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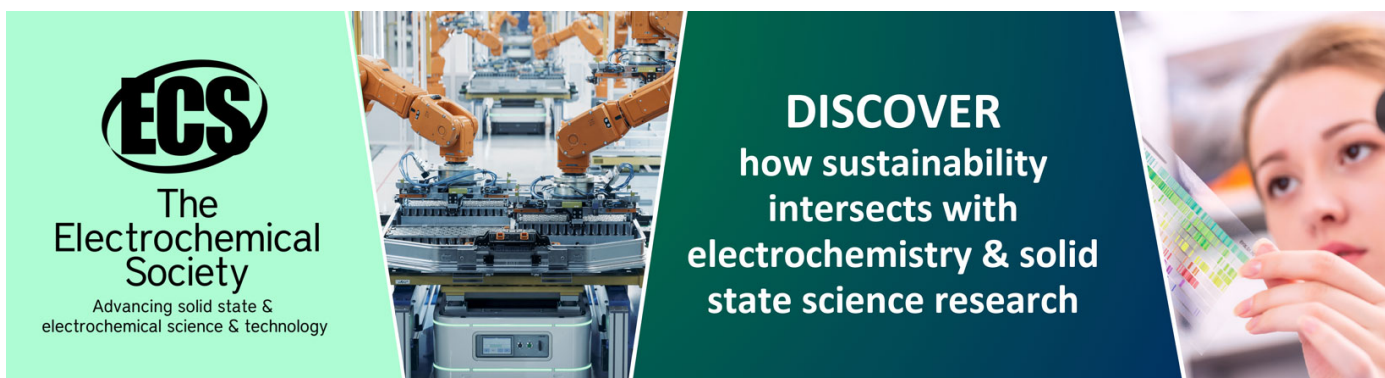
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To cite this article: S Subanti *et al* 2020 *J. Phys.: Conf. Ser.* **1567** 022079

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An application of Interregional effect on Central Java province economy (interregional input output approach)

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Abstract. The changes in the structure of the Indonesian economy not only affect the interregional linkages but also the intersectoral linkages, no exception the Central Java Province. This paper aims to calculate and to interpret the interregional effect, especially Central Java Province, to the main island in Indonesia. Using the Interregional Input - Output data for 2005. The study found that the sectors that provide the greatest interregional effect as follows (1) the electricity gas water sector for Central Java and other provinces in Java Islands; (2) the air transport sector for Central Java and Sumatra Islands; (3) the water transport sector for Central Java and Kalimantan, also Central Java and Bali, West Nusa Tenggara and East Nusa Tenggara; (4) oil refining industry sector for Central Java and Sulawesi; (5) animal husbandry and other products sector for Central Java and Maluku - North Maluku - Papua.

1. Introduction

The economy of a region tends to develop and constantly changing, this can be seen from changes in the economic structure of the region. One approach or method that can be described as a whole is the input output model [1]. However, this method has limitations which only include relationships or inter-sectoral linkages. Because a region coexists with other regions there is a tendency for inter-region linkages. To accommodate this, several studies developed interregional input output models, often known as the Interregional Input Output (IRIO) model. In this model, the economic structure is depicted in a certain time or has a static nature [2].

As mentioned above, as the country's economy continues to grow there is a tendency for sectoral structural change in an economy, known as structural transformation. In various literatures, this is characterized by a fundamental change in the economic structure of a country, city, or district; from formerly more subsistence and focusing on the primary sector to a more modern economic structure dominated by the secondary and tertiary sectors [1,3].



The importance of inter-sectoral linkages is important for evaluation as development of a sector requires other sectors, both as input provider and or as the output user of a particular sector. In other words, the progress of a sector is unlikely to be achieved without the support of other sectors. Meanwhile, inter-regional linkages are important because not all inputs are needed to produce output available within the region itself (due to resource constraints), so other regions need to support it. One of the way or the method to look at the shifting in the structure of the economy through changes in intra-sectoral or inter-sectoral and intra-regional or inter-regional relationships, through the IRIO model [2,4]. In this paper, we use the Interregional Input-output Model (IRIO), in some of the literature used to provide flexibility from the standard input output model framework, so this approach can capture transactions between economic sectors and between regions. The IRIO model itself was created to overcome the weaknesses of the IO model, where the input output model tends to only be able to analyze relationships and economic sectors in a particular industry and region. So it is not surprising, if IRIO is more systematic and comprehensive because it can represent product trading activities between industries and between regions [5]. Because one of the way or the method to look at the shifting in the structure of the economy through changes in intra-sectoral or inter-sectoral and intra-regional or inter-regional relationships, through the IRIO model. So, this paper aims to calculate and to interpret the inter-regional effect in Central Java Province.

