

## Food Sector Analysis in Indonesia: A Social Accounting Matrix (SAM) Approach

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### **Abstract**

*Indonesia has a long history in the agricultural management sector. The economic development in Indonesia shows that the development of the agricultural sector has a made great contribution to the change in the Indonesian economy. Agriculture also has an important role in providing employment. providing raw materials for other sectors. as foreign exchange. and as the basis for the food security of the Indonesian population. In the national policy. the government has prioritized the subsidies in the agricultural sector to stimulate it to be more productive. This research has some aims i.e.: to describe the role of the agricultural sector based on the distribution of household income groups in Indonesia; to describe the impact of household income level groups if the subsidies in the agricultural food sector or Indonesia have increased. The research was conducted by using the analysis of Social Accounting Matrix (SAM) with 2008 database. The food sectors are classified into: sector production of: rice. corn and soybeans. other crops. poultry meat (traditional farms). poultry meat (medium and large farms). eggs. forestry and hunting. fishing and others. The results of the study after the policy injection (simulation) show that the food industry has experienced a significant increase in productivity among the economic sectors. Agricultural entrepreneurs are the group that experienced a high increase in income among farming households. In addition. linkage analysis showed that the commodities of other food industries has experienced forward and backward linkages.*

**Keyword:** sector, food, policy, SAM, revenue

**JEL Classification:** D30, D50

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### **1. INTRODUCTION**

The agricultural sector is the core source of food in Indonesia. Currently, the development of the agricultural sector has contributed greatly to the change in the Indonesian economy. It has an important role not only for food security but also for providing employment. The importance of the agricultural sector also includes provision of raw materials for other sectors beyond agriculture. However, the agricultural sector has not been able to fully support our national food security program. This is evidenced by the

high volume of imports of some agricultural products such as rice, corn, soybeans, sugar, wheat flour, beef and poultry. The imported products are mainly from Thailand, Malaysia, Vietnam, China, Australia and others. It is inevitable that there are deficiencies in several aspects of the infrastructure which cause the agricultural productivity to remain low. Therefore, it is necessary to boost the productivity of this sector with a wide range of policy schemes. Among the policies that are being continually improved are the provision of quality seeds, fertilizers, repair of irrigation

systems and water supplies. Subsidizing the food sector must be given a priority to decrease food import in Indonesia and increasing efforts to increase productivity. If there is an increase in the productivity of the agricultural sector, the food sector can see increased income and welfare of some groups of households, especially the farming households in both rural and urban area. For example, the government policy in 2008 which was related to agricultural sector investment. Subsidies were given to farmers' production facilities, particularly fertilizers. The fertilizer price subsidy aim was to help farmers in the provision and use of fertilizers in accordance with six precise criteria (time, price, type, quantity, quality, and place). There was an increased subsidy of fertilizer from 5.7 million tons in 2005 to 7.0 million tons in 2008. The main objective of the policy was for the price of fertilizer subsidies to reach the target group households (Simorangkir & Adamanti, 2010). Another objective was to protect farmers prices of domestic agricultural products and to provide affordable prices for the community which could compete in the market.

Governments prioritize the food sector by providing subsidies to stimulate it to be more productive and to bring positive impacts. This research aims to find out the income multiplier and the output multiplier by using SAM analysis tools. There are some sectors which can be positively affected if governments make efforts to increase the productivity of their food sector through subsidies. Under these conditions, this study used the data of SAM in 2008 focusing on three main objectives:

1. To investigate the changes in household income level group when the food sector subsidy increased.

2. To examine the changes in economic sectors related to the food sector when the subsidy of the food sector increased.
3. To find out how much forward and backward linkages for each commodity structure of the economy will be obtained.

This study provides some inputs for governments which could lead to policy direction in order to increase productivity of the food sector. In addition, it also proposes a simulation or scenario for the community which can give an overview of policies relating to food security in Indonesia. For future researchers, this study could be a reference for a preliminary study to further the implementation of a more comprehensive study. This research was conducted with the scale of the national data base SAM 2008 for some sectors among them is agriculture and chemicals (fertilizer). The two sectors were disaggregated into 13 sub-sectors. Sectors that had been collapsed they will be improving productivity through subsidy.

