Law Number 22 of 1999 about regional government and Law Number 25 of 1999 about regional and central financial balance.

These two regulations have undergone several revisions until the last is Law Number 33 of 2004 about regional and central financial balance and Law Number 23 of 2014 about regional government. This regulation aims to facilitate the measurable identification of the objectives achieved in one budget year. The target to be achieved is stated in the Regional Budget /APBD. It contains all financial plans obtained and used by the Regional Government to carry out governmental duties and provide services to the public (Yunan, 2014).

Decentralization is an instrument for realizing efficient and participatory local governance (Tanzi, 2002). Dillinger (1994), in his research about the implementation of decentralization in various countries found that the trigger for this policy was to provide better public services. The purpose of decentralization is to make the government closer to its people, so that government services can be carried out more effectively and the formed budget posture is more efficient. This is based on the assumption that the local government has a better understanding of the needs and aspirations of the community than the central government, so they can maximize the use of existing economic resources in order to create prosperity in the community (Hermawan & Ananda, 2013).

We set the Human Development Index (HDI) as the government output as we believe that this index is a better measure than a mere economic indicator, such as GDP growth. HDI is a composite measure of health, education, and income that was

introduced by the United Nations Development Program (UNDP) in the first Human Development Report in 1990. HDI explains how residents can access the result of development in obtaining income, health, and education. The education component of the HDI is measured by the mean of years of schooling for adults aged 25 years and expected years of schooling for children of school-entering age. The health component is measured by life expectancy at birth, and the living standard is measured by per capita expenditures.
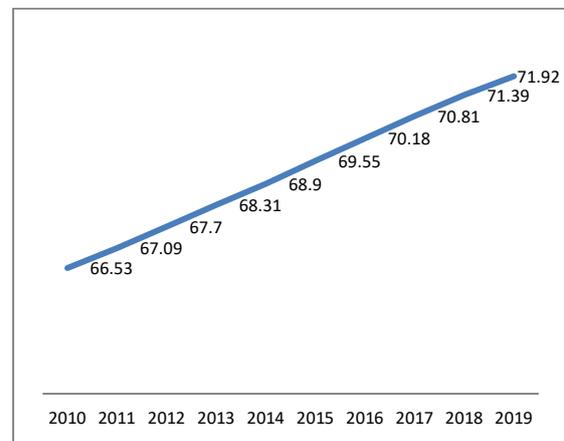
Source: BPS, 2020

Figure 1. Indonesian's Human Development Index

Indonesia's Human Development Index increased from 66.53 in 2010 to 71.92 in 2018. During that period, the HDI score grew by an average of 0.6 percent per year. Based on the international scale, the achievement of HDI can be categorized into four: high category (HDI> 80), upper middle category (66 <HDI <80), lower category (50 <HDI <66), and low category (HDI <50). According to international standards, the Indonesian Human Development Index (HDI) statistically belongs to the middle to the upper category, even close to the high

category. However, this achievement has not reached the national target as stated in the National Medium Term Development Plan 2015-2019 (RPJMN), which is 71.98. Indonesia's HDI is expected to increase to 75.54 in 2024, which indicates an improvement in the quality of human resources. (Bappenas, 2019).

Many studies have shown that government expenditures, do make a positive contribution to public goals. Gupta et al. (1998) mentioned that government expenditures on health and education sectors could bring positive effects on human capital that boost economic growth, increase equity, and reduce poverty. Furthermore, Doryan (2001) adds that government spending on the public sector can double benefits for the poor, namely better in the education and health sectors and increasing public consumption. Suescun (2007), in his research, also found that government spending in the public sector has a considerable positive effect on the performance of economic growth, welfare, human development, and social progress in Latin American countries.

Besides the availability of financial resources and fiscal capacity, there are other aspects that affect economic growth and human development in a region, that as the efficiency of the use of income owned by the region (Totalia & Rusydi, 2015). Professional and efficient management of regional revenues will strengthen the regional economic base. The ability of local governments to manage regional income, if it is not accompanied by efficient use, can make the expected goals will be hampered, and various economic problems will still occur. This study will analyze the efficiency of local government expenditure towards the Human Development Index (HDI) indicators achievement. To see the realization, this study will conduct an efficiency analysis of local government expenditures in Indonesia's 34 provinces in 2015-2018.