2. Research Methods

2.1. Data

In this paper, the IRIO data was build from input output data for each province. The IO data used is the IO data of 2005. The data came from Central Bureau of Statistics. So, the IRIO 2005 data based on domestic transaction for producer price. This data contained 30 economic sectors and covered 7 regions (Central Java, Sumatera, Other Java, Kalimantan, Bali-NTB-NTT, Sulawesi, Maluku-NorthMaluku-Papua).

2.2. Method

The IRIO table is a composite of the I-O tables for each province. All I-O tables are connected to each other by the table of inter-regional trade transactions. This table shows the flow of goods from one region to another. Thus, the table of inter-regional trade transactions can be considered as export or import from one region to another. However, export or import terms usually in the I-O model are more used for inter-state and non-regional trade transactions. For inter-regional trade transactions is more used interregional trade terms (interregional trade) [4,5,7,8,9,11,12].

From this table, we can construct the basic equation for interregional input output model. This model consist 7 regions and covered 30 economic sector.

$$X_i^{CentralJava} = \sum_{j=1}^{30} Z_{ij}^{CentralJava} + \dots + \sum_{j=1}^{30} Z_{ij}^{Papua+Maluku+NorthMaluku} + Y_i^{CentralJava} \quad (1)$$

and soon, until

$$X_i^{Pap+Mal+NorthMal} = \sum_{j=1}^{30} Z_{ij}^{CJ} + \dots + \sum_{j=1}^{30} Z_{ij}^{Pap+Mal+NorthMal} + Y_i^{Pap+Mal+NorthMal} \quad (2)$$

Where X is the number of output and Y is the number of intermediate input. From the equation above, we can calculate the regional input coefficient for Central Java Province as follows :

$$a_{ij}^{CJCJ} = \frac{a_{ij}^{CJCJ}}{x_j^{CJ}} \quad (3)$$

With the same operation system, we will calculate the regional input coefficient for Central Java and other regions. The interregional trade coefficient also calculated from that equation, where the divider defined by the number of sectoral output from the receiver region. Then, the trade coefficient for Central Java and Sumatera defined as

$$a_{ij}^{CJSUM} = \frac{a_{ij}^{CJSUM}}{x_j^{SUM}} \quad (4)$$

In the IRIO model known as the Interregional effect is an impact that occurs in one sector in a particular area, due to changes in exogenous variables in other regions, or defined as the effect of increasing output occurring in an area as a result of the change of one unit of final demand from one sector on other areas. This is often called the spillover effect of interregional (interregional spillover effect). This impact also illustrates the inter-regional linkages and the inter-regional interactions. Given the increase in output from other areas, it will also result in a change in the final demand in the area itself, resulting in an interregional feedback effect. Thus, this interregional effect measurement involves the off-diagonal matrix of interregional input output model.

Table 1. Intermediate Transaction Matrix in IRIO 2005 for 7 Regions and 30 Sectors

Region		1. Central Java						7. Papua + Maluku + North Maluku					
	Sector	1		30				1		9			
1. Central Java	1	Z_{11}^{11}		Z_{130}^1				Z_{11}^{17}		Z_{130}^7			
	30	Z_{301}^{11}	...	Z_{3030}^{11}				Z_{301}^{17}		Z_{3030}^7			
7. Papua + Maluku + North Maluku	1	Z_{11}^{71}		Z_{130}^7				Z_{11}^{77}		Z_{130}^7			
	30	Z_{301}^{71}		Z_{3030}^{261}				Z_{301}^{77}		Z_{3030}^7			

3. Results And Discussions

This section will discuss the intra region effects. This effect is defined as the impact of changes in exogenous variables in a sector on that sector and other sectors in the region. Another definition, the effect of increased output occurring in a region as a result of changes in one unit of final demand from one sector in the region itself.

