Assessing the Effects of Inter-Regional Spillover and Feedback in Indonesia

Arman [a], [*], Setia Hadi [b], Akhmad Fauzi [b], Noer Azam Achsani [b]

[a] Faculty of Bio-industry, University of Trilogi, Indonesia
[b] Department of Economics, Faculty of Economics and Management, Bogor Agricultural University, Indonesia

Abstract

The development and growth of economic in Indonesia shows a positive result, but the inequality between regions and quality of environment is still a major problem. Economic activity is centered on the Java Island, while other areas in eastern Indonesia lag behind. This study focuses on estimating the impact of inter-regional spillover and feedback. The data used is inter-regional input output data in 2005, then projected to year 2011 using the RAS technique. The research is conducted in Sulawesi (consisting of North Sulawesi, Gorontalo, Central Sulawesi and Southeast Sulawesi), South Sulawesi, East Java and East Kalimantan as well as ROI (rest of Indonesia). The result shows that the region of South Sulawesi produces the greatest spillover effect to other regions. It indicates South Sulawesi region can be a bridge with other regions to improve linkages and economic performance between regions. East Java generates the smallest spillover effect compared with other regions, but it produces a greatest feedback effect. The surprising result is south Sulawesi gives a little spillover effect to other Sulawesi areas, and vice versa. It shows that both regions have a weak interaction compared to the interaction with eastern Java.

Keywords: development, assesing, feedback, inter-regional, spillover.

1. Introduction

Economic disparities between different areas become the main problems in the economy and environment of Indonesia, where the area of Java controls over 60 % of gross domestic product (GDP). On the other hand, the economic contributions Kalimantan and Sulawesi each estimated to be about 9 % and 4 %. Aritenang (2008) showed that disparities in development between regions in Indonesia are still severe, even though economic decentralization is already running. Development gaps are quite severe in parts of eastern Indonesia, except in Sulawesi (Hill et al., 2008). Indonesia western section (comprised of Java and Sumatera) plays a dominant role in Indonesian economy, contributing around 80 %, while eastern Indonesia plays a very minor role (Kuncoro, 2013). Rustiadi and Priyarsono (2010) stated that imbalances between regions are the main problem to be solved by the government, as well as effects of development on environment conditions.

Amita and Kameron (2004) have showed the biggest obstacles that led to the development and industrialization of strategic industries outside Java due to the benefits of agglomeration are quite strong in Java. Java becomes a potential market for different types of industries that drive the

---

[*] Corresponding author
E-mail address: arman@universitas-trilogi.ac.id (Arman)

industry grow rapidly in the region. Challenges to accelerate the process of development among regions are to pay attention and understand *Indonesia's growth pole, leading sectors* in each province, *backward regions*, phenomena *debottlenecking infrastructure* and financial matters (Kuncoro, 2013).

Various studies on inequality in Indonesia less touche the spatial and economic interaction. This study emphasizes that the spatial aspects and interactions to assess the pattern of interregional linkages as a result of economic disparities between regions in Indonesia. Trade relations between the regions become a fundamental part to assess the extent of the economic impact across regions. This study aims to assess the spillover effect and the effect of feedback obtained due to the interaction of economic territory. Interdependent relationship of the various parts of the economic system is the most fundamental thing in economic analysis (Leontief, 1936). Isard (1951) say that there are two things that cause inter-regional economic relations, there are (1) because of the inequality of population distribution, income, in the broad sense of resources and (2) the existence of large-scale economic activity in certain regions. Demographic factors provide the most powerful influences on final demand (Feldman, et al., 1987). Chenery, et al (1962) reveal that changes in every industrial output in the region is caused by four things: (1) changes in the composition of domestic demand, (2) changes in the volume of exports, (3) changes in the volume of imports and (4) changes in technology and organization.

Trinh et al (2000) explain that the flow of goods between regions vary greatly affect the economic development of the region. Effect of inter-regional spillover is an important factor in the growth of output area. Big city such as Huabei region in China is a region gain enormous spillover effects from other regions, but relatively small impact spillover to other regions (Meng, Qu, 2007). In the contrary, *interregional economic* often face constraints caused by the *imperfect factor mobility*, *imperfect factor divisibility* and *imperfect mobility of goods and services* (Hoover, Giarratni, 1999). Often inter-regional trade creates asymmetric development of the region. Hughes and Holland (1994) found that in the Washington area has occurred impact backwash effects and spread effect between the core-periphery in the region. Spread effect of core-periphery to the region is not strong. The results of the analysis of trade and industry indicate that the added value of prime importance in the core region of influence of weak backward linkages to the periphery. In contrast, economic growth in the periphery is more likely to be felt by core region due to the magnitude of the backward linkages of the periphery.

Besides demographic factors, spatial and export-import affecting the economic performance of the region, the more important factor is human resources. Superior human resources are capable in stimulating and produce variety of innovations and new technologies. Technological invention and innovation will stimulate economic diversification, creating a chain of economy; generate more complex economy and stable (Hausman, et al., 2011).

The newest study of this research is to assess the economic benefits that occur between regions due to the economic interaction between the regions. The results show that there is an economic paradox occurred in eastern Indonesia, especially in the region of Sulawesi and East Kalimantan. Both regions rich in natural resources in agriculture, fishery, plantation and mining but is still a small contribution to the development of Indonesia. So far the economic disparities are often seen as the impact of development, but in this study further explore how inter-regional linkage pattern as a result of imbalances between regions. This research is expected to enrich the study of the economic linkages between the regions. On the other hand, the results of the study are expected to provide information and give you the option of government in formulating economic development between regions in Indonesia.

The method used to answer the research questions is inter-regional input-output (IRIO). IRIO is not only to estimate the stimulus production region of origin due to the increase in the final demand of other regions, but also the effect of final demand from other regions (Kwangmoon et al., 2010). The IRIO method can only be estimated and simulated in the table of final demand, while the intermediate input cannot be used as a basis to conduct inter-regional policy simulations. Therefore, further research is strongly recommended using the Computable General Equilibrium (CGE).

