Analysis of Leading Sector Identification in East Java Province in 2016 (Input-Output Aproach)

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Abstract: In planning alternative strategies, there are a variety of analytical tools that can be used, each with its own advantages and limitations. For example, indicators of prosperity are usually measured through Gross Regional Domestic Product (GRDP). Although GRDP provides an overview of the contribution of each sector to the regional economy, this data is proportional (share) and is not able to describe the relationship between sectors as a whole. In other words, GRDP cannot show the extent of inter-sectoral linkages as the main driver of the regional economy. Therefore, this study uses input-output analysis. This analysis is considered more comprehensive because it is able to describe the linkages between economic sectors in a region as a whole. Through this approach, the impact of production changes in one sector on other sectors can be known more clearly. In addition, input-output analysis can also measure the impact on community welfare through primary inputs in the form of added value. Thus, changes in production in certain sectors can show how much the prosperity of the people in the region has increased or decreased.

Keywords: *Identification, Input-output, Forward Linkages, Backward Linkages.*

Introduction

Economic growth occurs when current economic activity is greater than in the previous period. The greater the growth in each sector, the greater the country's economic development. This economic development will greatly affect the welfare of the community, so it becomes an important thing to be considered by the state. In this case, economic development can be measured through economic growth, per capita income and also the increase in gross domestic product (Pasaribu, Development Economics, et al., 2020).

Economic development is thus a manifestation of the growth of the leading sectors in a country. With the development of a sector, other sectors will be encouraged. This is what then forms inter-sectoral linkages. This inter-sectoral linkage can boost the regional economy for the better (Suharjo and Santoso, 2014).
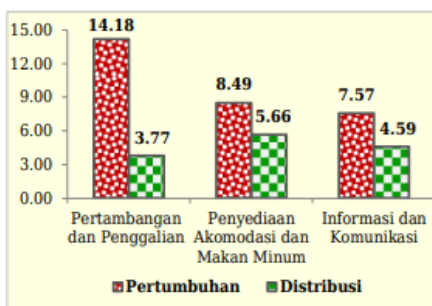

Figure 1. Growth and Distribution of Several Business Fields in 2016

Figure 1. shows that the economy of East Java Province in 2016 grew by 5.55 percent with all business field categories experiencing positive growth. The sector with the highest growth was Mining and Quarrying (14.18%), followed by Accommodation and Dining (8.49%), Information and Communication (7.57%), Financial and Insurance Services (6.99%), and Educational Services (5.97%). Nevertheless, the structure of the East Java economy in that year was still dominated by three main business sectors, namely Manufacturing Industry with a contribution of 28.92 percent; Wholesale and Retail Trade and Car and Motorcycle Repair at 18.00 percent; and Agriculture, Forestry and Fisheries at 13.31 percent. This shows that not all high-growth sectors are the sectors with the largest contribution to GRDP, so further studies are needed to identify leading sectors comprehensively.[1]

Conventional indicators such as Gross Regional Domestic Product (GRDP) are only able to show the magnitude of each sector's contribution to the total economy but cannot reveal the extent of inter-sectoral linkages in driving overall economic activity. Not all sectors with large contributions or high growth automatically become strategic leading sectors for regional development. Therefore, an analytical approach is needed that is able to see sectoral roles more thoroughly, not only in terms of output, but also in terms of linkages and multiplicative impacts on other sectors.

One approach that can provide a comprehensive picture of inter-sectoral linkages in the economy is input-output analysis. This analysis maps the interdependence between sectors, both in the form of *backward linkages* and *forward linkages*. Thus, if there is a change in production in a sector, the impact on other sectors can be systematically identified. Not only that, but this analysis also allows the measurement of *multiplier* effects, both on output, labor, and value added. Therefore, this approach is considered more comprehensive than the conventional approach because it is able to reveal which sectors are truly strategic and play a major role in driving the regional economy at large.

