



ANALYSIS OF STRUCTURE, CONDUCT, PERFORMANCE OF AGRO-INDUSTRY IN THE DAERAH ISTIMEWA YOGYAKARTA (DIY) IN 2016 USING THE INPUT OUTPUT APPROACH

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ABSTRACT

Agro-industry in DIY contributes to the economy in terms of the contribution of its product exports, where of the 16 commodities exported, 11 of them are dominated by agricultural processing product. This research aims to find out (1) what the structure-conduct-performance (SCP) of agro-industry in DIY in 2016, (2) which agro-industry sector was leading in DIY in 2016, and (3) compare the suitability between DIY government policies and the results of the analysis. This research uses an input-output method where forward and backward linkages are used to measure structure, output and income multipliers to measure conduct, and the degree of export dependence and export multipliers on output to measure performance. The research results show that DIY's leading agro-industry sector is the food and beverage supply sector because it has high forward and backward linkages, high output and income multipliers, as well as high degrees of export dependence and export multipliers on output. This is in line with the publication from the Bappeda DIY regarding the Final Report on Preparing Analysis of the Impact of Infrastructure on DIY's Economic Development in 2016 which stated that the food and beverage supply sector was included in the leading sectors in DIY in 2016.

Keywords: *structure-conduct-performance, agro-industry, input-output.*

1. Introduction

Daerah Istimewa Yogyakarta (DIY) is one of the provinces in Indonesia that has potential in agriculture. The importance of this agricultural sector makes the government strive to protect DIY agricultural land through regional laws contained in Daerah Istimewa Yogyakarta Regulation Number 6 of 2021 concerning Amendments to the Regional Regulation of the Daerah Istimewa Yogyakarta Province Number 10 of 2011 concerning the Protection of Sustainable Food Agricultural Land. However, in reality the contribution of the agricultural sector is declining and has always been exceeded by the processing sector since 2012-2015. Even BPS statistics show that in 2012-2019 the processing sector contributed the most to the DIY GDP, which was around 13,22% every year. As for the agricultural sector in the distribution of DIY GDP contributed around 10,38% from 2012-2019.

According to data from the Badan Pusat Statistik, the average area of agricultural land has always decreased by 0,32% since 2014-2016. Likewise, the amount of production on average decreased by 0,81% from 2012-2016. The decline in the contribution of the agricultural sector is caused by many things, one of which is from a social perspective, people feel that their lives are more prosperous when they leave the profession to become farmers and choose to sell their rice fields and change professions to become entrepreneurs (Wiraraja, Windia, 2016). However, there are still many people who work as farmers. In 2015, the distribution of DIY residents working in the agriculture, forestry, hunting, and fisheries sectors was 436,529 which is more than the population working in the processing industry sector which was 276,386

in 2015. It can be concluded that the DIY economy is still based on the agrarian sector because most of the population still depends on the agricultural sector. But on the other hand, the processing industry contributes more to DIY GDP than the agricultural sector, indicating a shift in the economic structure in DIY. Therefore, in order for a structural transformation from agriculture to a resilient industry is to link the agricultural sector with other sectors that are superior and create economic growth and have links with the agricultural sector, namely the processing sector (Jhingan, 2016).

The concept is called agro-industry, which means the agricultural product processing industry. Agroindustry is a series of interrelated activities, including production, processing, storage, marketing, and distribution of agricultural products. In simple terms, agro-industry is a concept that combines the manufacturing industry with the agricultural sector. Tarigan, 2007 in (Tresnawati, 2010) states that agro-industry activities have the opportunity to create jobs, increase income distribution, and have significant potential to encourage the development of the agricultural sector. Agro-industry needs to be developed because its role can contribute significantly to national development (Austin, 1992). Agorindustri has an impact on creating added value, increasing competitiveness, and increasing income (Udayana, 2011).

In 2015-2016 there were 16 export commodities originating from DIY where 11 of these commodities were included in the agro-industrial sector. Exports of agricultural products in 2015-2016 are enough to prove that agro-industry in DIY needs to be developed in order to be able to drive the economy of a region. Therefore, agro-industry needs further analysis so that the government can implement the right policies according to the priority scale. This study uses input-output analysis whose data comes from the input output table issued by BPS. Through the analysis of input output, it can be determined which sectors have advantages and which require priority in the development process. The research data taken refers to the DIY Provincial Input-Output table issued by BPS in 2016. In 2016, the Input Output Table was prepared simultaneously for each of thirty-four provinces in Indonesia. The year 2016 was chosen because in that year the 2016 Economic Census was held, which is an important basic data in the implementation of the preparation of input output tables for thirty-four provinces.