2. Data and Method
2.1 Data

The data used in this research is secondary data inter-regional input-output (IRIO) sourced from the Central Statistics Agency (BPS), Indonesia. The IRIO data used is the data in year 2005 because the data for the year 2011 is not yet available. Furthermore, the data are adjusted and estimated to the Year 2011 by using the technique of RAS. To meet the RAS technique, Gross Domestic Product data is collected from every region. The data are used to estimate and project the IRIO data in 2011. The estimated data is the data in 1 period, that is year 2011.

2.2 Method

The method is non-survey research or indirectly approach with a technique using RAS. RAS method is required to estimate coefficients of technology and trade between regions (Miller, Blair, 2005; Capello, Nijkamp, 2009). Leontief (1936) coefficient of technology is the basis to justify and estimate the value of the coefficient multiplier. The value of the coefficient multiplier is the ratio of inputs used in a particular sector and region ROI (rest of Indonesia) to the total use of inputs in the area.

$$A_{ij}^{AA} = \frac{x_{ij}^{AA}}{x_j^A} \qquad ; \qquad A_{ij}^{AB} = \frac{x_{ij}^{AB}}{x_j^B} \quad \text{.. (1)}$$

A_{ij}^{AA} = The coefficient input from the i sector in A region used j sector in A region

x_{ij}^{AA} = The used of i input sector from A region by j sector in A region

x_j^A = The total of use in i input sector by j sector in certain region

A_{ij}^{AB} = The coefficient input in trade between region

x_j^{AB} = The use of sector i output from A region, as the j input sector in B region

x_j^B = The total of use in input of j sector in B region

A = The matirx of input coefficient

Based on Isard (1951), Miller and Blair (2009) the IO inter-regional model with 5 regions can be formulated:

$$X = (I - A)^{-1} Y = B.Y \quad \text{.. (2)}$$

Where X, A, Y and B each of them is the output vector, matrix coefficient of inter-regional input, final demand vector and invers matrix of inter-regional leontief.

2.3 Data Projection

The IRIO data in 2005 can be estimated to Year 2011 with a number of considerations: (1) technology is relatively stable coefficient and (2) the structure of the economy of the region has not changed. Some of these considerations do not interfere with the basic assumption that the analysis of input-output (1) Linearity, (2) and proportionality (3) additivity and (4) homogeneity. The number of sectors is projected to consist of 35 sectors.

3. Results And Discussion

The economic linkages is based on the analysis of the region around sulawesi, South Sulawesi, East Java dan East Kalimantan.

3.1 Around Sulawesi

The results of this study is to describe the relationship and interaction between the region of South Sulawesi, the region around Sulawesi, East Kalimantan and East Java, as well as the entire region. Relations between the regions reflected on the effect of spillover, the feedback and inter-regional multiplier.

The region around Sulawesi is characterized as an agricultural region. The agricultural sector is the sector that produces the largest output in the economy. However, the sector has smaller added value than the other sectors. The sectors that generate most major spillover effect on the economy of the region around Sulawesi are the sector of air transport, electricity, gas and water,

construction and pulp and paper industries. In details the value of interregional multiplier effect, spillover and feedback in the region around Sulawesi are presented in Table 1.

Table 1. Impact of interregional, spillover and feedback in the region around Sulawesi

No	Sector	Interregional Multiplier Effect	Feedback Effect	Spillover Effect	Total Multiplier Effect
1	Air transportation	1.8504	0.0002	0.5483	2.3989
2	Building/Infrastructure	1.6426	0.0002	0.4929	2.1358
3	Electricity, gas & water	1.6852	0.0002	0.4661	2.1514
4	Pulp & Paper Industry	1.1317	0.0004	0.4535	1.5856
5	Footwear Industry	1.2842	0.0007	0.3830	1.6679
6	Land Industry	1.5005	0.0001	0.3296	1.8302
7	Rubber Industry	1.1408	0.0007	0.3116	1.4531
8	Water Transportation	1.3827	0.0001	0.2848	1.6677
9	Hotel & Restaurant	1.5932	0.0002	0.2437	1.8371
10	Iron & Steel Industry	1.7124	0.0002	0.2393	1.9519
Total multiplier		45.103	0.0057	6.4478	51.556

Source: Table IRIO-RAS 2011 after being processed

Based on the estimation in Table 1 above, it shows the total interregional multiplier effect, feedback and spillover to the economy of the region around Sulawesi with other regions amounted to 45.103 respectively, 0.0057 and 6.4478. That influence reflects that if final demand across all sectors each increased by 1 in the region around Sulawesi then the output of the economy in the region around Sulawesi will increase by 45 103. The increase in economic output around Sulawesi region will give a spillover effect on other regions (South Sulawesi, East Java, East Kalimantan and ROI) of 6.4478. The increase in output of other regions gives feedback to the economic output of the regions around Sulawesi in 0.0057.

The sector, which generates a multiplier effect, is the transportation sector. The second and third sectors that give major contribution to the region are the sector of infrastructure and the electricity, gas and water. On the other hand, the value of the feedback effect of these three sectors is smaller than the footwear and rubber industry. It means that the performance of the transportation sector, electricity and infrastructure provide a good influence to other regions, but the feedback effect is still smaller than the footwear industry and rubber industry. It shows that the economic performance of other regions provides a better effect on the footwear and rubber industry compare to transportation, infrastructure and electricity sectors.

The role of the air transportation sector is driven by the growing needs. Currently, the industry and infrastructure of aviation develop in the region of Sulawesi. The transport sector is opened in order to open access and facilitate investment in various regions in Indonesia. The development of the transportation sector is expected to improve the economic performance of the region and reduce economic disparities between regions. The development of the air transportation sector followed by the development of the infrastructure sector and the electricity and water sectors. To strengthen inter-regional connectivity, the development of infrastructure becomes a priority. The infrastructure sector linearly follows the performance of air transportation. Furthermore, the electricity and water sector follow the development of the air transportation and infrastructure sector.