## **2. THEORETICAL FRAMEWORK AND HYPOTHESES**

### **Subsidies in Agricultural Sector**

A subsidy is the provision given by the government to companies or households to achieve certain goals that make them able to produce or consume a product in a larger quantity or cheap price. Subsidies can be either in the form of transfer payments (such as food stamps and housing) or assistance in the agricultural sector (Ericson, et.al. 1998). In the form of goods, subsidies are given by providing a certain amount of goods to consumers free of charge or with payment below market price (Handoko and Patriadi, 2005).

In developing countries, subsidies are fiscal instruments to encourage productivity and improve

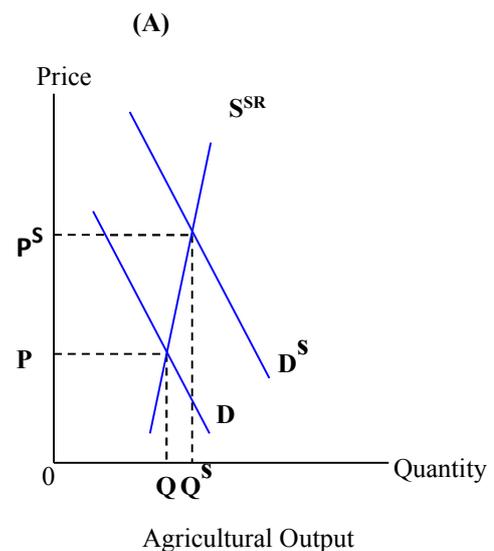
welfare (Norton, 2004). Subsidy transfer is a means of redistribution of welfare among the population, and between producers and consumers. To realize the important role of this subsidy contribution, the Indonesian economy still uses this subsidy instrument. From the institutional side, lowering taxes and increasing subsidies could raise the income and purchasing power of households. Higher incomes would support an increase in household consumption (Simorangkir & Adamanti, 2010). However, as mentioned earlier, the subsidies have a negative effect and can create inefficient allocation, wasteful use of resources, and likely to be poorly targeted (Basri, 2002).

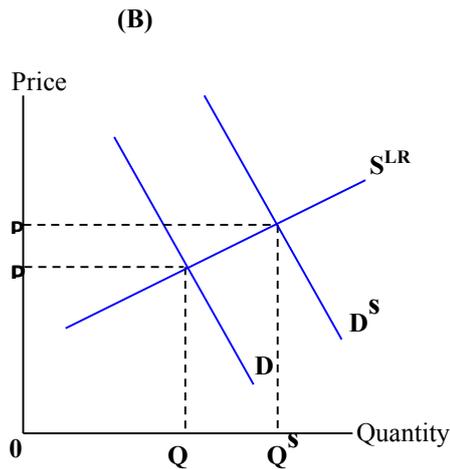
Increasing the productivity of the agricultural sector is an important concern because it involves food supply and the government's important role in the agricultural development program. Governments can develop policies that can facilitate the inflow of investments into the region (such as investment in the agricultural sector), create a concise bureaucracy and even direct involvement in economic activities through infrastructure development and infrastructure in various sectors. Investment in private companies directly or indirectly would increase economic activities and incomes (Firman, 2004). One example of a government policy in 2011 which is related to the agricultural sector of investment can be found in the subsidies given to production facilities of farmers, particularly fertilizers. The fertilizer price subsidy aims to help farmers in the provision and use of fertilizers in accordance with six precise criteria (time, price, type, quantity, quality, and place). There was an increase in subsidized fertilizer from 5.7 million tons in 2008 to 7.0 million tons in 2011 which was in line

with efforts to support the increased production of 4 million tons of rice in 2011. The fertilizer price subsidy was expected to reach the target and protect family farmers to obtain a lower price than the market price. In addition, investments in agriculture, such as in irrigation are expected to contribute to greater creation of Gross Domestic Product (GDP) in a region (NK & RAPBN 2015).

The impact of government subsidies, especially for agricultural products is shown in Figure 1. The supply curve of short-term agricultural production is assumed to be inelastic (Figure 1 (A)). If the government provides subsidies to agricultural products, there will be an impact on the increasing demand; the demand curve shifts to the right of the  $D$  to  $D^S$ . An increase in demand will be followed by a rise in price of  $P$  to  $P^S$  because in the short term (Short Run) the agricultural sector cannot increase its production. However, in the long term (Long Run) subsidies on agricultural products will increase the quantity supplied. because in the long run the supply curve is more elastic as shown in Figure 1(B).