Input-output analysis works by mapping how each sector in the economy needs and supports each other in the production process. Each sector needs inputs, both from itself and from other sectors, to produce output. These inputs can be raw materials (intermediate inputs) or primary inputs such as labor, capital, and skills. The output can then be consumed directly or reused in the production process in the next period. In this context, the involvement of the factors of production will reward the community with income according to their contribution. Therefore, changes in the level of production of a sector not only affect output but also have an impact on the creation of added value and the welfare of society as a whole. Thus, input-output analysis not only looks at sectoral relationships technically, but also becomes an important tool for assessing economic impacts socially.

Over time, this approach has become increasingly relevant. The latest data shows that the East Java economy in 2024 grew by 4.93 percent, with the Transportation and Warehousing sector recording the highest growth of 9.50 percent, followed by Other Services (8.58%) and Corporate Services (7.88%). However, East Java's economic structure is still dominated by the Manufacturing Industry sector (30.85%) and Wholesale-Retail Trade (18.81%). This shows a gap between the high-growth sectors and the sectors that make a large contribution to GRDP, a phenomenon that is consistent with the conditions in 2016.

Although many studies have examined the economic structure of East Java, there are still gaps in terms of comprehensively mapping sectoral linkages and using input-output analysis as a basis for strategically determining leading sectors. Most of the previous studies relied only on sectoral growth and contribution without considering the relationship between sectors and their socio-economic impact.

Based on this, this research is focused on answering the question: which sectors have the highest forward and backward linkages in East Java Province, and how these linkages can be used as a basis for determining the leading sectors that are truly strategic to encourage sustainable economic growth. The results of this study are expected to make a real contribution to the preparation of regional development

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[1] Official Statistic of East Java Province No. 11/02/35/Th.XV, February 6, 2017

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policies that are more *evidence-based* (*evidence-based policy*) and have a broad impact on improving the welfare of the community.

Literature Review
Economy
The definition of economics is all that concerns matters relating to livelihood in the household of course what is meant and in its development the word household not only refers to a family consisting of husband, wife, and children, but also a wider household, namely the household of the nation, state and world. (Iskandar, 2010)

Leading Sector
According to Hidayat Amir and Singgih Riphat (2005: 7) the definition of a leading economic sector is a sector that has a relatively large role compared to other economic sectors in spurring economic growth, in this case the sector can meet the needs of the region and has exported to other regions known as the base sector. Meanwhile, according to Tri Widodo (2006: 122), the leading economic sector or subsector is determined as the driver of regional economic growth or better known as the primary sector which has criteria as a developed and fast-growing sector in this case the sector or subsector that has a faster growth rate and has a relatively large contribution compared to the same sector at the provincial level

Sector
Economic sectors are groupings of the economy into sections. Traditionally, economic sectors are divided according to activity, namely the primary, secondary, and tertiary sectors. In the 20th century, the quaternary sector was added as a new group. Apart from activity, economic sectors can also be divided according to actors. Based on this grouping, the economic sector is divided into three, namely the public, business, and social sectors.

Input - Output
The Input-Output Table is basically just a *double entry system of* the balance of transactions that occur between producers in an economy. The Input-Output Table as a data presentation system was actually developed in the 1930s by Professor Wasilly Leontief. The Indonesian Input-Output (IO) Table was prepared with the intention of presenting an overview of the reciprocal relationships and interrelationships between units of activity (sectors) in the economy in Indonesia as a whole. The I-O Table is a matrix, and each row shows how a sector's output is allocated to meet intermediate and final demand while each column shows the use of intermediate and primary inputs by a sector in its production process. *Backward Linkage* (*BLC*) refers to: The extent to which sector X depends on other sectors to fulfill its input requirements. *Forward Linkage* (*FML*) refers to: The extent to which the output of sector X is used as input by other sectors.

This study uses the I-O Table because it is able to produce an effective tool for economic analysis and projection in a development plan, it can also be used as a basis for assessing and recognizing various weaknesses of other statistical data. Thus, the results of the preparation of an I-O Table can then be utilized in efforts to improve the national statistical system.