The result indicates that the spillover effect the around Sulawesi to the whole region (Indonesia) is about 6.4478. On the other hand, the entire region (Indonesia) gives small feedback effects (0.0057) to the region around Sulawesi. It shows the economic benefit received by the region around Sulawesi is still low. That happens because other regions are able to meet between the sources of the home region than any other regions. On the other hand, the region around Sulawesi requires relatively large intermediate inputs from other regions. The economy interaction becomes not symmetric due to the influence of economic power between regions and industries. Although some sectors in the region around Sulawesi has a good performance, but the economy interaction is still weak. It also indicates that the area around Sulawesi still relatively dependent on

other regions in Indonesia. In detail total interregional multiplier, spillover and feedback on Sulawesi of the other is presented in Figure 1.
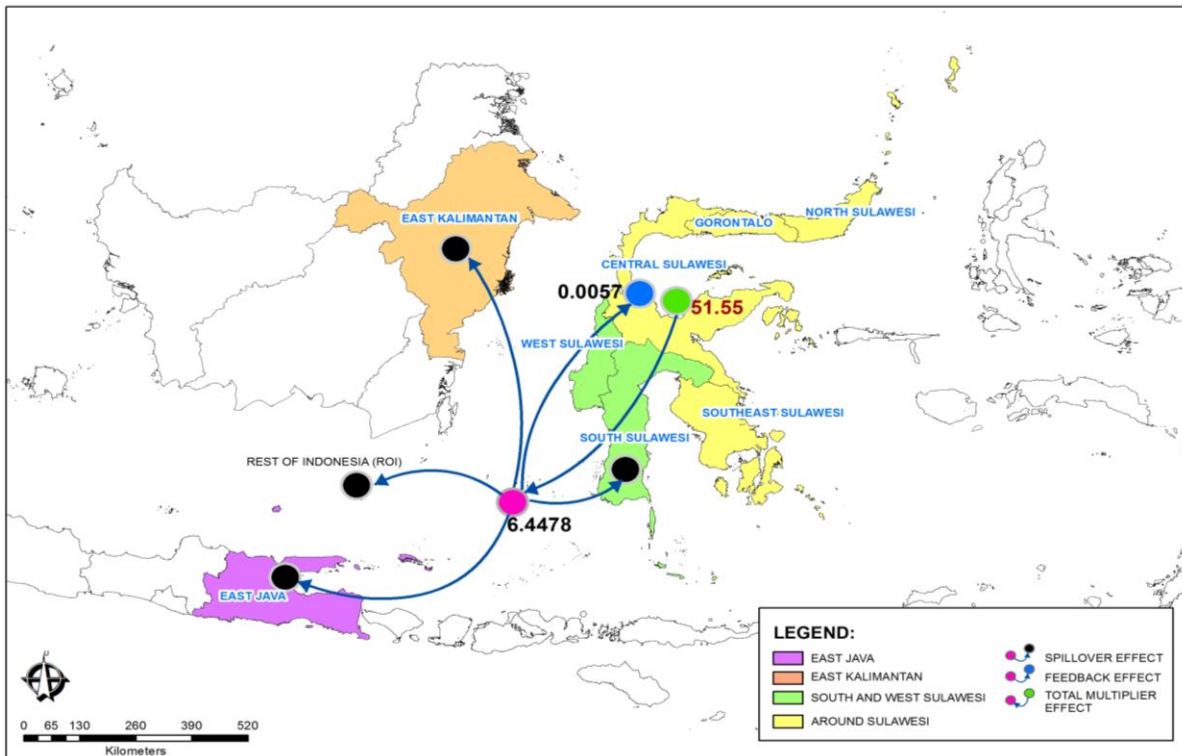

Fig. 1. Total interregional multiplier, spillover and feedback in Around Sulawesi

3.2 South Sulawesi

South Sulawesi region has started to develop into a regional industrialization and trade (initially still agriculture). However, the agricultural sector has not been able to participate to the maximum in driving regional economic output. There are three main sectors that produce spillover effect and the multiplier effect that the air transport sector, the sector of electricity, gas and water, as well as the textile industry. The influence of interregional, spillover, feedback in South Sulawesi presented in Table 2.

Table 2. Effect *interregional*, *spillover* and *feedback* in South Sulawesi

No	Sector	Interregional Multiplier Effect	Feedback Effect	Spillover Effect	Total Multiplier Effect
1	Air transportation	1.3989	0.0003	0.7488	2.1481
2	Building/Infrastructure	1.2789	0.0003	0.6081	1.8874
3	Electricity, gas & water	1.4458	0.0007	0.5654	2.0118
4	Pulp & Paper Industry	1.3605	0.0012	0.5653	1.9271
5	Footwear Industry	1.2204	0.0002	0.4691	1.6897
6	Land Industry	1.2094	0.0006	0.4534	1.6633
7	Rubber Industry	1.3233	0.0002	0.4489	1.7725
8	Water Transportation	1.4920	0.0005	0.4315	1.9241
9	Hotel & Restaurant	1.2110	0.0014	0.3982	1.6106
10	Iron & Steel Industry	1.6120	0.0003	0.3617	1.9739
Total multiplier		44.727	0.0098	8.6444	53.381

Source: Table IRIO-RAS 2011 after being processed

Based on the estimation in Table 2, it shows that the total interregional multiplier effect, feedback and spillover to the economy of South Sulawesi with other regions amounted to 44.727, 0.0098 and 8.6444. These values reflect the increase in economic output in South Sulawesi region will provide spillover impact in Indonesia (the region around Sulawesi, East Java, East Kalimantan and ROI) of 8644. The increase in output throughout the region (Indonesia) provides feedback to the output of economic in South Sulawesi region about 0.0098.

As in around Sulawesi, the air transportation sector in South Sulawesi begins to grow compared to other sectors. South Sulawesi region is a transit area of the flight path from western to eastern Indonesia, and vice versa. Low volume increased significantly due to the influence of investment, the mobility of people and the economic development of the region. Along with the development of the air transportation sector and investment and development of the region, the need for electricity and water sector increase. But the performance of these two sectors has a feedback effect that is still smaller than the other regions.

The sectors, which have a better feedback effect is the textile, rubber and petrochemical industry. These three sectors are not only influenced by the economic performance of the area of origin, but also by other regions. It reflects the economic linkages between regions provide substantial benefits to those industries. The development of the industrial sector in South Sulawesi has developed because of agglomeration economies have been formed. The industrial area in South Sulawesi (as a growth pole) gradually gives spread effect and creates economic linkages between regions.

