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Analysis of the Linkages and Performance of the Coffee to Other Economic Sectors in Indonesia Using Input-Output Analysis

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Abstract: *The purpose of this study was to analyze the linkage and performance of the coffee sector to other economic sectors in Indonesia by using 175 sector input output tables in 2005. Linkage analysis used the backward linkage and forward linkage models directly, and performance was measured by efficiency. Efficiency is the ratio between added value and intermediate costs. The results showed that first, the coffee sector has a low backward linkage and forward linkage relationship based on the distribution index and sensitivity degree index < 1, where the coffee sector in 2005 has not been able to spur production growth for sectors that have a linkage relationship with this coffee sector to be able to develop, secondly, the coffee sector is a relatively classified sector with an efficiency level of > 1.*
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I. Introduction

Indonesia is an agricultural country that relies on the agricultural sector as a support for development and a source of livelihood. Agriculture produces the dominant income for the people in Indonesia because the majority of Indonesia's population works as farmers. One of the sub-sectors in the agricultural sector is the plantation subsector where this sub-sector plays an important role in the Indonesian economy, because the commodity is very suitable with land conditions and weather in the country. Plantation products that can be used as industrial raw materials are needed by many countries, especially countries that do not have the same conditions as Indonesia.

Coffee is one of the commodities in the plantation subsector. In Indonesia the coffee commodity has an important role as the third largest foreign exchange earner after timber and rubber. Coffee is very attractive to many countries, especially developing countries, because it has an impact on high employment opportunities and provides foreign exchange needed for national development (Spillane in Purba, 2011: 1).

The existence of the coffee sector in the Indonesian economy will affect the upstream industry and its downstream industry or influence the backward linkage of the upstream industry, some of which are the fertilizer sector, basic chemical sectors except fertilizer, and the trade services sector, while forward linkage in downstream industries is the ground and peanut coffee sector, the coffee sector itself, and the peanut grain sector. From this linkage it will have an impact on the performance of the coffee sector, where the coffee sector is able to increase added value and can also increase revenue.

Industry performance shows its ability to continue to operate in the future, so that the performance indicator that can be used is efficiency. Efficiency is inseparable from the connection between input and output, meaning that inputs are used as well as possible to obtain as much output as possible (Hasibuan in Fitriani, 2005: 8).

An industry is said to be efficient if it competes and survives in the future so that the economic development of Indonesia through industrialization can stimulate the development of upstream industries and downstream industries which ultimately improve the Indonesian economy as a whole. The development of the coffee sector will encourage the development of other economic sectors including the coffee sector itself. Therefore, the writer will examine how the backward linkages and future linkages of the coffee sector with other economic sectors in Indonesia and how efficient the coffee sector is in Indonesia.

II. Materials and Method

This research covers the backward linkages and future linkages and efficiency performance of the Indonesian coffee sector where data comes from the 2005 input-output table with a classification of 175 sectors. The coffee sector in Indonesia's input-output table is coded 18. Thus the backward linkages and forward linkages and efficiency performance can be seen.

The data collection technique used is secondary data. This secondary data source comes from library research that has to do with research carried out in the form of books, journals, articles, and other relevant references in this study. The main data used in this study is the Indonesian input-output table in 2005. The reason for choosing the year of this study is because of the availability of data and to facilitate the authors in analyzing the interrelationships between commodity sectors and other sectors.

The technical analysis used is quantitative analysis techniques for historical data using leontif (I-O) input-output models. In the analysis of the input-output model, the results of a final request for the creation of output can be written into the following equation (BPS Output Input Table, 1995 in Zulyanti): $X = (\boldsymbol{I} - \boldsymbol{A^d})^{-1}.\boldsymbol{F^d}$.