B. LITERATURE REVIEW

The fundamental question of economics is concerned with the limited resources available to fulfill a relatively unlimited desire. One of the focuses in the economics literature is to provide efficient allocation of resources. The concept of efficiency comes from one microeconomic theory, namely, the producer theory. This theory tries to minimize the cost or maximize the profit from the firm's views.

In the producer theory, there is something called a production frontier line that describes the relationship between the production process's inputs and outputs (Bauer et al., 1998). This line on the production frontier depicts the maximum output that can be obtained by utilizing each input. Technical efficiency refers to the process of transforming inputs into outputs. This concept applies solely to the technical relationship between inputs and outputs. The production frontier line is shown as follows:
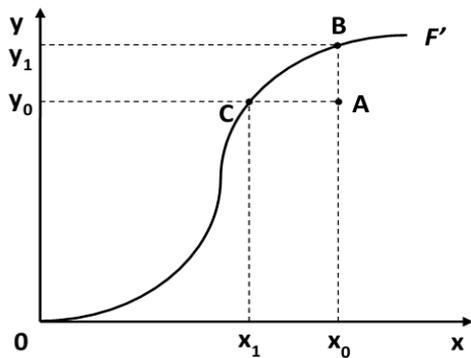
Figure 2. Production Frontier Curve

An activity can be categorized as efficient if the efforts that have been made provide maximum output, both in quality and quantity. An activity can also be categorized as efficient if, with minimum effort can achieve certain outputs. In the local government expenditure context, efficiency means a condition when it is no longer possible to reallocate resources that can improve the welfare of the community (Stiglitz, 2000). In other words, the efficiency of local government expenditure is a condition when every rupiah spent by the government produces the most optimal level of welfare. When these conditions are met, it can be said that government spending has reached an efficient level.

As time goes by, the model of frontier efficiency measurement has increased, both in theory and practice concepts. The following is a general overview of the development of a successful frontier efficiency measurement model based on Rusydiana (2018).

Table 1. Development of Efficiency Measurement Analysis

NO	MODEL	YEAR	AUTHORS	TYPE
1	Stochastic Frontier Approach als77	1977	Aigner, Lovell, Schmidt	Parametric
2	SFA Model mvb77	1977	Meeusen & van den Broeck	Parametric
3	Data Envelopment Analysis CCR	1978	Charnes, Cooper, Rhodes	NonParametric
4	SFA Model stev80	1980	Stevenson	Parametric
5	SFA Model mlti	1981	Pitt & Lee	Parametric
6	Malmquist Productivity Index	1982	Caves, Christensen, Diewert	NonParametric
7	DEA Model BCC	1984	Banker, Charnes, Cooper	NonParametric
8	Free Disposal Hull [FDH]	1984	Deprins, Simar, Tulkens	NonParametric
9	SFA Model fe	1984	Schmidt & Sickles	Parametric
10	SFA Model regls	1984	Schmidt & Sickles	Parametric
11	DEA Additive Model	1985	Charnes,Cooper,Golany,Seiford,Stutz	NonParametric
12	DEA Window Analysis	1985	Charnes, Clarke, Cooper, Golany	NonParametric
13	DEA Assurance Region [DEA-AR]	1986	Thompson, Singleton, Thrall, Smith	NonParametric
14	DEA Cross Efficiency	1986	Sexton, Silkman, Hogan	NonParametric
15	DEA Facet Model	1988	Bessent, Bessent, Elam, Clark	NonParametric
16	SFA Model mlti	1988	Battese & Coelli	Parametric
17	SFA Model fecss	1990	Cornwell, Schmidt, Sickles	Parametric
18	SFA Model kumb90	1990	Kumbhakar	Parametric

NO	MODEL	YEAR	AUTHORS	TYPE
19	DEA Cone Ratio	1990	Charnes, Cooper, Huang, Sun	NonParametric
20	TFA [Thick Frontier Approach]	1991	Berger & Humphrey	Parametric
21	SFA Model bc92	1992	Battese & Coelli	Parametric
22	Fuzzy DEA	1992	Sengupta	NonParametric
23	DFA [Distribution Free Approach]	1993	Berger	Parametric
24	SFA Model fels	1993	Lee & Schmidt	Parametric
25	DEA Super Efficiency	1993	Andersen & Peterson	NonParametric
26	SFA Model bc95	1995	Battese & Coelli	Parametric
27	Network DEA	1996	Fare & Grosskopf	NonParametric
28	Hierarchical/Nested Model DEA	1998	Cook, Chai, Doyle, Green	NonParametric
29	Bootstrapped DEA	1998	Simar & Wilson	Parametric
30	DEA Russell Measure [ERM]	1999	Pastor, Ruiz, Sirvent	NonParametric
31	Imprecise Data [IDEA]	1999	Cooper, Park, Yu	NonParametric
32	Parallel Model DEA	2000	Cook, Hababou, Tuenter	NonParametric
33	Dynamic DEA	2000	Fare & Grosskopf	NonParametric
34	DEA Slack Based Measure [SBM]	2001	Tone	NonParametric
35	Meta Frontier	2003	Rao, O'Donnel, Battese	NonParametric
36	Context-Dependent DEA	2003	Seiford & Zhu	NonParametric
37	SFA Model gre03	2003	Greene	Parametric
38	SFA Model tfe	2005	Greene	Parametric
39	SFA Model tre	2005	Greene	Parametric
40	Game Cross Efficiency	2008	Liang, Wu, Cook, Zhu	NonParametric

