Input-output analysis: Revenue facilites in Batam, Bintan and Karimun free trade zone

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ABSTRACT

Indonesia has four regions declared as free trade zone, which is Sabang, Batam, Bintan, and Karimun. However, Government Regulation Number 41 2021 only puts a lot of focus in the development of Batam, Bintan and Karimun. This study aims to see the impact of free trade zone as a facility given by government using input-output analysis. The impact will be measured as multiplier effect. The usage of input-output analysis differentiate this study with prior research. Input-output analysis is also used to provide priority sector of Batam, Bintan, and Karimun. This study finds that free trade zone facility provides total impact of Rp20.161,02 billion, but also shows that Batam, Bintan, and Karimun (Riau Islands Province) only provides the lowest multiplier effect compares to other provinces. By using priority sector, this study shows that from 22 development themes of Batam, Bintan, and Karimun, only 14 themes are worthy to be sustained and done. Therefore, the government needs to accelerate the integration within Batam, Bintan, and Karimun and other regions around them to boost their multiplier effect. Government also needs to reanalyze the feasibility of Batam, Bintan, and Karimun's development themes. This study implies that from input-output analysis can be derived how effective the revenue facility given and what sectors which government needs to focus on to develop Riau Islands' economies better. This study uses 2016 interregional input-output table, next study can be done using the latest interregional input-output table.

Introduction

On February 2nd of 2021, President Joko Widodo enact the Government Regulation Number 41 of 2021 on Management of the Free Trade and Free Port Zone (PP 41). According to PP 41, the free trade and free port zone (KPBPB) is a zone which located in the jurisdiction of Negara Kesatuan Republic Indonesia that is separated from the customs area so it is free from the import duty, value added taxes, sales tax on luxury goods, and excise. Indonesia has four regions which are set as free trade and free port zones (KPBPB): Sabang, Batam, Bintan, and Karimun. Each KPBPB is explained below:

1. KPBPB Sabang, covers Sabang Municipality (including Weh Island, Klah Island, Seulako Island, Rubiah Island, and Rondo Island) and Pulo Aceh District in Aceh Besar Regency (Nasi Island, Breuh Island, and Teunom Island). The establishment's legal basis is Law Number 36 of 2000 on Stipulation of Government Regulation Number 1 of 2000 on Free Trade and Free Port Zone as Law.

2. KPBPB Batam, covers Batam Island, Tonton Island, Setokok Island, Nipah Island, Rempang Island, Galang Island, dan Galang Baru Island. The establishment's legal basis is Government Regulation Number 46 of 2007 as frequently amended and last by Government Regulation Number 62 of 2019 on Free Trade and Free Port Zone of Batam.

3. KPBPB Bintan, covers part of Bintan Regency and part of Galang Batang Industrial Area, and a whole of Maritim Industrial Area, and Lobam Island; and part of Tanjung Pinang Municipality which include Senggarang Industrial Area and Dompak Darat Industrial Area. The establishment's legal basis is Government Regulation Number 47 of 2007 as amended by Government Regulation Number 41 of 2017 on Free Trade and Free Port Zone of Bintan.

4. KPBPB Karimun, covers part of Karimun Island and a whole of Karimun Anak Island. The establishment's legal basis is Government Regulation Number 48 of 2007 as amended by Government Regulation Number 40 of 2017 on Free Trade and Free Port Zone of Karimun.

According to PP 41 elucidation, the government hopes to increase the investment and business activities ecosystem to raise the economic growth, expand the employment, and increase the competitiveness in KPBPB. According to Kementrian Koordinator Bidang Perekonomian (2021) the scope of regulation is:

1. Institutional (Dewan Kawasan and Badan Pengusahaan/BP)

2. Licensing and permit services according to norm, standard, procedure, and criteria (BP issue all the business permits, specify the type and amount of consumption goods, and issue the entry permit)

3. Development and cooperation in the utilization of asset with business entity (state/regional-owned enterprises, cooperative, private/limited liability company, foreign legal entity)

4. Facility and easiness in entry and exit of goods, taxation, excise, immigration, and restriction/prohibition.

5. Development and management of the zone (master plan for 25 years period and can be reviewed each 5 years)

6. Sanctions

7. Transition (transition of dewan kawasan, BP, and OSS)

There is an interesting aspect about point number 5, which gives a lot of focus to KPBPB Batam,

Bintan, and Karimun (BBK). It is regulated in Chapter VI of PP 41. KPBPB Sabang is only mentioned one time in PP 41, in transitional provision, which says that the facility and sanction regulation in KPBPB Sabang comes into force mutatis mutandis. Pusat Strategi Kebijakan Kawasan Asia-Pasifik dan Afrika (2021) said that KPBPB Sabang has not given any reliable industry carrying capacity to push export and process the raw materials from import for domestic industry needs. In fact, the fisheries and tourism sector are given more attention than manufacture sector. Rivalsa et al (2022) supported that argument by saying that majority of KPBPB Sabang's people source of income is on tourism sector. This condition is also explained further by Melisa et al (2017) that said the problem at KPBPB Sabang is the lack of readiness of infrastructure to support investment and the condition of culture and local wisdom which are difficult to adapt by the investor. The authority of Aceh Province's Government to issue their own regulation (qanun) makes the regulation overlaps each other. These things can justify the government decision to not give focus on KPBPB Sabang's development.

