Changing in National Infrastructure Policy: How It Affect Indonesia's Economy?

Case Study of Indonesia 2010 and 2016 IO Table and 2016 IRIO Table

A M Arsani[1], C Huang[2]

[1]BPS-Statistics Indonesia
[2]Rikkyo University

*Corresponding author's e-mail: ademarsinta@gmail.com

Abstract. This research would like to firstly figure out how new infrastructure policy affects national economic structure changes, and secondly figure out does the new policy effect on inter-regional economy linkage. This study uses economic structure, growth decomposition, location quotient, and linkage analysis on Input-output table to indicate national and inter-regional level economic changes between 2010 and 2016 in Indonesia. We find that economic structure generally remains the same, only transportation and real estate sector increased their contribution, this may indicate the beginning of infrastructure development stage. During 2010 to 2016, the growth was led by the expansion of domestic demand in almost all sectors, however in some sectors the technological changes have a negative contribution. Furthermore, the two most linked sectors are manufacturing and electricity sectors. Inter-regional analysis indicated that Java and Sumatera have more power and sensitivity level compared to other regions. The suggestion to booster economy development is to implement technological process and publish policy considering regional characteristics may accelerate economic equity across regions.

1. Introduction

In overall perspective, determining national level sector's contribution can brings the perspective of national economic situation which can also assist to evaluate polices, and sometimes can also indicate economic stages. The shift of production from agriculture to manufactured product and service product can somehow suggests the stage of modern economy, which can lead to a better understanding of a country's economic stage and can also help to implement suitable policies for economic growth [1].

Indonesia's economy grows slowly since 2012, the growth rate was decreased from 6.03% to 5.03% in 2016. This is due to the growth rate of global economy is slowdown, and Indonesia's largest trading partner China's economy growth rate also being slow, which affects Indonesia can not only rely on exporting nature resources as a key to growth economy. However, the slowdown of economy growth does not reduce regional disparities but coming up with a persistence of high regional disparities. Regional disparities in Indonesia can be understood by this example: in year 2007, East Kalimantan is the most outstrips province at per capita regional product level compare to rest of the country, which the richest provinces' per capita regional product is 36 times more than poorest provinces [2]. The 2014 World-Bank report pointed out that Indonesia's economic growth lost at least 1 percent each year, due

to low investment in infrastructure, and Indonesia ranks 82 out of 148 countries surveyed in terms of overall infrastructure quality. The poor condition of infrastructure exacerbates the disparities. One indication is that logistics costs in Indonesia reach 27% of the total GDP, which is one of the highest in the ASEAN region. Comparing to other countries in ASEAN region, transportation costs in Indonesia account for 14.1% of all production costs, almost 3 times higher than in Japan [3], and the average time a container spends in seaport terminal such as Tanjung Priok port takes 6-7 days meanwhile it only takes 1.5 days in Singapore, and only 3 days in Malaysia standardly. The world bank logistic performance index 2014 has ranked Indonesia in 53rd out of 160 countries lower then surrounding countries including Thailand (35) and Vietnam (48) [4].

Due to the growth demands from regions, when the president change from President Yudhoyono to President Jokowi's administration, president Jokowi's strategy is focusing on investing in infrastructure, which the parliament of Indonesia has approved a revised state budget in 2015. Compares to the original budget, the 2015 budget has made a two-fold increase in capital expenditure. They made elimination of costly fuel subsidies to provide additional fiscal capacity for infrastructure project, that are expected to boost the growth of Indonesia economic, which shift economy strategy into the infrastructure-orientated of their fiscal allocation [4]. The budget allocation for infrastructure in this period was increased from 9.48% in 2014 to 14.64% in 2015, even to 18.46% in 2018 evidence from the data of Center for Indonesia Taxation Analysis (CITA).
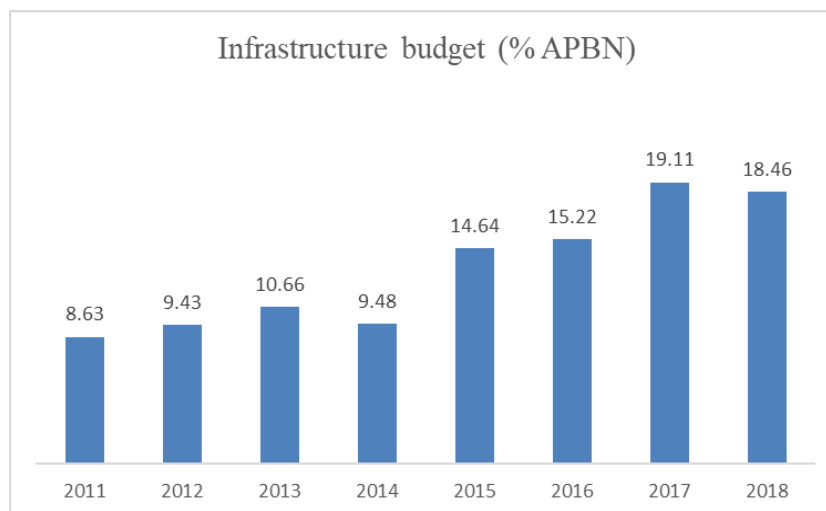
Source: CITA (calculated)

