Clustering of Provincial Government in Indonesia Based on Fixed Asset Ownership and Economic Growth

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Abstract—**The availability of infrastructure will affect the level of community access to resources, ultimately encouraging economic growth and reducing poverty levels. This study aims to cluster the provincial governments in Indonesia based on fixed asset ownership and economic growth during the 2015-2019 period. This research data is GRDP and fixed assets owned by the provincial governments in Indonesia, with the data period is 2014-2019. GRDP data is obtained from the BPS website, while fixed-asset data is obtained from the provincial government's financial reports. The analytical tool used is k-means analysis to cluster provincial governments in Indonesia based on fixed asset ownership and economic growth (as proxied by GRDP). The result shows that cluster one consists of one province with low fixed asset growth and high economic growth. Cluster two consists of 24 provinces with low fixed asset growth and near-average economic growth. Cluster three consists of one province that have high fixed asset growth and low economic growth. And cluster four consists of eight provinces that have low fixed asset growth and low economic growth.**

Keywords—economic growth; fixed asset ownership; gross regional domestic product; the provincial government

I. INTRODUCTION

Economic growth can be interpreted as an increase in the ability of a country to provide economic goods for its people. Continuous increase in national output, technological progress as a prerequisite for economic growth, and institutional adjustments, attitudes, and ideologies are three important main components that affect a country's economic capacity.

One of the efforts to increase the economic capacity of a country to create jobs, which can encourage the realization of welfare for the entire community, is through economic development. The greater autonomy will ultimately have a more significant impact on economic growth, which encourages allocating regional capital expenditures to be more efficient. Keynes states that every expenditure made has implications for obtaining higher income.

Income has a positive and significant relationship with poverty and economic growth [1]. One form of poverty reduction that is quite effective is infrastructure development. Infrastructure is one of the crucial things that must be considered in implementing development, especially poverty reduction. Some of the crucial basic infrastructures are roads, access to electricity connections, and school buildings. Roads are essential infrastructure in facilitating the mobility of people and goods. Access to electricity is also essential because it has an impact on social and economic activities. School buildings are essential infrastructure and have become a basic need for an area. Building an area requires reliable human beings, and this can only be obtained through mastery of science.

This study aims to cluster the provincial governments in Indonesia based on fixed asset ownership and economic growth during the 2015-2019 period. Other researchers have never done this research ([8], [9], [10], [11], [12], [14]), so doing this research can provide input that can be useful for government policymaking. This study was conducted to find empirical evidence related to capital expenditures to obtain fixed assets that can support the process of regional economic development.

II. LITERATURE REVIEW

According to [2], capital expenditure is local government expenditure whose benefits exceed one fiscal year. It will increase regional assets or wealth and further increase routine expenditures such as maintenance costs in the public administration expenditure group. Capital expenditure is used to acquire local government fixed assets such as equipment, infrastructure, and other fixed assets.

The availability of infrastructure will be very influential in supporting economic activities such as increasing labor productivity in the manufacturing sector. In the end, it will increase the per capita income of the poor. The availability of infrastructure will also affect community access to resources, ultimately encouraging economic growth and reducing poverty levels. The greater the investment, the more significant the economic impact because infrastructure has the nature of encouraging regions that are still not economically developed or complete with facilities to become more developed regions [3].

Local governments have fixed assets through capital expenditure as one of the main requirements to provide public services. Local governments allocate capital expenditure budgets in the regional revenue and expenditure budgets (APBD) to procure fixed assets by budget priorities and public services that provide long-term financial impact.

The financial independence of local government units is an essential element of decentralized public administration and an effective delivery system of public tasks. It allows for authentic, local community empowerment and independent public policies implementation that is important for regional development. As part of the public administration system, local government units must respect some general solutions and implement tasks determined at the central level, especially those affecting the community, and start functioning on a macro scale. It seems crucial whether central government interference in decentralized government activities does not go beyond the legitimate scope [4].