Pusat Strategi Kebijakan Kawasan Asia-Pasifik dan Afrika (2021) said that if compared to another region in Indonesia, KPBPB Batam has a much more developed infrastructure. Kristianto & Munzir (2021) said that those facilities related to KPBPB increase the export's volume and investment's value in Batam, increasing the economic growth of Batam in particular and Indonesia in general. This condition is also told by Azzahra et al (2022) which said that KPBPB Batam can encourage free trade that brings positive impact in growth of nation's economy. But, study from Negara & Hutchinson (2020) using ordinary least squares regression found that free trade zone related facilities were not significant in determining the industrial performances of firms in Batam, but the most important factor is linked to Batam location in the middle of global production networks. Another study from Indera et al (2018) using structural equation model showed that infrastructure has significant effect to regional development of Batam, and government needs to build integrated infrastructure such as roads, electricity, water, information and communication technology, and ports in the development plan. Negara & Hutchinson (2020) also found that firms' export in Batam tends to decline and import tends to increase, which suggest that intermediate input used by firms in Batam comes from import, then sell the products to domestic market.

There are not many studies about the impact of KPBPB to Bintan and Karimun. But, Pusat Strategi Kebijakan Kawasan Asia-Pasifik dan Afrika (2021) evaluated that KPBPB Bintan has been successful in attracting investor from the advantages of its tourism and maritime industry sectors, while KPBPB Karimun still has problem in infrastructure and institutional structure. This shows the lack of improvement from KPBPB Bintan and Karimun compared to KPBPB Batam. PP 41 is the catalysator and a way for developing the KPBPB Bintan and Karimun, by integrating the development between Batam, Bintan, and Karimun. Syuzairi & Iranita (2021); Syaputra et al (2023)

found that the nature of KPBPB Bintan which only an enclave of the island makes it hard for BP Bintan to keep an eye on the flow of goods in and out of the KPBPB. Furthermore, Syuzairi & Iranita (2021) found that the beaches in Bintan attract a lot of tourism and investment. Simanjutak (2022) in his qualitative study found that the oil tanking industry did not gain any benefit from Karimun status as KPBPB, because that status gives additional risk to oil supply by causing delay, because the firms need to finish their tax duties before the oil can be distributed out from KPBPB Karimun.

Input-output analysis is an analysis tool that can be used to measures the total impact of an increase in demand to regional economy by producing a multiplier index (Stimson et al., 2006). This analysis uses input-output model which divides the economy into sectors and tracing the flow of interindustry purchases (input) and sales (output) (Todaro & Smith, 2015). One of the usage of input-output, especially regional input-output, is to see the effects of government programs on a regional economy (Hewings, 1985). Input-output analysis can also be used by policy makers to help determine the types of investment which would do most to stimulate growth, helping developing the region (Miernyk, 1965). Outside Indonesia, input-output analysis is used by many writers, such as Ali et al (2019) which compared construction sector in three developing countries to see the effects of that sector in regional economy; and other usage outside of regional development, like Long & Yoshida (2018) who studied the city-scale emission responsibility in Tokyo. Ruiz-Peñalver et al (2019) who studied waste generation in Spain. Wang et al (2019) who tried to evaluate the water-related impacts of energy-related decisions in China. In Indonesia, one of the research about usage of output multiplier by using input-output analysis is conducted by Prasetyo et al (2021) who found that Asian Games 2018 impacts directly and indirectly Rp18,455 trillion in national scale. Input-output analysis using dispersion coefficient and sensitivity is conducted by Zaini (2004) who found that in agriculture, forestry, and fisheries sectors at East Kalimantan Province, there are 18 economic sector which have dispersion coefficient's value more than one, while paddy and rubber subsector have dispersion sensitivity's value more than one.

In the case of interregional input-output analysis (IRIO), Setiawan & Ariutama (2021) stated that total impact of annual meeting International Monetary Fund-World Bank 2018 is Rp10,7 trillion in national level, with Rp9,6 trillion impacted the organizer region (Bali Province) and Rp1,1 trillion impacted the non-organizer regions. Puspita & Ningsih (2021) said that regional government can focus in recovering their own region, because it can affect other regions economy. Compared to other study, the novelty in this study is the usage of input-output in seeing the effect of giving facility (in provision) to KPBPB and at the same time, showing how the plan in PP 41 compared to leading sectors seen in input-output analysis. The purpose of this research is to understand how effective the KPBPB revenue facilities and also give an additional view to how the development in BBK should be done. It is important so that the revenue facilities given can be

evaluated whether it brings benefit to Indonesia and especially Riau Islands Province. Besides, it is also important to understand that input-output analysis can also be used to make a development plan.

Method

This research is conducted using quantitative method with input-output analysis. Data used in this study is from tax expenditure and input-output table. Tax expenditure data is derived from tax expenditure report of 2021, issued by Badan Kebijakan Fiskal, Kementerian Keuangan. Input-output table used is producer price of 34 province and 52 industries interregional input-output table issued by Badan Pusat Statistik (2021). This research focuses in Riau Islands Province which covers the KPBPB BBK.

Table 1. Input-Output Table

Input Structure	Output Allocation	Intermediate Demand Production Sector			Final Demand	Total Output
		1	2	3		
Intermediate Input	Sector 1	X_{11}	X_{12}	X_{13}	F_1	X_1
	Sector 2	X_{21}	X_{22}	X_{23}	F_2	X_2
	Sector 3	X_{31}	X_{32}	X_{33}	F_3	X_3
Primary Input		V_1	V_2	V_3		
Total Input		X_1	X_2	X_3		

Source: Badan Pusat Statistik (2021)

Even though the input-output in Table 1 used from 2016, it is still relevant which is proven by Nugroho (2022) shown in Appendix I. By looking at the index of backward linkage and forward linkage, the quadrant of each sector is still the same. Another data that can explain why the IO table is still relevant is the economic structure of Indonesia (primary, secondary, and tertiary) shown in Table 2. It shows that Indonesia's economic structure has not really change much since 2016.