This study aims to analyze the structure, conduct, and performance of agro-industry in DIY in 2016 which is one of the studies in the field of industrial economics. Manson's thinking as cited in (Kuncoro, 2007), which relates to the SCP (Structure-Conduct-Performance) paradigm states that the structural characteristics of an industry will have an impact on conduct in that industry, which in turn will affect its performance. The relationship between the three variables, namely structure, conduct, and performance are linear, where the structure of the industry influences conduct, and the conduct then affects the performance of the industry. The results of the analysis of the structure, conduct, and performance of DIY agro-industry in 2016 will show the leading agro-industrial sectors which can be used as a reference by the government in determining the priority scale of development in the Daerah Istimewa Yogyakarta. The results of the analysis of the leading agro-industry sector in DIY in 2016 will be identified in accordance with government policies that have been realized in 2016. The suitability of research results and the application of government policies shows that input-output analysis is needed to assist the government in determining the priority scale of development of a region.

2. Literature Review

2.1 Literature Review

The Structure-Conduct-Performance (SCP) concept was first introduced by Mason in 1939, which stated that the structure of an industry will influence conduct in the industry which will ultimately determine the performance of that industry. (Lipczynski et al., 2005) defined the SCP concept as an analytical technique to determine the relationship between components,

namely market structure in the industry, conduct of company, and company performance in the industry. Market structure tends to influence the conduct of companies in the industry so that it will have an impact on company performance in the industry (Kuncoro, 2007). The structure, conduct and performance of agro-industry can be analyzed using an input-output approach. (Kuncoro, 1996) stated that forward and backward linkages can be used to determine the structure of an industry. Forward linkages are defined as the use of output from one sector which is used as input from other sectors, while backward linkages are defined as the linkages of a sector to other sectors that contribute input to that sector. The conduct of an industry can be analyzed through output multiplier and income multiplier. The output multiplier is an analysis to determine changes in final demand due to changes in production in the economy, while the income multiplier is used to determine the impact of changes in final demand on household income. Industrial performance is analyzed using the degree of export dependence and the export multiplier on output. The degree of export dependence is used to assess what sectors contribute to meeting export needs, while the export multiplier on output is used to assess the extent to which export activities influence the economy as a whole.

(Kuncoro, 1996) defines agro-industry by classifying into several economic sectors where in the table Input Output at Basic Prices for DIY Producers in 2016 there are 18 sectors included in the scope of agro-industry: food crop farming (01), seasonal horticultural crop farming, annual horticulture, and others (02), perennial plantations (03), farms (04), agricultural and hunting services (05), forestry and logging (06), fisheries (07), food and beverage industry (13), tobacco processing industry (14), textile and apparel industry (15), leather industry, leather goods and footwear (16), wood industry, goods made of wood and cork and woven goods made of bamboo, rattan and the like (17), paper industry, paper goods, printing and reproduction (18), chemical industry, pharmaceutical and traditional medicine (19), rubber industry, rubber and plastic goods (20), goods metal industry, computers, electronic goods, optics and electrical equipment (23), furniture industry (26), supply of food and beverage (41).

2.2 Empirical Review

The structure, conduct, and performance of agribusiness in Indonesia were analyzed in 2005 where the structure was measured using forward and backward linkages, conduct was analyzed through the output multiplier and income multiplier, and performance was analyzed based on the value of the export multiplier on output and the export multiplier on income. This research explains that in terms of Indonesia's agribusiness structure in 1990 - 2000, the sectors that had high forward and backward linkages were the agricultural product processing industry and agricultural input providers. In terms of Indonesian agribusiness conduct in 1990 - 2000, the sectors that had high output multipliers and income multipliers were the agricultural product processing sector and a few primary agricultural sectors. In terms of Indonesia's agribusiness performance in 1990 - 2000, the sectors that had export multipliers for output and high income were dominated by the agricultural product processing sector (Rondhi, 2005).