Furthermore, in this input-output analysis it will be analyzed how far the linkages of a sector play a role in the production activities of other sectors or how far the linkages between sectors occur. If there is an increase in sector i output, then there will be an increase in the production input of the sector i directly. Increasing the use of these inputs is an increase in output because the total input is equal to the total output. If there is an increase in one unit of output money in sector i, it will directly increase the input as shown by column i of the input coefficient matrix. The total additional input equal to the total additional output is the sum of the columns to i matrix A. This additional total output is called direct linkage to the back. This means that the direct backward link is the sum of the elements of the sector input coefficient according to the column in the input coefficient matrix where these elements are obtained by dividing each of the inputs required by the sector i with the total output produced. This direct backward link is formulated as follows: $B(d)j = \sum_{i=1}^{n} aij$

Where:

B(d)j = Direct backward linkage

a_{ij} = Matrix input coefficient element

The direct direct linkage calculates the total output created by increasing the output of an industrial sector through the mechanism of output distribution in the economy. If there is an increase in production output in sector i, the additional output will be distributed to the production sectors in the economy, including the sector i itself. Directly if there is an increase in one unit output of sector i, the increase in total output in the economy through the output mechanism is shown by the sum of rows of the input coefficient matrix. This can be interpreted that the direct forward linkages are obtained by adding up according to the lines of the input coefficient matrix elements which describe the direct distribution of sector i output to all sectors. Direct linking is formulated as follows: $F(d)i = \sum_{j=1}^{n} aij$

Where:

F(d)I = Direct forward linkage

Aij = Input coefficient matrix element

To obtain the spread power index from a sector, the following equations can be used:

$$\propto_j = \frac{\sum_i b_{ij}}{\frac{1}{n}\sum_i \sum_j b_{ij}}$$

Where:

$\propto_j$ = Sector spread power index j

Value $\propto_j$ > 1 shows the power of the spread of sector j is above the spread of all sectors of the economy $\propto_j$ < 1 shows the sector spread power j is lower than the average power distribution of all sectors. This means that if the average value of the index of future linkages is more or equal to one, then the sector can stimulate other sectors to develop.

To obtain a sensitivity degree index from a sector, the following equations can be used:

$$\beta_i = \frac{\sum_i a_{ij}}{\frac{1}{n}\sum_i \sum_j a_{ij}}$$

Where:

β_i = Index of the degree of sensitivity of the sector i

Value β_i > 1 shows that the sensitivity level of sector I is higher than the average degree of sensitivity of all sectors, on the contrary β_i < 1 shows the degree of sensitivity of sector i is lower than the average degree of sensitivity of all sectors. This means that if the average value of the index of backward linkages is more or equal to one, then the sector can attract other sectors to develop.

In this study the efficiency of the Indonesian coffee industry is also measured by looking at the trends that occur and wherever possible the explanations made are able to explain the relationship with facts that exist rationally.

To find out the efficiency of the measured variables used the efficiency formula as follows: **Efficiency = Added value/middle cost.**

In this equation, the efficiency level is measured by an indicator calculated from the ratio between added value and intermediate costs. This means that the higher the ratio, the higher the level of efficiency, because the lower the intermediate costs needed to produce an output unit. Efficiency is said to experience increased efficiency if the current level of efficiency of the year is greater than the level of efficiency of the previous year, or in other words the level of efficiency of an industry seen relatively during the year of observation.

III. Results and Discussion

3.1 Linkage Analysis

a. Direct Backward Linkage the Coffee to Other Economic Sectors in Indonesia

Direct backward linkages are obtained by summing the columns of all the elements of the input coefficient. Assuming the technology coefficient is the same, then the direct backward linkages in the coffee sector for 2005 can be seen as found in Table 1.

Table 1. Backward Linkage The Coffee to Other Economic Sectors in Indonesia, 2005

Code	Name Sectors	Backward	
		Coefficient	Percentage
18	Coffee	0.12413	34.90
95	Fertilizer	0.08393	23.59
159	Bank	0.07004	19.69
149	Trade Services	0.02887	8.12
94	Basic Chemicals Except Fertilizer	0.01190	3.35
96	Pesticide	0.00782	2.20
	Others	0.02903	8.11
	Total	0.35572	100
	Spread Power Index	0.94984	

Source: Tabel I-O Indonesia 2005, BPS (processed)

Based on calculations using the formula in determining the direct linkages to the back of the Indonesian coffee sector in 2005, it was found that in the coffee sector which has the highest direct backward linkage is the coffee sector itself with a value of 0.12413. Then followed by the fertilizer sector with a linkage value of 0.08393, the bank sector with a linkage value of 0.07004, the trade service sector with a linkage value of 0.02887, the basic chemical sector except fertilizer with a linkage value of 0.01190, the pesticide sector with a linkage value of 0.00782 and several economic sectors Other Indonesia.

b. Direct Forward Linkage the Coffee to Other Economic Sectors in Indonesia

Direct forward linkages are obtained by adding lines to each element of the input coefficient. Assuming the technology coefficient is the same, then the direct direct linkages in the coffee sector for 2005 can be known as found in Table 2.