Table 2. Indonesia Economic Structure (2016 and 2022)

Sector	Gross Domestik Product 2016 (Billion Rupiah)	Gross Domestik Product 2016 (Percentage)	Gross Domestik Product 2022 (Billion Rupiah)	Gross Domestik Product 2022 (Percentage)
Primary	1.985.548,60	21,82	2.293.999,90	20,49
Secondary	2.124.521,40	23,35	2.529.295,00	22,59
Tertiary	4.987.627,90	54,82	6.374.165,60	56,93
Total	9.097.697,90	100,00	11.197.460,50	100,00

Source: Badan Pusat Statistik

Setiawan & Ariutama (2021) said that input-output analysis was developed by Professor Wassily W. Leontief in 1930. By using input-output analysis, especially interregional, the multiplier effect of a sector in a region to other sectors in the same region or another region can be identified. Setiawan & Ariutama (2021) explained the definition of multipler effect as a chain effect of economy from exogen changes to other sector's output, that can affect changes in household income,

employment, and value-added. Input-output analysis stages start by determining technical coefficient matrix (A) as follows:

$$A_{ij} = \frac{x_{ij}}{x_j} \tag{1}$$

Where A_{ij} is the technical coefficient of sector i used as input in sector j; x_{ij} is the amount of output sector i used as input in sector j and x_j is the total input sector j; determines the Leontief matrix (I-A) by using matrix subtraction operation of matrix I (identity) to technical coefficient matrix (A) from equation (1). Then, the Leontief matrix (I-A) get inversed, resulting in Leontief inverse matrix (L). In input-output analysis, there is also linkage analysis. Kula (2008) explained that linkage analysis is used to see how much the dependency between each production structure (economic sector). Linkage analysis was introduced by three works: Rasmussen in 1956; Chenery and Watanabe in 1958; and Hirschman in 1958. Linkage analysis to see the dependency between sectors is called backward and forward linkage. To determine the value of backward and forward linkage, equation (2) and (3) are used.

$$BL_j = \sum_{i=1}^{n} L_{ij} \tag{2}$$

$$FL_j = \sum_{j=1}^{n} L_{ij} \tag{3}$$

Where BL_j is the backward linkage; FL_j is the forward linkage and L_{ij} is the Leontief inverse matrix's element. To determine the linkage, backward and forward linkage is notated by index, or called as Hirschman-Rasmussen Index (backward linkage index and forward linkage index) or dispersion coefficient and dispersion sensitivity. Atan & Arslanturk (2012) and Zaini (2004) said that if the value of index is more than one, then that sector has a high linkage, vice versa. The value of backward and forward linkage is used to determine the dispersion coefficient (backward linkage index) and dispersion sensitivity (forward linkage index). The equations used are:

$$Pd_j = \frac{n \sum_{i=1}^{n} L_{ij}}{\sum_{i=1}^{n} \sum_{j=1}^{n} L_{ij}} \ or \ Pd_j = \frac{nBL_j}{\sum_{i=1}^{n} \sum_{j=1}^{n} L_{ij}} \tag{4}$$

$$Sd_j = \frac{n \sum_{j=1}^{n} L_{ij}}{\sum_{i=1}^{n} \sum_{j=1}^{n} L_{ij}} \ or \ Sd_j = \frac{nFL_i}{\sum_{i=1}^{n} \sum_{j=1}^{n} L_{ij}} \tag{5}$$

Where Pd_j for dispersion coefficient; Sd_j for dispersion sensitivity and n the amount of sectors.

Table 3. Sector Priority Categories

No	Dispersion Coefficient	Dispersion Sensitivity	Priority
1	High	High	I
2	High	Low	II
3	Low	High	III
4	Low	Low	IV

Source: Zaini (2004)

Zaini (2004) divided priority sectors based on the ranking of the sector compared to other

sectors. Table 3 shows the category used is high category, if the sectors are in 50 percent highest ranking, or low category, if the sectors are in 50 percent lowest ranking. If the dispersion coefficient and sensitivity both has a value of more than one, then that sectors can also be defined as key sectors. Therefore, the development of a region can be focused to the key sectors or priority one sectors, so the impact generated from multiplier effect is much bigger to upstream sector (backward) and downstream sector (forward).

$$H_j = \frac{h_{ij}}{x_j} \tag{6}$$

Where H_j is the income coefficient of sector j; h_{ij} is the income of sector j and x_j is total input of sector j. In input-output table, the value of backward linkage from equation (2) is also called as output multiplier, while, to determine the income multiplier, writer use matrix multiplication operation of Leontief inverse to income coefficient (H_j) which comes from equation (6). The multipliers allow users to make estimates of the effects of changes in the economy (d'Hernoncourt et al., 2011).

Results and Discussion

Multiplier Effect Facility in KPBPB

Table 4 shows that the output multiplier effect of Riau Islands Province is 1.41690. Multiplier effect in term of the study, referring to the proportional amount of increase or decrease in final output, multipliers effects measure the impact a change in economic activity will have on the total economic output. That value is the lowest compared to other provinces. This shows that if there is an addition of output by Rp1 in Riau Islands Province, it will increase total output nationally by Rp1.41690. The small value indicates that if there is a shock or changes in final demand in Riau Islands Province, it will only generate the smallest effect to national output compared to other provinces. If seen from the income multiplier aspect, the value for Riau Islands Province is 0.35394. According to that value, Riau Islands Province is at rank 20 from 34 province. That value means that if there is an addition of output by Rp1 in Riau Islands Province, it will increase household income nationally by Rp0.35394. Based on the data, writer sees that Riau Islands Province is better in encouraging increase in income than output. It is because the demand in Riau Islands Province does not really consist a lot of inputs from other sectors in other provinces in Indonesia, which in line with Negara & Hutchinson (2020) findings about the increase in import. Besides that, the minimum wage in Riau Islands Province is high (included in ten highest minimum wage in Indonesia by 2022), so it is reasonable if the income multiplier is also high. The multiplier effect can be seen in several different types of scenarios and used by a variety of different analysis in term of this study on regional economy of KPBPB.