Research related to structure, conduct, and performance was also carried out in 2019 where the research subject was the manufacturing industry. The focus of the research is to look at changes in terms of structure, conduct, and performance of the manufacturing industry in Indonesia from 2005-2016. This research uses forward and backward linkages to measure structure, income and output multipliers to measure conduct, and the degree of export dependence and export multipliers on output to measure performance. Meanwhile, to see changes in the structure, conduct, and performance of the manufacturing industry in 2005-2016, it was analyzed using non-parametric testing, namely the Wilcoxon Signed Runk Test. The research results stated that there were no changes in structure, conduct, or performance between 2005 and 2010, whereas in 2010-2016 there were changes. When viewed as a whole

period, from 2005-2016 there were changes in terms of structure, conduct, and performance of the manufacturing industry in Indonesia (Kayoselba, 2023).

3. Research Methods

This research is a type of quantitative research with secondary data sources in the form of Input-Output (IO) Tables on Basic Prices of Producer of the Daerah Istimewa Yogyakarta Province in 2016, which consists of 52 sectors. The analytical method in research is input-output analysis where the agro-industrial structure is analyzed using forward and backward linkages, behavior is calculated based on the income multiplier and output multiplier, and performance is analyzed based on the degree of export dependence and export multiplier on output (Kuncoro, 1996). Data processing was carried out using Microsoft Excel software.

3.1 Input-Output Analysis

Input-Output analysis begins by calculating the input coefficient matrix, identity matrix, identity matrix minus the input coefficient matrix which then inverses the results of subtracting the two matrices (identity matrix - input coefficient matrix). The result of the inverse matrix is called the Leontief Inverse matrix (Firmansyah, 2006).

- a. Calculating the Input Coefficient Matrix or Technology Coefficient (Matrix A)

$$a_{ij} = \frac{x_{ij}}{x_j}$$

x_{ij} : usage sector "i" by sector "j"

x_j : output of sector j

a_{ij} : input coefficient

- b. Calculating the Leontief Inverse Matrix (Matrix $(I - A)^{-1}$)
 - 1) In calculating the Leontief Inverse matrix, it is necessary to first calculate the matrix (I-A). For matrix A or matrix technology has been obtained as a first step. The next step is form an identity matrix or Matrix I. Matrix I is matrix longitude figure that contains the main diagonal value 1 and elements valued at 0.
 - 2) Calculating I-A by subtracting identity matrix (Matrix I) against the input coefficients matrix (Matrix A).
 - 3) The next step is to calculate matrix I-A where researcher already has matrix A and matrix I obtained from steps 1 and b.1.
 - 4) The Leontief inverse matrix would be obtained by inversing the matrix $I - A^{-1}$
- c. The acquisition of the Leontief Inverse matrix will later become a component for calculating forward and backward linkage, output multipliers, income multipliers, export dependence degrees and export multipliers on output.

3.2 Analysis Structure, Conduct, Performance of Agro-industry

3.2.1 Agro-industry Structure Analysis

The structure of agro-industry is defined as the state of sectors that are structurally arranged under the scope of the agro-industrial sector. The structure of agro-industry analyzed by using forward linkage and backward linkage indicators. Forward linkage to see the level of linkage between outputs from one sector to be used as input to other sectors. Backward linkage is the ability of a sector to use another sector or the sector itself as its input (Kuncoro, 1996).

- a. Forward Linkages

The forward linkage model is described in the following equation:

$$F(d)_i = \sum_{j=1}^n a_{ij} \dots \dots (1)$$

Information:

- F(d)_i : forward link index
- a_{ij} : Leontief coefficient

b. Backward Linkages

The bakward linkage model is described in the following equation:

$$L_{bj} = \frac{\sum_{i=1} X_{ij}}{X_j} = \sum_{i=1}^n \bar{a}_{ij} \dots \dots (2)$$

Information:

- L_{bj} : backward link index
- X_j : value of the j product
- X_{ij} : value of sector i's service input to produce in sector j
- \bar{a}_{ij} : inverse of the Leontief coefficient matrix

c. Forward and Backward Linkages Mapping

Mapping by grouping forward and backward linkage values serves to find out the leading sectors that are able to be a driver for other sectors (Widodo, 2006). The mapping is presented in the form of a matrix by grouping the linkage values into 4 categories. The classification of 4 mapping categories is as follows;

