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INTERREGIONAL ANALYSIS INPUT-OUTPUT OF LAMPUNG PROVINCE AND BANTEN PROVINCE (UPDATING IRIO 2018)

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Abstract

Purpose: The research objective was to analyze the economic structure of Lampung Province and Banten Province using the IRIO 2018 Table, as well as analysis of the linkage power to the upstream sector (backward linkage) and the driving force of the downstream sector (forward linkage).

Research Methodology: This paper builds updating use Euro method IRIO Table 2018 with an approach based on producer prices in 2018 sourced from the Lampung Province Input-Output Table in 2010 and the Banten Province Input-Output Table by classifying 34 business sectors.

Result: By updating using the IRIO 2018 Table, Lampung Province and Banten Province can find out the economic structure in Lampung Province and Banten Province with the power of dispersion as the backward linkage coefficient, the degree of sensitivity as the forward linkage coefficient.

Limitations: This paper was built based on the Lampung Province Input-Output Table in 2010, where there were 53 Sector and Input-Output Tables for Banten Province 2010 where there were 58 business sector sectors than for aggregation into 34 categories of business sectors then building a reconciliation of the IRIO 2018 Table based on Producer Prices 2018.

Contribution: The findings of this study have implications in the form of useful contributions for the Lampung provincial and Banten Provincial government in taking and implementing future development policy directions.

Authenticity / Value: This paper is updating using the Euro method with 2 areas 34 business sectors that have been aggregated, the data source uses the Hybrid method and the IRIO Table Model uses the Riefler and Tibout table models so that the IRIO 2018 Table based on 2018 Producer Prices is formed.

Keywords IRIO, Backward Linkage, Forward Linkage. Paper type Technical paper and Policy-Oriented

INTRODUCTION

Indonesia is the largest archipelagic country in the world which has 5 large islands and consists of 17,504 islands (Prasetya, 2017) consisting of 34 provinces, Indonesia has an alternative name commonly used is Nusantara (Kroef, 1951). According to the 2010 Indonesian Population Census, Indonesia has a population of around 237 million (BPS, 2010), an estimated population of more than 270,054,853 people in 2018 (BAPPENAS 2013). The territory of Indonesia stretches from western Indonesia, namely Sabang and the eastern region of Indonesia Merauke. The land area of Indonesia is 1,922,570 km^2 and its water area is 3,257,483 km^2. Has a GDP of IDR 14,837.4 Trillion (2018) with a growth of 5.27% (2018) GDP Per Capita of $ 3,927 or Rp. 56 million (2018) (BPS, 2018a).

Based on BPS (2018) the Gini coefficient is used to measure the level of income inequality as a whole, the Gini coefficient for Indonesia (2017) is 0.391 and the Gini coefficient for the province of Lampung (2017) is 0.301 including the medium group category (BPS, 2018b). According to Marantika and Viphindrartin (2018) in the title, "Regional disparities between provinces in Indonesia 2011-2015" found that even though Indonesia

has provinces that are scattered throughout the archipelago, disparities between regions in Indonesia based on income have a negative effect, where every change in the index Gini in the study area will affect the Gini index value in neighbouring areas (Marantika & Viphindrartin, 2018).

Aspiyansyah and Damayanti's research (2019) in the title of Indonesia's economic growth model: the role of spatial dependence aims to examine the role of spatial dependence on Indonesia's regional economic growth based on panel data of all provinces in Indonesia during 1990-2015, using the Spatial Durbine model, finding that dependence spatial role plays an important role in achieving regional economic growth in Indonesia (Aspiansyah & Damayanti, 2019).

Table 1. GRDP Rate Over 2010 Constant Prices 2015 - 2019

Province	2015	2016	2017	2018*	2019**
(1)	(2)	(3)	(4)	(5)	(6)
Lampung	5,13	5,14	5,16	5,25	5,27
Banten	5,45	5,28	5,75	5,82	5,53
Indonesia	**4,88**	**5,03**	**5,07**	**5,17**	**5,02**

** Preliminary Figures ** Very Preliminary Figures*

BPS sources are compiled from the results of the Census, Survey and various other sources

Geographically, Lampung Province is located at the tip of the island of Sumatra, adjacent to the domiciled Java Island (BPS, 2019b). Lampung's economy is dominated by 4 (four) sectors of economic activity, namely the Agriculture, Forestry and Fisheries sectors; Manufacturing; Wholesale and Retail Trade, Repair of Motor Vehicles and Motorcycles; and Construction (BPS, 2018c).

Meanwhile, Banten Province is a province on the island of Java, Indonesia. This province was once part of West Java Province. Banten's economy is dominated by 4 (four) sectors of economic activity, namely the Manufacturing; Wholesale and Retail Trade, Repair of Motor Vehicles and Motorcycles; Transportation and Storage; and Construction (BPS, 2019a).

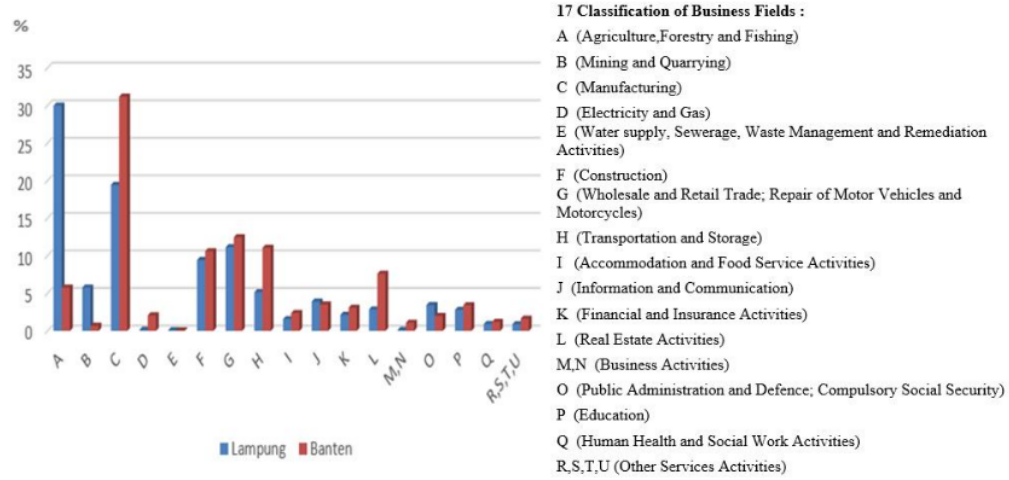

Figure 1. Comparison of the Economic Structure of Lampung and Banten Provinces based on 2018 Gross Regional Domestic Product (GRDP)