Figure 1. The Impact of Subsidies to





Generally, the policy of giving subsidies is associated with goods and services that have positive outcomes in order to increase output. This is a positive effect of the subsidy. However, subsidies also have a negative effect which can create inefficient allocation. This is because consumers pay a lower price than the market price so that there is a tendency for consumers not to save subsidized goods consumption. Moreover, when the price is lower than the opportunity cost, it can be a waste in the use of resources to produce goods that are subsidized (Spencer & Amos, 1993). Subsidies that are non-transparent and poorly-targeted may cause price distortions, inefficiencies and not enjoyed by those who are entitled (Basri, 2002). Nevertheless, this can be overcome by the opposite, namely transparency, proper targets, not being excessive, and only being offered for infant industries and crucial sectors and strategic positions.

### System Social Accounting Matrix (SAM)

The Social Accounting Matrix (SAM) is a system of economic balance based on money-metrics and double-entry that records all transactions between actors, institutions and production that occur in the economy at a given period of

time. Primarily, SAM describes the related information of input and output, household consumption, government subsidies granted to the production and institutions, worker's remittances (remittances), export and import, and others (see table below). Furthermore, Table 1 demonstrates that SAM can serve as a framework to describe and analyze the socio-economic structure in the economy. SAM can be as an analytical tool that can simulate the potential impact of economic policies on employment and income distribution with *multiplier* analysis. *Dynamic SAM* refers to SAM static and time series data in the latest national accounts. This causes the model dynamically to change in time (BPS 2010). In the framework of SAM, there are some endogenous and exogenous variables as shown in Table 1. If there are changes in exogenous variables, the influence caused to the endogenous variables can be seen through the SAM system which is interdependent. Social accounting can be used to estimate the effect of changes in urban and rural areas, as well as low, medium and high income households. Additionally, SAM can be used to indicate a specific sector of the economy that will benefit from the changes which can affect the transfer of workers. The workforce in various economic sectors can be used to connect a *money-metric* Dynamic SAM and labor statistics. The multiplier labor (*labor multipliers*) can show how changes affect employment levels.

Table 1: Scheme Balance of Social Economic System

		EXPENDITURE												
		FACTORS		INSTITUTION			PRODUCTION			OTHERS		TOTAL		
		1	2	3	4	5	6	7	8	9	10			
R E C E I P T	1. FACTORS	1. Labor	2. Capital									Factorial Income	Income of Factors	
	2. INSTITUTION	3. Household	4. Firms	5. Government								Transfers, Taxes, and Subsidies	Income of Institutions	
	3. PRODUCTION	6. Agriculture	7. Manufacture	8. Services	9. Combined Capital							Interindustry Demand for Goods & Demand	Gross Output/ Demand	
	4. OTHERS	10. Rest of The World										Domestic Saving	Aggregate Savings	
												Import of Compet. goods	Foreign Exchange Outflow	
												Import of Complem. goods	Foreign Exchange Outflow	
													Aggregate Investment	Foreign Exchange Inflow

Source : BPS. 2014

The impact of SAM multiplier analysis can be classified into: 1) Impact of intra-account (*intra-account effect*) and 2) Impact pull (*induced effect*). Impact of intra-account reveals the impact of changes on the account, plus the impact of the group account. For example, if the subsidies are given to oil production activities, the intra-account multiplier will detect the effect of the subsidy on oil production activities and influence all production activities. On the other hand, impact pull measures the effect of changes in other accounts (such as household, commodity, and factors of production when production accounts are manipulated), as well as further influences which occur when the injection is done to trigger economic changes.

### 3. RESEARCH METHODS

#### Analysis Method

Research analysis tools that are used to address issues raised in this study are the use of Social Accounting Matrix (SAM) analysis. The method in this study is static analysis that focuses on a single point of balance changes and does not consider the time element changes. There are three reasons why this method was used. The first reason is because SAM is able to comprehensively describe the structure of the national economy, the relationship between the activities of production, consumption, savings, investment, foreign trade and more importantly, the distribution of income. The second reason is that SAM provides a framework to unify and present all regions of economic data. It is important for the socio-economic data to be issued by many different agencies and saved with different formats. The third reason is that SAM can be calculated through the economic multiplier that is very useful to measure the impact of the

development of the agricultural sectors of agriculture based on production, income distribution and demand which all describe the structure of an economy as a whole.