In general, the estimation results indicate that South Sulawesi is a region that most influence spillover to other regions (greater than in the areas of Sulawesi, East Java and East Kalimantan). However, the number of the feedback effect of the whole region (Indonesia) to the South Sulawesi at 0.0098. The feedback influence of South Sulawesi is still greater than the area around Sulawesi. It shows that the economic interaction of South Sulawesi is still better than other area around Sulawesi. However, the value of the effect of feedback in South Sulawesi is still low compared to East Java. It shows the economic performance of East Java is better than South Sulawesi. In detail the total interregional multiplier effect, spillover and feedback in South Sulawesi is presented in Figure 2.
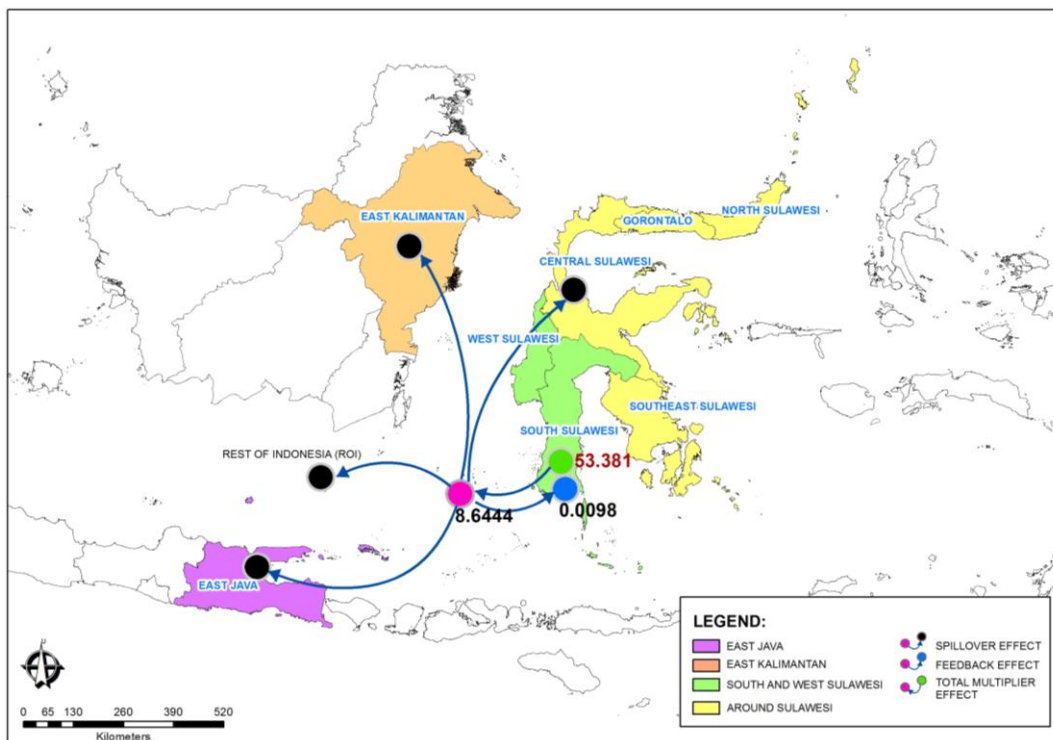

Fig. 2. Total *interregional multiplier*, *spillover* and *feedback* in South Sulawesi

3.3 East Java

East Java is an area, which, is very strong and complex of industrial agglomeration and economic activity. The economic output of East Java is far surpasses than other areas. The role of East Java in Java Island and Indonesia is very important to support the provision of inputs among other areas. The greatest impact of spillover to other areas is the industrial sector of electrical machinery and electrical equipment, the palm oil industry and air transportation. Those three sectors provide a high feedback to East Java region. The influence of interregional, spillover and feedback in East Java are presented in Table 3.

Table 3. The Effect of *inter-regional*, *spillover* and *feedback* in East Java

No	Sector	Interregional Multiplier Effect	Feedback Effect	Spillover Effect	Total Multiplier Effect
1	Electrical Machinery Industry	1.3580	0.0118	0.7604	2.1302
2	Oil Palm Industry	1.3893	0.0063	0.6012	1.9969
3	Air Transportation	1.6268	0.0057	0.4383	2.0708
4	Rubber Industry	1.5216	0.0033	0.3582	1.8830
5	Water Transportation	1.2331	0.0042	0.3399	1.5772
6	Textile Industry	1.2756	0.0025	0.3049	1.5829
7	Electricity, Gas & Water	1.6669	0.0020	0.1765	1.8454
8	Building	1.7336	0.0036	0.1520	1.8892
9	Seafood Processing Industry	1.4196	0.0015	0.1384	1.5595
10	Land Transportation	1.0590	0.0017	0.1324	1.1931
	Total multiplier	46.782	0.0762	4.7758	51.721

Source: Table IRIO-RAS after being processed

Based on the estimation in Table 3 shows the total interregional multiplier effect, feedback and spillover to the economy of East Java with other regions about to 46 782 respectively, 0.0762 and 4.7758. That influence reflects that the economy of East Java will provide spillover effect on the entire territory or Indonesia (Sulawesi, East Kalimantan and ROI) of 4.7758. The increase in output throughout the region (Indonesia) gives the feedback effects to the economic output of the East Java region of 0.0762.

However, the total value of the spillover effect of the East Java region to other regions is much lower than South Sulawesi region, the region around Sulawesi and East Kalimantan. On the other hand, the feedback effects of sectors in East Java are relatively better than other regions (South Sulawesi, the region around Sulawesi and East Kalimantan). This reflects that the East Java's economy gives a little spread effect on the economy of the entire region. East Java's economy tends to give a backwash effect to other regions. The region in East Java gets big benefit and advantage from interactions with regions in Indonesia.

The advantages are; first, the area of East Java gets benefit from the economic performance of other regions. It shows from the value of the feedback effect (0.0762) in the East Java region. Second, economic performance provides a large output of the East Java region but little impact on the economies of other regions. Third, the economic development of East Java will continue to stimulate the economic development of the area, but other areas will be difficult to accelerate when there is no innovation and change in national policy.