Table 4. Output Multiplier Effect and Income Multiplier

Code	Province	Output Multiplier Effect	Income Multiplier
11	Aceh	1.71418	0.41787
12	North Sumatera	1.85985	0.36023
13	West Sumatera	1.68091	0.40204
14	Riau	1.71653	0.35395
15	Jambi	1.75059	0.39469
16	South Sumatera	1.83325	0.35139
17	Bengkulu	1.71616	0.40096
18	Lampung	1.66420	0.35415
19	Bangka Belitung Islands	1.65166	0.42578
21	**Riau Islands**	**1.41690**	**0.35394**
31	Special Capital Districts of Jakarta	1.54125	0.34084
32	West Java	1.77435	0.35998
33	Central Java	1.77715	0.34661
34	Special Region of Yogyakarta	1.77755	0.39704
35	East Java	1.66251	0.38198
36	Banten	1.59572	0.24055
51	Bali	1.74626	0.39643
52	West Nusa Tenggara	1.69276	0.44996
53	East Nusa Tenggara	1.69283	0.39315
61	West Kalimantan	1.79279	0.33208
62	Central Kalimantan	1.88269	0.35137
63	South Kalimantan	1.67352	0.24047
64	East Kalimantan	1.68745	0.26103
65	North Kalimantan	1.61893	0.43382
71	North Sulawesi	1.69043	0.46937
72	Central Sulawesi	1.66337	0.33661
73	South Sulawesi	1.70461	0.34289
74	Southeast Sulawesi	1.54754	0.36184
75	Gorontalo	1.65993	0.44221
76	West Sulawesi	1.66241	0.37725
81	Maluku	1.58790	0.31478
82	North Maluku	1.57550	0.35148
91	West Papua	1.76683	0.33001
94	Papua	1.59472	0.28450

Source: data processed

Table 5 analyze the impact of tax expenditure related to KPBPB to national output. Tax expenditure is used as direct impact which affect output, because there is an excess revenue supposed to be paid as tax liability, but then used for consumption, ends up increasing final demand.

Table 5. Tax Expenditure Related to KPBPB, 2018-2021, in billion rupiah

Facility	2018	2019	2020	2021
Exemption of VAT and Sales Tax on Luxury Goods; VAT and Sales Tax on Luxury Goods not collected (determined by goods flow of origin and destination)	824	937	814	1.079
Exemption of Import Duty and Excise of goods' import on Free Trade and Free Port Zone	6.294	3.771	7.936	10.306
Total	7.118	4.708	8.750	11.385

Source: Badan Kebijakan Fiskal (2022)

Table 6. It shows that with Rp11,385 billion tax expenditure in Riau Islands Province from KPBPB, there is an increase of output by Rp16,131.46 billion and household income by Rp4,029.56 billion. In total (output and income), tax expenditure related to KPBPB has the effect in proportion of 0.1188 percent of Indonesia's gross domestic product in 2021 (nominal GDP).

Table 6. Changes in Domestic Output and Income

Code	Province	Changes in Domestic Output	Changes in Income
11	Aceh	11.69	2.95
12	North Sumatera	105.72	20.18
13	West Sumatera	42.64	10.52
14	Riau	405.10	83.33
15	Jambi	523.45	120.13
16	South Sumatera	144.15	27.07
17	Bengkulu	3.76	0.91
18	Lampung	21.70	4.66
19	Bangka Belitung Islands	9.28	2.47
21	**Riau Islands**	**13,461.38**	**3,473.88**
31	Special Capital Districts of Jakarta	296.59	66.09
32	West Java	394.35	79.98
33	Central Java	82.75	15.93
34	Special Region of Yogyakarta	20.88	4,80
35	East Java	214.58	50,31
36	Banten	192.60	26,94
51	Bali	12.08	2,82
52	West Nusa Tenggara	3.81	1,06
53	East Nusa Tenggara	3.29	0,78
61	West Kalimantan	25.06	4,52
62	Central Kalimantan	11.69	2,13
63	South Kalimantan	8.18	1,09
64	East Kalimantan	25.85	3,80
65	North Kalimantan	3.95	1,13
71	North Sulawesi	5.78	1,69
72	Central Sulawesi	21.27	4,22
73	South Sulawesi	59.93	12,08
74	Southeast Sulawesi	4.46	1,07
75	Gorontalo	0.98	0,27
76	West Sulawesi	0.65	0,15
81	Maluku	4.02	0,79
82	North Maluku	1.40	0,32
91	West Papua	2.58	0,47
94	Papua	5.86	1,02
	Total	16,131,46	4,029.56

Source: data processed

Table 6 shows that from total multiplier effect by Rp20,161.02 billion, Rp16,935.26 billion or 84 percent is the effect to Riau Islands Province itself and Rp3,225.75 billion or 16 percent is the effect to other provinces. The provinces which have the biggest output and income changes, except Riau Islands Province, are Jambi Province (Rp643.58 billion or 3.19 percent), Riau Province (Rp488.43 billion or 2.42 percent), and West Java Province (Rp474.34 billion or 2.35 percent).

Accuracy of Development Master Plan of KPBPB BBK

In Article 67 of PP 41, there is a mandate to issue Presidential Regulation about the development master plan of KPBPB BBK. That master plan is arranged to integrate development and management of Batam, Bintan, and Karimun region. The time period of the master plan is 25 years and can be reviewed each 5 years or anytime depending the national necessity.