- 1) Sectors that have high forward and backward linkages
- 2) Sectors that have high forward and low backward linkages
- 3) Sectors that have low forward and high backward linkages
- 4) Sectors that have low forward and backward linkages

As for the linkage mapping, it is presented as shown below;

Table 26. Mapping Backward and Forward Linkages

Backward Linkage		Forward Linkages	
		Low	High
	High	Backward linkage is high, forward linkage is low, tends to be high risk, markets are limited	Forward and backward linkage is high, conglomerates tend to occur
Low	Forward and backward linkages are low, neither markets for output nor input providers	Forward linkages are high, backward linkages are low, tend to be prospective and markets are guaranteed	

Source: (Widodo, 2006)

3.2.2 Agro-industry Conduct Analysis

Agro-industrial conduct is defined as industrial action due to final demand. (Kuncoro, 1996) stated that to determine agro-industrial behavior using the effect of output multipliers and income multipliers. An output multiplier is an analytical tool for calculating the change in final demand against the change in total output. Meanwhile, income multiplier is defined as an analytical technique to calculate the change in final demand against the change in income received by households as a labor supply.

a. Output Multiplier

The output multiplier equation model is as follows:

$$O_j = \sum_{i=1}^n \beta_{ij} \dots \dots (3)$$

Information:

O_j : output multiplier value

β_{ij} : the number of columns in the Leontief inverse matrix

b. Income Multiplier

The output multiplier equation model is as follows:

$$H_j = \sum_{i=1}^n O_j K_u \dots \dots (4)$$

Information:

H_j : income multiplier value

O_j : output multiplier

K_u : wage coefficient

3.2.3 Agro-industry Performance Analysis

Agro-industry performance is the achievement achieved by sectors in the agro-industry in economic activities. (Kuncoro, 1996) stated that to determine the performance of agro-industry, use the degree of export dependence and the export multiplier on output. The degree of export dependence is an analytical technique to see the proportion of production of a sector used as a exports fulfillment. Export multiplier on output is an analytical technique to see the rate of change due to exports in a sector to total output in the economy.

a. Degrees of Export Dependence

The model of degrees of export dependence equation is described in the equation as follows:

$$dk_i = \frac{\sum_i b_{ij} E_j}{x_i} \dots \dots (5)$$

Information:

dk_i : degree of export dependence of sector i

E_j : export sector j

x_i : total output of sector i

b_{ij} : inverse elements of the Leontief matrix

b. Export Multiplier on Output

The model of export multiplier on output equation is described in the equation as follows:

$$Poi = \frac{\sum_j b_{ij} E_j}{\sum E_j} \dots \dots (6)$$

Information:

Poi : export multiplier on output index

b_{ij} : inverse elements of the Leontief matrix

E_j : export sector j

4. Research Finding and Discussion

4.1 Research Finding and Discussion

4.1.1 Forward Linkages

The agro-industrial sectors in DIY in 2016 with high forward linkage figures were the food and beverage industry (13) with a value of 1,962, supply of food and beverage (41) with a value of 1,500, and the textile and apparel industry (15) with a value of 1,232. These sectors are said to be high because their value exceeds the average of 1,225.