The condition of economic and industry are better than any other regions (Sulawesi and Kalimantan). The economic activity in East Java has the effect of forward linkage and backward linkage better than other regions. It shows that inputs for industrial activity are available in larger quantities and industrial output can be absorbed by the import and export market. Demographics and technology factors in East Java provides a better economic scale and scope than other regions.

It causes economic agglomeration to grow and develop thereby increasing industrial investment. This situation led the East Java region grows faster than other regions. The asymmetrical developments led to economic imbalances between the regions. In details, the total effect of interregional, spillover and feedback in East Java is presented in Figure 3.
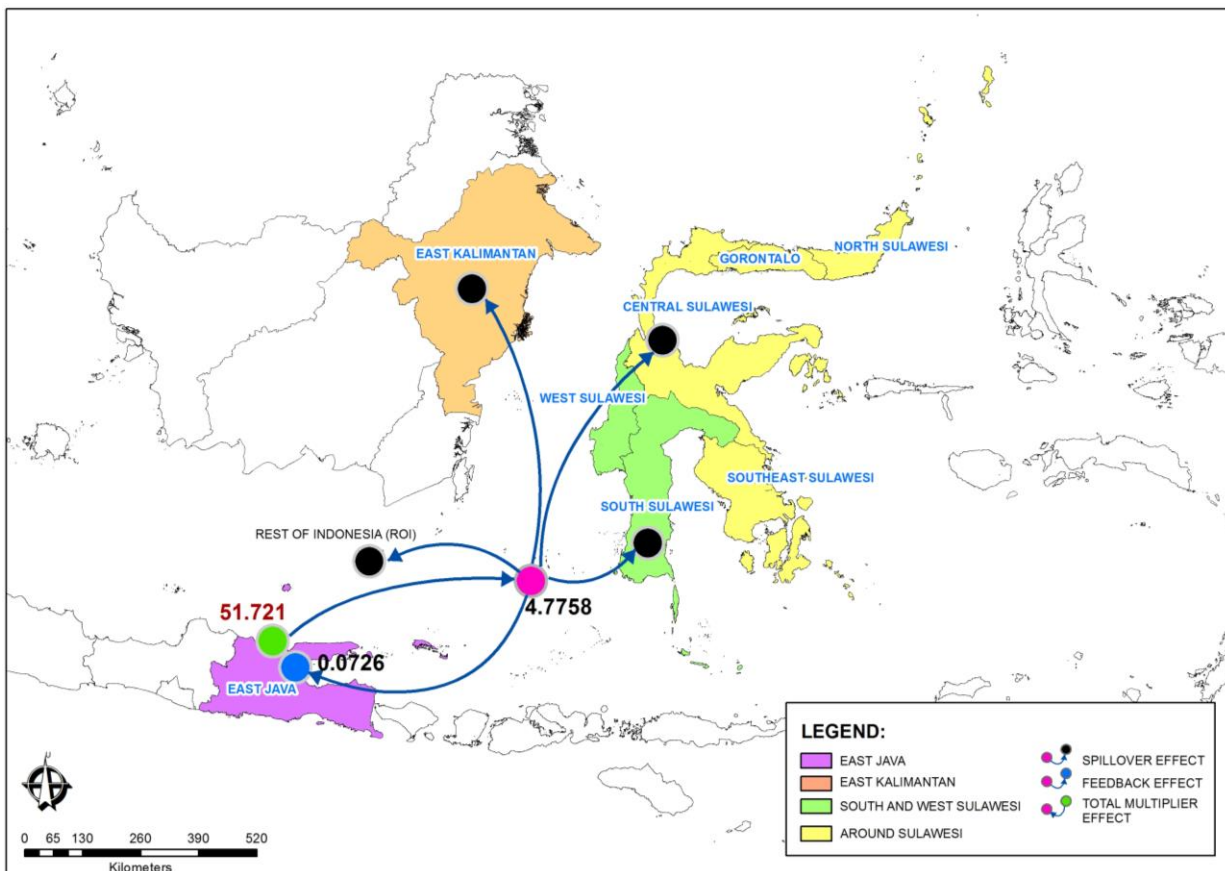

Fig. 3. Total *interregional*, *spillover* and *feedback* in East Java

3.4 East Kalimantan

Unlike the three areas previously discussed, East Kalimantan is a region characterized by the extraction of natural resource economics. More than 40 % of the economy of East Kalimantan region comes from coal mining and oil. But the performance of the mining sector only encourages the economic performance of the supply side but it is still smaller than the demand side. Some factors that may cause the performance of the coal sector to be low on the supply side are (1) production for coal mines is not into the domestic market, (2) the product is sold exports, (3) the product is marketed in the form of raw material that has low value added, and (4) the use of coal by another country or region is larger than the region of origin.

Unfortunately, the potential of mining in East Kalimantan has not been optimally used by the government. That's why East Kalimantan has not been able to reduce disparities with other regions in Indonesia. The government prefers raw materials to be exported, without considering the construction of coal processing industry. Coal actually can be used as a source of energy that can propel industrial and economic development. Government needs to have strict regulations so that coal is not exported to other countries in the form of raw materials. This regulation is expected to increase the use of coal energy for processing a wide variety of industries in Kalimantan. It will also create inter-regional linkage is more strategic in Indonesia.

The sectors that provide the biggest spillover effect to other areas are the industrial sector and improved transportation, textile industry and husbandry. Many activities of coal mining, oil palm plantation and industrial tree plantations led to an increased need for transportation in East Kalimantan. It makes the industrial transportation sector in East Kalimantan give a large spillover

effect on other regions (especially in East Java). The sector that gets the feedback effect in East Kalimantan is the textile industry and husbandry. The interregional multiplier effect, spillover and feedback in East Kalimantan are presented in Table 4.