Methodology
The data used in this study are secondary data sourced from the Input-Output Table of East Java Province Domestic Transactions at Producer Prices in 2016 (in million rupiah), which includes 17 categories of business fields. The method applied in the analysis is Input-Output analysis, which includes two main focuses: forward and backward linkage analysis, and *multiplier* calculation. The year 2016 was chosen as the base year in this study because it was the last available and complete year for the Input-Output Table of East Java Province at the time of the study. The selection of this year also considers the macroeconomic stability of that year, so that the analysis conducted will be more representative of the structure of the regional economy under normal conditions (not affected by the economic crisis or pandemic).

Forward linkages describe the amount of total output generated due to an increase in the output of an industrial sector, through the process of output distribution to all sectors in the economy. When the output of sector i increases, the additional output will flow to various other sectors, including back to

sector i itself. Directly, if the output of sector i increases by one unit, the increase in total output in the economy that occurs through the flow of output can be seen from the row in the input-output coefficient matrix (matrix A). Therefore, the direct forward linkages for sector j, denoted by F(d), can be formulated as follows:

$$F(d)i = \sum_{j=1}^{n} aij$$

In the context of Input-Output analysis, the i-th sector and j-th sector refer to two different sectors or categories of businesses in the economic system being analyzed. The i-th sector is the sector being analyzed as a provider of inputs (products or services) for other sectors. In other words, sector i is the source of output that is then used by other sectors in their production process. For example, if sector i is the agricultural sector, then agricultural products (such as rice or vegetables) can be used by the food and beverage sector (sector j) as raw materials. Meanwhile, the jth sector is a sector that receives inputs from other sectors (including from sector i), and uses them in its own production process. So sector j is a user or consumer of other sectors' output. For example, sector j could be the food processing industry, which uses agricultural products from sector i as its production input.

Forward Linkage
Describes the extent to which the output of sector i is utilized by other sectors as inputs. If the output of sector i increases, then other sectors that use that output as input will also be affected. Direct forward linkage formula:

$$F(d)i = \sum_{j=1}^{n} aij$$

Where aij is the element in row i and column j of the Input Coefficient Matrix (A). This means, if the output of sector i increases by 1 *unit*, then we add up how much other sectors (j) use the output of sector i.

Example: If the agricultural sector (i) supplies raw materials to the food industry (j), and the value of aij =0.2, it means that 20% of the agricultural sector's output is used by the food industry.

Total forward linkages (direct + indirect):

$$F(d + i)i = \sum_{j=1}^{n} bij$$

Where bij is an element of the Leontief *Inverse* Matrix $(I - A)^{-1}$

Backward Linkage
Describes how much sector i depends on inputs from other sectors. When sector i increases its output, the demand for inputs from other sectors also increases.
Direct backward linkage formula:

$$B(d)j = \sum_{i=1}^{n} aij$$

Where aij here is the element in column j of Matrix A, meaning that sector j uses inputs from sector i.

Example: If the car industry (j) buys steel (i), and $aij=0.3$, then 30% of the car industry's input comes from the steel sector.

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Total backward linkages (direct + indirect):

$$B(d + i)j = \sum_{i=1}^{n} bij$$

Output Multiplier

Measures the total output created across all sectors of the economy due to a one-unit increase in final demand in a sector.

$$Oj = \sum_{i=1}^{n} bij$$

Taken from the sum of the jth column in the *Inverse* Leontief Matrix. The higher the value of Oj, the greater the impact on the economy.

Example: If Oj=2.5, then a Rp1 million increase in final demand in sector j will lead to a Rp2.5 million increase in total output.

Income Multiplier **(Household Income Multiplier)**

Describes the total additional household income due to a one-unit increase in final demand in a sector.

$$H_j = \sum_{i=1}^{n} (a_{\text{n}} + 1,_j \times a_{\text{i}j})$$

Where an+1,j is the coefficient of household income distribution towards sector j.

Example: If Hj=1.2, then every additional final demand of Rp1 million will result in an additional household income of Rp1.2 million.

Employment **Multiplier**

Measures the amount of additional labor created due to a *one-unit* increase in final demand in a sector.

$$E_j = \sum_{i=1}^{n} (\omega_{\text{n}} + 1,_j \times a_{\text{i}j})$$

Where $\omega_{\text{n}}+1,_j$ is the ratio of labor to input of sector j.