#### Data Collection

The data used is secondary data of SAM in 2008 that was published by BPS. This research was conducted with the scale of national data which was broken down among sectors. Among them is: agriculture, meat, and chemicals (fertilizer).

#### Sector of Injection

There are 13 economic sectors which have done injection or shock by 5 percent according to the consideration of the ministry of agriculture to increase food supply and reduce the volume of food commodity imports. The 13 sectors are presented as follows:

Table 2: Sectors Which Have Received 5% Injection

Code	Sector
3.1	Production Sector of Rice, Corn and Soybean
3.2	Other Crops Production Sector
3.3	Other Crops Agricultural Production Sector
3.4	Poultry Meat Production Sector (Traditional Farms)
3.5	Poultry Meat Production Sector (Medium and Large Farms)
3.6	Egg Production Sector
3.7	Livestock Production and other Sector
3.8	Forestry and Hunting Production Sector
3.9	Fisheries Production Sector
3.10	Rice Production Sector
3.11	Fodder Production Sector
3.12	Chemical Industry Production Sector
3.13	Constructions Production Sector

### 4. DATA ANALYSIS AND DISCUSSION

The results are described by several tables that explain the shock impact of agriculture, chemical, and construction for all groups of households to all sectors of the

economy, and forward linkages and backward linkages. In this study, groups of households are classified into eight groups.

Table 3: Impacts on All Types of Household

Code	Household (HH) And Company Group	Unit	Impact (Unit)	Impact Of Distribution(%)
2.1	HH Agricultural Laborers	6.89	0.10	0.032
2.2	HH Agricultural Farm Employers	27.04	0.46	0.156
2.3	HH Non Agricultural Rural Entrepreneurs	15.23	0.18	0.060
2.4	HH Non Agricultural Rural And Not Labor Force And Groups Are Not Clear	6.51	0.08	0.029
2.5	HH Non Agricultural Rural Entrepreneurs Elite Free	17.63	0.23	0.078
2.6	HH Non Agricultural Urban Entrepreneurs	19.86	0.21	0.071
2.7	HH Non Agricultural Urban And Not Labor Force And Groups that Are Not Clear	7.63	0.08	0.026
2.8	HH Non Agricultural Urban Entrepreneurs	26.83	0.28	0.095
2.9	Companies	44.69	0.58	0.197

The above table reflects the impact of increased investment by the government by as much as 5 percent in the agricultural sector (11 sectors), chemical and construction led to the largest increase in income in the Companies by 0.58 units and an increase in revenue of Household Agricultural Entrepreneurs of 0.46 units. Seen from the distribution of the overall impact, the total distribution is the impact on the company which was

by 0.197 percent, followed by Household Agricultural Entrepreneurs by 0.156 percent. While the group Households Non Agricultural and Rural Not Work Force Groups Unclear, enjoyed an increase in revenue of at least 0.08 units or 0.029 percent. The conclusion that can be drawn is that many have benefited from the contributions of development from the Household Agricultural Employers can increase subsidies or increase investment in the agricultural sector. The farm workers have suffered from only a relatively small increase in revenue with the number of 0.032 percent.

Table 4: Impact of The Whole Economy Sectors

Economy Sectors	Unit	Impact (Unit)	Impact of Distribution (%)
3.1. Production Sector of Rice, Corn and Soybean	11.26	0.24	0.080
3.2. Production of Other Food Crops Sector	9.55	0.21	0.071
3.3. Other Crops Agricultural Production Sector	7.56	0.20	0.066
3.4. Poultry Meat Production Sector (Traditional Farms)	4.50	0.13	0.044
3.5. Poultry Meat Prod. Sector (Farms Medium, Large)	4.81	0.14	0.047
3.6. Egg Production Sector	3.80	0.12	0.041
3.7. Livestock Production Sector and Other Results	4.22	0.13	0.043
3.8. Production Sector Forestry and Hunting	2.74	0.10	0.034
3.9. Fisheries Production Sector	8.00	0.18	0.060
3.10. Coal Mining, Crude Oil Production Sector	7.67	0.07	0.024
3.11. Mining and Quarrying Other Production Sector	2.29	0.01	0.002
3.12. Rice Production Sector	<b>1265.43</b>	<b>22.43</b>	<b>7.589</b>
3.13. Animal Feed Production Sector	<b>413.55</b>	<b>7.37</b>	<b>2.494</b>
<b>3.14. Production of Other Food Industry Sectors</b>	<b>6335.15</b>	<b>111.95</b>	<b>37.871</b>
3.15. Spinning Industry, Textile, Leather Production Sector	6.98	0.06	0.019
3.16. Production Sector of Industrial Wood, Wood Products	4.04	0.02	0.008
3.17. Production Sector of Paper Industry	18.72	0.21	0.069
3.18. Production Sector of Chemical Industry	4.70	0.13	0.043
3.19. Pharmaceutical Production Sector	3.05	0.02	0.005
3.20. Industrial Prod. Sector of Fertilizer. Clay. Cement	6.55	0.19	0.065