Table 4. The impact of *interregional*, *spillover* and *feedback* di East Kalimantan

No	Sector	Interregional Multiplier Effect	Feedback Effect	Spillover Effect	Total Multiplier Effect
1	Transportation Equipment Industry	1.3683	0.0004	0.4905	1.8592
2	Textile Industry	1.3122	0.0012	0.4426	1.7560
3	Animal Husbandry	1.3970	0.0009	0.3586	1.7565
4	Footwear Industry	2.0377	0.0003	0.3359	2.3739
5	Iron & Steel Industry	2.0377	0.0003	0.3359	2.3739
6	Metal Industry	2.0377	0.0003	0.3359	2.3739
7	Electric Machine Industry	2.0377	0.0003	0.3359	2.3739
8	Cement Industry	1.0377	0.0003	0.3359	1.3739
9	Hotel & Restaurant	1.5066	0.0008	0.2962	1.8036
10	Air Transportation	1.6485	0.0006	0.2866	1.9357
	Total multiplier	49.321	0.0112	5.4608	54.793

Source: Table IRIO-RAS 2011 after being processed

Based on the estimation in Table 4 above shows the total multiplier effect of interregional, feedback and spillover to the economy of East Kalimantan with other regions amounted to 49.321 respectively, 0.0112 and 5.4608. The influence reflects that the increasing output of the economy of East Kalimantan will provide spillover effects on other regions (South, East Java and ROI) of 5.4608. The increase in output of other regions provides feedback effect on the output of the regional economy in East Kalimantan at 0.0112.

In general, the estimation results in East Kalimantan shows that the effect of spillover to other regions is smaller than the area around Sulawesi and South Sulawesi, but larger than the area of East Java. The feedback effects obtained by the East Kalimantan region is 0.0112. The performance of the mining sector in East Kalimantan is not yet optimal in boosting the regional economy. The interregional total multiplier effect, spillover and feedback in East Kalimantan are presented in Figure 4.
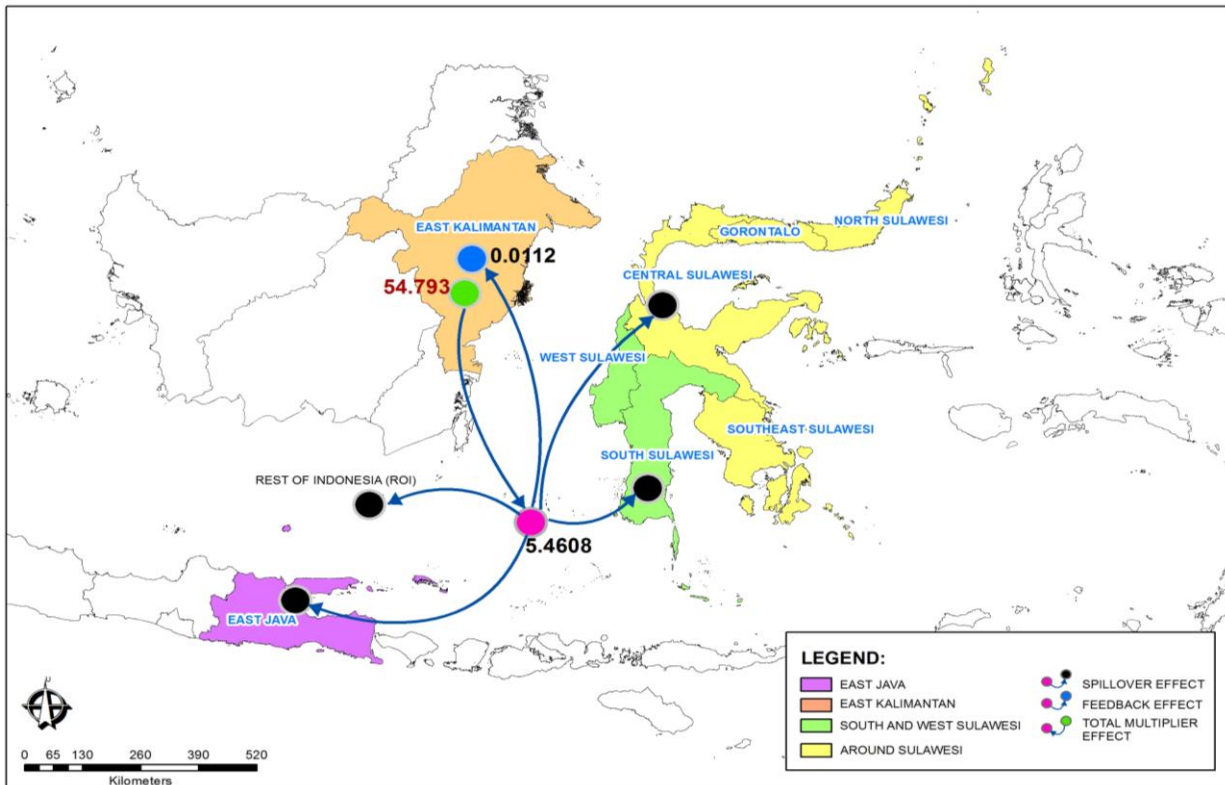
Fig. 4. The impact of *interregional*, *spillover* and *feedback* in East Kalimantan

Based on the analysis in each region, the important findings in the research are presented in the Table 5 below.

Table 5. Important findings in the research

No	Sector	Interregional Multiplier Effect	Feedback Effect	Spillover Effect	Total Multiplier Effect
The Around Sulawesi					
1	Air transportation	1.8504	0.0002	0.5483	2.3989
2	Building/Infrastructure	1.6426	0.0002	0.4929	2.1358
3	Electricity, gas & water	1.6852	0.0002	0.4661	2.1514
South Sulawesi					
1	Air transportation	1.3989	0.0003	0.7488	2.1481
2	Building/Infrastructure	1.2789	0.0003	0.6081	1.8874
3	Electricity, gas & water	1.4458	0.0007	0.5654	2.0118
East Java					
1	Electrical Machinery Industry	1.3580	0.0118	0.7604	2.1302
2	Oil Palm Industry	1.3893	0.0063	0.6012	1.9969
3	Air Transportation	1.6268	0.0057	0.4383	2.0708
East Kalimantan					
1	Transportation Equipment Industry	1.3683	0.0004	0.4905	1.8592
2	Textile Industry	1.3122	0.0012	0.4426	1.7560
3	Animal Husbandry	1.3970	0.0009	0.3586	1.7565

4. Conclusion

This study has been assessing the economic linkages between regions in Indonesia through the projection IRIO 2005 to 2011. This estimation is based on the pattern and inter-regional economic interaction in Indonesia. Patterns and interactions that occur in the area around Sulawesi with other regions yet give better feedback effect. It appears once; the economic performance of the region around Sulawesi is lower than in other regions (see spillover effect and feedback) even though in some sectors the economic performance is quite good. It also shows how the quality of the region's economy around Sulawesi with another region is.