Example: If $E_j = 0.8$, it means that an increase in final demand of Rp1 million will create 0.8 *units of* new jobs in that sector and related sectors.

Results and Discussion

Table 1. East Java Province Input-Output Table Domestic Transactions at Producer Prices (17 Business Fields), 2016 (Million Rupiah)

Code	Sector Description	Total Output	Total Input
1	Agriculture, Forestry and Fisheries	278,359,110	278,359,110
2	Mining and Quarrying	114,522,198	114,522,198
3	Processing Industry	1,237,843,510	1,237,843,510
4	Electricity and Gas Procurement	89,613,178	89,613,178
5	Water Supply, Waste Management, Waste and Recycling	2,822,479	2,822,479
6	Construction	396,427,935	396,427,935
7	Wholesale and Retail Trade; Repair of Cars and Motorcycles	376,866,220	376,866,220
8	Transportation and Warehousing	159,602,185	159,602,185
9	Provision of Accommodation and Drinking Meals	150,708,537	150,708,537
10	Information and Communication	115,710,444	115,710,444
11	Financial and Insurance Services	77,013,641	77,013,641
12	*Real Estate*	92,016,014	92,016,014
13	Company Services	61,366,597	61,366,597

14	Government Administration, Defense and Compulsory Social Security	75,140,910	75,140,910
15	Education Services	40,874,978	40,874,978
16	Health and Social Services	75,885,705	75,885,705
17	Other Services	3,404,869,619	3,404,869,619

Source: Central Bureau of Statistics, Input-Output Table of East Java Province 2016 (processed)

Based on the data provided, economic sectors have variations in total output and input that show different levels of efficiency and contribution. The Other Services sector recorded the highest total output of 3,404,869,619, with a much smaller input of 75,885,705. This indicates that this sector is highly efficient and has a large impact on the economy. In addition, the Manufacturing Industry is also an influential sector with a total output of 1,237,843,510, making it one of the main sectors in the economic cycle.

On the other hand, some sectors have a balance between inputs and outputs, such as Agriculture, Forestry, and Fisheries, Mining and Quarrying, and Processing Industry. This indicates that these sectors operate with high efficiency without much surplus or deficit. Meanwhile, sectors such as Health Services and Social Activities and Government Administration, Defense, and Compulsory Social Security show a significant gap between output and input, indicating that they are able to generate higher economic value compared to the resources used.

From this analysis, it can be concluded that Other Services is the most influential sector as it has the largest total output and a high output-input gap, signifying outstanding efficiency. However, Manufacturing Industry remains a key sector in the economy due to its large volume of output as well as the stability of the balance between input and output. As such, these two sectors play an important role in overall economic growth.

Backward Linkage Analysis

Table 2. Backward Linkage Table of East Java Province Sectors Domestic Transactions at Producer Prices (17 Business Fields), 2016 (Million Rupiah)

Code	Sector Description	Backward Linkage		
		Direct	Indirect	Total
1	Agriculture, Forestry and Fisheries	0.516278072	0.32485599	0.841134062
2	Mining and Quarrying	0.495921382	0.349591448	0.84551283
3	Processing Industry	1.247555079	-0.191328518	1.056226561
4	Electricity and Gas Procurement	1.932461126	-0.557428667	1.375032459
5	Water Supply, Waste Management, Waste and Recycling	0.890649152	0.085370962	0.976020114
6	Construction	1.389878731	-0.289184733	1.100693998
7	Wholesale and Retail Trade; Repair of Cars and Motorcycles	0.72563344	0.183247874	0.908881314
8	Transportation and Warehousing	1.041808243	-0.040937418	1.000870825
9	Provision of Accommodation and Drinking Meals	1.177922033	-0.150725944	1.027196089
10	Information and Communication	1.131282588	-0.067864394	1.063418194
11	Financial and Insurance Services	0.599186018	0.271439666	0.870625684
12	*Real Estate*	0.502920842	0.342751346	0.845672188

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13	Company Services	1.262770235	-0.18174137	1.081028865
14	Government Administration, Defense and Compulsory Social Security	0.988286571	0.00489055	0.993177121
15	Education Services	0.894264469	0.071755069	0.966019538
16	Health and Social Services	1.222056287	-0.163857244	1.058199043
17	Other Services	0.981124733	0.009165383	0.990290116