The results show that the intraregion effect of IRIO 2005 data yields the ten largest intraregion effects as detailed in Table 2, in that period it can be interpreted that the dominant sector which has the highest intraregion effect are the air transportation sector, the metal goods industry sector, and the textile industry, leather goods, and footwear. These three sectors are located in other Java region. For example, the air transportation sector in the other region Java, where this sector has an intraregion effect of 2.2577 means that if there is an increase in the final demand in that sector and that area of one (one) billion rupiah, then it will increase the regional economic output of 2.2577 billion rupiah. It can be seen that the air transportation industry has the highest intra-regional effect compared to other industries. One of the reasons that can be stated is that air transportation media is one of the modes of transportation preferred by passengers (in this case economic actors) to access a region or region, so it is natural that the air transportation industry is a category of connecting industries which usually has a spillover rate tall one. At the same time, supporting activities and additional transportation will usually

emerge, which can provide a key role in the regional and national air transportation industry [13]. However, one thing that needs to be noted, in some literature the figures produced are still not able to see the impact of certain transport sectors in general, both in the upstream and downstream sectors. The literature also supports the need to include spatial aspects if there are differences in the structure of production and trade between regions. Many studies sometimes ignore this, because they look more at interactions between economic sectors in certain regions, assuming imports from other regions have the same technology. However, several studies support the existence of spatial linkages because policy makers usually pay attention to this aspect, where interactions between regions due to the effects of transportation tend to be broader [14].

Tabel 2. The Ten Biggest Sectors with Intraregion Effects

Rank	Region		Economic Sector	Multiplier
1	Other Java	26	Air transportation	2.2577
2	Other Java	18	Metal goods industry	2.1764
3	Other Java	11	Textile industry, leather goods, and footwear	2.1713
4	Bali+NTB+TT	16	Iron base industry, steel, and non iron base metal	2.0992
5	Bali+NTB+TT	26	Air transportation	2.0760
6	Kalimantan	14	Fertilizers industry, chemical, rubber, and nonmetallic minerals	2.0758
7	Other Java	17	Industry of transportation equipment, machinery, and equipment	2.0284
8	Kalimantan	10	Food, beverage, and tobacco industry	1.9860
9	Kalimantan	12	Industrial goods of wood and other forest products	1.9592
10	Sulawesi	9	Petroleum refining industry	1.9479

From this results, we can say that Central Java Province has become one of the dominant economic forces besides East Java Province and West Java Province. This is indicated by the increasingly massive agglomeration and industrialization, of course it is hoped that economic activity will become more efficient and this has been seen from the minimum wage level in Central Java being more competitive compared to other regions. In addition, we also need to look at estimated trade flows calculated from the total total regional supply and demand. In trade flows, it is not easy to calculate how goods or services are distributed to demand, and how to obtain minimum transportation costs. On the other hand, there are efforts to differentiate products and other strategies in the form of localization economies that can be modeled with certain models such as the gravity model so that it can capture regional supply and demand [15].

Table 3 shows that the inter-regional effects are quite large from Central Java to Sulawesi and Bali + NTB + NTT, particularly in the petroleum refinery industry and water transportation sector. Meanwhile, the largest inter-regional effect for Central Java Province with each region is as follows (1) Central Java to Sumatra is the water transportation sector (equal to 0.0779); (2) Central Java to Java Others are electricity, gas and water sector (equal to 0.0348); (3) Central Java to Kalimantan is the water transport sector (equal to 0.1303); (4) Central Java to Sulawesi is the petroleum refining industry sector (equal to 1.9488); (5) Central Java to Bali + NTB + NTT is the water transportation sector (equal to 0.1429); and (6) Central Java to Maluku + North.Mal + Papua is the livestock sector and their products (equal to 0.0452). From this results, we can say that economic activity between the Central Java and Sulawesi Region has a strategic contribution and role. Where, the Sulawesi region is a representation of Indonesia in the Eastern region, so it is not surprising that the region tends to have a large spillover effect compared to other regions in the eastern part of Indonesia [6]. Whereas in the Kalimantan region, East Kalimantan Province is very dependent on the mining sector as an economic driver, besides the forestry sector. Of course, activities between regions will be stronger along with the planned move of the national capital to the Kalimantan region [2]. Economic development itself in the process always involves the industry, especially the industrial supply chain, because it will influence

and correlate with each other. For the mining and quarrying sector, it categorized in the sector or secondary industry, this sector is usually the input of other sectors because the sector provides the resources needed for economic development. Thus, the mining and quarrying sector tends to be upstream in relation to economic development. In practice, there are economic and geographical distance factors that can connect the mining sector with other sectors within the framework of regions, especially resources taken from one region to be transported to other regions [10].