Sources are processed from BPS PDRB Lampung Province and Banten Province in 2018

IRIO analysis is an analysis that describes the linkages and dependencies as well as the relationships between sectors and other regions. The lack of studies on IRIO analysis in Indonesia shows that the picture has not been shown in detail the relationship between sectors in one region and another (Subanti, Hakim, Riani, Hakim, & Irawan, 2020). One of the factors causing the lack of research studies on IRIO analysis is due to the lack of availability of data on domestic transactions between regions, in addition to obtaining the required data sources requires a long time and a large survey cost (Ploszaj, Celinska-Janowicz, Rok, & Zawalinska, 2015) (Faturay, Lenzen, & Nugraha, 2017). Leontief's theory (1953) in its publication entitled "Interregional Theory: Studies In The Structure Of The American Economy" states that there are 4 (four) basic analysis concepts of economic structure (FES), namely dependence, independence, hierarchy and circularity or multiregional

interdependence (Geoffry JD Hewings, Jensen, West, Sonis, & Jackson, 1989) (Sonis, Hewings, Guo, & Hulu, 1997).

A research study on Interregional Input-Output (IRIO) analysis that describes the economic structure was carried out by Sonis et al (1997) in a research study conducted in 1980 - 1985 publication entitled "Interpreting spatial economic structure: feedback loops in the Indonesian interregional economy, 1980. -1985 "in this study, the inter-regional economic structure tends to strengthen the domination role of the island of Java against the island of Sumatra in the Indonesian economy. The analysis presented reveals the difficulty of developing a development strategy aimed at reducing disparities in economic prosperity between regions in the face of significant differences in regional economic strength. Based on the evidence presented, the government had to reduce or change the dominant position in Java towards Sumatra and this would require enormous policy intervention. (Sonis, Hewings, Guo, et al., 1997)

Several research studies identified the basic economic structure in a region, followed by an evaluation of the relationship between structural features and various characteristics of economic flows (West, Morison, & Jensen, 1984; Geoffry JD Hewings et al., 1989; Sonis, Hewings, & Sulistyowati, 1997; Thakur & Alvayay, 2012).
According to Chenery and Clark (1959) and Chenery (1960), there are 3 (three) types of effects of inter-sectoral interdependence, namely: (1) inter-industry linkage effect, measuring the effect of increasing one unit of final demand (final demand). to the level of production in each sector, (2) the employment linkage effect, measures the use of total labour in a sector as a result of a change in one unit of final demand, and (3) the income generation linkage effect measures the effect of changing one of the exogenous variables in final demand on an increase in income. (Chenery, 1960; Chenery & Clark, 1959)

The Inter-Regional Input-Output (IRIO) analysis in addition to describing the inter-regional economic structure, the Interregional Input-Output table can also see and describe the inter-regional linkages and dependencies. Research conducted by Akita (2002) conducted a research study of IRIO in the Kyushu region with the Kanto region and throughout Japan (as a remnant region), the results of this IRIO research study found that the results of final demand in Kyushu are a direct and indirect effect from outside of Kyushu, Kyushu has facilitated inter-regional and international interconnectedness and dependence. The emergence of the manufacturing and assembly sectors, together with the construction of a new network of main railways, toll roads and communications, encouraged closer interregional industrial relations between Kyushu, Kanto, and the rest of Japan (Akita & Kataoka, 2002).
Meanwhile, according to Meier (1995), the two mechanisms that work directly in the production activity sector are the first, the provision of inputs that generate demand or backward linkage effects, that is, every non-primary economic activity will affect efforts to supply through domestic production the inputs required by these activities. . Second, the use of output or forward linkage effects, which is any activity which by its nature is not an end product, will affect efforts to utilize output as input to new activities (Meier & Rauch, 1995).
Analysis of backward linkage effects and forward linkage effects has long been used to determine key sectors in development planning (Rueda-Cantuche, Neuwahl, & Delgado, 2012); (Midmore, Munday, & Roberts, 2006); (Cai, Leung, Pan, & Pooley, 2005); (Cai & Leung, 2004); (Rashid, 2004); (Hoen, 2002); (Andreosso - O'Callaghan & Yue, 2004); (Muchdie, 1998); (Sonis, Guilhoto, Hewings, & Martins, 1995); (Geoffrey JD Hewings, Fonseca, Guilhoto, & Sonis, 1989); (Geoffrey JD Hewings, 1982); (Beyers, 1976).
According to Adam Polaszaj (2015), a fundamental problem that is still under scientific debate and discussion is how to get data sources for analysis at the regional level, which is how to get an Interregional input-output table. If Interregional input-output tables are not available from statistical service agencies, the researcher must go through statistical and estimation procedures. Research in the manufacture of obtaining the data source of the Interregional input-output table distinguishes three methodological paths, namely:
1. The bottom-up method, based on regional surveys; (Kockelman, Jin, Zhao, & Ruíz-Juri, 2005) (Wittwer & Horridge, 2010) (Cazcarro, Duarte, & Sánchez Chóliz, 2013)
2. Top-down method, regionalization of national input-output tables using data from regional accounts; (Akita & Kataoka, 2002) (L. Yang & Lahr, 2008) (Kataoka, 2013) (X. Yang, Feng, Su, Zhang, & Huang, 2019)
3. Hybrid method, using both approaches (survey and data estimation from data provider account); (West et al., 1984) (Stoeckl, 2012) (Muchdie, 2017) (Subanti et al., 2020).

Literature studies of articles at the regional level reveal that only the first two approaches are used in practice, while mixed methods are very rare (Ploszaj et al., 2015). Top-down estimation, much more popular than surveying, is likely because it is significantly more expensive and time-consuming. On the other hand, the top-down approach requires the collection of large amounts of detailed data at the regional level which is usually less available than national data (Wittwer & Horridge, 2010), whereas using the survey method takes a very long time and requires considerable survey costs. For the hybrid method, namely the survey and non-survey methods, is a solution if the Interregional Input-Output table between Lampung and Banten provinces are not yet available in a national or regional account provider, in this case, the Central Statistics Agency (BPS).
In the input-output table for the provinces of Lampung and Banten Province in 2010, according to the type of transaction table, there are transactions based on buyer prices, transactions based on producer prices, total transactions and domestic transactions (BPS, 2012b). In updating the IRIO 2018 Table using transactions at producer prices, this means that in this transaction table the elements of trade margin and transportation costs have been separated as inputs purchased from the trade and transportation sector. By removing the elements of trading margin and transportation costs from the transaction table based on the buyer's price, a transaction table is obtained based on the producer price.
To see the picture of the magnitude of trade in goods and services in these two provinces, between Lampung Province and Banten Province, it is obtained from the Lampung Province Input-Output Table in 2010 and the Banten Province Input-Output Table in 2010, as