Source: Central Bureau of Statistics, Input-Output Table of East Java Province 2016 (processed)

The *forward linkage* analysis in the table shows the extent to which economic sectors contribute to the demand for output in other sectors, either directly or indirectly. The following is the interpretation based on the data:

1. Direct Forward Linkage, this value shows the direct relationship between a particular sector and other sectors that use its output. The higher the value, the greater the influence of the sector on the demand for other sectors' output. Sectors with high values: Electricity and Gas Procurement (2,68010189): Has the highest direct forward linkages, indicating that the output of this sector is needed by other sectors directly. Corporate Services (2,15048783): Its output also has a significant influence on direct demand in other sectors. Financial and Insurance Services (1,61670457): Indicates the importance of financial services in supporting other economic activities. Low value sector: Public Administration, Defense and Compulsory Social Security (0,103854621): Relatively small direct linkages, as its output tends not to be used directly by many sectors. Educational Services (0.096545283): Shows low direct impact on demand in other sectors.

2. 2. Indirect Forward Linkages, This value represents indirect linkages through supply chains or knock-on effects in the economy. Positive values indicate a significant indirect contribution, while negative values indicate a smaller impact or even a reduction in indirect linkages. Sectors with high positive values: Construction (0.522213065): Has strong indirect linkages, indicating that construction activities affect many sectors through the supply chain. Education Services (0.598956671): Although the direct impact is small, this sector has considerable indirect influence. Water Supply, Waste Management, Waste and Recycling (0.321968355): This sector makes a significant indirect contribution through multiplier effects. Sector with negative values: Electricity and Gas Procurement (-0.866708744): Despite having high direct forward linkages, its indirect effects are negative. Corporate Services (-0.767356957): Its impact on indirect linkages is less than its direct impact.

Forward Linkage Analysis

Table 3. Table of *Forward Linkages* of Sectors in East Java Province Domestic Transactions at Producer Prices (17 Business Fields), 2016 (Million Rupiah)

Code	Sector Description	Forward Linkage		
		Direct	Indirect	Total
1	Agriculture, Forestry and Fisheries	1.305826844	-0.249872646	1.055954198
2	Mining and Quarrying	1.377947303	-0.277012972	1.100934331
3	Processing Industry	1.008910434	-0.051825029	0.957085405
4	Electricity and Gas Procurement	2.680108193	-0.866708744	1.813399449
5	Water Supply, Waste Management, Waste and Recycling	0.495575788	0.321968355	0.817544143
6	Construction	0.194982357	0.522213065	0.717195422
7	Wholesale and Retail Trade; Repair of Cars and Motorcycles	1.233846496	-0.197799373	1.036047123
8	Transportation and Warehousing	1.276082672	-0.21436113	1.061721542
9	Provision of Accommodation and Drinking Meals	0.371267817	0.408013976	0.779281793

10	Information and Communication	1.327206233	-0.211488904	1.115717329
11	Financial and Insurance Services	1.616706454	-0.407178108	1.209528346
12	*Real Estate*	0.903534047	0.047475557	0.951009604
13	Company Services	2.15048783	-0.767356957	1.383130873
14	Government Administration, Defense and Compulsory Social Security	0.103854621	0.601859453	0.705714074
15	Education Services	0.096545283	0.598956671	0.695501954
16	Health and Social Services	0.320700041	0.447128967	0.767829008
17	Other Services	0.536417587	0.29598782	0.832405407

Source: Central Bureau of Statistics, Input-Output Table of East Java Province 2016 (processed)

The data displayed shows the direct backward and indirect backward values of various sectors of the economy.

1. Direct backward values represent the direct impact of a sector on other sectors in the supply chain, while indirect backward values represent the impact through more complex inter-sectoral linkages. Based on the table, the average direct backward value is higher than the indirect backward value. The sector with the highest direct backward value is "Electricity and Gas Procurement" (1.9324), followed by "Construction" (1.3898), and "Accommodation and Food Supply" (1.1779). This indicates that these sectors have a large direct influence on other sectors.