In 2015, the infrastructure budget allocation reached IDR 290 trillion, which is a 63% jump compared to the end of President Yudhoyono's administration in 2014. Since 2009, this is the first time that the 2015 National Budget allocates IDR 290 trillion for the infrastructure budget, more than double the energy subsidy budget. The budget needed to finance Indonesia's infrastructure development during the 2014-2019 period, which estimated as US$ 545 billion [5], [6]. Moreover, the "state spending is now projected to reach US $158 billion, and total state income is projected to reach US $140 billion" [4].

To find out if there really have changes and how much does it changed due to the president switch and policy re-orientated, this paper will use Input-output table as a main method, to compare data before and after president changes to generate a conclusion. Input-output tables have been considerate as a traditional method to identify the role and degree of key sectors in an economy [7], which can analyze impact of economics, politics and making estimations[8]. Input-output tables has included several coefficient matrixes, such as input coefficient which also named as technical coefficient, which coefficient changes can be a research focus, because issues that related to coefficient changes is always coming up with structural change, technology change, change in markets, and the general impacts of economic growth and development [9]. Therefore, analysis a certain economy by using input-output table can assist to manipulate to uncover important components related to structural changes [7]. To manipulate and uncover key components of a certain economy, direct input coefficient is one of the

main sectors that taking concern by researchers. Reason of this is to clarify changes happened within the certain economy, by analysis direct input coefficients, input-output tables can help to measure and evaluate the main source of changes, which assist to provide information of changes which brought by spread of new policies [9]. For example, Tilanus in [10] used to analysis the Dutch economy by using input-output tables and provided the conclusion which the differences between "average and marginal input-output coefficients" are paralleled with the differences come from individual consumer consumption theory. Furthermore, in macro perspective final demand changes is another valuable indicator, which can provide important information to determine whether and how it has a structure change of a certain economy [11].

To analyses regional level input-output table will face more difficulties compare to national level. The issue of coefficient changes in regional level is more problematical because there has so many regions and regional level data, and interregional relationship is always unclear, which made the data is difficult to analysis. Nevertheless, it also provided more possibilities to find out more differences between nations and regions in each sector such as industry sector, construction sector and industrial technical structures [9]. Input coefficient change can be identified by analyze (1) power dispersion index and (2) sensitivity index [9], which will be included in this research.

Based on economic structural changes has been observed over all 21 APEC countries, including Indonesia [1], this research is also interested in how the Indonesia economic structure changes in recent years, therefore, this research will involve both 2010 and 2016's input-output table to analysis changes in Indonesia's economy. To further describe the impact on current condition in regional perspective, this paper will analyze the regional economic structure and inter-regional linkages. This is intended to map the potential of the region as consideration for reducing regional inequality.

2. Data and Methodology

This study examines the transformation of economic structure in Indonesia between 2010 and 2016. The data using in this study are obtained from the BPS-Statistics Indonesia. The 2010 and 2016 Input Output Tables are used to describe the structure of Indonesia's economy while 2016 Inter Regional Input Output is used to explain the relationship among regional economics' structure in Indonesia.

