

## **Structural Model Of Economic Growth On The Island Of Java**

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### **Abstract**

*Structural transformation is an important topic in the literature on economic growth. Recent research identifies various paths of structural transformation in developing countries, emphasising that the key to growth is the shift of labour from agriculture to manufacturing and services. Input-output analysis of 17 sectors can identify sectors with important roles on the island of Java. The type and design of this research use a descriptive quantitative approach. The results of this study show that the key sectors are played by three sectors, namely sector 4 (electricity, gas and ice production), sector 8 (transportation and warehousing), and sector 13 (business services), because these sectors have strong backward and forward linkages. Therefore, it is important to support these key sectors as well as other economic sectors for the sustainability of Java's economic transformation, particularly in increasing the output multiplier, income multiplier, and employment opportunity multiplier, through support such as investment, both domestic investment (PMDN) and foreign investment (PMA). Furthermore, to sustain economic growth on the island of Java, support is also needed for international trade, with a focus on labour productivity and technology.*

**Keywords: Structural transformation; Economic growth; Input-output analysis; Leading sectors**

### **INTRODUCTION**

Graphs on trend research and publications by country/territory in input-output analysis of economic sectors in Scopus journals tend to show positive conditions that are increasingly interesting to study. The issue of Java Island still colours Indonesia's economic spatial structure over the last 12 years, according to a report by Statistics Indonesia, with a contribution rate consistently above 50%. In 2024, its contribution will be the largest at 57.02%.

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Impact identification shows that a lack of in-depth understanding of the economic growth structure and inter-sectoral linkages has resulted in the formulation of regional economic policies that may not be optimal. Gaps have been identified in terms of knowledge, empirical evidence, methodology, and data. The justification and need for this research requires a deep understanding of economic growth mechanisms. This research is designed to reveal how the 17 economic sectors are interconnected and how economic impulses in one sector are transmitted to other sectors through a complex input-output network.

This study fills the gap in identifying the above disparities in input-output studies in Indonesia, which have so far been national or provincial in nature. For example, existing input-output studies have analysed West Java and DKI Jakarta provinces. There are several studies in other provinces, but they have not yet analysed the strength of the impact of diffusion, income multipliers and employment multipliers. The explanation of the research gap above provides a strong and interesting direction for further studies in Indonesia, particularly on the island of Java, using BPS input-output data from 2016 to analyse the relationship between 17 sectors, focusing on output multipliers, income, employment opportunities, and the impact of diffusion.

Input-output analysis was chosen as the primary method for this study because it has unique capabilities: it is the only method that can simultaneously measure inter-sectoral linkages, identify key sectors, and calculate various types of multiplier effects within a single analytical framework that is consistent, comprehensive, practical, suitable for research needs, and relevant to the context of Java, capable of handling the complexity of Java's economic structure with 17 heterogeneous sectors and providing practical insights for regional development planning. However, development dynamics are not only seen from the figures in the input-output analysis, but also from the descriptive elaboration on the importance of investment, international trade, labour productivity, and technology presented by Barro and Martin (2004), which can contribute to supporting the growth of these sectors in shaping the structural model of Java's economic growth.

## LITERATURE REVIEW

Leontief (1986) developed a revolutionary framework for understanding the interrelationships between sectors in the economy, primarily through three main calculations. The first calculation was to determine the interrelationships between 17 economic sectors on the island of Java. The variables used were direct interrelationship coefficients, indirect interrelationship coefficients, and total inter-sectoral interdependence coefficients, which describe the input-output interactions between sectors. Then, the backward and forward interdependence value variables, which measure the influence of a