standard parameters based on Indonesia's 2010 Input-Output table which has been published (BPS, 2012a, 2012b, 2015). From each of the 2010 Input-Output tables, the 2018 Input-Output table was then updated. The research used updating including (Geoffrey JD Hewings, 1984) (Nidaira, 1998) (Shuja, 2017) (Fournier Gabela, 2020), Interregional research Input-output that uses updating estimates include Nidaira (1997) in the title "An Inter-Regional Input-Output Analysis for Regional Development in Indonesia" in his research using the basis of Indonesian input-output tables in 1990 then estimating updating in 1993, for research studies in Malaysia Shuja (2017) estimates the basic updating of Malaysia Input-Output Table (MIOT) 2010 to MIOT 2015 using the Euro method, while Fournier Gabela (2020) in a publication entitled "On the Accuracy Of Gravity-RAS Approaches Used For Inter-regional Trade Estimation: Evidence Using The 2005 Inter-regional Input-Output Table of Japan "using the 2005 inter-regional input-output table based on a survey in Japan. pang as benchmarks and the results show a high degree of overall accuracy for the standard approach, better than when using international data, albeit with heterogeneous errors for sectors and regions.

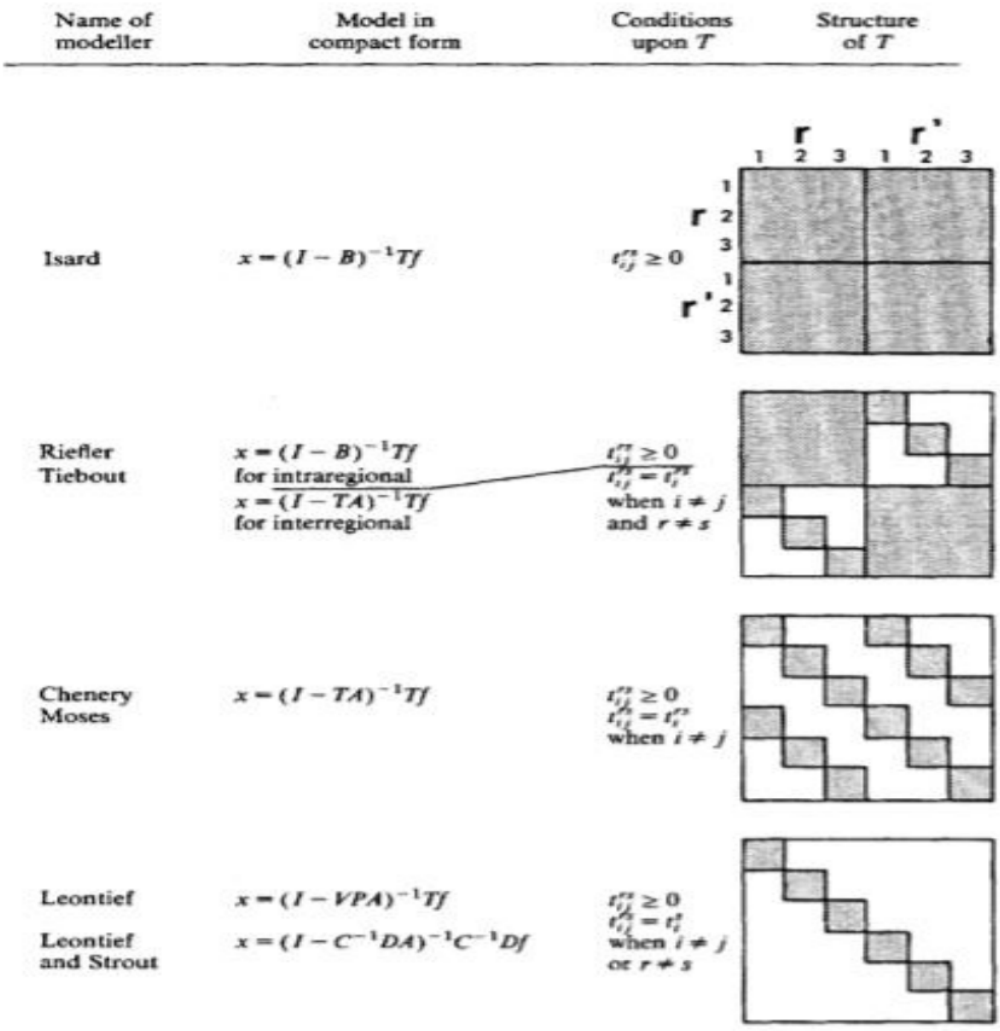

Figure 2. Regional Input-Output Model
Source: Regional, Interregional and Multiregional Input-Output Analysis (Geoffrey JD Hewings & Jensen, 1987)

The IRIO table model was first developed by Isard (1951) and Chenery (1953) and by Moses (1955) for nine census regions in the United States, then Tiebout (1957) and Riefler (1970) developed the Interregional IO Model and the Intraregional IO Model (Tiebout, 1957) (Riefler & Tiebout, 1970) (Geoffrey JD Hewings & Jensen, 1987). According to Hewings (1970), the percentage of overall error involved in using a simple single region input-output (IO) model in a two-region inter-region (IRIO) context is actually very small in a very wide range of

representative situations (Geoffrey JD Hewings, 1970).

