Forward and Backward Linkages of Economic Sectors and Determination of Leading Sectors in Southeast Aceh Regency

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ABSTRACT

This study examines the forward and backward linkages of economic sectors in Southeast Aceh Regency, Indonesia, to identify leading sectors that can drive regional economic growth. Using input-output analysis, the research evaluates the interdependence between sectors by assessing how changes in one sector influence others through supply chains (backward linkages) and demand distribution (forward linkages). The findings reveal key sectors with strong linkages, indicating their potential to stimulate economic activity and generate multiplier effects. The study identifies agriculture, mining, and manufacturing as sectors with significant backward linkages, while trade and services exhibit strong forward linkages. Based on these linkages, the research proposes strategic recommendations for prioritizing leading sectors to enhance regional development. The results provide valuable insights for policymakers in Southeast Aceh Regency to design targeted economic policies, optimize resource allocation, and foster sustainable growth. This study contributes to the broader understanding of regional economic dynamics and offers a framework for identifying leading sectors in similar contexts.

Keywords: *Economic Sectors, Leading Sectors, Input-Output Analysis,Regional Economic Growth, Southeast Aceh Regency*

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1. INTRODUCTION

Regional economic development is a critical aspect of achieving sustainable growth and reducing disparities within a country. Identifying key economic sectors that can drive growth is essential for policymakers to allocate resources effectively and design targeted interventions. Southeast Aceh Regency, a region in Indonesia with significant potential in agriculture, mining, and trade, faces challenges in optimizing its economic structure to maximize growth and improve livelihoods. Understanding the interconnections between economic sectors through forward and backward linkages provides a foundation for identifying leading sectors that can stimulate regional development.[1]

Forward linkages refer to the impact of a sector's output on other sectors that use its products as inputs, while backward linkages measure the dependence of a sector on inputs from other sectors. Analyzing these linkages helps determine the strength of interdependencies within an economy and identifies sectors with the potential to generate multiplier effects. Input-output analysis is a widely used tool for this purpose, as it quantifies the relationships between sectors and highlights their roles in driving economic activity.[2]

Economic development is a multifaceted process that requires a deep understanding of the structural interdependencies within a region's economy. For regions like Southeast Aceh Regency in Indonesia, where economic potential is vast but underutilized, identifying key sectors that can drive growth is critical for achieving sustainable development. The concept of forward and backward linkages provides a robust framework for analyzing how economic sectors interact and influence one another, offering valuable insights into which sectors can serve as engines of growth. Forward linkages measure how a sector's output is utilized as input by other sectors, while backward linkages assess the extent to which a sector relies on inputs from other sectors. Together, these linkages reveal the interconnectedness of an economy and highlight sectors with the potential to generate significant multiplier effects.

Southeast Aceh Regency, rich in natural resources such as agricultural land, minerals, and fisheries, has traditionally relied on primary sectors like agriculture and mining. However, the region faces challenges in diversifying its economy and reducing its dependence on a narrow range of industries.[3] While agriculture and mining have been the mainstay of the local economy, their ability to stimulate broader economic growth remains underexplored. Additionally, emerging sectors such as trade, services, and manufacturing present opportunities for economic diversification but require strategic investment and policy support to realize their full potential.

Understanding the dynamics of sectoral linkages is essential for policymakers to prioritize investments and design targeted interventions. Input-output analysis, a widely used tool in regional economics, offers a systematic approach to quantifying these linkages.[4] By mapping the flow of goods and services between sectors, this method helps identify sectors with strong forward and backward linkages, which are likely to have a greater impact on overall economic activity. Such sectors, often referred to as "leading sectors," can act as catalysts for regional development by creating employment, stimulating ancillary industries, and attracting investment.

In the context of Southeast Aceh Regency, where economic activities are predominantly resource-based, understanding sectoral linkages is crucial for diversifying the economy and reducing reliance on a few key industries. Agriculture, mining, and manufacturing have traditionally been the backbone of the region's economy, but their potential to stimulate broader economic growth remains underexplored. Similarly, the trade and services sectors, which have shown growth in recent years, may hold untapped potential as drivers of development.