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particular sector on other sectors, namely the upstream-downstream sectoral relationships in the economy. Second, to determine the impact of the spread of 17 economic sectors on the island of Java, the variables used are the spread coefficient (spread power) variables, which are the weights of direct forward and backward output interrelationships that are normalised to assess the relative effects of the spread of economic impacts between sectors. Then there is the variable of sensitivity of diffusion (driving force), which shows how sensitive changes in sector output are to changes in demand from other sectors. And the variable of strength of backward and forward linkages, to assess how developments in sector strength affect other sectors through input and output market transactions. Thirdly, to determine the multiplier effect of 17 economic sectors on the island of Java, using the output multiplier variable, which measures the total increase in economic output due to a one-unit change in output in a particular sector. Then there is the income multiplier variable, which assesses the increase in community income due to an increase in sector output. And finally, the labour opportunity multiplier variable, which calculates the increase in employment opportunities or labour absorption due to changes in output from a particular sector.

According to Leontief (1986), these variables reflect the use of output from one sector as input for other sectors, which is the core of the input-output model. Leontief's (1986) grand theory became a fundamental epistemological basis in quantitative studies in economic analysis, especially in the context of input-output analysis of 17 business sectors with variables available in the input-output table.

## METHOD

The type and design of this research use a descriptive quantitative approach. This study explains the structural model of economic growth in Java using input-output analysis in 17 economic sectors according to business fields in Java with a theoretical approach from Leontief (1986).

## RESULT AND DISCUSSION

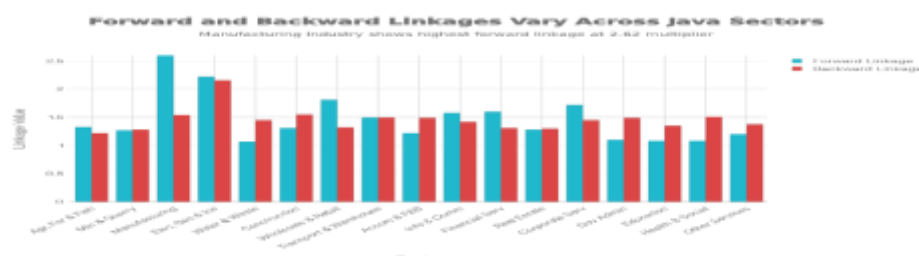


**Figure 1. Total Forward and Backward Linkages on Java Island**

Source: Data processed by researchers, Excel 2025.

**Total forward linkage (linkage with downstream sectors)**

If there is an increase of Rp. 1 billion in the endogenous sector (e.g. in final demand), then sector 1 (agriculture, forestry and fisheries) will, in total (directly and indirectly), drive the economic sector (its downstream industry) by Rp. 1.32 billion. Then in sector 2 (mining and quarrying) Rp. 1.26 billion, sector 3 (manufacturing) Rp. 2.62 billion, sector 4 (electricity, gas and ice production) Rp. 2.20 billion, sector 5 (water supply, waste management and recycling) Rp. 1.04 billion, sector 6 (construction) Rp. 1.31 billion, sector 7 (wholesale and retail trade, repair of motor vehicles and motorcycles) Rp. 1.80 billion, sector 8 (transportation and warehousing) Rp. 1.48 billion, sector 9 (accommodation and food service activities) Rp. 1.17 billion, sector 10 (information and communication) Rp. 1.54 billion, sector 11 (financial and insurance services) Rp. 1.56 billion, sector 12 (real estate) Rp. 1.25 billion, sector 13 (business services) Rp. 1.68 billion, sector 14 (public administration, defence and compulsory social security) Rp. 1.08 billion, sector 15 (education services) Rp. 1.05 billion, sector 16 (health services and social activities) Rp. 1.04 billion, and sector 17 (other services) in total (directly and indirectly) will drive the economic sector (downstream industry) by Rp. 1.14 billion.