Table 7. Development of KPBPB BBK

No.	KPBPB	Main Theme	Sector Theme (according to 52 sector of BPS)
1	Batam	• International logistic hub (e-commerce) • Aviation industry (MRO) • Light and valuable industry (optic electronic and home appliance) • Digital and creative industry • International finance trade center • Integrated health tourism	• Warehousing and Transportation Support Services, Post and Courier • Other Processing Industry, Machinery and Equipment Repair and Installation Services • Metal, Computer, Electronic Goods, Optical and Electrical Equipment Industries • Information and Communication • Company Services • Health Services and Social Activities
2	Bintan and Tanjung Pinang	• Tourism sector • MRO industry • Base metal processing industry (alumina) • Food processing • Maritime defense • Sports industry • Heritage tourism	• Provision of Accommodation • Provision of Food and Drink • Other Processing Industries, Machinery and Equipment Repair and Installation Services • Basic Metal Industry • Food and Beverage Industry • Chemical, Pharmaceutical, and Traditional Medicine Industries
2	Bintan and Tanjung Pinang (cont.)	• Halal industry • Fisheries • Business center • Integrated zone center	• Transportation Equipment Industry • Metal, Computer, Electronic Goods, Optical and Electrical Equipment Industry • Fisheries • Company Services • Warehousing and Transportation Support Services, Post and Courier
3	Karimun	• Maritime Industry • Oil Tanking Industry • Agri-tech Industry • Fishing Industry • Tourism	• Transportation Equipment Industry • Coal Industry and Oil and Gas Refining • Seasonal and Annual Plantations • Food and Beverage Industry • Fisheries • Provision of Accommodation • Provision of Food and Drink

Source: Processed from Deputi Bidang Koordinasi Pengembangan Wilayah dan Tata Ruang (2021)

Table 7 shows and Based on the calculation done in Appendix II, the value of simple output multiplier, income multiplier, dispersion coefficient, and dispersion sensitivity are acquired. Dispersion coefficient shows which sector is backward-looking (value more than 1), in this case are: (1) food and beverage industry; (2) textile and apparel industry; (3) wood industry, products from wood and cork and woven products from bamboo, rattan and the like; (4) paper and paper products

industry, printing and reproduction of recorded media; (5) chemical, pharmaceutical and traditional medicine industries; (6) non-metal minerals industry; (7) electricity; (8) provision of food and drink; and (9) government administration, defense and compulsory social security. Dispersion sensitivy shows which sector is forward-looking (value more than 1), in this case are: (1) electricity; (2) wholesale and retail, not autos and motorcycles; and (3) company services, like the study from Rosyida & Bhakti (2022). From those values, writer classifies each sector by priority, shown in Appendix III. Using that classification, writer tries to evaluate on the sector theme in the development master plan of KPBPB BBK, with the results below:

Table 8. Evaluation of Sector Theme in Development Master Plan of KPBPB BBK

No.	Sector	Priority	Output Multiplier		Income Multiplier	
			Value	Rank	Value	Rank
1	Warehousing and Transportation Support Services, Post and Courier	II	1.5471	12	0.3652	27
2	Other Processing Industry, Machinery and Equipment Repair and Installation Services	III	1.2530	38	0.2740	40
3	Metal, Computer, Electronic Goods, Optical and Electrical Equipment Industries	III	1.1931	45	0.2763	39
4	Information and Communication	I	1.4642	16	0.3260	33
5	Health Services and Social Activities	II	1.5403	13	0.3881	20
6	Provision of Accommodation	II	1.5262	14	0.4064	18
7	Provision of Food and Drink	I	1.8862	3	0.4481	12
8	Basic Metal Industry	I	1.4404	19	0.2939	37
9	Food and Beverage Industry	I	1.7663	4	0.3801	23
10	Chemical, Pharmaceutical, and Traditional Medicine Industries	I	1.6946	6	0.3264	32
11	Transportation Equipment Industry	I	1.5804	10	0.3867	21
12	Fisheries	III	1.0875	50	0.4940	5
13	Company Services	III	1.2335	41	0.4208	15
14	Coal Industry and Oil and Gas Refining	IV	1.2076	44	0.2307	45
15	Seasonal and Annual Plantations	III	1.1769	47	0.3770	24

Source: data processed

Table 8 analyze that majority of the sectors which are going to be developed still have small value of multiplier. There are also only 6 out of 15 sectors which is priority I. Sectors and theme that need to be maintained by using the input-output analysis, according to writer, is (changes are presented in Table 9):

a. Provision of food and drink, in tourism and halal industry theme.

b. Food and beverage industry, in food processing, agri-tech industry, fishing industry, and halal industry theme.

c. Chemical, pharmaceutical, and traditional medicine industries, in halal industry theme.

d. Transportation equipment industry, in maritime defense and industry theme.

e. Information and communication, in digital and creative industry theme.

f.   Basic metal industry, in base metal processing industry (alumina) theme.

g.   Health services and social activities, in integrated health tourism theme.

h.   Provision of accommodation, in tourism and halal industry theme.

i.   Warehousing and transportation support services, post and courier, in international logistic hub (e-commerce) and integrated zone center theme.