East Java region gives contribution and influence to the Indonesian economy. Unfortunately, the economic impact on the region of East Java has led to another backwash effect. That means the economic growth of East Java provides little effect on other regions. However, economic growth of Sulawesi gives large spillover effect on the region of East Java.

East Java is still very dominant in the economic dimension because of agglomeration and industrialization is very strong. East Java generate spillover effect of the smallest compared with other regions, but it produces a feedback effect is greatest. It shows the area of East Java provides a spread effect is relatively small compared with other regions, but tends to cause backwash effect. Economic activity in East Java appears to be more efficient and effective because of the agglomeration is still very strong.

The influence of agglomeration provides enormous benefits to the economy in East Java. Industry in East Java has a forward linkage and backward linkage better than other regions. It encourages investment and growing industries in East Java, while other regions are relatively slow development (except in South Sulawesi).

South Sulawesi region's position is very strategic, because it is able to bridge in eastern Indonesia. That is why South Sulawesi gives the greatest spillover affect compared with other areas and obtains feedback effect is better than the area around Sulawesi. In addition, South Sulawesi gives the feedback effect better than the area around Sulawesi.

Although the mining sector in East Kalimantan is a major sector, but the sector has not been able to push to the maximum economic performance in East Kalimantan and other regions. Inter-regional spillover and feedback in East Kalimantan is more influenced by the industry.

Indonesia's economy would create imbalances of development and environmental limitations when there is no strategic policy of the government. Strategic policy to build in the eastern Indonesian region is (1) Encourage the increase of capital expenditure of the central government to the island of Sulawesi and East Kalimantan, (2) Encourage private investment in the industrial sector and production base in the island of Sulawesi and East Kalimantan, (3) Encourage South Sulawesi region as an economic hub towards other regions, especially the eastern part of Indonesia, (4) increase and improve inter-connectivity between South Sulawesi region by region around Sulawesi in order to create economic linkages across the region, (5) encourage the inter-regional capital movement to Sulawesi and East Kalimantan to ensure equal distribution of development and stable environment among regions, (6) create linkage sectors (downstream industry) mining (East Kalimantan) and plantations (Sulawesi) within and between regions, and (8) Strengthen economic territory of interregional Linkage toward interregional Partnership.

References

[BPS] Badan Pusat Statistik, 2007 – Badan Pusat Statistik. (2007) .Sensus Ekonomi Nasional. Badan Pusat Statistik. Jakarta (In Bahasa Indonesia).

Amita, Cameron, 2004 – *Amiti, M., & Cameron, L.* (2004). Economic Geography and Wages: The Case of Indonesia. IMF Working Paper Wp/04/79.

Chenery et al., 1962 – *Chenery, H.B., Shishido, S., & Watanabe, T.* (1962). The Pattern of Japanese Growth, 1914-1954. *Econometrica*, 30(1), 98-139.

Feldman et al., 1987 – *Feldman, S.J., McClain, D., & Palmer, K.* (1987). Source of Structural Change in The United States 1963-1978: An Input-Output Perspective. *Review of Economics and Statistics*, 69, 503-510.

Hausmann et al., 2011 – *Hausmann, R., Hidalgo, C.A., Bustos, S., Coscia, M., Chung, S., Jimenez, J., Simoes, A., & Yildirim, M.A.* (2011). The Atlas of Economic Complexity; Mapping Paths to Prosperity, Center for Internationl Development, Harvard University.

Hill et al., 2008 – *Hill, H., Resosudarmo, B. and Vidyattama, Y.* (2008). Indonesia's Changing Economic Geography", *Bulletin of Indonesian Economic Studies*, 44(3), 407-435.

Hoover, Giarratni, 1999 – *Hoover, E.M., & Giarratni, F.* (1999). An Intruduction Regional Economic, West Virgina University's Regional Research Institute.

Hughes, Holland, 1994 – *Hughes, D.W., & Holland, D.W.* (1994). Core-Periphery Economic Linkage: A Measure of Spread and Possible Backwash Effects for the Washington Economy. *Land Economics*, 7(3), 364-377.

Isard, 1951 – *Isard, W.* (1951). Interregional and Regional Input-Output Analysis: A Model of A Space-Economy. *The review of Economic and Statistic*, 33(4), 318-328.

Kuncoro, 2013 – *Kuncoro, M.* (2013). Economic Geography Of Indonesia : Can MP3EI Reduce Inter-Regional Inequality. *South East Asia Journal of Contemporary Business*, *Economic and Low*, 2(2), 17-33.

Kwangmoon et al., 2010 – *Kwangmoon, K., Francisco, S., & Hidefumi, K.* (2010). Measurement on inter-regional differentials and dependencies in the philippine economy based on a multi-region's interregional input-output table, paper presented at 11 th National Convention on Statistics, 4-5 October EDSA Shangri-La Hotel, available at: www.nscb.gov.ph/ncs/11thncs (accessed 20 February 2014).

Leontif, 1936 – *Leontif, W.* (1936). Quantitative Input and Output Relation in the Economic Sytem of teh United State. *The Review of Economic Statistic*, 8 (3), 105-125.

Meng, Qu, 2007 – *Meng, B., & Qu, C.* (2007). Application of the Input-Output Decompotition Technique to China's Regional Economies, paper presented at Institute of Developing Economies" April 2007, available at: www.ide.go.jp/English/Publish/Download/Dp/pdf/102.pdf (acessed 21 October 2016).

Miller, Blair, 2009 – *Miller, R.E. and Blair, P.D.* (2009). Input Output Analysis; Foundations and Extensions, Cambridge University Press.