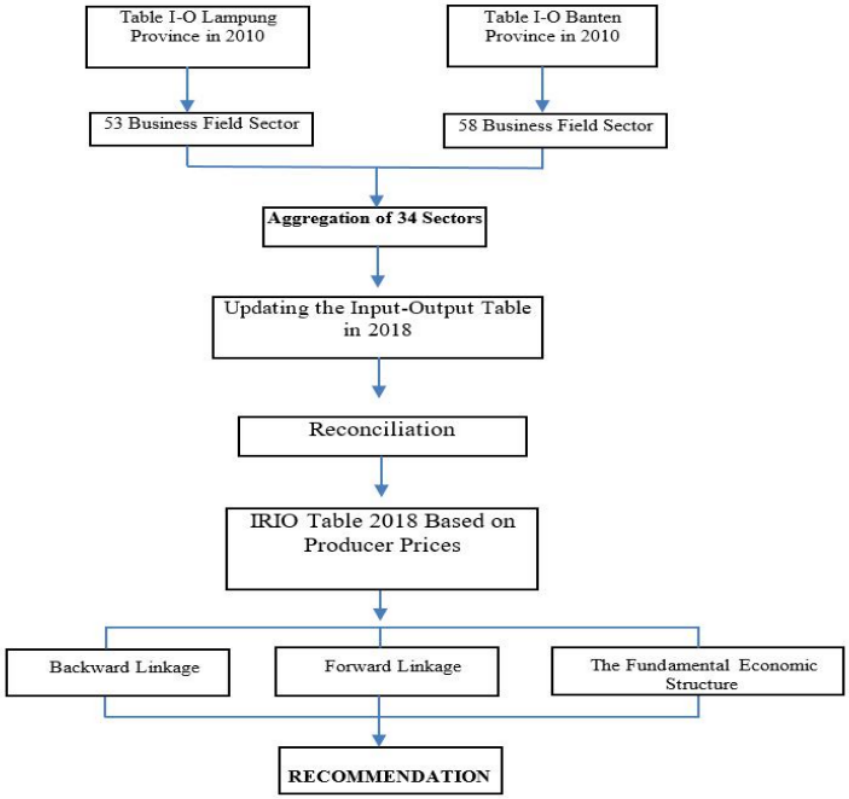

Figure. 3 Updating IRIO 2018 Framework

This study aims to determine the dominant business sector in 2018 in Lampung Province and Banten Province; how the backward linkage and forward linkage in the economic structure of Lampung Province and Banten Province.

RESEARCH METHODS

Data and Data Sources

The data used in this study is a hybrid method, namely survey and non-survey methods in the preparation of Interregional Input-Output tables between Lampung Province and Banten Province, namely the 2010 Lampung Province Input-Output Tables and the Banten Province 2010 Input-Output tables. presented in the form of a matrix that is classified and aggregated into 34 economic sectors. The data sources for IRIO tables in Lampung Province and Banten Province in 2018 were obtained from the Lampung Central Statistics Agency and Banten Province as well as from other related agencies.

Data Analysis Methods and Tools

The data analysis method used in this study is the IRIO Model. Interregional input-output models were first developed by Isard (1951) and Chenery (1953) and by Moses (1955) for nine census regions in the United States then Tiebout (1957) and Riefler (1970) developed the Interregional IO Model and the Intraregional IO Model (Tiebout, 1957) (Riefler & Tiebout, 1970) (Geoffrey JD Hewings & Jensen, 1987) According to Hewings (1970) the percentage of overall error involved in using a simple single region input-output (IO) model in a two-region inter-region (IRIO) context is actually very small in a very wide range of representative situations (Geoffrey JD Hewings, 1970) The idea is very simple but can be a powerful analytical tool in seeing the relationship between sectors in the economy (Nazara, 1997). The most important component in the input-output analysis is the inverse matrix of the input-output table, which is often referred to as the Leontief inverse (Miller & Blair, 2009). This matrix contains important information on how an increase in production from one sector (industry) will lead to the development of other sectors. The analysis that will be calculated in this study is as follows:

a. Economic Structure in IRIO 2018 table.
b. Backward Linkage Analysis.
c. Forward Linkage Analysis

Basic Concepts of IRIO

Riefler and Tiebout (1970) in their publication "Interregional Input-Output: An Empirical California-Washington Model" provides a further modification of the Leontief-Strout system for the two-region case; in some ways, their model could be considered a compromise between the Leontief-Strout and Isard systems, the model was implemented for the states of Washington and California where there are two survey-based regional

input-output tables.

Isenske (1970) has proposed two versions of the Leontief-Strout model, one column, the other the row coefficient model noting how different formulations require different amounts of data and assumptions about the nature of flow between regions. This interregional model has been developed and elaborated by Evans and Baxter (1980) in the publication "Regionalizing national projections with a multiregional input-output model linked to a demographic model" and Hoffman and Kent (1976) whose research entitled "Design for commodity-by- industrial interregional input-output models "in the case of commodity industry modelling as well as Batten's (1982) publication entitled" The interregional linkages between national and regional input-output models "attempts have been made to link these models with some new developments in commodity flow modelling. According to Miernyk (2020), the interregional input-output model is more complex than the national or regional model. This is because the two types of interdependence between industries and between regions must be mixed. This model detailed data on industrial buying and selling by region is not available. It is important to limit the analysis to a few large areas, if more refined area groupings are used, to work with somewhat aggregated industry data If reliable data are available in the detail required, and tables, as illustrated can be created, this interregional model can be very useful. This will show how changes to the final demand for products in one region result in impulses being sent to another region. In practice, there has been much success in applying a balanced cross-region model.

Interregional I-O Model or (IRIO) is an I-O model that displays economic relations and activities in two or more regions (Nazara, 1997). This model was developed basically as an anticipation of the data that actually exists in the economy, especially the regional economy. Then Leontief together with Strout (1963) established a version of the interregional model using the 'gravity' coefficient. They assume that trade flows from region 'g' to 'h' are proportional to the total amount produced in region 'g' and consumed in region 'h' and inversely proportional to the aggregate amount of commodities produced (consumed) in all regions (Leontief & Strout, 1963).

This Interregional Model divides the national economy by sectors and areas of activity. So, more specifically, this interregional input-output model is defined as a statistical framework that shows the relationship between economic sectors from one region to another. Basically, this model describes a combination of several regional I-O tables (single area) by treating special estimates of the inter-regional import matrix. Interregional I-O Model requires the availability of data to calculate the regional input coefficients. The data were obtained through a regional input-output survey. Business sectors in a region are asked to identify not only the structure of the intermediate inputs used but also the origin of these intermediate inputs. Furthermore, these business sectors must be able to explain which inputs originate from their own region (region) and which inputs originate from other regions. The Interregional Input-Output (TIOI) table is presented in table 2. However, to facilitate understanding of TIOI, simplifications are made, namely: it is assumed that there are only two sectors in the economy, namely sector 1 and sector 2, and there are only two regions or regions. namely regions A and B. Conceptually, the understanding of the input arrangement and output allocation in the IOP framework is the same as the single region IO table. The arrangement of the inputs in the bilateral I-O Table between provinces A and B can be shown by the following mathematical equation:

The equation above shows the sum of the input between ($\sum Xij^A$) and primary input or gross value added (Vi^A) into total input (Xi^A). The difference that can be specifically

$$x_{11}^{AA} + x_{21}^{AA} + x_{11}^{BA} + x_{21}^{BA} + x_{1}^{MA} + V_1^A = X_1^A$$

shown through the TIOI and the two-province model is the difference between the inputs from domestic production and those from imports.

According to Jensen and West (1986), regional I-O tables can be used for several purposes, including:

1. An important ingredient in the preparation of a regional social account, which allows forecasting the gross regional product and the contribution of each sector to macroeconomic indicators.
2. Overview of the local economy, showing the nature of the economy in terms of significant transaction categories and characteristics of the economic structure.
3. Indicators of patterns of buying and selling in the sector, particularly patterns within regions.
4. Seeing the impact of changes in one or more of the final demand in an economy.
5. Database or components of other models, such as one for the general equilibrium model.