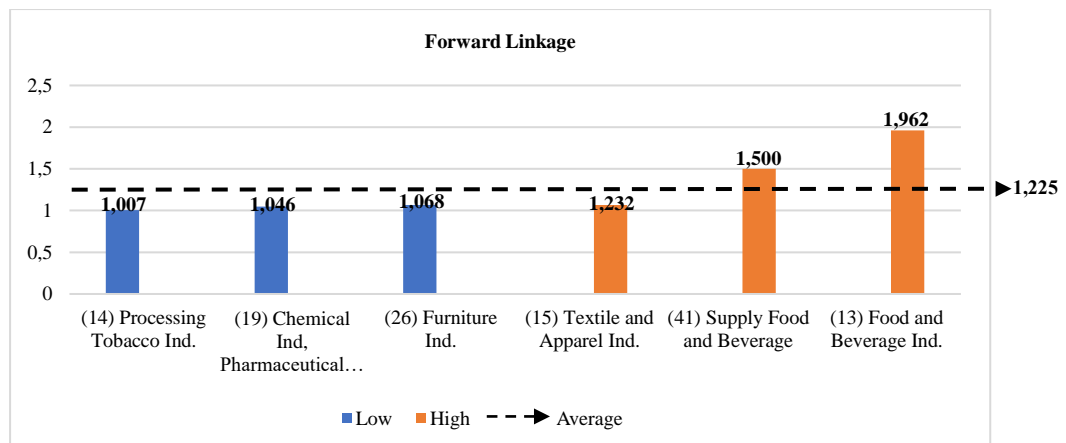


Figure 18. Forward Linkages of DIY Agro-industry in 2016

4.1.2 Backward Linkages

The agro-industrial sector in DIY in 2016 with high backward linkage figures was the food and beverage industry (13) with a value of 1,665, the leather, the supply of food and beverage (41) with a value of 1,530, and the textile and apparel industry (15) with a value of 1,495. These sectors are said to be high because their value exceeds the average of 1,265.

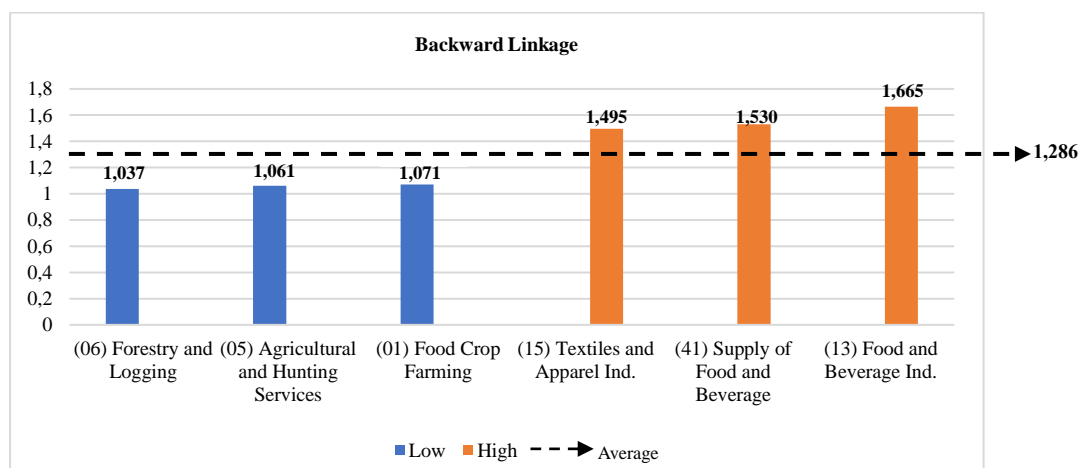


Figure 19. Backward Linkages of DIY Agro-industry in 2016

4.1.3 Forward and Backward Linkages Mapping

From the results of the analysis of forward and backward linkages in the DIY agro-industry in 2016, mapping can be carried out through a forward and backward linkage matrices according to the classification proposed by (Widodo, 2006). The following mapping classification is divided into four parts, consisting of:

- (1) has high forward and backward linkage;
- (2) has high forward linkage but low backward linkage;
- (3) has high backward linkage, but low forward linkage;
- (4) has low forward and backward linkage.

Sectors that are included in the high category if the linkage values exceed the average of the entire agro-industry sector. On the other hand, the low category consists of sectors with lower linkage values than the average of the entire agro-industry sector.

Table 27. Mapping of Forward Linkages and Backward Linkages of DIY Agroindustry in 2016

		Forward Linkage	
		High (Conglomeration)	Low (Limited market)
Backward Linkage	High	(13) Food and Beverage Industry (15) Textiles and Apparel Industry (41) Supply of Food and Beverage	(04) Farms (16) Leather, Leather Goods and Footwear Industry (17) Wood, Goods Made of Wood and Cork and Woven Goods Made of Bamboo, Rattan and the like (18) Paper and Goods from Paper, Printing and Reproduction of Recorded Media Industry (19) Chemical, Pharmaceutical and Traditional Medicine Industry (20) Rubber, Rubber Goods and Plastic Industry (26) Furniture Industry
	Low	(Prospective market) (01) Food Crop Farming (06) Forestry and Logging	(Not a market for output or it's the input providers) (02) Seasonal Horticultural Crop Farming, Annual Horticulture, and Others (03) Perennial Plantations (05) Agricultural and Hunting Services (07) Fisheries (14) Processing Tobacco Industry (23) Goods from Metals, Computers, Electronics, Optics, and Electrical Equipment Industry

4.2 Conduct of Agro-Industry Daerah Istimewa Yogyakarta in 2016

4.2.1 Output Multiplier

The agro-industrial sector in DIY in 2016 with high output multiplier figure was the food and beverage industry (13) with value of 1,665, supply of food and beverage (41) with value of 1,530, and the textile and apparel industry (15) with value of 1,495. These sectors are said to be high because their value exceeds the average of 1,286.