Government Expenditure

Government expenditure can be interpreted as the use of a country's resources to finance a state activity in the context of carrying out its functions in maintaining and realizing prosperity (Mangkoesoebroto, 2001). Government expenditure is compiled in the State and Regional Government Budget in Indonesia. Government expenditure is one element of aggregate demand. Based on Keynes's Theory, the calculation of national income with the public expenditure approach states that;

$$Y = C + I + G + (X - M)\ldots\ldots(1)$$

This formula is known as national income identity, which was first introduced by Keynes. The variable on the right side is aggregate demand, and G represents government expenditure. By comparing the value of Y, it can be seen how much government spending contributes to determining aggregate demand or national income. With this formula, it can be analyzed how much influence government spending, especially in the state expenditure sector has on the economy. Government expenditure reflects government policy. If the government has established a policy to buy goods and services, government expenditure reflects the costs that the

government must incur to implement the policy.

In this research, measuring the efficiency of government expenditure is also related to decentralization issues. Morizov (2016) describes decentralization as a transfer by the central government to local governments (states, regions, or cities) in the form of special functions with administrative authorities. As explained in Law Number 22 of 1999 article 1, that decentralization is the surrender of governmental authority by the central government to autonomous regions. The success of fiscal decentralization can be found in the quality of regional budgets and budget management. The allocation of regional budgets to improve public services and infrastructure development will increase regional economic capacity. Increasing regional economic capacity encourages improvement in community welfare (Ida, 2018).

Decentralization in Indonesia was implemented in the regional autonomy policy. According to Law Number 32 of the Year 2004, regional autonomy is the right, authority, and obligation of autonomous regions to regulate and manage their own government affairs and the interests of the local community in accordance with the laws and regulations (Hanif, 2007). The implementation of the regional autonomy policy is expected to give more authority to local governments to regulate their territories in accordance with the wishes of their people.

Previous Research

Research on the efficiency of government spending has been carried out by several previous researchers. Among them, Gupta (1997) analyzed the efficiency of government spending in education in his research entitled "The Efficiency of Government Expenditure: Experience from Africa". This study's results show that African countries are relatively less efficient in education sectors than Asian countries. This research also shows that an increase in funding for education will result in increased output. Research related to government spending in education was also carried out by Alfonso and Miguel (2005) entitled "Cross-Country Efficiency of the Provision of Secondary Education: A Semi-Parametric Analysis with Nondiscretionary Input". This study found that Finland, South Korea, and Sweden are the most efficient countries in the education sector. The results of the analysis also show that good education conditions reflected in the ratio of teachers per student and duration of study as variables that positively influence student performance formation.

Almekidenders et al.'s research (2007) entitled "Arab Republic of Egypt: Selected Issues" measured the efficiency of the public sector in Egypt. The results found in this study are that the efficiency level in education and health in Egypt is at a standard level. But the efficiency level of social protection sectors in Egypt is far below the international average. Next, Sabermahani et al.'s research (2012) entitled

"Provincial Human Development Index, A Guide for Efficiency Level Analysis: The Case of Iran" measures the public sector efficiency in Iran. This research founds that the distribution of HDI status across provinces was highly varied, and the difference between high- and low-developed provinces increased in 2009. The government needs to revise policies concerning the distribution of resources among the provinces. Sekiguci (2019) also conducted research about a country's expenditure efficiency, which measured the efficiency of Vietnam's local government expenditure in 57 Provinces and 5 Major Cities.