Table 2. Forward Linkage The Coffee to Other Economic Sectors in Indonesia, 2005

Code	Name Sectors	Forward	
		Coefficient	Percentage
65	Milled Coffee and Peel	0.23612	64.99
18	Coffee	0.12413	34.17
63	Peel Grains	0.00170	0.47
64	Chocolate and Confectionery	0.00109	0.30
66	Processed Tea	0.00013	0.04
71	Non-Acoholic Drinks	0.00013	0.04
	Total	0.36330	100
	Spread Power Index	0.90079	

Source : Tabel I-O Indonesia 2005, BPS (processed)

Based on the results of the analysis of the future linkages of the coffee sector to various sectors of the Indonesian economy (Table 2), it can be seen that the coffee sector which has the highest direct forward relationship is the milled and peanut sectors with a value of 0.23612. Then followed by the coffee sector itself with a linkage value of 0.12413, the peanut grain sector with a linkage value of 0.00170, the chocolate and sugar

flower sector with a linkage value of 0.00109, the processed tea sector with a linkage value of 0.00013 and the non-alcoholic beverage sector with a value linkage of 0.00013.

The total direct and back linkages coefficients of the coffee sector in the table are 0.35572 and 0.36330, respectively. This figure shows the understanding that for the backward linkage if the coffee sector adds output of 0.35572 it will cause an increase in demand from the coffee sector towards intermediate inputs or capital goods produced by all sectors in the economy of 0.35572 or share of input value between sectors Others used by the coffee sector amounted to 35.57 percent of the output value, whereas the increase in the coffee sector output of 0.36330 also means an increase in inputs available for sectors that use the coffee sector output as an input of 0.36330 in the production process. This means that there is also an increase in supply from the coffee sector to sectors that use the output of the coffee sector as input in their production.

From Table 1 and Table 2, it can be seen that in 2005 the coffee sector had a dispersion power index of 0.94984 which indicates that the power distribution of the coffee sector is below the average power of the spread of all sectors of the economy, while the sensitivity degree index is 0.90079 which indicates the degree of sensitivity of the sector coffee is lower than the average degree of sensitivity of all economic sectors.

Based on the description above, it shows that the relationship between the coffee sector in 2005 and the power index of distribution and index of sensitivity is < 1. In general it can be concluded that the coffee sector in 2005 has not been able to spur production growth for sectors that have a relationship with the sector this coffee to grow.

In 2005 the sector that benefited the most was the increase in production because the final demand for the coffee sector (backward linkage) was the coffee sector itself, which amounted to 34.90 percent of the total percentage of the entire sector. The strong direct relationship behind the coffee sector and the coffee sector itself is because coffee is the main supplier of coffee plants in creating production productivity. If coffee is not available, coffee cultivation cannot be done, so it will not spur the development of the coffee sector. The lowest percentage of direct linkages to the back of the coffee sector in 2005 was the other chemical goods sector, which was 0.00 percent of the total percentage of the entire sector. This direct linkage to the back of the coffee sector and other chemical goods sectors shows that other chemical goods sectors have little influence on the development of the coffee sector.

The sector that absorbs the most output from the coffee sector to be used as input (forward linkage) is the milled and peeled coffee sector, which is a percentage of 64.99 percent of the total percentage of the entire sector. This is because coffee is the main raw material for producing various types of ground coffee and peel which is the end result of coffee processing. For the lowest percentage of direct linkages to the front of the coffee sector in 2005 was the processed tea sector, which amounted to 0.04 percent of the total percentage of the entire sector. The relationship between the direct future linkages of the coffee sector and the processed tea sector shows that coffee is not the main raw material in producing processed tea.