2. In contrast, for the indirect backward value, the "Mining and Quarrying" sector has the highest value (0.3495), followed by "*Real Estate*" (0.3427) and "Financial and Insurance Services" (0.2714). These sectors contribute greatly through indirect effects in the supply chain. However, some sectors such as "Electricity and Gas Procurement" have a negative indirect backward value (-0.5574), which indicates that their impact on other sectors through indirect linkages tends to be reduced.

Sectors with high direct backward values tend to be the main drivers in the economic supply chain, while sectors with high indirect backward values play an important role in more complex inter-sectoral linkages. This understanding can be used to design more targeted economic policies according to the characteristics of each sector.

Sectoral Dynamics Analysis (2010 and 2016)

Table 4. Comparative Table of *Backward Linkages* of Sectors in East Java Province Domestic Transactions at Producer Prices (17 Business Fields), between 2010 and 2016

Code	Sector	To the Back		To the Back	
		Direct 2010	Indirect 2010	Direct 2016	Indirect 2016
1	Agriculture, Forestry and Fisheries	0.22	1.09	0.516	0.325
2	Mining and Quarrying	0.15	1.05	0.496	0.350
3	Processing Industry	0.42	1.16	1.248	-0.191
4	Electricity and Gas Procurement	0.28	1.10	1.932	-0.557
5	Water Supply, Waste Management, Waste and Recycling	0.25	1.11	0.893	0.085
6	Construction	0.42	1.19	1.389	-0.290
7	Wholesale and Retail Trade; Repair of Cars and Motorcycles	0.14	1.06	0.726	0.183
8	Transportation and Warehousing	0.32	1.13	1.042	-0.041

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Code	Sector				
9	Provision of Accommodation and Drinking Meals	0.42	1.18	1.178	-0.151
10	Information and Communication	0.13	1.05	1.131	-0.068
11	Financial and Insurance Services	0.39	1.17	0.599	0.271
12	*Real Estate*	0.24	1.12	0.503	0.343
13	Company Services	0.30	1.12	1.263	-0.181
14	Government Administration, Defense and Compulsory Social Security	0.34	1.15	0.988	0.005
15	Education Services	0.19	1.07	0.894	0.072
16	Health and Social Services	0.49	1.21	1.222	-0.164
17	Other Services	0.19	1.08	0.981	0.009

Source: Central Bureau of Statistics, Input-Output Table of East Java Province 2010 & 2016 (processed)

Table 5. Comparison Table of *Forward Linkages* of Sectors in East Java Province Domestic Transactions at Producer Prices (17 Business Fields), between 2010 and 2016

Code	Sector	Looking Ahead		Looking Ahead	
		Direct 2010	Indirect 2010	Direct 2016	Indirect 2016
1	Agriculture, Forestry and Fisheries	0.22	1.09	0.516	0.325
2	Mining and Quarrying	0.15	1.05	0.496	0.350
3	Processing Industry	0.42	1.16	1.248	-0.191
4	Electricity and Gas Procurement	0.28	1.10	1.932	-0.557
5	Water Supply, Waste Management, Waste and Recycling	0.25	1.11	0.893	0.085
6	Construction	0.42	1.19	1.389	-0.290
7	Wholesale and Retail Trade; Repair of Cars and Motorcycles	0.14	1.06	0.726	0.183
8	Transportation and Warehousing	0.32	1.13	1.042	-0.041
9	Provision of Accommodation and Drinking Meals	0.42	1.18	1.178	-0.151
10	Information and Communication	0.13	1.05	1.131	-0.068
11	Financial and Insurance Services	0.39	1.17	0.599	0.271
12	*Real Estate*	0.24	1.12	0.503	0.343
13	Company Services	0.30	1.12	1.263	-0.181
14	Government Administration, Defense and Compulsory Social Security	0.34	1.15	0.988	0.005
15	Education Services	0.19	1.07	0.894	0.072
16	Health and Social Services	0.49	1.21	1.222	-0.164
17	Other Services	0.19	1.08	0.981	0.009

Source: Central Bureau of Statistics, Input-Output Table of East Java Province 2010 & 2016 (processed)