On a national scale, the research about efficiency analysis of local government expenditure is inclined to analyze efficiency on a provincial scale. Among them are Pertiwi (2007), which analyzed government spending of 35 districts/cities in Central Java in the education and health sectors, Rapiudin & Rusydi (2017), that measured health and education efficiency in 24 districts/cities in South Sulawesi, and Sihaloho et al. (2019) analyzed health expenditure efficiency in Maluku. Research with the same topic as this paper, which analyzes island efficiency, is authored by Yunan (2004). Yunan (2004) measures Java's Government efficiency in the education and health sectors.

In terms of methods, non-parametric methods with DEA models in recent years are increasingly being used in order to analyze efficiency. In the application of the DEA method to measure the efficiency of government spending, the author refers to research conducted by Verhoven & Carcillo (2007), Afonso & Miguel (2005), Pertiwi (2007), Sihaloho et al. (2019), Rapiudin & Rusydi (2017), and Yunan (2004). Next, the SFA method is used by Sekiguci (2019) to measure Vietnam's local government efficiency. The other method used in measuring expenditure efficiency is the Free Disposable Hull (FDH). This method is used by Kurnia (2006) in his research "Model of Performance Measurement and Efficiency of the Public Sector", with a district/city case study in Central Java and Gupta (1997) about the efficiency of government spending in the education sector in Africa. This paper analyzes the efficiency level of Indonesian provincial government expenditure and its determinant using DEA and Tobit regression. To the best author's knowledge, there has been no paper before which discusses this issue.

C. RESEARCH METHODOLOGY

This study aims to analyze the efficiency of government expenditure in Indonesia's 34 Provinces in the 2015-2018 period. Data related to regional government expenditure is derived from the realization of provincial government expenditure per function obtained from the Directorate-General of Regional Fiscal Balance (Ministry of Finance). Data related to the Human Development Index Indicators, derived from the Central Bureau of Statistics.

The selection of a combination of input and output variables is based on indicators that represent the achievement of the Human Development Index. The input

variable used in this study is the realization of local government spending based on the public sector, namely the function of education, health, and economy. While the output variables are indicators that develop the Human Development Index, i.e., Life expectancy, Mean Years of Schooling, Expected Years of Schooling, and Per capita expenditure.

Data Envelopment Analysis (DEA)

This research uses a quantitative non-parametric approach. The non-parametric approach uses Data Envelopment Analysis (DEA) method to measure the efficiency of the Decision Making Unit (DMU). This method constructs an envelopment frontier over the data points such that all observed points lie on or below the production frontier (Coelli, 1996). This method, however, does not generate a general relationship and only relies on input-output ratio optimization. It was first introduced by Farrell (1957) and then extended by Banker, Charnes, & Cooper (1984) to accommodate when the Decision Making Units (DMUs) are operating in a non-optimal scale environment. These non-optimal scales might be caused by imperfect competition, the constraint on resources, etc. DEA can be used to determine the relative efficiency level of several Decision-Making Units (DMU) and can use many outputs and inputs with different units. DEA method can also provide information about Decision Making Unit (DMU) that do not use efficient inputs and causes of inefficiencies, both in input and output variables. Last, this method can generate information on how much input

and output must be adjusted to have a maximum relative efficiency value.

Farrell (1957), as the pioneer in efficiency measurement, divided efficiency into technical and allocative efficiency. The definition of technical efficiency is based on the radial expansion of the factors of production, i.e., inputs and outputs. Technical efficiency could be achieved through either the maximization of outputs with a given amount of inputs or input minimization to produce a given amount of outputs. Allocative efficiency is the result of choosing the combination of inputs subject to their prices to maximize outputs. DEA Term refers more to the definition of technical efficiency, which is about the relationship between input and output in a business unit (Rusydiana, 2013). To measure the efficiency of a Decision Making Unit (DMU), there are two approaches can be used (Rusydiana, 2013), these are:

1. Input Approach

The input side approach answers how much input quantity can be reduced proportionally to produce the same output quantity.

2. Output Approach

The output side approach answers how much the output quantity can be increased in proportion to the same input quantity.