Investment in infrastructure is often seen as an essential part of economic policy at the regional, national, and international levels ([5], [6], [7]. It is often used to solve various problems such as unemployment, depopulation of rural areas, and low economic activity. Government spending must be able to encourage economic growth. For this reason, the government is required to play an active role in providing physical facilities or infrastructure to encourage rapid economic growth. The government must also be more severe in controlling capital expenditures so that the funds issued are realized and on target to reduce poor people.

Several researchers have conducted studies on mapping Indonesia's economic growth from various aspects. ([8], [9], [10], [11], [12]). These studies provided varying results. Economic growth is influenced by income per capita, unemployment, capital expenditure, and poverty.

The clustering of Indonesian territory into 3 clusters [10] shows that cluster 1 has a relatively serious problem of economic inequality, cluster 2 has problems in the field of unemployment, and cluster 3 has problems in almost all fields. A comprehensive clustered policy design is needed to address the problems in each region.

Research of examination districts/cities that experienced financial distress (fiscal distress) reveals many districts/cities in Indonesia experiencing financial distress [14]. Researchers formed three clusters. Cluster 1 consists of 407 districts/cities, with characteristics of low Financial Independence, low Budgetary Solvency, and low DSCR. Cluster 2, consists of 64 districts/cities that have above-average Financial Independence, above-average Budgetary Solvency, and low DSCR. Cluster 3, consists of 37 districts/cities that have low Financial Independence, above-average Budgetary Solvency, and above-average DSCR.

III. RESEARCH METHOD

The scope of this research is to analyze the clustering of provincial governments in Indonesia based on fixed asset ownership and economic growth for the 2015-2019 period. This research data is GRDP and fixed assets owned by the provincial governments in Indonesia, with the data period is 2014-2019. GRDP data is obtained from the BPS website, while fixed-asset data is obtained from the provincial government's financial reports.

The operational definition for the variable economic growth is the change in the measured value of real GRDP by using changes in the GDP of each region in development region I at 2010 constant prices. Ownership of fixed assets changes the value of fixed assets in a year compared to the previous year.

The analytical tool used is k-means analysis to cluster provincial governments in Indonesia based on fixed asset ownership and economic growth (as proxied by GRDP). The cluster method is used to present the economic growth clustering of each

province in Indonesia. Each cluster is determined by the magnitude of changes in fixed asset ownership and economic growth, divided into cluster 1, cluster 2, cluster 3, and cluster 4.

IV. RESEARCH RESULT

The development of Indonesia's economic growth cannot be separated from the Gross Regional Domestic Product (GRDP) development/change of the provinces in Indonesia. GRDP is an indicator to measure the extent to which the government successfully utilizes existing resources and can be used for planning and decision making. The higher of regional GRDP, the greater the potential source of regional revenue.

The GRDP is influenced by several factors, including the wealth in economic resources (natural wealth), population, and population (human resources) ability to apply production techniques or process wealth owned by the region. The distribution tendency of GRDP control and the variable growth rate will lead to unequal development between regions.

4.1 Fixed Asset Ownership of Provincial Governments

Assets owned by local governments can be used to support productive local government activities so that, in the end, it is expected to be able to increase economic growth. Government expenditures are aimed at expenditures that can increase the productivity of local governments, such as infrastructure development or the acquisition of fixed assets that can be used to support and increase people's income through the provision of facilities. Data of provincial government fixed asset growth in Indonesia during the 2015-2019 period is presented in table 1.

TABLE I.   THE AVERAGE GROWTH OF FIXED ASSET

Province	% Fixed Asset					
	Year					Average
	2015	2016	2017	2018	2019	
Aceh	-23.45	13.13	4.86	-6.73	20.44	1.65
Sumut	-40.50	12.45	37.22	2.83	-9.13	0.57
Sumbar	-29.00	14.58	33.73	-2.89	-0.94	3.10
Riau	-11.25	33.34	5.46	1.34	0.37	5.85
Jambi	-43.22	17.54	34.90	4.57	6.29	4.02
Sumsel	13.45	10.15	17.06	-1.94	23.62	12.47
Bengkulu	17.17	11.81	40.23	19.66	11.10	19.99
Lampung	-36.09	28.56	54.60	24.69	7.29	15.81
Babel	-25.74	16.36	6.20	3.28	6.96	1.41
Kepri	-	-4.21	23.93	22.15	8.98	6.09