The IRIO table is a detailed description of the regional economic balance system which contains the consumption balance, the capital/investment accumulated balance and the regional/foreign external accounts. According to Ariefin (2012) in his dissertation entitled spatial transformation patterns in the spatial arrangement of Jabotabek areas, the IRIO table is used for; (1) estimate the impact of final demand and its changes (household expenditure, government expenditure, investment and exports) on various production sector outputs, added value (GDP at the national level or GRDP at the regional level), community income, labour requirements, taxes (PAD at the regional level) and so on; (2) knowing the composition of the supply and use of goods or services to facilitate analysis of import needs and possible substitutions; (3) guide sectors that have a strong influence and are sensitive to economic growth (Ariefin, 2012).

Jhingan (1998) states that IRIO analysis is also the best variation of general equilibrium which has three main elements. First, The input-output analysis focuses its attention on the economy in a state of balance. Second, it does not focus on-demand analysis but on technical production issues. Third, this analysis is based on empirical research (Jhingan, 1998).

The IRIO model presents information on transactions of goods and services and is interrelated between units of economic activity within a certain time (one year) presented in a matrix form. The entries along the rows show the allocation of output and according to the column shows the structure of the inputs in the production process (BPS, 2000). As a quantitative model, the Input-Output table (I-O table) can provide an overview of:

1. Economic structure which includes the output structure and value-added of each economic activity in a region;

2. Intermediate input structure, which shows the use of goods and services by production activities in an area;
3. The structure of the provision of goods and services, both in the form of domestic production and imported goods; and
4. The structure of demand for goods and services, both demand by production activities and final demand for consumption, investment and exports.

According to Muhammad Irfan Affandi (2009) and BPS (2000) in the theoretical framework and analysis of input-output tables in Indonesia, the input-output model can also be used for various purposes, including (1) structural analysis that describes the relationship between supply and demand in Indonesia. level of balance, (2) tools for evaluating the impact of the economy on public investment on the regional and national economy, (3) forecasting and planning tools through certain mechanisms, (4) regional and interregional analysis tools, (5) impact analysis between economic sectors, labour, income, etc., (6) sensitivity analysis and due diligence, (7) together with the linear programming method can be used for planning purposes, and (8) together with comparative cost analysis, for complex industrial analysis in a series of regional economic analyzes (Affandi, 2009) (BPS, 2000).

An input-output table presents information about transactions of goods and services that occur in all sectors in the economy, in a matrix form. In an open and static Input-Output Table, the transactions used in the preparation of the input-output table must meet three basic assumptions, namely:

1. Homogeneity, namely the assumption that each economic sector produces only one type of goods and services with a single (uniform) input arrangement and there is no automatic substitution of inputs from different sectors.
2. Proportionality, which is the assumption that the relationship between input and output in each production sector is a linear function, meaning that the increase and decrease in the output of a sector will be proportional to the increase and decrease in input from the sector concerned.
3. Additivity, namely assumptions

that the total effect of production activities in various sectors is the sum of the effects of each activity.

Based on these assumptions, the IRIO table as a quantitative model has limitations, namely that the input coefficient or technical coefficient is assumed to be constant throughout the analysis or projection period. So the producer cannot adjust input changes or change the production process. Because the technical coefficient is considered constant, the technology used by economic sectors in the production process is considered constant. As a result, changes in the quantity and price of inputs will always be proportional to changes in the quantity and price of output. Despite its limitations, the input-output model remains a complete and comprehensive economic analysis tool (BPS, 2012b).

Table 2. Simplified IRIO table 2 Region 2 Business Field Sector

Output / Input			Intermediate Demand				Final Demand			Total Output
			Province A		Province B		Province A	Province B	Export ROR	
			1	2	1	2				
INTERMEDIATE INPUT	Province A	1	x_{11}^{AA}	x_{12}^{AA}	x_{11}^{AB}	x_{12}^{AB}	F_1^{AA}	F_1^{AB}	F_1^{A}	X_1^A
		2	x_{21}^{AA}	x_{22}^{AA}	x_{21}^{AB}	x_{22}^{AB}	F_2^{AA}	F_2^{AB}	F_2^{A}	X_2^A
	Province B	1	X_{11}^{BA}	x_{12}^{BA}	x_{11}^{BB}	x_{12}^{BB}	F_1^{BA}	F_1^{BB}	F_1^{B}	X_1^B
		2	X_{21}^{BA}	x_{22}^{BA}	x_{21}^{BB}	x_{22}^{BB}	F_2^{BA}	F_2^{BB}	F_2^{B}	X_2^B
	Import ROR		X_1^{MA}	x_2^{MA}	x_1^{MB}	x_2^{MB}	F^{MA}	F^{MB}		
	Total Intermediate Input		Σx_{i1}^A	Σx_{i2}^A	Σx_{i1}^B	Σx_{i2}^B				
Input Primer (Gross Added Value)			V_1^A	V_2^A	V_1^B	V_2^B				
Total Input			X_1^A	X_2^A	X_1^B	X_2^B				

With a similar interpretation, the equation for the input arrangement can be formulated for sector 2 in province A, and sectors 1 and 2 in province B using the following formula:

$$x_{11}^{AA} + x_{21}^{AA} + x_{11}^{BA} + x_{21}^{BA} + x_{1}^{MA} + V_{1}^{A} = X_{1}^{A}$$

$$x_{12}^{AA} + x_{22}^{AA} + x_{12}^{BA} + x_{22}^{BA} + x_{2}^{MA} + V_{2}^{A} = X_{2}^{A}$$

$$x_{11}^{AB} + x_{21}^{AB} + x_{11}^{BB} + x_{21}^{BB} + x_{1}^{MB} + V_{1}^{B} = X_{1}^{B}$$

$$x_{12}^{AB} + x_{22}^{AB} + x_{12}^{BB} + x_{22}^{BB} + x_{2}^{MB} + V_{2}^{B} = X_{2}^{B}$$

The above equation is derived from the relationship between cells in the matrix quadrant I (intermediate input) and the matrix quadrant III (primary input). It is shown through the composition of sectoral inputs the dependence of a sector with other sectors within the same province and the dependence of a sector with other sectors outside the province concerned. Through the equation for the composition of the inputs, it can be seen that the dependence of sector 1 in province A on raw/auxiliary materials imported from province B or other provinces. Likewise, the opposite is the situation faced by economic sectors in province B, which are dependent on intermediate inputs that must be imported from province A and other provinces.