3.21. Prod. Sector of Electricity, Gas, and Water Supply	5.38	0.04	0.014
3.22. Production Sector of Construction	4.67	0.08	0.028
3.23. Production Sector of Trade	30.27	0.44	0.149
3.24. Production Sector of Restaurant	10.15	0.10	0.034
3.25. Production Sector of Hospitality	2.28	0.00	0.001
3.26. Production Sector of Land Transport	9.89	0.10	0.035
3.27. Prod. Sector of Air Transport, Water, Communications	10.26	0.10	0.034
3.28. Prod. Sector of Sup Services Transport. Warehousing	3.30	0.01	0.005
3.29. Production Sector of Banks and Insurance	9.58	0.10	0.032
3.30. Production Sector of Real Estate. Corporate Services	9.45	0.09	0.032
3.31. Prod. Sector of Governance, Social Services Other	11.44	0.12	0.040
3.32. Prod. Sector of Individual Services, Other Services	9.87	0.09	0.032

The impact of the shock increase in agriculture, construction, and chemicals is based on the economic sector (see Table 4) which demonstrates that the sector of Industrial Production of other foods will get an additional output of 111.75 units. The total distribution of the impact in this sector has gained the addition of total output effect distribution as much as 37.871 percent. The sector trade production has increased 30.27 percent, whereas the Paper Industry Production Sector, Government Sector Production, and Other Social Services have increased respectively by 18.72 percent and 11.44 percent. In terms of sectors in shock or injected, only Rice Production sector. Sector of Forage Production and Production Sector Rice, Corn and Soybean which enjoyed the largest output increase, which was respectively 22.43 (7.6%), 7.47 (2.5%), and 0.24 (0.08%) units.

Table 5: Forward and Backward Linkage

Economy Sectors	Forward Linkage	Backward Linkage
3.35. Domestic Commodities of Rice. Corn	0.0922	1.2659

and Soybean		
3.36. Domestic Commodities of Other Crops	0.0767	1.2658
3.37. Domestic Commodities of Other Crops	0.0521	1.1080
3.38. Domestic Commodities of Poultry (Traditional Farms)	0.0382	1.5251
3.39. Domestic Commodities of Poultry Meat (Livestock Medium, Large)	0.0338	1.8047
3.40. Domestic Commodities of Eggs	0.0266	1.6962
3.41. Domestic Livestock Commodities and other Results	0.0307	1.6962
3.42. Domestic Commodities of Forestry and Hunting	0.0149	0.8458
3.43. Domestic Commodities of Fishing	0.0686	1.0035
3.44. Domestic Commodities of Coal Mining, Metals, Crude Oil	0.0516	0.5695
3.45. Domestic Commodities of Other Mining and Quarrying	0.0117	1.0530
3.46. Domestic Commodities of Rice	<b>9.2664</b>	<b>4.1129</b>
3.47. Domestic Commodities of Animal Feed	<b>3.0230</b>	<b>4.1129</b>
<b>3.48. Domestic Commodities of Other Food Industries</b>	<b>46.4232</b>	<b>4.1129</b>
3.49. Domestic Commodities of Spinning Industries, Apparel, Leather	0.0507	0.8144
3.50. Domestic Commodities of Industrial Wood & Articles of Wood	0.0276	0.8825
3.51. Dom Com. Of Paper Ind., Printing, Transport Equipment, Metal	0.1569	0.6797
3.52. Domestic Commodities of Chemical Industry	0.0315	0.6776
3.53. Domestic Commodities of Pharmacy	0.0179	0.6776
3.54. Dom. Com. of Fertilizer Industry, The Results of Clay, Cement	0.1354	0.6776
3.55. Domestic Commodities of Electricity, Gas and Water Beverages	0.0330	0.5905
3.56. Domestic Commodities of Construction	0.0273	0.7502
3.57. Domestic Commodities of Trading	0.2224	0.9767
3.58. Domestic Commodities of Restaurants	0.0697	1.8692
3.59. Domestic Commodities of Hospitality	0.0102	1.3603