Province	% Fixed Asset					
	Year					Average
	2015	2016	2017	2018	2019	
	20.43					
DKI Jakarta	-2.22	4.55	0.97	9.01	4.84	3.43
Jabar	-26.50	14.09	40.97	8.77	3.69	8.20
Jateng	-7.36	36.75	6.78	3.69	2.41	8.45
DIY	-32.59	15.84	30.43	18.57	13.66	9.18
Jatim	9.38	6.41	31.98	3.04	4.66	11.09
Banten	-18.81	5.38	65.83	5.05	2.24	11.94
Bali	-23.52	91.04	6.85	20.51	3.61	19.70
NTB	-10.61	7.65	14.04	-3.21	0.39	1.65
NTT	-33.12	17.09	17.87	27.91	24.94	10.94
Kalbar	17.84	8.19	21.66	34.22	4.62	17.31
Kalteng	-14.01	2.81	0.70	9.16	-2.52	-0.77
Kalsel	-4.44	10.25	12.36	44.87	6.98	14.00
Kaltim	-24.10	-6.57	24.35	12.09	2.39	1.63
Kaltara	244.51	176.39	110.21	14.46	1.79	109.47
Sulut	11.99	33.27	13.67	8.77	24.85	18.51
Sulteng	-31.33	12.19	29.29	1.23	15.63	5.40
Sulsel	12.01	9.94	26.18	39.81	19.28	21.44
Sultara	-1.26	9.57	11.41	3.13	8.82	6.33
Gorontalo	-23.92	12.36	26.42	4.62	4.41	4.78
Sulbar	31.76	21.56	31.63	5.30	8.43	19.74
Maluku	-39.78	20.31	20.96	5.54	-5.99	0.21
Malut	14.15	32.40	42.80	7.28	11.60	21.65
Papua	-26.00	15.41	16.23	5.86	10.46	4.39
West Papua	-18.53	34.46	15.94	13.57	12.55	11.60
Average	**-5.75**	**21.91**	**25.82**	**10.89**	**7.61**	**12.10**

[a.] Source: Processed Data

The fixed asset growth of the provincial governments in Indonesia during the 2015-2019 period shows 11 provinces with growth in fixed assets above the average and 23 provinces with growth in fixed assets below the average. Fixed assets owned by the provincial governments are obtained through capital expenditures.

Capital expenditures are budget expenditures to acquire fixed assets and other assets that benefit more than one accounting period. Based on Government Regulation Number 24 of 2005, capital expenditures include, among others, capital expenditures for the acquisition of land, buildings, equipment, and

intangible assets. Capital expenditures or public infrastructure expenditures are physical installations such as roads, airports, telecommunication facilities, electricity, water supply systems, sewage treatment facilities, etc. This public infrastructure expenditure or capital expenditure is believed to provide services that are part of a collection of public consumption in the form of capital and labor as inputs in the production process [13].

4.2 Economic Growth of Provincial Governments

Economic growth is an effort to increase production capacity to achieve additional output. It is measured using Gross Domestic Product (GDP) and Gross Regional Domestic Product (GRDP) in a region. Economic growth is the increasing process output per capita in the long term, emphasizing three aspects (process, output per capita, and long term). Data of economic growth trends in 34 provincial governments in Indonesia for the 2015-2019 period are presented in table 2.