The linkage of the coffee sector to other economic sectors in Indonesia can be seen from the high Indonesian coffee exports, which amounted to 341,400 tons in 2011. The high coffee exports in Indonesia are due to the high productivity of coffee which shows an increase in demand for coffee. When coffee exports increase, Indonesia's trade balance will experience a surplus.

The trade balance is a coffee trade transaction and services from Indonesia to other countries. The coffee trade transaction that experiences a surplus will increase the offer of the rupiah exchange rate against other currencies. The increase in the rupiah exchange rate will directly lead to increased economic growth in Indonesia. This is what causes the appreciation of the strengthening of the rupiah exchange rate, so the coffee sector can encourage the coffee sector itself and other economic sectors in Indonesia to develop.

4.2 Efficiency of the Indonesian Coffee Sector

In this equation, the level of efficiency of the Indonesian coffee sector is measured by an indicator calculated by the ratio of value added to intermediate costs. Added value is the output value minus intermediate costs. With high added value, the coffee sector will benefit and be able to produce more output. The efficiency of the backward and forward sectors of the coffee sector can be seen in Table 3 and Table 4.

Table 3. Value Added, Middle Cost and Efficiency Backward Linkage of the Indonesian Coffee Sector, 2005

Code	Sector	Value Added (Million Rupiah)	Middle Cost (Million Rupiah)	Efficiency
18	Coffee	6,047,505	3,469,961	1.74
95	Fertilizer	5,575,116	11,307,537	0.49
159	Bank	87,072,864	47,451,329	1.83
149	Trade Services	331,987,421	175,866,788	1.89
94	Basic Chemicals Except Fertilizer	11,717,120	34,428,650	0.34
96	Pesticide	870,568	1,653,631	0.53

Source: Tabel I-O Indonesia 2005, BPS (processed)

In the coffee sector in Indonesia, the added value and intermediate costs created are shown in Table 3 and Table 4. The added value of the coffee sector in Indonesia is 6,047,505 million rupiahs, while the intermediate cost of the coffee sector in Indonesia is 3,469,961 million rupiah.

Table 4. Value Added, Middle Cost and Efficiency Forward Linkage of the Indonesian Coffee Sector, 2005

Code	Sector	Value Added (Million Rupiah)	Middle Cost (Million Rupiah)	Efficiency
65	Milled Coffee and Peel	5,446,701	10,715,657	0.508294
18	Coffee	6,047,505	3,469,961	1.742816
63	Peel Grains	1,100,733	2,118,208	0.519653
64	Chocolate and Confectionery	3,287,885	5,445,795	0.603747
66	Processed Tea	1,703,118	2,217,451	0.768052
71	Non-Acoholic Drinks	3,859,044	6,575,544	0.586878

Source: Tabel I-O Indonesia 2005, BPS (processed)

Based on the calculation of efficiency in the 2005 input-output table, the coffee sector is classified as efficiency. The efficiency of the coffee sector caused by the greater value added from intermediate costs can be seen in the input-output table in 2005. The reason is that there is an increase in input use due to price increases, so that it positively impacts the output value of goods produced and added value in the coffee sector higher than the cost of use, on this basis the coffee sector is said to be efficient with an efficiency level of > 1 which is 1.74.

IV. Conclusion

The coffee sector has a backward relationship and a low forward relationship, with the spread power index and sensitivity degree index of 0.94984 and 0.90079 respectively. This is because the power index spread and the sensitivity degree index are < 1, where the coffee sector in 2005 has not been able to spur production growth for sectors that have a relationship with the coffee sector to develop. The direct linkage to the back of the coffee sector in 2005 was concentrated in the coffee sector itself (0.12413) and in the second rank, namely the coffee sector (0.08393), while direct future linkages were concentrated in the milled and peanut sectors (0.23612) and second place in the coffee sector itself (0.12413).

The level of efficiency of the coffee sector in Indonesia in 2005 was considered efficient. This is due to an increase in input use due to price increases, so that it has a positive impact on the output value of the goods produced and the added value in the coffee sector is classified as higher than the cost of use. Based on the discussion, the coffee sector is said to be efficient with an efficiency level of > 1 which is equal to 1.74.

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