There are three main analysis that used in this study, namely economic structure analysis, linkage analysis, and the growth factor decomposition analysis. The economic structure analysis consists of analysis of output structure, value added, and final demand. Furthermore, in final demand structure analysis the composition of final demand has been examined by its types. In the output structure and value-added analysis, the composition of economy has been measured by sector with formula:

$$O_i = \frac{X_i}{X} \tag{1}$$

$$v_i = \frac{V_i}{X_i} \tag{2}$$

Where O_i, X_i, X, v_i, V_i represent share output of sector i to total output, Output of sector i, total output, value added ratio of sector i, and value added of sector I, respectively.

Meanwhile, the linkage analysis consists of index of power dispersion and index of the sensitivity of dispersion. Index of power dispersion measures relative magnitudes of production impacts, defined as the change in total sector output caused by a change in sector j's final demand while index of the sensitivity of dispersion measures the relative influences of sector i's output when all sector's final demands increase one unit. The formula of index of power dispersion and index of the sensitivity of dispersion are as below:

$$IP_j = \frac{\sum_{i=1}^{n} b_{ij}}{\frac{1}{n}\sum_{i=1}^{n}\sum_{j=1}^{n} b_{ij}} = \frac{b_j}{\bar{b}} \tag{3}$$

$$IS_i = \frac{\sum_{j=1}^{n} b_{ij}}{\frac{1}{n}\sum_{i=1}^{n}\sum_{j=1}^{n} b_{ij}} = \frac{b_i}{\bar{b}} \qquad (4)$$

Where b_{ij} is the element of inverse matrix coefficients in row i column j and n is total sector in the input output table. The dispersion indexes are also used to analyze the regional linkage using IRIO 2016. In this case, we aggregated all sectors in each region into single cell for each inter-region transaction.

To get clearer economic transformation information between 2010 and 2016, growth factor decomposition analysis has been used. The decomposition analysis relies on factor decomposition method that proposed by [12] that is based on the following balance equation for the input output account:

$$X = W + D + E - M \qquad (5)$$

Where X, W, D, E, and M are vectors of gross output, intermediate demand, final demand, export, and import, respectively. Using the Leontief inverse matrix and some algebraic modifications, Akita in [13] wrote the change in gross output as below:

$$\Delta X = X_t - X_0 = B_0[(p_t - p_0)(A_t X_t + D_t) + p_0(A_t - A_0)X_t + p_0(D_t - D_0) + (E_t - E_0)] \qquad (6)$$

Where 0 and t are the indexes for the base year and the terminal year, respectively. Based on that formula, Akita in [13] defined the change in gross output can be divided into four factors:

- Import substitution (IS) represents the impact on output from each sector of raising the share of domestic demand supplied by domestic production in all sectors. It is indicated by $B_0[(p_t - p_0)(A_t X_t + D_t)]$
- Technological change (TC) represents the total impact on output from each sector of changing input-output coefficient throughout the economy. It is indicated by $B_0[p_0(A_t - A_0)X_t]$
- Expansion of Domestic Demand (DD) represents the total effect on output from each sector of the expansion of domestic demand in all sectors. It is indicated by $B_0[p_0(D_t - D_0)]$
- Export Expansion (EE) represents the total impact on output from each sector of increasing exports in all sectors. It is indicated by $B_0[(E_t - E_0)]$.

This growth factor decomposition analysis is obtained by using the base year structural parameters, p_0 and B_0 and the terminal year volume weights, X_t and D_t.

Moreover, to analyze the regions' specializations, this study uses Location Quotient (LQ) index with formula as below:

$$LQir = (Eir/Er)/(Ein/En) \qquad (7)$$

Where Eir, Er, Ein, Eir are sector i's employment in region r, total employment in region r, sector i's employment in a nation and total employment in a nation, respectively.

In this study, we compare the structure of two IO Tables to get a general condition in 2010 and 2016. We assume that general conditions in that year are influenced by government policies on that year. To analyze the condition in recent time, after government allocated higher budget for infrastructure, this paper utilizes IRIO 2016. Analysis in IRIO 2016 is also used to examine the inter-islands economic linkages.

3. Results and Discussion

Leadership changes led to changes in development policies in Indonesia. The most notable difference between President Yudhoyono's era and President Jokowi's era is the structure of national budget. In the Jokowi's era, the infrastructure era got a higher proportion compared to the previous era that allocated large portion for fuel subsidies. For example, from 2014 to 2016, under President Jokowi administration, Indonesia built about 132km highways and 16246 km bridges. The new policies related to physical development and infrastructure are intended to increase economic growth and accelerate regional economic equality. Moreover, this new development policy is expected to have a significant impact on all economic sectors in Indonesia.