Using a mathematical equation, the formula of DEA is drawn as follows (Ascarya & Yumanita, 2006)

The efficiency of DMU $= \frac{\sum_{k=1}^{P} u_k y_{kj}}{\sum_{i=1}^{m} v_i x_{ij}}$ ......(2)

Description:

DMU = decision-making unit

N = number of DMU observed

m = different inputs

p = different outputs

μk = average output

vi = average input

In DEA, there are two basic models that can be used, namely Charnes, Cooper, and Rhodes (CCR) models and Banker, Charnes, and Rhodes (BCR) Models. The CCR model is used with the assumption that changes in the value of output produced by DMU will always be equal to the proportion of adding a certain output value. This is in line with the Constant Return to Scale (CRS) assumption that the production function is fixed. Whereas the BCR model assumes changes in the output value generated by DMU are different for each proportion of change in the value of a particular input. This is in line with Variable Return to Scale (VRS), which means that each input does not necessarily produce the same output.

In this study, we used DEA by using input oriented with assuming Variable Return to Scale (VRS). This model assumes that the ratio between input and output increment is different, which means that the addition of input x times will not cause output to increase by x times, it can be smaller or larger. The VRS model is used to determine the level of efficiency in each regional expenditure. The use of input oriented means that DEA results will be oriented to what percentage of inputs can be reduced by a fixed level of output.

Tobit Regression

The second research stage employs Tobit regression. Hoff (2007) argued that the Tobit approach as the second stage of DEA is sufficient in most cases. The method was introduced by James Tobin in the year 1958 to evaluate the relationship between limited dependent variables and independent variables. (Gujarati & Porter, 2009). Initially, he wants to evaluate the expenditure of American households to buy a car. However, this creates a problem in the OLS estimation as some households may not buy a car (zero expenditure). The estimation will tend to be zero and not significant. If it is significant, the value will be biased and not consistent. (Tobin 1958). Statistically, the Tobit model can be expressed as follow (Gujarati & Porter, 2009):

$$Y_t = \beta_1 + \beta_2 X_i + \mu_i \ldots\ldots(3)$$

Several variables have been selected as the independent variables, namely size, population, and dummy (Java or not Java). Hence, the Tobit model of the research is as follows:

$$Y_t = \beta_1 + \beta_2 Size + \beta_3 Population + \beta_4 Dummy + \mu \ldots\ldots(4)$$

Table 2. Tobit Variable Specification

Tobit Variable	Definition
Efficiency Scores (Y)	Relative efficiency scores obtained from DEA computation
Size (X1)	The area of the province
Population (X2)	Total population of the province
Dummy (X3)	Categorization of provinces based on Java and non-Java Islands

D. RESULT AND DISCUSSION

Before entering into the discussion of the efficiency of local government expenditure, table 2 provides an overview of input and output variables used in this study. Table 2 shows descriptive statistics of the input and output variable

Table 3. Input and Output Descriptive Statistics

Variable	Max	Min	Average
Input			
Education	16,153,348,621,320	3,080,129,306	1,536,111,183,264
Health	8,936,162,370,451	4,232,821,398	574,570,685,688
Economic	3,719,192,957,942	7,114,989,682	482,594,283,639
Order and Security	830,309,910,256	259,741,837	42,861,931,614
Environment	2,668,433,302,558	165,520,000	78,105,685,434
Culture and Tourism	3,365,846,406,590	270,861,809	72,466,712,510
Public Services	15,698,060,996,958	31,143,478,452	2,187,517,264,035
Social Protection	1,918,378,783,509	806,923,857	78,948,615,167
Housing and Public Facilities	10,016,756,680,029	1,693,722,665	712,879,903,900
Output			
Life Expectancy	74.82	64.22	69.37
Mean Years of Schooling	11.05	5.99	8.15
Expected Years of Schooling	15.56	9.95	12.87
Per Capita Expenditure	18,128,000	6,468,548	10,079,908

The table shows that on the input variable side, the largest average expenditure incurred by local governments in Indonesia during the 2015-2018 period was the public services function, which was IDR 2,187,517,264,035. Meanwhile, order and security functions were the lowest, with IDR 42,861,931,614. In terms of the Human Development Index (HDI) achievement in the health sector, the average life expectancy was 69.73 years, with a maximum achievement of 74.82 years and a minimum of 64.22 years. As for the education sector, the average Mean Years of Schooling was 8.15 years, with a maximum achievement of 11.05 years and a minimum of 5.99 years. Meanwhile, the average Expected Years of Schooling was 12.87, with a maximum achievement of 15.56 years and a minimum achievement of 9.95 years. Another output variable used was Per Capita Expenditure which represents HDI achievement in economic sectors. The average Per Capita Expenditure was IDR 10,079,908, with a maximum achievement of IDR 18,128,000 and a minimum of IDR 6,468,548.