Table 9. Proposed Theme to be Maintained

No.	KPBPB	Main Theme (before)	Main Theme (after)
1	Batam	• International logistic hub (e-commerce) • Aviation industry (MRO) • Light and valuable industry (optic electronic and home appliance) • Digital and creative industry • International finance trade center • Integrated health tourism	• International logistic hub (e-commerce) • Digital and creative industry • Integrated health tourism
2	Bintan dan Tanjung Pinang	• Tourism sector • MRO industry • Base metal processing industry (alumina) • Food processing • Maritime defense • Sports industry • Heritage tourism • Halal industry • Fisheries • Business center • Integrated zone center	• Tourism sector • Base metal processing industry (alumina) • Food processing • Maritime defense • Heritage tourism • Halal industry • Integrated zone center
3	Karimun	• Maritime Industry • Oil Tanking Industry • Agri-tech Industry • Fishing Industry • Tourism	• Maritime Industry • Agri-tech Industry • Fishing Industry • Tourism

Source: data processed

Table 9, it can be seen that the main theme maintained in Batam is about logistic hub, digital and creative industry, and integrated health tourism. The development of logistic hub is in line with Negara & Hutchinson (2020) which focus in Batam position in the middle of global production networks and Indera et al (2018) which suggest government to build roads and ports and focusing to communication and information, which is the main things in digital and creative industry. Some sectors which are maintained in Bintan and Tanjung Pinang are also correlated with other studies. Pusat Strategi Kebijakan Kawasan Asia-Pasifik dan Afrika (2021) found that maritime industries and tourism sectors are the main power of Bintan, like what Syuzairi & Iranita (2021) also found. The development of integrated zone center will also be important to the lack of control on goods'

flow mentioned by Syaputra et al (2023); Syuzairi & Iranita (2021). While in Karimun, the oil tanking industry in dropped and not included to be maintained, just like the condition explained by Simanjutak (2022). These findings show that there are correlation between the results from input-output analysis and other methods used by other writers related to Batam, Bintan, and Karimun.

Conclusion

Input output analysis shows that Riau Islands Province has 1.41690 output multiplier effect, lowest from other provinces, and 0.35394 income multiplier effect, rank 20 from 34 provinces. Writer finds that revenue provision (facility) in KPBPB BBK gives total impact (output and income) Rp20,161.02 billion, Rp16,935.26 billion or 84 percent is the affect to Riau Islands Province itself and Rp3,225.75 billion or 16 percent is the affect to other provinces. Because the output multiplier effect is the lowest. so the final demand changes in Riau Islands Provinces gives the smallest effect to Indonesia compared to other provinces. Backward-looking sectors in Riau Islands Province are: (1) food and beverage industry; (2) textile and apparel industry; (3) wood industry, products from wood and cork and woven products from bamboo, rattan and the like; (4) paper and paper products industry, printing and reproduction of recorded media; (5) chemical, pharmaceutical and traditional medicine industries; (6) non-metal minerals industry; (7) electricity; (8) provision of food and drink; and (9) government administration, defense and compulsory social security, while the forward-looking sectors are: (1) electricity; (2) wholesale and retail, not autos and motorcycles; and (3) company services. There are 22 themes which development divided to the three KPBPB. The 22 sectors are being converted to 15 sectors based on 52 sectors classification from BPS. From input-output analysis using simple output multiplier, income multiplier, dispersion multiplier, and sensitivity multiplier, writer sets the themes which are going to be maintained. In total, there are 14 out of 22 themes which writer maintained based on the position as priority I and II and the value of multiplier effect that sector has.

Based on the research done, writer recommends three things. First, government needs to push the integration between KPBPB BBK with other sectors outside the BBK area, including outside the Riau Islands Province, whether it is in supplying input or output, so that the multiplier effect from the facility given to KPBPB BBK can be increased. After the integration is managed, government needs to enact the Presidential Regulation on development master plan of KPBPB BBK as soon as possible, as a catalysator for KPBPB Bintan and Karimun to catch up with KPBPB Batam. When integration intra-KPBPB BBK or with another province, government needs to reevaluate the feasibility of the development themes based on the multiplier effect value, so that the development that is going to be done has a higher impact to national economy in general, and Riau Islands Province in particular. This study implies that from input-output analysis can be derived how

effective the revenue facility given and what sectors which government needs to focus on to develop Riau Islands' economies better. There is limitation this research which is the usage of IRIO table of 2016, that can make the real condition in the field different from the data provided, even though it's been proven by some data from Badan Pusat Statistik and other writer that it's still relevant. Writer hopes that when the latest IRIO table is published, there will be additional research that talks about this topic to prove the analysis provided here.