This study analyzed the output structure and value-added of the Indonesian economy in 2010 (during the administration of President Yudhoyono) and 2016 (during the administration of President Jokowi) to compare the basic conditions of the economy in Indonesia.

Table 1. Value-Added Share, 2010 and 2016

Code	Sector	Value Added Share (%)	
		2010	2016
001	Agriculture, Forestry and Fisheries	14.64	12.31
002	Mining and excavation	10.32	6.48
003	Processing industry	23.23	21.28
004	Electricity and Gas	1.08	1.16
005	Water Supply, Waste Management, Waste and Recycling	0.29	0.33
006	Construction	8.88	9.47
007	Wholesale and Retail Trade; Car and Motorcycle Reparation	13.87	13.96
008	Transportation and Warehousing	3.64	5.58
009	Provision of Accommodation and Food and Drink	2.98	3.48
010	Information and Communication	3.82	3.79
011	Financial Services and Insurance	3.61	4.29
012	Real Estate	3.05	4.87
013	Company Services	1.79	3.00
014	Mandatory Government Administration, Defense and Social Security	3.88	3.53
015	Education Service	3.02	3.37
016	Health Services and Social Activities	1.00	1.18
017	Other Services	0.89	1.90

There are several noteworthy findings in this period. First, in general, the economic structure is quite stable. In term of output, manufacturing, construction, and trade sectors were still the leading sectors in 2010 and 2016. The same phenomenon is also found in value-added composition. Manufacturing, trade, and agriculture are still the main sectors of Indonesia's GDP, although there is a slightly shift between the trade and agriculture sector's rank. While the general structures remain the same, two sectors show a significant increase in output contribution when viewed from the overall economic structure, namely Sector 8 (transportation and warehousing) and Sector 12 (real estate). These two sectors are not only increasing rapidly in terms of the contribution of output but also in terms of the contribution of value-added to the national GDP. The increased contribution of the transportation sector may indicate the benefits of improved road infrastructure, which allows for more efficient movement of people and goods. It is also indicated by the growth of air transport passengers from 2014 to 2017 that rose 6.5 percent, trains rose 8.9 percent, crossings rose 1.3 percent, as well as Damri which rose 1.7 percent. Likewise, the growth of freight transport has begun, which means, inter-regional economic competitiveness is also starting to grow According to KSP (2018), the growth of freight transportation from 2014 to 2017 by land is claimed to have increased by 3 percent, sea transportation has increased by 3 percent, and air transportation has increased by 2,7 percent. This indication is reinforced by data on development achievements as presented in [15]. The development report shows that there has been a significant increase in the quality and quantity of transportation and warehousing infrastructure, such as ports, airports, national roads, and toll roads. Meanwhile, a significant change in the contribution of real estate sector was led by the property bubble in most cities in Indonesia.

Second, the main source of Indonesia's output growth was the expansion of the final demand (DD), accounting for more than 80% of total output growth. The most affected sectors were manufacturing sector (22.81 percent), construction sector (11.98 percent), and wholesale trade (9.11 percent). These figures indicated that household consumption and public investment expenditures also played a significant role in Indonesia's output growth in this period. Unfortunately, the technological change has a negative contribution to the output growth during 2010 and 2016. The technological changes contribute the most only in the company service sector. In this sector, the technological changes are mainly led by the investment in start-up business service and financial service sectors [16]. In other sectors, the contributions of technological changes are tiny, even negative in primary sectors and the manufacturing sector. The study conducted Akita and Hermawan in [17] also found the same phenomenon that the technological change has a negative contribution on Indonesia's economy during 1985-1990. Meanwhile, as addition of demand expansion, export expansion also boosted the economic growth in manufacturing and mining and excavation sectors. The main commodity are food products and mining of coal and lignite [18].