This study aims to analyze the forward and backward linkages of economic sectors in Southeast Aceh Regency to identify leading sectors capable of propelling regional economic growth. By employing input-output analysis, the research seeks to uncover the interdependencies between sectors, assess their relative importance, and provide evidence-based recommendations for policymakers. The findings will contribute to the strategic prioritization of industries, enabling more effective resource allocation and fostering sustainable development in the region. To analyze the forward and backward linkages of economic sectors in Southeast Aceh Regency to determine its leading sectors. Using input-output analysis, the research aims to uncover the structural relationships between sectors, assess their relative importance, and identify those with the highest potential to drive economic growth. The findings will provide an evidence-based foundation for policymakers to prioritize sectors, allocate resources efficiently, and design strategies that promote sustainable and inclusive development.

The significance of this research extends beyond Southeast Aceh Regency, offering a replicable framework for other regions with similar economic structures. [5]By identifying leading sectors and understanding their linkages, this study contributes to the broader discourse on regional economic development and provides actionable insights for fostering resilience, reducing economic disparities, and improving the quality of life for local communities.[6] In doing so, it underscores the importance of evidence-based policymaking in achieving long-term development goals. This study's significance lies in its potential to inform regional economic policies and support the achievement of long-term development goals. By identifying leading sectors with strong linkages, the research offers a framework for enhancing economic resilience, creating employment opportunities, and improving the overall well-being of the population in Southeast Aceh Regency.

2. RESEARCH METHODOLOGY

The location of this research is in Southeast Aceh Regency, which is part of Aceh Province with an area of 4,165.63 km2, consisting of 16 sub-districts, 386 villages. The data used in this study consists of primary and secondary data. This study employs a quantitative approach to analyze the forward and backward linkages of economic sectors and identify leading sectors in Southeast Aceh Regency. The primary methodological framework used is input-output analysis, a well-established tool in regional economics for examining the interdependencies between sectors. The study utilizes secondary data from the Central Bureau of Statistics (BPS) of Indonesia, specifically the input-output table for Southeast Aceh Regency. The input-output table provides a comprehensive snapshot of the flow of goods and services between sectors, detailing how outputs from one sector serve as inputs for others. Additional data on sectoral output, employment, and value-added were also collected to complement the analysis. The stages of analysis carried out are, analysis of the relationship between production sectors, integration of production sectors, and sustainable integrated agricultural models on a household scale in rural areas. To further evaluate the economic impact of leading sectors, the study calculates output, income, and employment multipliers. These multipliers quantify the ripple effects of changes in sectoral output on the overall economy. Output Multiplier: Measures the total increase in economic output resulting from a unit increase in final demand for a sector. Income Multiplier: Measures the increase in household income generated by a unit increase in final demand. Employment Multiplier: Measures the increase in employment resulting from a unit increase in final demand. The data analysis method used to test the integration of economic growth and job creation in the

agricultural sector uses one of the time series regressions, namely Vector Autoregression (VAR) or using the Vector Error Correction Model (VECM).

3. RESULTS AND DISCUSSION

Interrelationships between Production Sectors

To find out the leading sectors that can generate higher economic growth, it can be found by calculating the multiplier. Based on the multiplier coefficient matrix derived from the output multiplier matrix (I-A)-1 in the Input Output table, the relationship between production sectors can be analyzed. The relationship between production sectors can be divided into two parts, namely: (1) the sensitivity index, and (2) the dissemination power index. The sensitivity index shows the impact of a particular sector on the sector that uses the sector's output directly per unit increase in total demand, or the direct forward linkage shows the relationship of the sector to its output market. Meanwhile, the dissemination power index shows the impact of a particular sector on another sector that provides intermediate input for the sector directly per unit increase in total demand or the direct backward linkage shows the relationship of the sector to its input market. The sensitivity index and dissemination power are obtained by dividing the total forward and backward linkages of each sector by their average. If the sensitivity index and dissemination power obtained are greater than one, then the sector has a relatively high sensitivity index or dissemination power, while if it is less than one, then the sector has a low sensitivity index or dissemination power.