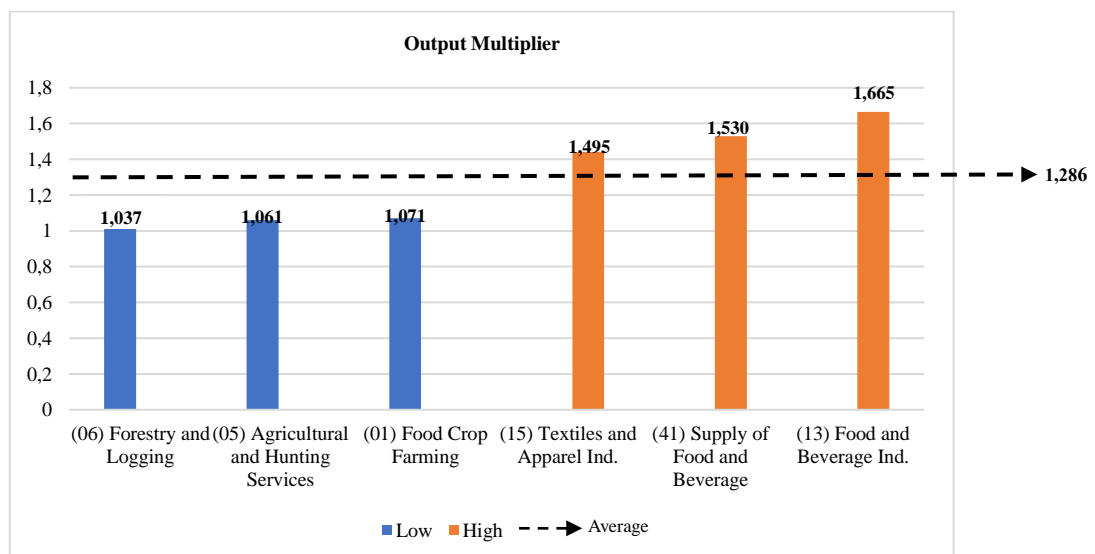


Figure 20. Output Multiplier DIY Agro-industry in 2016

4.2.2 Income Multiplier

Agro-industrial sector in DIY in 2016 with high value of income multiplier is farm sector (04) with value 0,546, agricultural and hunting services (05) with value 0,516, and supply of food and beverage (41) with value 0,413. These sectors are said to be high because their value exceeds the average of 0,289.