Table 2. Sources of Growth Decomposition

Code	Source of Growth (% to sector's growth)				Source of Growth (% to total output growth)			
	IS	TC	DD	EE	IS	TC	DD	EE
001	1.57	-14.22	98.54	14.10	0.11	-1.00	6.91	0.99
002	9.29	-77.40	135.21	32.90	0.21	-1.74	3.04	0.74
003	6.79	-26.09	94.30	25.00	1.64	-6.31	22.81	6.05
004	1.49	36.88	56.79	4.84	0.05	1.29	1.98	0.17
005	37.48	-26.11	84.12	4.50	0.12	-0.08	0.27	0.01
006	0.90	-4.09	102.25	0.93	0.11	-0.48	11.98	0.11
007	1.76	-3.50	88.49	13.25	0.18	-0.36	9.11	1.36
008	5.53	22.01	63.23	9.24	0.51	2.03	5.84	0.85
009	5.97	-2.49	83.93	12.59	0.28	-0.11	3.87	0.58
010	1.65	2.09	86.08	10.19	0.05	0.07	2.79	0.33
011	3.86	15.64	73.59	6.91	0.14	0.58	2.75	0.26
012	0.26	29.01	69.25	1.48	0.01	1.49	3.56	0.08
013	2.68	56.17	25.02	16.13	0.11	2.36	1.05	0.68
014	2.91	0.05	94.78	2.25	0.10	0.00	3.23	0.08
015	0.67	-1.12	99.84	0.61	0.02	-0.03	3.00	0.02
016	2.46	-14.33	108.59	3.28	0.03	-0.20	1.48	0.04
017	5.62	-25.43	115.98	3.82	0.16	-0.70	3.20	0.11

Third, the manufacturing and electricity sectors have the most substantial linkage effect in 2010 and 2016. These two sectors exert significant production repercussions on entire industries and, at the same time sensitive to fluctuations in business cycles in whole industries because they provide vital supports to a wide range of sectors. In general, there were not many changes in the power and sensitivity dispersion indexes, but there have several sectors that shifted into different quadrants. In 2016, company service sectors' final demands became more sensitive to other sectors' final demands, and its sensitivity

dispersion became over the average. It means that the company service sector provided more service to other industries than the condition in 2010. On the other hand, the government service sector became more impactful in changing total sectors' output. It was indicated from the government service sector's power dispersion index, which became higher than the average. In contrast, the "other service" sector became less impactful in changing total sectors' output. As a result, in 2016, the "other service" sector is categorized in the third quadrant with low power dispersion and low sensitivity dispersion index.

Table 3. Power Dispersion and Sensitivity Dispersion Index, 2010 and 2016

Code	IP		IS		Quadrant	
	2010	2016	2010	2016	2010	2016
001	0.78	0.79	1.20	1.13	2.00	2.00
002	0.83	0.90	1.12	1.14	2.00	2.00
003	1.13	1.12	2.76	2.42	1.00	1.00
004	1.59	1.58	1.33	1.42	1.00	1.00
005	0.77	0.88	0.64	0.64	3.00	3.00
006	1.17	1.13	0.84	0.80	4.00	4.00
007	0.91	0.87	1.18	1.18	2.00	2.00
008	1.12	1.09	0.93	1.07	4.00	1.00
009	1.06	1.05	0.73	0.75	4.00	4.00
010	0.95	0.96	1.01	1.02	2.00	2.00
011	0.85	0.84	0.94	1.00	3.00	3.00
012	0.78	0.83	0.65	0.78	3.00	3.00
013	0.98	0.98	0.82	1.05	3.00	2.00
014	0.96	1.03	0.67	0.67	3.00	4.00
015	0.92	0.90	0.64	0.64	3.00	3.00
016	1.09	1.05	0.67	0.63	4.00	4.00
017	1.10	0.99	0.85	0.67	4.00	3.00