The relationship between production sectors can be seen in the table below.

Table 3.1. Interrelationships between Production Sectors

No	Sectors	Spreading Power	Degree of Sensitivity
1	Agriculture, Forestry, Fisheries	1,12553	1,20421
2	Mining and Quarrying	0,94133	1,03976
3	Processing industry	1,73231	1,40514
4	Electricity and Gas Procurement	0,83378	1,95653
5	Water Supply, Waste Management, Waste and Recycling	1,08182	0,69387
6	Construction	1,04138	0,90676
7	Wholesale and Retail Trade; Car and Motorcycle Repair	0,90833	1,37664
8	Transportation and Warehousing	0,94529	1,05298
9	Provision of Accommodation and Food and Drink	1,10658	0,74408
10	Information and Communication	0,84186	0,80036
11	Financial Services and Insurance	0,81924	0,81913
12	Real Estate	0,93073	1,09122
13	Company Services	0,93627	0,85234
14	Government Administration, Defense and Compulsory Social Security	0,94456	0,83109
15	Education Services	0,88434	0,69208
16	Health Services and Social Activities	1,01722	0,73691
17	Other Services	0,90944	0,79690

Source: Secondary Data

Based on Table 4.3, the highest distribution index value is owned by the manufacturing industry sector of 1.7323, this means that if the exogenous variable or final demand of each economic sector increases by one unit, the total production of all economic sectors is grown by the increase in the exogenous variable or final demand of the manufacturing industry sector of 1.7323. This means that the manufacturing industry sector is able to attract growth in its upstream sector, or this sector is very sensitive to driving regional economic growth. In second and third place are the agriculture, forestry, and fisheries sectors of 1.1255 and the accommodation and food and beverage

provision sector of 1.1065. Furthermore, sectors that have a distribution index value of less than one, such as: the mining and value extraction sector of 0.9413. This means that the sector is less able to attract growth in its upstream sector or this sector is less sensitive to driving economic growth.[7], [8], [9], [10], [11]

Next, the highest sensitivity index value is owned by the manufacturing industry sector of 1.4051, this means that if the exogenous variable or final demand of each economic sector increases by one unit, then from the total production of all economic sectors, it is grown by an increase in the exogenous variable or final demand of the manufacturing industry sector of 1.4051. This means that the manufacturing industry sector is able to drive the growth of its downstream sector or this sector is very sensitive to driving economic growth. In second and third place are the wholesale and retail trade sector, car and motorcycle repairs of 1.3766, and the agriculture, forestry, and fisheries sector with a value of 1.2042. Sectors that have a sensitivity index value of less than one, such as: water supply, waste management, waste and recycling, construction, provision of accommodation and food and beverages, information and communication, financial services and insurance, corporate services, government administration, defense and mandatory social security, education services, health services and social activities, and other services, namely 0.79690, this means that the sector is less able to drive the growth of its downstream sector, or this sector is less sensitive to driving economic growth.

Concluded that the agriculture, forestry, fisheries, mining and excavation, manufacturing, electricity and gas supply, wholesale and retail trade, car and motorcycle repair, transportation and warehousing and real estate sectors have the highest distribution power index compared to other sectors. This means that the increase in this sector has a high ability to attract growth in other sectors. Meanwhile, the electricity and gas supply, manufacturing and agriculture, forestry, and fisheries sectors have the highest degree of sensitivity compared to other sectors. This means that the increase in this sector has a high ability to encourage growth in other sectors.

The agriculture sector emerged as a cornerstone of the regional economy, exhibiting strong backward linkages. This indicates its heavy reliance on inputs from other sectors, such as manufacturing (e.g., fertilizers, machinery) and services (e.g., transportation, logistics). However, its forward linkages were relatively weaker, as a significant portion of its output is directed toward final consumption rather than serving as input for other sectors. Despite this, agriculture remains a leading sector due to its foundational role in supporting livelihoods and stimulating demand for inputs from other sectors.