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Appendix I Quadrant Analysis of Indeks of Backward Linkage and Indeks of Forward Linkage, 2016 and 2020
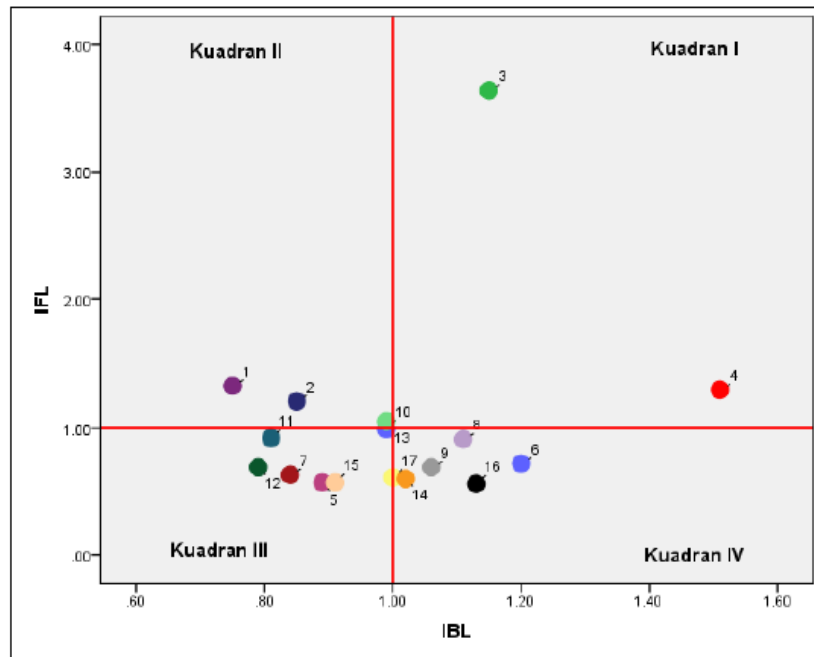
2016
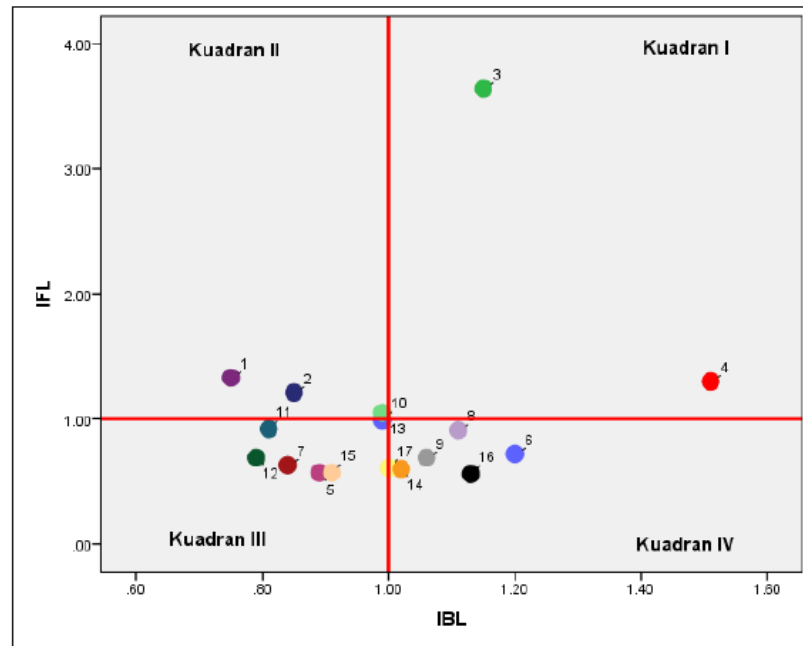
2020

Source: Nugroho (2022)

Appendix II. Simple Output Multiplier, Income Multiplier, Dispersion Coefficient, and Dispersion Sensitivity of Economic Sectors in Riau Islands Province

Code	Province	Sectors Code		Simple Output Multiplier	Income Multiplier	Dispersion Coefficient	Dispersion Sensitivity
21	Riau Islands	I-01	Food Crop Agriculture	1.229267	0.265538	0.754067	0.619921
21	Riau Islands	I-02	Seasonal Horticultural Plant Farming, Annual Horticulture, and Others	1.216318	0.45549	0.746124	0.635375
21	Riau Islands	I-03	Annual and Annual Plantations	1.176925	0.377018	0.721959	0.747324
21	Riau Islands	I-04	Farm	1.495031	0.446185	0.917094	0.658792
21	Riau Islands	I-05	Agricultural and Hunting Services	1.248999	0.551385	0.766171	0.629674
21	Riau Islands	I-06	Forestry and Logging	1.135829	0.182776	0.696749	0.613428
21	Riau Islands	I-07	Fishery	1.087476	0.494039	0.667088	0.790662
21	Riau Islands	I-08	Oil, Gas and Geothermal Mining	1.178461	0.281277	0.722901	0.922747
21	Riau Islands	I-09	Coal and Lignite Mining	1	0	0.613428	0.613428
21	Riau Islands	I-10	Metal Ore Mining	1.409815	0.435835	0.86482	0.731207
21	Riau Islands	I-11	Mining and Other Quarrying	1.245529	0.456615	0.764042	0.644214
21	Riau Islands	I-12	Coal Industry and Oil and Gas Refining	1.207619	0.230735	0.740787	0.69911
21	Riau Islands	I-13	Food and Beverage Industry	1.766296	0.380081	1.083495	0.826381
21	Riau Islands	I-14	Tobacco Processing Industry	1.258508	0.192786	0.772004	0.63646
21	Riau Islands	I-15	Textile and Apparel Industry	1.68591	0.358209	1.034185	0.903107
21	Riau Islands	I-16	Leather Industry, Leather Goods and Footwear	1.38026	0.370004	0.84669	0.639204
21	Riau Islands	I-17	Wood Industry, Products from Wood and Cork and Woven Products from Bamboo, Rattan and the Like	1.751913	0.398679	1.074673	0.625567
21	Riau Islands	I-18	Paper and Paper Products Industry, Printing and Reproduction of Recorded Media	2.121568	0.455787	1.301429	0.849918
21	Riau Islands	I-19	Chemical, Pharmaceutical and Traditional Medicine Industries	1.694617	0.326356	1.039526	0.842035
21	Riau Islands	I-20	Rubber Industry, Rubber and Plastic Products	1.453818	0.31556	0.891813	0.751614
21	Riau Islands	I-21	Non-Metal Minerals Industry	1.660893	0.40661	1.018838	0.676264
21	Riau Islands	I-22	Basic Metal Industry	1.440418	0.293938	0.883592	0.709786
21	Riau Islands	I-23	Metal, Computer, Electronic Goods, Optical and Electrical Equipment Industries	1.193138	0.276295	0.731904	0.822533
21	Riau Islands	I-24	YTDL Machinery and Equipment Industry	1.576303	0.269536	0.966948	0.669622
21	Riau Islands	I-25	Transportation Equipment Industry	1.580357	0.386745	0.969436	0.867628
21	Riau Islands	I-26	Furniture Industry	1.266043	0.368836	0.776626	0.6164
21	Riau Islands	I-27	Other Processing Industry, Machinery and Equipment Repair and Installation Services	1.252952	0.274017	0.768596	0.975649
21	Riau Islands	I-28	Electricity	2.856048	0.267343	1.75198	1.618359
21	Riau Islands	I-29	Gas Procurement and Ice Production	1.361877	0.188073	0.835414	0.804727