The changing in leadership usually brings the policy transformation. Under President Jokowi administration, the priority of development is building the infrastructure that connect the archipelago to distribute the wealth equally. In the first two years of his leadership, Government of Indonesia built many infrastructures such as harbors, airports, highways, and national roads. However, the regional disparity was still high, even higher than in 2010. In 2010, Java dominated the economic share to national GDP with more than 50 percent share to total. Western Indonesia, that consisted of Sumatera and Java, accounted more than 80 percent of Indonesia's economy. Meanwhile, in 2016, Java still dominated the economic share to national GDP, the percentage even became more than 60 percent. These figures indicated that the regional disparity between Western and Eastern Indonesia became worsen. One of the possible reasons is the conflicting infrastructure effect. Although some studies, such as [19]–[21], claimed that public investment has boosted economic output while lowering inequality, several other studied conducted in developing countries, such as [22], [23], showed that public investment as a contributor to rising income inequality in Africa and India, respectively. Also, it may happen because the infrastructure policy which was just started in 2015 has not shown the impact of reducing regional disparities.
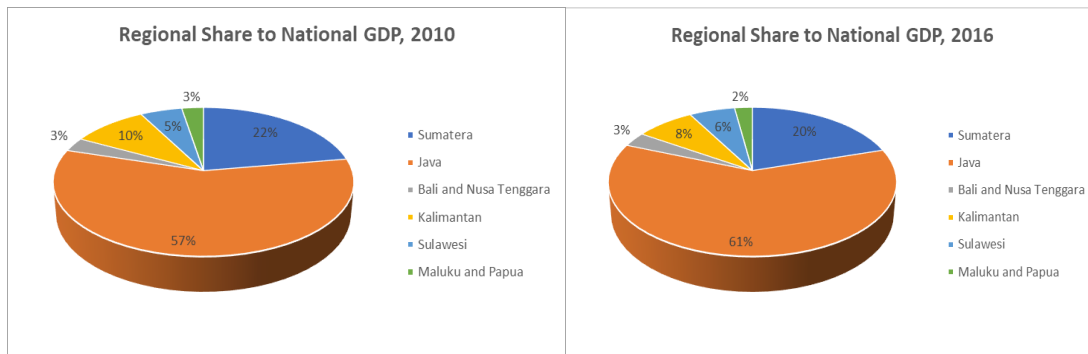
Figure 1. Regional Share to National GDP

Fourth, based on the 2016 IRIO Table, the domination of Java Island is almost in all sectors, except for the mining and excavation sector, which Kalimantan Island and Sumatera Island dominate. For the leading sectors such as manufacturing, trade, and construction sectors, Java Island accounted for more than 60 percent of total output. Meanwhile, the regional inequalities are even higher for the service sectors such as the financial sector, company service sector, and "other service" sector. In these sectors, Western Indonesia accounted for approximately 90 percent of total output.

To reduce the regional inequality, government should pay attention to the regions' specialization sectors. Maluku and Papua, for example, has specialization in mining and excavation sector and very weak in manufacturing sector. The planning that accommodates the strength and the weakness of the region will boost the economy effectively.

**Table 4.** Distribution of Outputs and LQ Index

Code	Distribution of Output by Region						LQ Index					
	Sumatera	Java	Bali & Nusra	Kalimantan	Sulawesi	Maluku & Papua	Sumatera	Java	Bali & Nusra	Kalimantan	Sulawesi	Maluku & Papua
001	34.42	37.15	4.69	9.84	10.83	3.06	1.73	0.61	1.43	1.22	1.92	1.33
002	27.81	18.86	2.84	38.16	5.32	7.01	1.41	0.32	0.95	4.69	0.91	3.34
003	20.88	68.05	0.92	5.9	3.49	0.77	0.94	1.16	0.23	0.74	0.56	0.31
004	19.17	68.55	2.94	4.27	3.46	1.61	0.81	1.24	0.44	0.40	0.48	0.40
005	16.64	60.47	4.27	7.96	8.51	2.15	0.82	0.98	1.41	0.96	1.59	1.01
006	20.21	62.41	2.86	5.89	6.63	2	1.03	1.01	0.92	0.73	1.21	1.05
007	19.7	65.13	2.59	5.37	5.6	1.61	0.95	1.09	0.79	0.63	0.99	0.71
008	18.15	57.67	5.29	7.99	7.62	3.27	0.87	0.97	1.57	0.96	1.32	1.41
009	13.71	68.01	9.08	4.36	3.98	0.86	0.63	1.13	3.28	0.51	0.64	0.37
010	14.02	70.58	3.44	4.77	5.21	1.99	0.70	1.17	1.06	0.60	0.87	0.82
011	11.5	74.93	3.11	4.23	4.98	1.24	0.61	1.20	1.07	0.59	0.90	0.57
012	13.29	72.99	3.69	4.19	3.93	1.91	0.66	1.19	1.19	0.54	0.72	0.86
013	8.28	83.63	1.97	3.26	1.95	0.9	0.40	1.38	0.60	0.42	0.34	0.39
014	18.68	52.98	4.75	7.49	8.47	7.62	0.99	0.85	1.58	1.01	1.52	2.95
015	18.96	60.71	5.02	5.18	7.42	2.7	0.97	0.98	1.66	0.69	1.30	1.10
016	17.69	64.18	4.48	4.69	6.4	2.55	0.92	1.02	1.54	0.66	1.17	1.00
017	14.67	70.91	4.12	3.79	4.68	1.84	0.73	1.17	1.25	0.48	0.76	0.76