Apart from the composition of the input, other information records that can be obtained from the bilateral I-O table between provinces A and B above are the sectoral output allocations which provide an overview of the distribution of production value of a sector in the economy across provinces. The allocation of sectoral output in the bilateral I-O tables for provinces A and B is shown by the sum of the cells of the matrix quadrant I (intermediate demand) and quadrant II (final demand) arranged according to rows. The allocation of sector 1 and 2 output in provinces A and B can be formulated through the following 4 equations:

$$x_{11}^{AA} + x_{12}^{AA} + x_{11}^{AB} + x_{12}^{AB} + F_1^{AA} + F_1^{AB} + E_1^{A} = X_1^{A}$$

$$x_{21}^{AA} + x_{22}^{AA} + x_{21}^{AB} + x_{22}^{AB} + F_2^{AA} + F_2^{AB} + E_2^{A} = X_2^{A}$$

$$x_{11}^{BA} + x_{12}^{BA} + x_{11}^{BB} + x_{12}^{BB} + F_1^{BA} + F_1^{BB} + E_1^{B} = X_1^{B}$$

$$x_{21}^{BA} + x_{22}^{BA} + x_{21}^{BB} + x_{22}^{BB} + F_2^{BA} + F_2^{BB} + E_2^{B} = X_2^{B}$$

while knowing the forward linkages and backward linkages the following formula is used:

1. Backward Linkage

This concept is defined as the ability of a sector to increase the growth of its upstream industry. The total index of backward linkage is also known as the power of dispersion index which is used to measure backward linkage.

$$\alpha j = \frac{\Sigma i\ bij}{\left(\frac{1}{n}\right)\Sigma i\ \Sigma j\ bij}$$

Information

α_i : power of dispersion

$\Sigma_i\ b_{ij}$: sum of intermediate input coefficients / Leontief, where i = row sector

$\Sigma_i\ \Sigma_j\ b_{ij}$: the number of intermediate input coefficients / Leontief, where j = column sector

N: number of sectors

Conclusion criteria

$\alpha_i = 1$, the attractive power of sector i is equal to the average attractiveness of all sectors of the economy.

$\alpha_i > 1$, the attractive power of sector i is greater than the average attractiveness of all sectors of the economy.

$\alpha_i < 1$, the attractiveness of sector i is less than the average attractiveness of all sectors of the economy.

Aggregation of Business Fields

Table 3. Aggregation of Business Fields

Sector Number	Sector of 2010	Sector Number	Sector Aggregation 2018
1	Food Crops	1	Food Crops
2	Horticultural Plants	2	Horticultural Plants
3	Plantation	3	Plantation
4	Ranch	4	Ranch
5	Agriculture and Hunting Services	5	Agriculture and Hunting Services
6	Forestry and Logging	6	Forestry and Logging
7	Fishery	7	Fishery
8	Oil and Gas Mining	8	Mining for Petroleum, Natural Gas and Geothermal, Coal and Lignite
9	Coal and Lignite Mining		
10	Metal Ore Mining	9	Metal Ore Mining
11	Mining and Other Excavation	10	Mining and Other Excavation
12	Coal and Oil and Gas Refining Industry		
13	Food and Beverage Industry		
14	Tobacco Processing Industry	11	Manufacturing Industry

2. Forward Linkage

This concept is defined as the ability of a sector to encourage production growth in other sectors that use inputs from this sector. The total forward linkage is also known as the degree of sensitivity index which is used to measure the forward linkage.

$$\beta i = \frac{\Sigma j\ bij}{\left(\frac{1}{n}\right)\Sigma i\ \Sigma j\ bij}$$

Information

β_i: degree of sensitivity

$\Sigma_j\ b_{ij}$: sum of intermediate input coefficients / Leontief, where i = row sector

$\Sigma_i\ \Sigma_j\ b_{ij}$: the number of intermediate input coefficients / Leontief, where j = column sector

n: number of sectors

Conclusion criteria:

$\beta_j = 1$, the degree of sensitivity of sector j is the same as the average degree of sensitivity of all sectors of the economy.

$\beta_j > 1$, the degree of sensitivity of sector j is greater than the average degree of sensitivity of all economic sectors.

$\beta_j < 1$, the degree of sensitivity of sector j is smaller than the average degree of sensitivity of all economic sectors.

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15	Textile and Apparel Industry		
16	Leather, Leather Goods and Footwear Industry		
17	Wood Industry, Wood and Cork Products and Woven Products from Bamboo, Rattan and the Like		
18	Paper and Paper Products Industry, Printing and Recording Media Reproduction		
19	Chemical, Pharmaceutical and Traditional Medicine Industry		
20	Rubber Industry, Rubber and Plastics Products; Rubber Industry, Rubber and Plastics Products;		
21	Non-Metal Mineral Industry		
22	Base Metal Industry		
23	Metal, Computer, Electronic, Optical and Electrical Equipment Industry		
24	Machinery and Equipment Industry Etc		
25	Transportation Equipment Industry		
26	Furniture Industry		
27	Other processing industries, repair services and installation of machinery and equipment		
28	Electricity	12	Electricity
29	Natural and artificial gas	13	Gas
30	Water Supply	14	Water supply, waste management and recycling, disposal and cleaning of waste and garbage
31	Building Construction	15	Construction
32	Civil Building Construction		
33	Special Construction		
34	Wholesale and Retail Trade	16	Wholesale and Retail Trade, and Repair of Automobiles and Motorcycles
35	Rail Transportation	17	Rail Transportation
36	Highway Transportation	18	Highway Transportation
37	Sea Freight	19	Sea Freight
38	River, Lake and Crossing Transportation	20	River, Lake and Crossing Transportation
39	Air Freight	21	Air Freight
40	Warehousing and Transportation Support Services, Post and Courier	22	Warehousing and Transportation Support Services, Post and Courier
41	Provision of Accommodation	23	Provision of Accommodation
42	Provision of Drinking Food	24	Provision of Drinking Food
43	Information and Communication	25	Information and Communication
44	Bank	26	Bank
45	Insurance and Pension Funds	27	Insurance and Pension Funds
46	Other Financial Services	28	Other Financial Services and Financial Support Services
47	Financial Support Services		
48	Real Estate	29	Real Estate
49	Company Services	30	Company Services
50	Mandatory Government Administration, Defense and Social Security	31	Mandatory Government Administration, Defense and Social Security
51	Education Services	32	Education Services
52	Health Services and Social Activities	33	Health Services and Social Activities
53	Other services	34	Other services

Based on the Lampung Province Central Statistics Agency (2012) the classification of each sector in Table IO 2010 is prepared based on the 2009 Indonesian Standard Business Field Classification (ISBFC) under the Regulation of the Head of BPS No. 57 of 2009 concerning the Classification of Indonesian Business Field Standards (BPS, 2012). To update the Input-output table for 2018, the classification according to the business field for Lampung Province is based on the Input-Output Table for 2010, there are 53 (fifty-three) sectors, so business sector aggregation is needed. According to Sahara (2017) in Input-Output Analysis: Leading Sector Planning and Rina Oktaviani (2011) in a general balance economic model of theory and its application in Indonesia and in The impact of APEC trade liberalization on Indonesia Economy and its Agricultural Sector, one of the steps in preparing Input-Output table data is the aggregation and disaggregation of sectors (Oktaviani, 2011; Oktaviani & Drynan, 2000) (Sahara, 2017), for this reason, in preparing the Interregional Input-Output Table for 2018 which is sourced from the 2010 Input-Output Table, the aggregation these sectors become 34 (Thirty-four) business sectors.