21	Riau Islands	I-27	Other Processing Industry, Machinery and Equipment Repair and Installation Services	1.252952	0.274017	0.768596	0.975649
21	Riau Islands	I-28	Electricity	2.856048	0.267343	1.75198	1.618359
21	Riau Islands	I-29	Gas Procurement and Ice Production	1.361877	0.188073	0.835414	0.804727
21	Riau Islands	I-30	Water Procurement, Waste Management, Waste and Recycling	1.357635	0.503759	0.832811	0.616368
21	Riau Islands	I-31	Construction	1.34072	0.385693	0.822435	0.680727
21	Riau Islands	I-32	Trade in Cars, Motorcycles and Their Repair	1.361267	0.419175	0.835039	0.945521
21	Riau Islands	I-33	Wholesale and Retail, Not Autos and Motorcycles	1.336851	0.523367	0.820062	1.401544
21	Riau Islands	I-34	Rail Transport	1	0	0.613428	0.613428
21	Riau Islands	I-35	Land Transportation	1.42247	0.267763	0.872583	0.729948
21	Riau Islands	I-36	Sea Freight	1.429838	0.205399	0.877103	0.924779
21	Riau Islands	I-37	River Lake and Crossing Transportation	1.316459	0.470818	0.807553	0.622011
21	Riau Islands	I-38	Air Freight	1.43881	0.338562	0.882606	0.810872
21	Riau Islands	I-39	Warehousing and Transportation Support Services, Post and Courier	1.547106	0.365187	0.949038	0.674238
21	Riau Islands	I-40	Provision of Accommodation	1.526204	0.406372	0.936216	0.615085
21	Riau Islands	I-41	Provision of Food and Drink	1.886162	0.448081	1.157025	0.977777
21	Riau Islands	I-42	Information and Communication Services	1.464207	0.325964	0.898186	0.915362
21	Kep. Riau	I-43	Financial Intermediary Services other than the Central Bank	1.170379	0.341321	0.717943	0.957346
21	Kep. Riau	I-44	Insurance and Pension Funds	1.320718	0.305751	0.810166	0.688941
21	Kep. Riau	I-45	Other Financial Services	1.336208	0.349169	0.819667	0.627282
21	Kep. Riau	I-46	Financial Support Services	1.372816	0.308457	0.842124	0.711785
21	Kep. Riau	I-47	Real Estate	1.286502	0.209496	0.789176	0.849979
21	Kep. Riau	I-48	Company Services	1.233474	0.420782	0.756648	1.12132
21	Kep. Riau	I-49	Government Administration, Defense and Compulsory Social Security	1.642365	0.467777	1.007473	0.674713
21	Kep. Riau	I-50	Education Services	1.44978	0.49204	0.889335	0.657784
21	Kep. Riau	I-51	Health Services and Social Activities	1.540311	0.388087	0.94487	0.622568
21	Kep. Riau	I-52	Other Services	1.335679	0.510797	0.819343	0.658264

APPENDIX III. Sectors Priorities Division

PRIORITY I
HIGH COEFFICIENT, HIGH SENSITIVITY

- Electricity
- Provision of Food and Drink
- Sea Transportation
- Information and Communication Services
- Textile and Apparel Industry
- Transportation Equipment Industry
- Paper and Paper Products Industry, Printing and Reproduction of Recorded Media
- Chemical, Pharmaceutical and Traditional Medicine Industries
- Food and Beverage Industry
- Air Transport
- Gas Procurement and Ice Production
- Rubber Industry, Rubber and Plastic Products
- Metal Ore Mining
- Land Transportation
- Financial Support Services
- Basic Metal Industry

PRIORITY II
HIGH COEFFICIENT, LOW SENSITIVITY

- Non-Metal Mineral Industry
- Government Administration, Defense and Compulsory Social Security
- Warehousing and Transportation Support Services, Post and Courier
- YTDL Machinery and Equipment Industry
- Farm
- Educational Services
- Leather Industry, Leather Goods and Footwear
- Wood Industry, Wood and Cork Products and Woven Products from Bamboo, Rattan and the Like
- Health Services and Social Activities
- Provision of Accommodation

PRIORITY III
LOW COEFFICIENT, HIGH SENSITIVITY

- Wholesale and Retail, Not Cars and Motorcycles
- Company Services
- Other Processing Industries, Machinery and Equipment Repair and Installation Services
- Financial Intermediary Services other than the Central Bank
- Car, Motorcycle Trading and Repair
- Oil, Gas and Geothermal Mining
- Real Estate
- Metal, Computer, Electronic Goods, Optical and Electrical Equipment Industry
- Fisheries
- Seasonal and Annual Plantations

PRIORITY IV
LOW COEFFICIENT, LOW SENSITIVITY

- Coal Industry and Oil and Gas Refining
- Insurance and Pension Funds
- Construction
- Other Services
- Other Mining and Quarrying
- Tobacco Processing Industry
- Agriculture of Annual Horticultural Plants, Annual Horticulture, and Others
- Agricultural and Hunting Services
- Other Financial Services
- River Lake and Crossing Transportation
- Food Crop Agriculture
- Furniture Industry
- Water Procurement, Waste Management, Waste and Recycling
- Forestry and Logging
- Coal and Lignite Mining
- Rail Transport