The phenomena of regional disparity were also reflected in each region's power dispersion and sensitivity dispersion index. Unlike other studies that focus on the index of each sector, this study uses a different perspective to get a more straightforward explanation about the linkage between six regions in Indonesia. This research found that Java and Sumatera have power dispersion and sensitivity dispersion above the average. It means that both regions exert great production repercussions on entire

Indonesia and simultaneously provide raw materials and services to other regions. On the other hand, Eastern Indonesia "Bali and Nusa Tenggara, Sulawesi, Maluku, and Papua" have power dispersion and sensitivity dispersion below the average. As a result, these regions cannot induce production in other regions and provide little material.
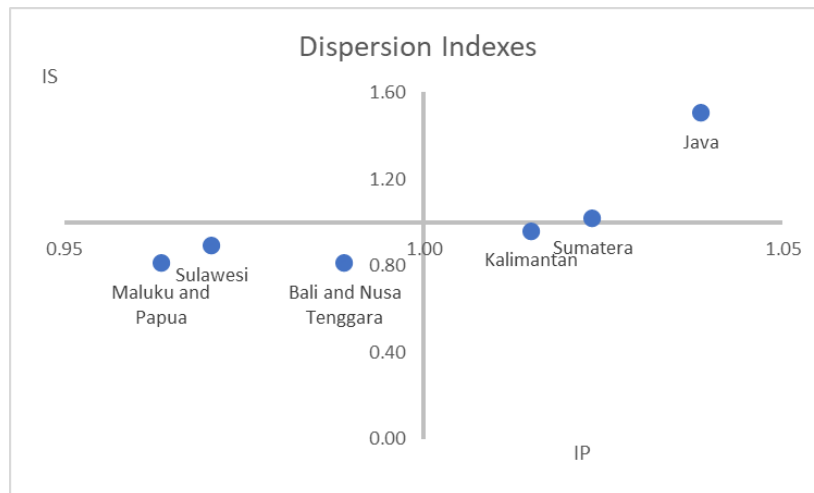
Figure 2. Power Dispersion and Sensitivity Dispersion Index, 2016

The impact of changes in infrastructure policy on regional inequality may not show results in the first two years. Thus, a more extended period is needed to study if infrastructure development effectively reduces regional inequality in Indonesia.

4. Conclusion and Implementation

The comparison between 2010 and 2016 Input Output Table reveals that the manufacturing sector is the leading sector of Indonesia's economy in both years. Generally, the economic structure remains the same with slight changes in several sectors due to the changes in development policy and other economic phenomenon such as property bubble. During 2010-2016, the growth was led by the expansion of domestic demand in almost all sectors, while the technological changes have a negative contribution. Regarding the dispersion index, manufacturing and electricity sectors have the strongest linkages with other sectors. These results suggest that government and related stakeholders should intensify the technological progress in order to boost the economy. Also, Indonesia should consider developing reliable platforms and collaborate with other countries to boost the export expansion.

The analysis of 2016 Inter Regional Input Output Table shows that Western Indonesia still dominated the economy, and the regional disparity became even higher than in 2010. The dispersion indexes also show that Java and Sumatera have more power and sensitivity level compared to other regions. Based on these results, integration of regional planning and national policy for region, should consider regional condition to accelerate the economic equality across the archipelago. Other policy transformations, in addition to infrastructure development, may also be required to alleviate regional inequality.

To conclude, the economy strategy changes orientated on infrastructure, can be seen from the result of this analysis, and increasement of domestic demand in overall sector can reflect the impact of local spending. To further develop Indonesia's economy, involving joint venture enterprises and private investors in infrastructure sector can be the next step. Moreover, to further prevent stable economic growth, clear regulatory framework with good monitoring system is also needed.

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