Discussion

The results highlight the interconnected nature of Southeast Aceh Regency's economy and the critical role of leading sectors in driving regional development. While agriculture and mining remain the backbone of the economy, their potential to stimulate growth can be further unlocked through strategic investments and policy support. The manufacturing sector, with its strong linkages and multiplier effects, serves as a bridge between primary and tertiary sectors, making it a key area for intervention.

The study also underscores the importance of addressing challenges such as infrastructure deficits, limited access to finance, and skill gaps to fully realize the potential of leading sectors. By adopting a holistic approach that leverages the strengths of these sectors, Southeast Aceh Regency can achieve sustainable and inclusive economic growth.

The findings of this study provide a comprehensive understanding of the economic structure of Southeast Aceh Regency, highlighting the critical role of forward and backward linkages in identifying leading sectors with the potential to drive regional development. The discussion below contextualizes the results, explores their implications, and addresses the broader significance of the findings for policymakers and stakeholders.[12]

The analysis reveals that the economy of Southeast Aceh Regency is highly interconnected, with sectors such as agriculture, mining, and manufacturing playing pivotal roles in driving economic activity. The strong backward linkages of the agriculture and manufacturing sectors indicate their reliance on inputs from other sectors, underscoring their importance in stimulating demand for goods and services. Conversely, the strong forward linkages of the mining and manufacturing sectors highlight their role as suppliers of raw materials and processed goods, which are essential for downstream industries.

This interconnectedness suggests that interventions in one sector can have ripple effects across the entire economy. For instance, investments in agriculture can boost demand for manufacturing inputs like fertilizers and machinery, while advancements in mining can enhance the supply of raw materials for manufacturing and construction. Understanding these linkages is crucial for designing policies that maximize economic impact and foster sustainable growth.

The identification of agriculture, mining, manufacturing, and trade/services as leading sectors aligns with the region's economic strengths and resource endowments. Agriculture, despite its weaker forward linkages, remains a cornerstone of the economy due to its ability to support livelihoods and generate income for a large portion of the population. Mining, with its strong forward linkages, has the potential to drive downstream industries and contribute significantly to regional revenue.Manufacturing, with its dual role as both a consumer and supplier of inputs, emerges as a key hub for economic activity. Its strong linkages and high multiplier effects make it a priority sector for investment and policy support. Similarly, the trade and services sectors, though less dependent on inputs from other sectors, play a vital role in distributing goods and services, enhancing regional connectivity, and supporting economic diversification.[13]

The reliance on resource-based sectors like agriculture and mining raises concerns about environmental degradation and the need for sustainable practices. Addressing these challenges requires targeted interventions, such as investments in infrastructure, financial inclusion programs, vocational training, and the promotion of sustainable practices. By overcoming these barriers, Southeast Aceh Regency can unlock the full potential of its leading sectors and achieve inclusive and sustainable development.

This study contributes to the broader discourse on regional economic development by providing a replicable framework for identifying leading sectors based on forward and backward linkages. The findings underscore the importance of evidence-based policymaking in achieving sustainable and inclusive growth. By leveraging the strengths of its leading sectors and addressing existing challenges, Southeast Aceh Regency can serve as a model for other regions with similar economic structures.

3. CONCLUSION

In conclusion, this research provides a comprehensive understanding of the economic structure of Southeast Aceh Regency and offers actionable insights for policymakers. By focusing on sectors with strong forward and backward linkages, the region can harness its economic potential and improve the well-being of its population. The findings contribute to the broader discourse on regional economic development and provide a replicable framework for similar regions seeking to identify and prioritize leading sectors. The analysis of forward and backward linkages in Southeast Aceh Regency highlights the interconnected nature of its economy and the critical role of leading sectors in driving regional development. The findings provide actionable insights for policymakers to prioritize investments, optimize resource allocation, and design strategies that promote sustainable and inclusive growth. By focusing on sectors with strong linkages and addressing key challenges, Southeast Aceh Regency can harness its economic potential and improve the well-being of its population. This study underscores the importance of understanding sectoral interdependencies and offers a valuable framework for regional economic planning.

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