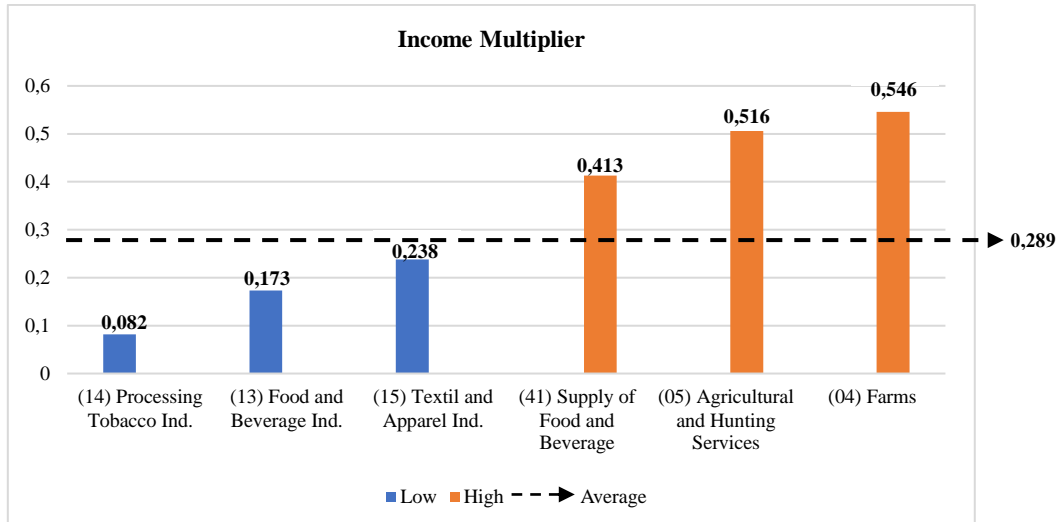


Figure 21. Income Multiplier DIY Agro-industry in 2016

4.3. Performance of Agro-Industry Daerah Istimewa Yogyakarta in 2016

4.3.1 Degree of Export Dependence

The agro-industrial sector in DIY in 2016 with a high degree of export dependence is the textile and apparel industry (15) with a value of 0,848, chemical industry, pharmaceutical and traditional medicine (19) with a value of 0,790, and supply of food and beverage (41) with a value of 0,567. These sectors are said to be high because their value exceeds the average of 0,463.

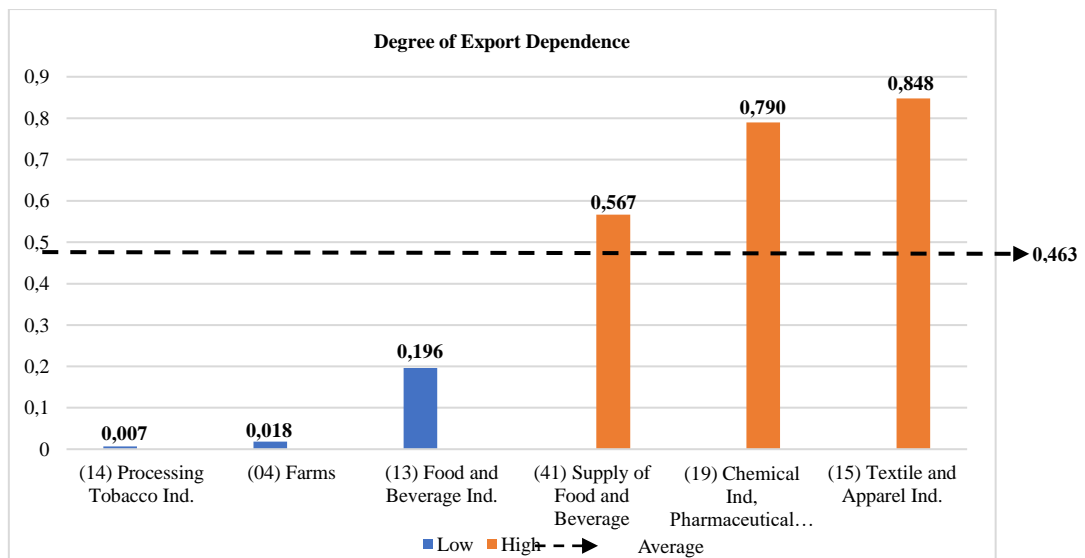


Figure 22. Degree of Export Dependence DIY Agro-industry in 2016

4.3.2 Multiplier Export On Output

The agro-industrial sectors in DIY in 2016 with high output multipliers were supply food and beverage sector (41) with a value of 0,171, the textile and apparel industry (15) with a value of 0,079, and the food and beverage industry (13) with a value of 0,063. These sectors are said to be high because their value exceeds the average of 0,028.