Table 6. Comparative Table of Sectoral Dynamics of *Backward Linkage* and *Forward Linkage*, Sectors of East Java Province Domestic Transactions at Producer Prices (17 Business Fields), between 2010 and 2016

Code	Sector	Backward Change		Backward Change	
		Direct	Indirect	Direct	Indirect
1	Agriculture, Forestry and Fisheries	0.296	-0.765	0.906	-1.550
2	Mining and Quarrying	0.346	-0.700	1.068	-1.400
3	Processing Industry	0.828	-1.351	-0.121	-1.438
4	Electricity and Gas Procurement	1.652	-1.657	2.550	-1.897
5	Water Supply, Waste Management, Waste and Recycling	0.643	-1.025	0.416	-0.688
6	Construction	0.969	-1.480	-0.115	-0.538
7	Wholesale and Retail Trade; Repair of Cars and Motorcycles	0.586	-0.877	0.404	-1.338
8	Transportation and Warehousing	0.722	-1.171	0.916	-1.384
9	Provision of Accommodation and Drinking Meals	0.758	-1.331	0.221	-0.632
10	Information and Communication	1,001	-1.118	1.047	-1.115
11	Financial and Insurance Services	0.209	-0.899	1.207	-1.557
12	*Real Estate*	0.263	-0.777	0.794	-1.013
13	Company Services	0.963	-1.301	1.880	-1.867
14	Government Administration, Defense and Compulsory Social Security	0.648	-1.145	0.083	-0.408
15	Education Services	0.704	-0.998	0.017	-0.421
16	Health and Social Services	0.732	-1.374	0.310	-0.563
17	Other Services	0.791	-1.071	0.506	-0.714

Source: Central Bureau of Statistics, Input-Output Table of East Java Province 2010 & 2016 (processed)

Table 6. presents a comparative analysis of sectoral dynamics between 2010 and 2016, based on changes in the value of backward linkages (direct and indirect) and forward linkages (direct and indirect) for 17 economic sectors.

Changes in *Backward Linkages*
1. Direct Linkages: Almost all sectors experienced an increase in direct backward linkages between 2010 and 2016. The highest increase was recorded in the Electricity and Gas Procurement sector (by 1.652), followed by Manufacturing Industry (0.828), Construction (0.969), Corporate Services (0.963), and Information and Communication (1.001). This indicates that these sectors are becoming increasingly dependent on intermediate inputs from other sectors directly. The lowest increase occurred in the Financial and Insurance Services sector (0.209).
2. Indirect Linkages: In contrast to direct linkages, almost all sectors show a decline in the value of indirect backward linkages. The largest declines occurred in the Electricity and Gas Procurement (-1,657), Manufacturing Industry (-1,351), Health and Social Services (-1,374), Corporate Services (-

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1,301), and Transportation and Warehousing (-1,171) sectors. This decline implies a weakening of the indirect input multiplier effect between sectors in the economy during the period

Changes in *Forward Linkages*
1. Direct Linkages: Most sectors also experienced an increase in direct forward linkages. The most significant increases were seen in the Electricity and Gas Procurement (2.550), Corporate Services (1.880), Financial and Insurance Services (1.207), Information and Communication (1.047), and Agriculture (0.906) sectors. This indicates that the outputs of these sectors are increasingly being used as direct inputs by other sectors. The lowest increase was recorded in the Education Services sector (0.017).
2. Indirect Linkages: Most sectors show a decline in the value of indirect forward linkages. The largest decreases occurred in the Agriculture (-1.550), Mining and Quarrying (-1.400), Trade (-1.338), Transportation and Warehousing (-1.384), and Financial and Insurance Services (-1.577) sectors. This decline indicates a reduction in the spread of a sector's output as indirect input through the production chain to other sectors.