TABLE II.   THE AVERAGE GROWTH OF GRDP

Province	% GRDP					
	Year					Average
	2015	2016	2017	2018	2019	
Aceh	-0.73	3.29	4.18	4.61	4.14	3.10
Sumut	5.10	5.18	5.12	5.18	5.22	5.16
Sumbar	5.53	5.27	5.30	5.14	5.01	5.25
Riau	0.22	2.18	2.66	2.35	2.81	2.04
Jambi	4.21	4.37	4.60	4.69	4.37	4.45
Sumsel	4.42	5.04	5.51	6.01	5.69	5.33
Bengkulu	5.13	5.28	4.98	4.97	4.94	5.06
Lampung	5.13	5.14	5.16	5.23	5.26	5.19
Babel	4.08	4.10	4.47	4.45	3.32	4.08
Kepri	6.02	4.98	1.98	4.47	4.84	4.46
DKI Jakarta	5.91	5.87	6.20	6.11	5.82	5.98
Jabar	5.05	5.66	5.33	5.65	5.07	5.35
Jateng	5.47	5.25	5.26	5.30	5.40	5.33
DIY	4.95	5.05	5.26	6.20	6.59	5.61
Jatim	5.44	5.57	5.46	5.47	5.52	5.49
Banten	5.45	5.28	5.75	5.77	5.29	5.51
Bali	6.03	6.33	5.56	6.31	5.60	5.96
NTB	21.76	5.81	0.09	-4.50	3.90	5.41
NTT	4.92	5.12	5.11	5.11	5.24	5.10
Kalbar	4.88	5.20	5.17	5.07	5.09	5.08
Kalteng	7.01	6.35	6.73	5.61	6.12	6.36

Province	% GRDP					
	Year					Average
	2015	2016	2017	2018	2019	
Kalsel	3.82	4.40	5.28	5.08	4.08	4.53
Kaltim	-1.20	-0.38	3.13	2.64	4.74	1.79
Kaltara	3.40	3.55	6.80	5.36	6.90	5.20
Sulut	6.12	6.16	6.31	6.00	5.65	6.05
Sulteng	15.50	9.94	7.10	20.60	8.83	12.39
Sulsel	7.19	7.42	7.21	7.04	6.91	7.15
Sultara	6.88	6.51	6.76	6.40	6.50	6.61
Gorontalo	6.22	6.52	6.73	6.49	6.40	6.47
Sulbar	7.31	6.01	6.39	6.26	5.67	6.33
Maluku	5.48	5.73	5.82	5.91	5.41	5.67
Malut	6.10	5.77	7.67	7.86	6.10	6.70
Papua	7.35	9.14	4.64	7.32	-15.75	2.54
West Papua	4.15	4.52	4.02	6.25	2.66	4.32
Average	**5.71**	**5.34**	**5.23**	**5.66**	**4.69**	**5.33**

The economic growth of the provincial governments in Indonesia during the 2015-2019 period showed that two provinces had economic growth equal to the average (Jateng and Jabar). A total of 15 provinces with above-average economic growth and 17 provinces with below-average economic growth.

Regional economic growth is the increase in people's income that occurs in the region. The rise in income is measured in absolute value, meaning that it is measured in constant prices. It also describes the remuneration for the factors of production operating in the area. Region prosperity is determined not only by the amount of added value created but also by how much transfer payments occur, the share of income that flows outside the region or receives funds from outside the region.

4.3 Clustering of Provinces Based on Fixed Asset Ownership and Economic Growth

Regional economic growth theory analyzes a region as an open economic system related to other regions through the flow of production factors and commodity exchange. Development in one region will affect the growth of the other regions in the form of sector demand for other regions, which will encourage the development of that region, or economic development of other regions will reduce the level of economic activity in a region and its interrelationships. Regional economic growth increases the volume of economic variables from a spatial sub-system of a nation or country. It can also be interpreted as an increase in the prosperity of a region.

TABLE III.   FINAL CLUSTER CENTERS

	Cluster			
	1	*2*	*3*	*4*
Zscore(Fixed_Aset)	-0.36122	-0.06871	5.25449	-0.40552
Zscore(GRDP)	4.00395	0.20980	-0.07135	-1.12099

c. Source: Processed Data

The classification results based on clusters into four parts are explained as follows: cluster 1 consists of provinces with below-average growth in fixed assets and above-average GRDP growth. Cluster 2 consists of provinces with below-average growth in fixed assets and near-average GRDP growth. Cluster 3 consists of provinces with above-average growth in fixed assets and below-average GRDP growth. Cluster 4 consists of provinces with below-average growth in fixed assets and below-average GRDP growth.