Table 4. Ten Business Field Sectors of Lampung Province Based on the IRIO 2018 Table

NO	IO CODE	SECTOR	TOTAL INPUT	TOTAL OUPUT
1	11	Manufacturing Industry	Rp 215,189,372.51	Rp 111,193,274.15
2	15	Construction	Rp 68,710,617.01	Rp 80,832,635.18
3	16	Wholesale and Retail Trade, and Repair Of Automobile and Mororcycles	Rp 46,996,144.94	Rp 68,798,291.17
4	1	Crops	Rp 35,558,446.23	Rp 40,151,393.36
5	7	Fishery	Rp 22,356,511.78	Rp 35,810,817.94
6	3	Plantation	Rp 23,134,345.48	Rp 35,247,260.89
7	25	Information and Communication	Rp 20,549,754.78	Rp 24,575,676.68
8	8	Mining for Petroleum, Natural Gas and Geothermal, Coal and Lignite	Rp 9,100,549.79	Rp 23,572,997.87
9	18	Highway Transportation	Rp 21,218,662.08	Rp 21,534,447.04
10	4	Ranch	Rp 19,380,649.18	Rp 19,772,968.75
		Others	Rp 103,790,618.91	Rp 124,495,909.70
		Amount	**Rp 585,985,672.69**	**Rp 585,985,672.73**

Source: IRIO 2018 table, compiled.

Based on the results of the Interregional Input-Output (IRIO) 2018 table in table 4, the 2018 Lampung Province economic structure in the manufacturing Industry field business sector has an export value (output) of Rp. 111,193,274.15 (million) which is not comparable to the value of imports (input) to meet the manufacturing Industry sector, namely Rp. 215,189,372.51 (million) while for the business sector, wholesale and retail trade, and repair of automobile and motorcycles; Crops; Fishery; Plantation; Information and communication; Mining for petroleum, natural gas and geothermal, coal and lignite; Highway transportation; and Ranch has an export value (output) that is greater than the value of imports (input).

Table 5. Ten Business Field Sectors of Banten Province Based on the IRIO 2018 Table
Source: IRIO 2018 table, compiled.

NO	IO CODE	SECTOR	TOTAL INPUT	TOTAL OUPUT
1	16	Wholesale and Retail Trade, and Repair Of Automobile and Mororcycles	Rp 130,230,310.20	Rp 2,455,692,896.15
2	21	Air Freight	Rp 40,822,988.22	Rp 721,614,687.74
3	18	Highway Transportation	Rp 30,324,264.86	Rp 372,525,574.84
4	19	Sea Freight	Rp 7,216,035.98	Rp 116,694,391.79
5	15	Construction	Rp 80,279,116.54	Rp 112,750,342.81
6	22	Warehousing and Transportation Support Services, Post and Courier	Rp 8,774,363.39	Rp 47,660,229.84
7	12	Electricity	Rp 12,634,188.85	Rp 35,486,517.92
8	29	Real Estate	Rp 42,167,408.11	Rp 33,846,818.25
9	24	Provision of Food and Drink	Rp 21,811,781.50	Rp 32,739,763.16
10	32	Education Services	Rp 19,754,894.68	Rp 21,332,292.18
		Others	Rp 713,899,701.00	-Rp 2,842,428,461.00
		Amount	**Rp 1,107,915,053.33**	**Rp 1,107,915,053.68**

Based on the results of the Interregional Input-Output (IRIO) table for Lampung Province and Banten Province 2018 in table 5, the economic structure of Banten Province 2018 in the sector of large and retail trade and repair of cars and bicycles has an export value (output) of Rp. 2,455,692,896.15 (million), which is greater than the components with the value of imports (input) to fulfil the wholesale and retail trade sector, and car and bicycle repairs, which is Rp. 130,230,310.20 (million) as well as for the air transportation sector; Highway transportation; Sea transportation; Construction; Warehousing and transportation support services, post and courier; electricity; Provision of food and drink; and education services have an export value (output) that is greater than the value of imports (input). Meanwhile, the real estate sector has an export value (output) of Rp. 33,846,818.25 (million) while the import value (input) for the business sector is Rp. 42,167,408.11 (million) means a greater import component (input) in Banten Province 2018 to support the real estate sector in Banten Province.

Tabel 6. Backward Linkage of Ten Business Field Sectors in Lampung Province Based on the IRIO 2018 Table

NO	IO CODE	SECTOR	VALUE
1	12	Electricity	4.94
2	20	River, Lake and Crossing Transportation	4.53
3	23	Provision of Accommodation	4.46
4	19	Sea Freight	4.11
5	33	Health Services and Social Activities	4.10
6	21	Air Freight	4.09
7	34	Other services	3.79
8	15	Construction	3.78
9	2	Horticultural Plants	3.60
10	24	Provision of Food and Drink	3.58

Source: IRIO 2018 table, compiled.

In the results of the IRIO 2018 table analysis, Lampung Province has αi> 1, which means that the hook power/degree of spread of sector i is greater than the average attractiveness of all economic sectors. From table 6, the backward linkage or commonly called the spreading power of Lampung Province. Based on the IRIO 2018 table, the electricity sector has a value of 4.94 which has a high hook/dispersal power in Lampung Province in 2018, meaning the attractiveness/degree of spread of the field sector The electricity business is greater than the average attractiveness of all economic sectors, then the river lake and ferry transportation business sector has an index coefficient value of 4.53.

Tabel 7. Backward Linkage of Ten Business Field Sectors in Banten Province Based on the IRIO 2018 Table

NO	IO CODE	SECTOR	VALUE
1	12	Electricity	4.43
2	14	Water Supply, Waste Management and Recycling, Waste and Garbage Disposal and Cleaning	3.88
3	17	Rail Transportation	3.67
4	21	Air Freight	3.40
5	18	Highway Transportation	3.38
6	4	Ranch	3.25
7	33	Health Services and Social Activities	3.19
8	24	Provision of Food and Drink	3.08
9	16	Wholesale and Retail Trade, and Repair of Automobiles and Motorcycles	2.97
10	20	River, Lake and Crossing Transportation	2.92

Source: IRIO 2018 table, compiled.