Rustiadi, Priyarsono, 2010 – *Rustiadi, E., & Priyarsono, D.S.* (2010). Regional Development in Indonesia: Problems, Policies, and Prospect, Regional Development in indonesia, Crestpent Press. Bogor.

Trinh et al., 2012 – *Trinh, B., Kobayashi, K., Quang, T.N., & Viet, P.N.* (2012). Multi-interregional economic impact analysis based on multi-interregional input output model consisting of 7 regions of Vietnam, 2000. *Journal of Finance and Investment Analysis*, 1(2), 83-117.

Appendix

The formulation:

$$X = \begin{pmatrix} X^A \\ X^B \\ X^C \\ X^D \\ X^E \end{pmatrix}, A = \begin{pmatrix} X_{ij}^{AA} & X_{ij}^{AB} & X_{ij}^{AC} & X_{ij}^{AD} & X_{ij}^{AE} \\ X_{ij}^{BA} & X_{ij}^{BB} & X_{ij}^{BC} & X_{ij}^{BD} & X_{ij}^{BE} \\ X_{ij}^{CA} & X_{ij}^{CB} & X_{ij}^{CC} & X_{ij}^{CD} & X_{ij}^{CE} \\ X_{ij}^{DA} & X_{ij}^{DB} & X_{ij}^{DC} & X_{ij}^{DD} & X_{ij}^{DE} \\ X_{ij}^{EA} & X_{ij}^{EB} & X_{ij}^{EC} & X_{ij}^{ED} & X_{ij}^{EE} \end{pmatrix}, Y = \begin{pmatrix} Y^A \\ Y^B \\ Y^C \\ Y^D \\ Y^E \end{pmatrix}, B = \begin{pmatrix} B_{ij}^{AA} & B_{ij}^{AB} & B_{ij}^{AC} & B_{ij}^{AD} & B_{ij}^{AE} \\ B_{ij}^{BA} & B_{ij}^{BB} & B_{ij}^{BC} & B_{ij}^{BD} & B_{ij}^{BE} \\ B_{ij}^{CA} & B_{ij}^{CB} & B_{ij}^{CC} & B_{ij}^{CD} & B_{ij}^{CE} \\ B_{ij}^{DA} & B_{ij}^{DB} & B_{ij}^{DC} & B_{ij}^{DD} & B_{ij}^{DE} \\ B_{ij}^{EA} & B_{ij}^{EB} & B_{ij}^{EC} & B_{ij}^{ED} & B_{ij}^{EE} \end{pmatrix}$$

If X represents each sector and region, then matrix B can be decomposed into three parts, there are:

$$
\begin{pmatrix}
B_{ij}^{AA} & B_{ij}^{AB} & B_{ij}^{AC} & B_{ij}^{AD} & B_{ij}^{AE} \\
B_{ij}^{BA} & B_{ij}^{BB} & B_{ij}^{BC} & B_{ij}^{BD} & B_{ij}^{BE} \\
B_{ij}^{CA} & B_{ij}^{CB} & B_{ij}^{CC} & B_{ij}^{CD} & B_{ij}^{CE} \\
B_{ij}^{DA} & B_{ij}^{DB} & B_{ij}^{DC} & B_{ij}^{DD} & B_{ij}^{DE} \\
B_{ij}^{EA} & B_{ij}^{EB} & B_{ij}^{ED} & B_{ij}^{ED} & B_{ij}^{EE}
\end{pmatrix}
=
\begin{pmatrix}
\left(I - A^{AA}\right)^{-1} & 0 & 0 & 0 & 0 \\
0 & \left(I - A^{BB}\right)^{-1} & 0 & 0 & 0 \\
0 & 0 & \left(I - A^{CC}\right)^{-1} & 0 & 0 \\
0 & 0 & 0 & \left(I - A^{DD}\right)^{-1} & 0 \\
0 & 0 & 0 & 0 & \left(I - A^{EE}\right)^{-1}
\end{pmatrix}
+
$$

$$
\begin{pmatrix}
B^{AA} - \left(I - A^{AA}\right)^{-1} & 0 & 0 & 0 & 0 \\
0 & B^{BB} - \left(I - A^{BB}\right)^{-1} & 0 & 0 & 0 \\
0 & 0 & B^{CC} - \left(I - A^{CC}\right)^{-1} & 0 & 0 \\
0 & 0 & 0 & B - \left(I - A^{DD}\right)^{-1} & 0 \\
0 & 0 & 0 & 0 & B - \left(I - A^{EE}\right)^{-1}
\end{pmatrix}
+
$$

$$
\begin{pmatrix}
0 & B_{ij}^{AB} & B_{ij}^{AC} & B_{ij}^{AD} & B_{ij}^{AE} \\
B_{ij}^{BA} & 0 & B_{ij}^{BC} & B_{ij}^{BD} & B_{ij}^{BE} \\
B_{ij}^{CA} & B_{ij}^{CB} & 0 & B_{ij}^{CD} & B_{ij}^{CE} \\
B_{ij}^{DA} & B_{ij}^{DB} & B_{ij}^{DC} & 0 & B_{ij}^{DE} \\
B_{ij}^{EA} & B_{ijij}^{EB} & B_{ij}^{EC} & B_{ij}^{ED} & 0
\end{pmatrix}
$$

The output of region A can get by combining the equation (2) with the equation above with this formulation:

$$
X^{A} = \left(I - A^{AA}\right)^{-1} Y + \left[B - \left(I - A^{AA}\right)^{-1}\right] Y +
$$
$$
\left[B^{AB} Y^{2} + B^{AC} Y^{3} + B^{AD} Y^{4} + B^{AE} Y^{5}\right] \quad \text{.................................} (3)
$$

The equation (3) contains with three parts, there are (1) reflecting the inter-regional multiplier effect, (2) feedback effect and (3) interregional spillover effect. The interregional spillover effect reflects the total added value as the result from one sector towards the economy due to the high final demand. *Interregional spillover effect* reflects the effect of economy output as the result of certain sector in a region due to the output demand from another sector. Feedback effect reflects the feedback from the region, which have the spillover effect. Feedback effect is the interaction effect of both inter-regional trades.