TABLE IV.   NUMBER OF CASES IN EACH CLUSTER

Cluster	1	1.000
	2	24.000
	3	1.000
	4	8.000
Valid		34.000
Missing		0.000

d. Source: Processed Data

Cluster 1 consists of 1 province with the characteristics of below-average fixed asset growth and above-average GRDP growth. The province in this cluster is Sulteng. Low asset ownership, but this province has high economic growth can mean that the provincial government is still not correctly allocating public expenditures that support capital expenditures at the expense of another spending.

Cluster 2 consists of 24 provinces with characteristics of below-average fixed asset growth and near-average GRDP growth. The province in this cluster are Sumut, Sumbar, Sumsel, Bengkulu, Lampung, DKI Jakarta, Jabar, Jateng, DIY, Jatim, Banten, Bali, NTB, NTT, Kalbar, Kalteng Kalsel, Sulut, Sulsel, Sultara, Gorontalo, Sulbar, Maluku and North Maluku. It indicates a positive relationship between fixed asset ownership and economic growth in the province. If provincial government fixed asset ownership increases, then economic growth will also increase, and vice versa. If fixed asset ownership is low, then economic growth will also be below.

Cluster 3 consists of 1 province with characteristics of above-average fixed asset growth and below-average GRDP growth. The province in this cluster is Kaltara. High fixed asset ownership but not able to increase provincial government economic growth. Capital expenditures for buildings, networks, bridges, and roads expenditures sometimes take more than one year to utilize the community.

Cluster 4 consists of 8 provinces with below-average growth in fixed assets and below-average GRDP growth. The province in this cluster are Aceh, Riau, Jambi, Babel, Kepri, Kaltim, Papua, and West Papua. It indicates a positive relationship between fixed asset ownership and economic growth in the province. If provincial government fixed asset ownership increases, then economic growth will also increase, and vice versa. If fixed asset ownership is low, then economic growth will also be below.

4.4 *Discussion*

In general, provincial governments in Indonesia have fixed assets growth below the average, except for the province of Kaltara, which has fixed assets growth above the average, but GRDP growth is below average. It is indicated that the province still needs time to impact the economic recovery through the acquisition and ownership of fixed assets because the community can only feel the benefits of fixed assets after more than one year.

The growth in fixed assets below the average indicates that the capital expenditures of the provincial government in Indonesia have not been able to increase ownership of fixed assets that can be utilized to meet the facilities needed by the community. Meanwhile, government spending for capital expenditures is substantial and takes up most of the overall government spending allocation. The government must encourage economic growth, which is one way to provide physical facilities or the proper infrastructure to be utilized by the community [12].

It is necessary to fulfill the proper infrastructure facilities for the community to support a sustainable economic development process. Thus, the increase in the ownership of fixed assets of the provincial government will affect the increase in economic growth. The research findings [6] conclude that asset ownership has a positive but not significant effect on income.

If capital expenditures for infrastructure are appropriately allocated, it will stimulate the economy and increase economic growth indicators (GRDB). It should be directed to spending that produces benefits and is in accordance with the potential of each region, for example, building markets, agricultural centers, fisheries centers, and others. The funding results can immediately provide benefits to the community, which can improve the regional economy.

V.   CONCLUSION

The allocation for provincial government expenditures is expected to be more efficient to push forward economic growth. Provision of the proper infrastructure demands the active role of governments in creating good economic growth. The provincial government must also be careful and severe in

controlling capital expenditures to realize the funds to target and increase economic growth.

Government spending should be directed at aspects that can provide benefits and are in accordance with the potential of each region (e.g., building markets, agricultural centers, fisheries centers, etc.). If government spending allocation is appropriate, it can stimulate economic growth.

This research can be developed further by clustering all districts/cities government in Indonesia. The results can be compared with the clustering of each province in which the district/city is located. Thus, research results can be generalized to the provincial and district/city government in Indonesia.

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