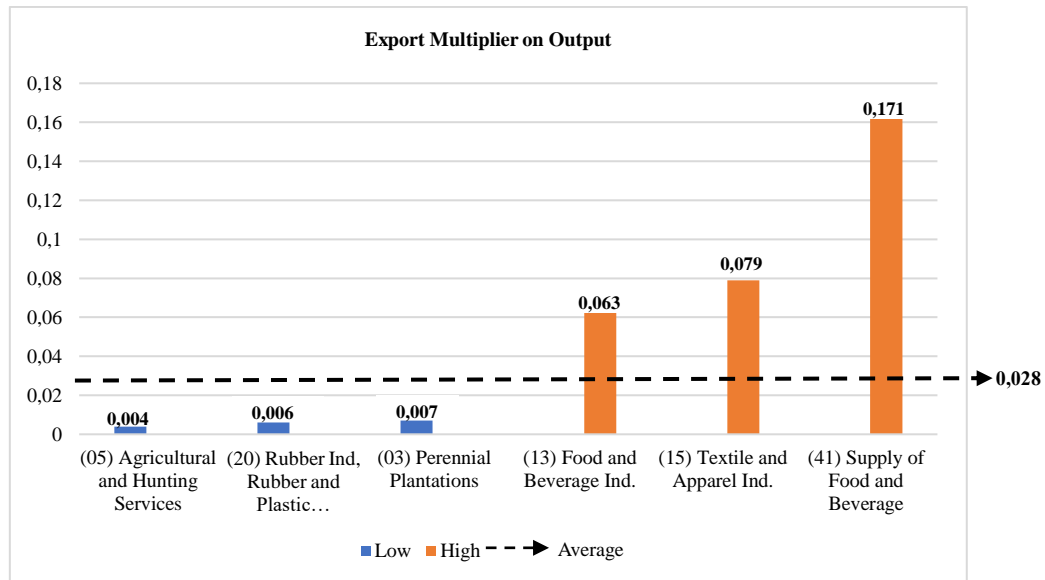


Figure 23. Multiplier Export On Output DIY Agro-industry in 2016

4.4. Leading Sector of Agro-Industry Daerah Istimewa Yogyakarta in 2016

The leading sector is a sector that has high forward and backward linkage values, high output and income multipliers, as well as a high degree of export dependence and export multipliers on output. Based on the input output analysis of the agro-industry sector in DIY in 2016, it was found that the leading sector was the supply of food and beverage sector with sector code in the input output table 41. This sector's value was consistently above average starting from the analysis of links, multipliers and exports. Meanwhile, two other sectors, namely the food and beverage industry (13) and the textile and apparel industry (15), are sectors that have opportunities to be developed because these two sectors have high values of both forward and backward linkages. However, both sectors have low income multipliers so they are not included in the leading sectors. The low income multiplier value is caused by the food and beverage industry as well as the textile and apparel industry including industries with a labor-intensive character, which means relying more on high utilization of human resources rather than the use of technology and machines in the production process. The more the number of workers in a sector, the lower the wages received because wages are considered a burden or cost for the company (Raharjo et al., 2022).

Based on table 4.1, the supply of food and beverage sector (41) is classified as a conglomeration industry. Conglomeration is an attempt by large companies to merge into one group with great power so that they are able to beat competitors, have control in regulating transaction prices between companies, especially to avoid taxes, can hold lots subsidies, and have "bargaining power" (Priasmoro et al., 1994). Similar research explained that companies with low market power have a low ability to raise prices. On the other hand, companies with large market power are able to influence prices (Datta et al., 2013). So in line with this phenomenon, the food and beverage industry sector (13) and the textile and apparel industry (15) are included in the conglomeration market, which can be interpreted that both industries

are dominated by companies with large market share so that companies in these industries tend to be able to control prices, especially in this phenomenon of lowering prices or in matter this called income received by labor. This then has an impact on the low income multiplier of the two industries.

5. Conclusion

The structure of the DIY agro-industry in 2016 which had a high number of forward linkages and backward linkages were the food and beverage industry (13), the textile and apparel industry (15), and the supply of food and beverage (41). DIY agro-industry conduct in 2016 which had high output multiplier and income multiplier figures were farm sector (04), the leather industry, leather goods and footwear (16), and the supply of food and beverage sector (41). The performance of DIY agro-industry in 2016 which has a high degree of export dependence and export multiplier on output were the textile and apparel industry (15) and the supply of food and beverage sector (41). The leading agro-industrial sector in DIY in 2016 is the supply of food and beverage with the sector code in the input output table (41), because it has a high number of forward and backward linkages, high output and income multipliers, as well as a degree of dependence on exports and export multipliers on high output. This is in accordance with the Final Report on the Preparation of Analysis of the Impact of Infrastructure Development on DIY's Economic Development in 2016 issued by the Bappeda DIY in 2016, which states that the supply of food and beverage sector is a key sector or leading sector of DIY in 2016.

Based on this fact, it is advisable for the government to prioritize development both physically in the form of infrastructure facilities and policies that support the supply of food and beverage sector. The government also needs to encourage potential sectors such as the food and beverage industry and the textile and apparel industry by focusing on wage policy aspects in both industries so that their existence can increase the multiplier impact in the income sector. On the other hand, agro-industrial sectors with low linkage, multiplier and export values still need to be encouraged so that these sectors can still survive in meeting the needs in the region so that it is hoped that the DIY region will not need to import products produced by sectors that have a small contribution.

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