3.60. Domestic Commodities of Land Transport	0.0674	0.8839
3.61. Domestic Com. of Air Transport, Water and Communications	0.0703	0.7408
3.62. Domestic Com. of Supporting Services Transport, Warehousing	0.0179	0.9108
3.63. Domestic Commodities of Bank and Insurance	0.0638	0.7389
3.64. Domestic Commodities of Real Estate and Business Services	0.0643	0.6781
3.65. Domestic Com. of Defense Education, Health, Social Services	0.0775	1.2761
3.66. Domestic Commodities of Individuals Services, Other Services	0.0670	0.7920

Table 5 describes the challenge of economic sectors that have relevance in the future when this sector has increased by one unit. It will also increase the output of other sectors; for x units, which is used as an input. Backward linkage explains if the output has increased by one unit, it will increase the output of the previous sector amounting to x units which is the input to them; which is the highest key sector in the economy. Code 3.48, namely the Domestic Commodity Food Industry Others has relevance in the future growth. When every food industry has increased output by 1 unit, it will increase the output of other sectors that use inputs of Domestic Commodities Other Food Industry, which in total will increase the economy's output as much as 46.42 units. Likewise, commodities that have the highest backward linkages are Domestic Commodities Other Food Industry, which amounted to 4.1129. This means an increase of one unit of output of this sector will increase the output of other sectors which can be supplies or as input Domestic Commodity sector and other food industry in total output will increase the use of the entire economy of 4.1129 units. Both forward and

backward linkage namely commodity Domestic Commodities Coal Mining, Seeds Metals and Petroleum are having the lowest linkages which respectively amounted to 0.0516 and 0.5695. This means that the mining sector has a relatively low ability to stimulate the growth of other sectors. However, if observed, all the agricultural sectors have backward linkage figures which are greater than the figure for forward linkage. This means that if it is done to increase the investment in the agricultural sector, it will stimulate and increase productivity sectors of the economy which are providers of inputs for the agricultural sector, such as the business sector of plant breeding, cultivation of fish seeds, producing eggs, and breeding stock.

## 5. CONCLUSION,IMPLICATION, SUGGESTION, AND LIMITATIONS

### Conclusion

To conclude, the SAM analysis has discussed the impact of capital injection in the agricultural sector, chemicals (fertilizer) and construction (irrigation) of all household groups. It also discusses the impact on all sectors of the economy as well as analyzes to what degree each sector has forward and backward linkages. Some conclusions that can be drawn are:

- 1) There was a decrease in the largest revenues in the company by 0.58 units and an increase in revenue of household agricultural entrepreneurs of 0.46 units. This means that if there is an increase in investment in the agricultural, chemical and construction sectors, the people who enjoyed the contribution of the construction are the owners of the company and the group of household agricultural employers.

- 2) The agricultural sector experienced relatively large changes in the rice production sector, production animal feed sector and production sector of rice, corn and soybeans, where the three sectors encountered the largest output increase, which was respectively 22.43, 7.47 and 0.24 units; or respectively by 7.6 percent, 2.5 percent and 0.080 percent. However, the agricultural sector is still below its change of other food industry sectors (non-agricultural sectors) amounted to 37.871 percent.
- 3) The Commodity Food Industries have forward linkages which is the largest part that amounting to 46.42 units. Likewise, commodities that have the highest backward linkages are in the amount of 4.1129 units. The lowest linkages for both forward and backward linkages were found in: Commodity Coal Mining, Seeds Metals and Petroleum, which respectively amounted to 0.0516 and 0.5695.

### Suggestions

- 1) Future researchers can break down the sectors into a more detailed categorization, for instance: irrigation sector and construction sector.
- 2) If the policy change is made so the future studies can be more complete especially when the SPA analysis (Structural Path Analysis) is conducted to determine the pattern of transmission lines sectors in the structure of the economy.

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