The efficiency level of 34 provinces in Indonesia will be displayed during the 2015-2018 period using the Data Envelopment Analysis (DEA) method. Results of DEA measurements will be displayed through efficiency scores ranging from 1-100%. A score of 100% illustrates the ability of local

governments to manage their owned funds optimally. Whereas if the efficiency score keeps away from the 100%, it can be indicated that a local government is inefficient or has not managed its funds optimally. Based on the DEA result with Variable Return to Scale (VRS) assumption and using Max Dea 6.1 software, it can be seen the level of efficiency of regional government expenditure in 34 provinces in Indonesia. The results illustrate the achievement of efficiency values of each provincial government in managing regional expenditure. The expenditure efficiency score of regional governments in 34 provinces in Indonesia can be seen in the following table.

Table 4. Efficiency Score of Provincial Government Expenditure

Province	2015	2016	2017	2018	Mean
Aceh	0.86	0.57	1.00	1.00	0.86
North Sumatera	0.47	1.00	0.25	0.31	0.51
West Sumatera	1.00	0.96	1.00	0.75	0.93
Riau	0.12	0.06	0.16	0.30	0.16
Jambi	0.14	0.10	0.09	0.07	0.10
South Sumatera	0.12	0.08	0.10	0.08	0.10
Bengkulu	0.55	0.79	0.88	0.76	0.75
Lampung	0.17	0.08	0.09	0.11	0.12
Jakarta			1.00	1.00	1.00
West Java	0.46		1.00	0.21	0.56
Central Java	1.00	1.00	1.00	1.00	1.00
Yogyakarta	1.00	1.00	1.00	1.00	1.00
East Java	0.04	0.04	0.04	0.03	0.04
West Kalimantan	0.05	0.07	1.00	0.02	0.28
Central Kalimantan	0.12	0.58	0.10	0.08	0.22
South Kalimantan	0.15	0.06	0.14	0.47	0.21
East Kalimantan	1.00		1.00	1.00	1.00
North Sulawesi	0.90	1.00	0.50	0.78	0.79
Central Sulawesi	0.10	0.08	0.10	0.25	0.13
South Sulawesi	0.06	0.27	0.24	0.31	0.22
Southeast Sulawesi	0.27	0.55	0.76	1.00	0.64
Bali	0.09	1.00	0.53	1.00	0.65
West Nusa Tenggara	0.16	0.69	0.34	0.45	0.41
East Nusa Tenggara	0.13	1.00	0.06	0.10	0.32
Maluku	1.00	1.00	0.92	1.00	0.98
Papua	0.16	0.08	0.05	0.04	0.08
North Maluku	0.49		1.00	1.00	0.83
Banten	0.06	0.06	0.14	0.22	0.12
Bangka Belitung	0.12	0.12	0.12	0.10	0.12
Gorontalo	0.27	0.30	0.14	0.15	0.22
Riau Island	1.00	0.72	1.00	1.00	0.93

Province	2015	2016	2017	2018	Mean
West Papua	0.10	0.44	0.12	0.15	0.20
West Sulawesi	0.15	0.14	0.26	0.23	0.19
North Kalimantan	1.00	1.00	0.88	1.00	0.97

In this research, some data cannot be displayed due to the confidentiality of data or the data has not been officially published, including the government expenditure of DKI Jakarta in 2015 and 2016, West Java, East Kalimantan, and North Maluku in 2016. We eliminated these DMU as running subjects and analyzing data. Because the absence of data makes the DMU cannot be analyzed for efficiency.

Based on an average efficiency score from 2015-2018, Jakarta, Central Java, Yogyakarta, and East Kalimantan achieved the highest score. These 4 Provinces reach maximum efficiency level. While the province with the lowest average efficiency is East Java, with a score of 0.04. The average local government expenditure efficiency score in Indonesia relatively increased during the research period. The efficiency trends of 34 provinces in Indonesia in 2015-2018 are listed in the figure 3 below.