Whereas from table 7 Backward Linkage or commonly called the spreading power of Banten Province based on the IRIO 2018 table, the electricity sector has a coefficient value of 4.43 high hook/spreadability in Banten Province in 2018 which means the attractiveness/degree of spread the electricity business sector is greater than the average attractiveness of all economic sectors. So that αi> 1, the attractiveness/degree of spread of sector i is greater than the average attractiveness of all economic sectors. The water supply, waste management and recycling, disposal and cleaning of waste and garbage sectors have a coefficient of spread/attractiveness of 3.88. Furthermore, rail transportation, air transportation and road transportation are business sectors in Banten Province which can also influence backward linkage distribution in Banten Province. The tenth rank of business sectors that have hook/spread power is the river, lake and ferry transportation business sector, which is 2.92.

Tabel 8. The Forward Linkage of Ten Business Field Sectors in Lampung Province Based on the IRIO 2018 Table

NO	IO CODE	SECTOR	VALUE
1	16	Wholesale and Retail Trade, and Repair of Automobiles and Motorcycles	8.08
2	11	Manufacturing Industry	6.53
3	25	Information and Communication	5.01
4	29	Real Estate	4.27
5	2	Horticultural Plants	4.15
6	4	Ranch	3.51
7	7	Fishery	3.46
8	26	Bank	3.46
9	18	Highway Transportation	3.43
10	1	Food Crops	3.39

Source: IRIO 2018 table, compiled.

From the results of the analysis of the 2018 IRIO table in Lampung Province table 8, generally, βj> 1 means that the driving force/degree of sensitivity of sector j is greater than the average degree of sensitivity of all economic sectors. The business sector that has the highest degree of sensitivity in Lampung Province is the wholesale and retail trade sector, car and motorcycle repair has a coefficient value of the degree of sensitivity/thrust of 8.08. Furthermore, the manufacturing industry sector has a value of 6.53 and the information and communication sector has a value of 5.01. The tenth rank which has a degree of sensitivity/forward linkage is that the food crop business sector has a coefficient value of 3.39.

Tabel 9. The Forward Linkage of Ten Business Field Sectors in Banten Province Based on the IRIO 2018 Table

NO	IO CODE	SECTOR	VALUE
1	11	Manufacturing Industry	8.81
2	12	Electricity	7.39
3	16	Wholesale and Retail Trade, and Repair of Automobiles and Motorcycles	7.09
4	21	Air Freight	3.48
5	15	Construction	3.24
6	25	Information and Communication	3.22
7	30	Company Services	3.09
8	18	Highway Transportation	3.03
9	29	Real Estate	2.75
10	22	Warehousing and Transportation Support Services, Post and Courier	2.71

Source: IRIO 2018 table, compiled.

The results of the analysis of the IRIO 2018 table for Banten Provin in table 9 in general βj> 1 means that the driving force/degree of sensitivity of sector j is greater than the average degree of sensitivity of all economic sectors. The business sector which has the highest degree of sensitivity in Banten Province is the manufacturing industry business sector which has a coefficient value of the degree of sensitivity/thrust of 8.81. Furthermore, the electricity sector business sector has a value of 7.39 and the wholesale and retail trade, car and motorcycle repair sector have a value of 7.09. The tenth rank that has a degree of sensitivity / forward linkage is the warehousing business sector and transportation support services, post and courier, which has a coefficient value of 2.71.

CONCLUSION

Based on the analysis and research objectives, the conclusions in this research study are:

1. The economic structure for Lampung Province, the total value of the 2018 Lampung Province structure is Rp. 585,985,672.73 (million) the processing industry

business sector has an export value (output) of Rp. 111,193,274.15 (million) is not comparable to the value of imports (input) to fulfil the manufacturing sector, namely Rp. 215,189,372.51 (million), while for the wholesale and retail trade business sector, and car and motorcycle repair; crops; Fishery; Plantation; Information and communication; Mining for petroleum, natural gas and geothermal, coal and lignite; road transport; and livestock have an export value (output) that is greater than the value of imports (input).

While the Economic Structure of Banten Province, the total value of the 2018 Banten Province Structure is Rp. 1,107,915,053.68 (million) business sector Wholesale and retail trade and repair of cars and bicycles have an export value (output) of Rp. 2,455,692,896.15 (million), which is greater than the components with the value of imports (input) to fulfil the wholesale and retail trade sector, and car and bicycle repairs, which is Rp. 130,230,310.20 (million) as well as for the air transport sector; road transport; sea transportation; construction; warehousing and transportation support services, post and courier; electricity; provision of food and drink; and education services have an export value (output) that is greater than the value of imports (input).

2. Analysis of the IRIO 2018 table in Lampung Province has αi> 1, which means that the hook power/degree of spread of sector i is greater than the average attractiveness of all economic sectors. Backward linkage or commonly called the spreading power of Lampung Province based on the IRIO 2018 table, the electricity business sector has a value of 4.94 which has a high hook/distribution power in Lampung Province in 2018 which means that the attractiveness/degree of distribution of the electricity business sector is greater than the average attractiveness of all sectors of the economy. Meanwhile, the business sector that has the highest degree of sensitivity in Lampung Province is the wholesale and retail trade sector, car and motorcycle repair has a coefficient value of degrees of sensitivity/thrust 8.08.

Backward linkage or commonly known as the distribution power of Banten Province based on the IRIO 2018 table, the electricity sector has a value of 4.43. High linkage/distribution in Banten Province in 2018 means that the attractiveness/degree of distribution of the electricity business sector is greater than the average attractiveness of all economic sectors. So that αi> 1, the attractiveness/degree of spread of sector i is greater than the average attractiveness of all economic sectors. Meanwhile, the business sector which has the highest degree of sensitivity in Banten Province is the manufacturing industry business sector which has a coefficient value of the degree of sensitivity/thrust of 8.81.

From the above conclusions, several suggestions can be made which are expected to be useful for government policy-making and further research.

1. As one of the sources of information based on academic research studies for the direction of development planning in the government policies of Lampung Province and Banten Province.

2. Theory and methodology, can develop the use of Multi-Regional Input-Output (MRIO) Lampung and Banten Provinces by involving other provinces in Indonesia.

3. Empirical contribution, further research studies are expected to use the GRAS method, RAS or the Euro method with a dynamic model.

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