Table 7. Table of Sectoral Dynamics Category Results (Tentative) *Backward Linkage* and *Forward Linkage*, East Java Province Sectors Domestic Transactions at Producer Prices (17 Business Fields), from 2010 and 2016

Code	Sector	Sectoral Dynamics Categories (Tentative)
1	Agriculture, Forestry and Fisheries	*Stagnant/changing structure*
2	Mining and Quarrying	*Stagnant/changing structure*
3	Processing Industry	*Stagnant/changing structure*
4	Electricity and Gas Procurement	*Potential leading sector*
5	Water Supply, Waste Management, Waste and Recycling	*Stagnant/changing structure*
6	Construction	*Stagnant/changing structure*
7	Wholesale and Retail Trade; Repair of Cars and Motorcycles	*Stagnant/changing structure*
8	Transportation and Warehousing	*Stagnant/changing structure*
9	Provision of Accommodation and Drinking Meals	*Stagnant/changing structure*
10	Information and Communication	*Potential leading sector*
11	Financial and Insurance Services	*Stagnant/changing structure*
12	*Real Estate*	*Stagnant/changing structure*
13	Company Services	*Potential leading sector*
14	Government Administration, Defense and Compulsory Social Security	*Stagnant/changing structure*
15	Education Services	*Stagnant/changing structure*
16	Health and Social Services	*Stagnant/changing structure*
17	Other Services	*Stagnant/changing structure*

Table 7. Categories of Sectoral Dynamics (Tentative) shows the analysis of changes in backward and forward linkages (direct and indirect) between 2010 and 2016 shows a diverse pattern of sectoral dynamics. Based on the direction of change in the four types of *linkages*, sectors are tentatively grouped into several categories.
1. Majority Sector: *Stagnant/Changing Structure Sector*
   Most of the 17 sectors analyzed show inconsistent changes between direct and indirect *linkages*, both on the input and output side. These fluctuations indicate a change in the internal structure of the production chain or the role of the sector in the economy without a clear trend of development towards a leading sector or a significant decline overall. These sectors include: Agriculture, Mining and Quarrying, Manufacturing, Water and Waste Management, Construction, Trade, Transportation and Warehousing, Accommodation and Food Services, Financial and Insurance Services, *Real Estate*, Government Administration, Educational Services, Health Services and Social Activities, and Other Services.

2. Leading Sector Potential

There are several sectors that show potential to become *Leading Sectors* in the future, mainly driven by the significant strengthening of *direct linkages*, despite the decline in *indirect linkages*. These sectors are:

- Electricity and Gas Procurement: Substantial increase in direct dependence on other sectors' inputs and significant increase in providing direct output to other sectors. Although its indirect effects declined, the sector's central role in direct transactions between sectors strengthened
- Information and Communication: A large increase in the use of direct inputs from other sectors and a significant increase in providing direct outputs to other sectors. This strengthening of direct linkages places this sector as a *Leading Sector* candidate in terms of direct interactions between sectors

Enterprise Services: A marked increase in direct dependence on other sectors' inputs and a large increase in providing direct output to other sectors. This strengthening role in direct transactions between sectors indicates potential as a *Leading Sector.*

Conclusion

This study aims to identify the leading sectors in East Java Province in 2016 through the Input-Output analysis approach, with a focus on backward linkage and forward linkage. The results of the analysis of changes in sectoral dynamics between 2010 and 2016 show that the majority of sectors tend to experience structural changes without a dominant trend as a clear leading sector. However, the Electricity and Gas Procurement, Information and Communication, and Corporate Services sectors indicate potential as Leading Sectors in the future. This potential is based on a significant increase in the direct linkages of these sectors with other sectors in the East Java economy. This research contributes to comprehensively mapping the structure of inter-sectoral linkages using Input-Output analysis, which goes beyond conventional GRDP indicators. The identification of potential Leading Sectors provides a deeper empirical basis for the formulation of more strategic regional development policies based on inter-sectoral linkages.

Based on the results of the analysis, the East Java Provincial Government is advised to prioritize the development of the Electricity and Gas Procurement, Information and Communication, and Corporate Services sectors given their potential as Leading Sectors with strong direct linkages. In addition, efforts to strengthen synergies and linkages between economic sectors as a whole need to be increased to maximize the multiplier effect. Special facilitation also needs to be given to sectors with high value of linkages. For validation and more accurate planning, further analysis with updated I-O Table data and integration of the results of this study in regional development strategic planning is highly recommended.

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