Efficiency scores can be classified into 4 groups based on their efficiency scale, namely Fully Efficient (100%), High Efficient (80-99%), Medium Efficient (50-79%), and Low Efficient (less than 50%) (Rusydiana, 2017). Of the total 131 DMU analyzed, there were 35 DMU reached a maximum efficiency value of 100%, while the other 96 DMUs did not reach maximum efficiency (100%), with details; efficiency of 80-99% by 7 DMU, 50-80% by 5 DMU, and efficiency scores below 50% by 77 DMU, in 2015-2018 period.
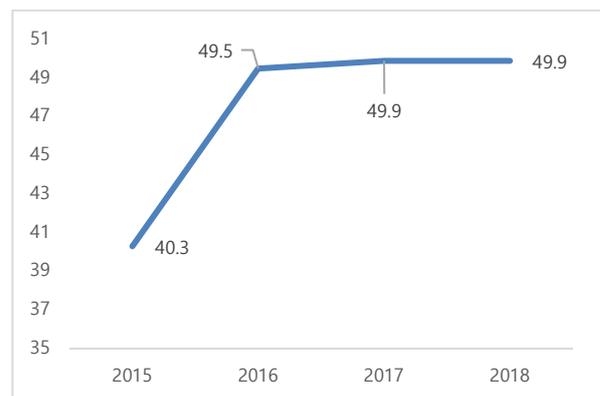

Figure 3 Trend of Government Expenditure Efficiency (Mean)

Potential Improvement

In addition to producing efficiency scores, DEA can also produce potential improvement or the level of improvement needed to achieve optimal efficiency values. Then it can be seen which variables need to be optimized. The author uses government expenditure in 2018 to conduct a potential improvement analysis. The use of this last year is an effort to explain the amount of real value that must be achieved. The results of the measurement of potential improvement can be seen in the following Figure 4.

Based on potential improvement analysis, it can be seen that the main causes of inefficiency are in the use of inputs to produce certain outputs. This means that the main source of inefficiency is because the uses of government expenditure are still not

optimal. The most suboptimal expenditure is in the education sector. The average of potential improvement results in 34 Provinces shows that the utilization of the education expenditure was the main source of inefficiency which has not been optimal at 14%. Then followed by public services expenditure at 12.23%, housing and public facilities expenditure at 11.52%, environment expenditure at 10.83%, culture and tourism expenditure at 10.42%, health expenditure at 10.32%, social protection expenditure at 9.38%, economic expenditure at 9.16%, order and security expenditure 8.52%. In an effort to achieve maximum efficiency, the provincial government should reduce the input value by these percentages.
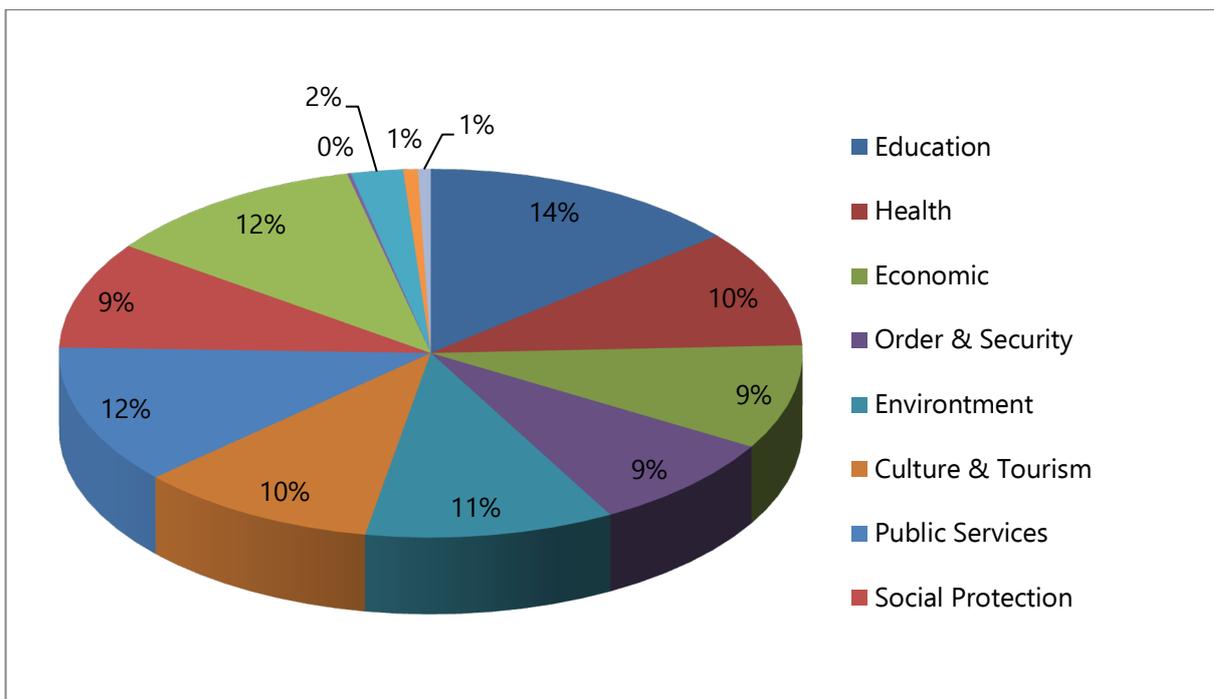