Table 3. The Three Biggest Sector of Interregional Effect Between Central Java and Other Regions

Region		Economic Sector	Multiplier
Central .Java – Sumatera	26	Air transportation	0.0779
Central.Java – Sumatera	24	Land transportation	0.0681
Central.Java – Sumatera	25	Water transportation	0.0600
Central.Java - Other Java	20	Electricity, gas, and water	0.0348
Central.Java - Other Java	25	Water transportation	0.0327
Central.Java - Other Java	24	Land transportation	0.0309
Central.Java – Kalimantan	25	Water transportation	0.1303
Central.Java – Kalimantan	20	Electricity, gas, and water	0.1009
Central.Java – Kalimantan	26	Air transportation	0.0778
Central.Java – Sulawesi	9	Petroleum refining industry	1.9488
Central.Java – Sulawesi	20	Electricity, gas, and water	0.1220
Central.Java – Sulawesi	26	Air transportation	0.1160
Central.Java - Bali+NTB+NTT	25	Water transportation	0.1429
Central.Java - Bali+NTB+NTT	24	Land transportation	0.1225
Central.Java - Bali+NTB+NTT	26	Air transportation	0.1002
Central.Java – Maluku + North.Mal + Papua	4	Animal husbandry and other products	0.0452
Central.Java – Maluku + North.Mal + Papua	23	Hotel and restaurant	0.0303
Central.Java – Maluku + North.Mal + Papua	10	Food, beverage, and tobacco industry	0.0181

The animal husbandry and other products sector originating from Central Java to Maluku + North.Mal + Papua with inter-regional effect value of 0.0452 means that if there is an increase in demand in the sector in Central Java of one billion rupiah, it will increase the economic output in Maluku + North.Mal + Papua of 0.0452 billion rupiah. From the empirical results show that a link between the husbandry sector, hotel restaurants, and food - beverage; between the regions of Central Java and the regions of Maluku - North Maluku - Papua. The husbandry sector has an important role as an input for other sectors, not only the secondary sector (such as manufacturing) but also the tertiary sector. From these findings, we can see the potential of the tourism sector holding an important war on the regional economy in the future, although this study has not helped to provide a complete answer. From the consumer side as an economic actor, the husbandry and food beverages sector is one of the important industries to support the domestic tourism sector, because the biggest tourist expenditure is in these two sectors, in addition to the transportation sector, of course. Several studies also provide and support this, where the sector has a different role when promoting domestic tourism [8].

In addition, local governments need to encourage the contribution of the husbandry sector and other supporting sectors (such as agricultural sector), because this sectors can be an input for a variety of other economic sectors, in other words, not only a contributing input to the sector itself but also to secondary sectors (such as the manufacturing industry) and tertiary sector (such as hotel restaurant, food – beverage, and others). It has become an opportunity for increased cooperation between local governments to develop regional scale industries which can later be upgraded to national and even international scales based on animal husbandry, hotel restaurants, and food – beverages. So, it needs to be an effort from the local government to identify and encourage strengthening linkages between potential regions (at the district / city level) so the established collaboration can be created in order to support an increasingly competitive industry.

4. Conclusion

The paper provides the following conclusions: (1) sectors with the highest intraregional effect are the air transportation sector, the metal goods industry, and the industry for textile, leather goods, and footwear. These three sectors are located in other Java region; (2) the inter-regional effect is quite large from Central Java to Sulawesi and Bali + NTB + NTT, especially in the petroleum refinery industry and water transportation sector.

Suggestion given, (1) local government need to make sector which give the biggest value both in transactions intra/inter sector and inter sector/inter area as sector priority of regional development. (2) the development of this sector should consider the specialization of industrial types, especially at the district/cities level which has different characteristics. (3) for the next study, researchers can use graphical illustration to see the differences between regions more systematically as well as being able to see whether or not there is a significant relationship between regions. (4) It is necessary to include spatial relationships because several studies conclude that there are benefits to be gained when doing multiregional modeling so that complete information is obtained for policy makers at the regional level, when allocating resources and making the right decisions.

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