Figure 4. Potential Improvement Analysis

In reality, local governments are unlikely to reduce regional income. The interpretation of the reduction in input values, in this case, can be translated as reducing the allocation of funds in sectors that do not add output values or optimizing the use of input values. This can be done in 3 ways: choosing activities, reducing activities, and eliminating activities that do not add value to people's welfare (Mardismo, 2004). Therefore, the regional government must develop a budget planning strategy because different strategies require different activities and different activities have different cost requirements (Totalia, 2015).

Furthermore, the results of the potential improvement analysis on the output variable explain that the source of inefficiency is 2.27% in mean years of schooling, 0.64% in expected years of

schooling, 0.56% in per capita expenditure, and 0.16% in life expectancy. This means that local governments must try to improve the indicators of the Human Development Index of these numbers so that maximum efficiency is created in the output variable.

Tobit Regression Analysis

The results of efficiency calculation by using DEA have not taken into account the factors that influence it. Therefore, to measure the factors that measure local government efficiency in Indonesia, the second stage of analysis is used (Coelli, 1998). The second analysis of this study uses the Tobit model. The Tobit model is used because the dependent variable consists of efficiency values between 0 and 1.

Based on the results of the Tobit regression calculation for the second stage of DEA, the dependent variable is the level of budget efficiency (Y), and the independent variable is the size (X1), population (X2), and dummy variables in Java and non-Java (X3), obtained the following results;

Table 5. Tobit Regression Analysis

Variable	Coefficient	Prob.
C	0.663417	0.0000
Dummy Java/Non	0.473777	0.0001
Size	-1.56E -06	0.0358
Population	-1.34E -08	0.0454

The table depicts that all independent variable affects the efficiency of government expenditure. Population and size have a significant negative effect, with a standard error of 10% on the budget's efficiency level. This means the more population of a region, the lower budget efficiency. With fairly good HDI achievement, West Java as the province with the largest population, only achieved an efficiency score of 0.56. The result also means the wider the province, the smaller the efficiency of the budget. This can be seen from the efficiency score of Papua as the largest province, which achieves an efficiency score below 0.1. Meanwhile, Jakarta reaches the highest efficiency scores as the smallest province. This is logical because a province's larger population and area require a larger budget in terms of economy, education, health, and others.

Meanwhile, the dummy variable shows a significant and positive value with a standard error of 5%. The meaning is that the difference between Java and non-Java provinces has a significant influence on achieving budget efficiency. Here it can be seen that the provinces in Java are relatively more efficient compared to the provinces outside Java.

E. CONCLUSION & RECOMMENDATION

Conclusion

1. The average score of local government expenditure efficiency in Indonesia is relatively increased. The provinces with the highest efficiency score in the 2015 to 2018 periods are Jakarta, Central Java, Yogyakarta, and East Kalimantan, which reach maximum efficiency levels. While the lowest efficiency is East Java, with an average score of 0.04.

2. The main source of inefficiency is in the education sector. The most suboptimal expenditure as an input variable is education expenditure which has not been optimal at 14%. While the most suboptimal is an achievement of mean years of schooling, which is not optimal at 2.27%.

3. All independent variables used in this study have a significant effect on the efficiency of regional government expenditure. Population and size of province variables have a significant negative effect on the efficiency level. Meanwhile, dummy variable java and non-java have a significant influence in achieving budget efficiency.

Recommendation

Based on the results of the study, it can be suggested to the provincial government as follows:

1. Provinces that have reached maximum efficiency levels must be able to maintain government performance by maintaining a large portion of inputs and continue to work to increase output. So that the level of community welfare can be maintained, or even increased in the following year.

2. Provinces that have not yet reached the maximum efficiency level should further optimize the use of their regional expenditures, by choosing the right strategy in using their regional income allocations and referring to other provinces that are already efficient. Expenditures should be oriented towards the public interest, preventing

corruption, overspending, and misdirection in allocating budgets to areas that are not a priority.

3. This study, however, is not without limitations. The tobit variables used in this study are still limited to the geographical variables for each province. The authors suggest further research to add macroeconomic variables so that the determinants that affect efficiency are captured more comprehensively.

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