Total forward linkages measure the complete impact (direct and indirect) of 1 billion units of output from one sector on the production of other downstream sectors through multi-stage supply chains. In the 17 sectors of Java, the manufacturing sector dominates with a multiplier of 2.62, meaning that 1 billion units of output trigger 2.62 billion units of downstream activity such as construction, trade, etc. Field Evidence in Java: The total contribution of the provinces of Java (West Java, East Java, Central Java, Banten, DKI) is well over 60% of total national exports in 2024, with textile and food output from East Java being utilised in construction and retail in Jakarta. The utilities sector (electricity, gas: 2.20) and trade (1.80) are strong, while social services such as health (1.04) and education (1.05) are low due to their end-consumer orientation.

**Total backward linkages (linkages with upstream sectors)**

If there is an increase in final demand of Rp. 1 billion, sector 1 (agriculture, forestry and fisheries) will directly and indirectly attract economic sector development (its upstream industry) of Rp. 1.23 billion. Then in sector 2 (mining and quarrying) Rp. 1.26 billion, sector 3 (manufacturing) Rp. 1.53 billion, sector 4 (electricity, gas and ice production) Rp. 2.12 billion, sector 5 (water supply, waste management and recycling) Rp. 1.44 billion, sector 6 (construction) Rp. 1.53 billion, sector 7 (wholesale and retail trade, repair of motor vehicles and motorcycles) Rp. 1.32 billion, sector 8 (transportation and warehousing) Rp. 1.50 billion, sector 9 (accommodation and food service activities) Rp. 1.46 billion, sector 10 (information

and communication) Rp. 1.41 billion, sector 11 (financial and insurance services) Rp. 1.30 billion, sector 12 (real estate) Rp. 1.27 billion, sector 13 (business services) Rp. 1.44 billion, sector 14 (public administration, defence and compulsory social security) Rp. 1.47 billion, sector 15 (education services) Rp. 1.37 billion, sector 16 (health services and social activities) Rp. 1.50 billion, and sector 17 (other services) will directly and indirectly attract economic sector development (upstream industry) amounting to Rp. 1.38 billion.

Total backward linkages capture a sector's complete dependence on upstream inputs through repeated indirect effects. The electricity, gas and ice sectors excel with 2.12, indicating that Rp1 billion of output attracts Rp2.12 billion from upstream sectors such as mining, processing, etc. The manufacturing and construction industries (1.53) are strong, while agriculture (1.23) and real estate (1.27) are lower, reflecting relative independence. Field Evidence in Java: Pertamina's gas consumption in Java attracts Kalimantan coal production via imports to Central Java's coal-fired power plants, creating a strong backward effect. The IKN project spills over into Java's construction sector, absorbing Indocement cement at high rates in 2023-2025, while Bekasi's manufacturing sector depends on fertilisers from upstream petrochemicals.

Overall, this analysis emphasises that economic growth on Java Island, which contributes the majority of the national GDP, is driven by category 3 as the backbone, supported by category 2 as the supplier, and category 4 as the potential downstream driver. Category 1 remains stable but non-critical. Policy implications include: (1) prioritising investment allocation to category 3 for maximum spillover effects; (2) developing upstream supply chains for category 4; (3) diversifying category 2 through downstreaming; and (4) integrating digital technology across categories to enhance interconnectivity. This approach will strengthen Java's economic resilience to external shocks, maximise the multiplier effect, and support the national vision of inclusive growth.

**Table 1. Classification of Correlation Results (Rasmussen-Hirschman Index)**

| Total for<br>ward linkage     | Low (<1)                                                                                                            | High (>1)                                                                                                    |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| Total<br>backward<br>linkages |                                                                                                                     |                                                                                                              |
| Low (<1)                      | Category 1:<br>Generally independent<br>Sector 12, Sector 15, Sector 17                                             | Category 2:<br>Dependent on interindustry<br>demand<br>Sector 1, Sector 2, Sector 7, Sector<br>10, Sector 11 |
| High (>1)                     | Category 4:<br>Dependent on interindustry supply<br>Sector 3, Sector 5, Sector 6, Sector 9,<br>Sector 14, Sector 16 | Category 3:<br>Generally dependent<br>Sector 4, Sector 8, Sector 13                                          |

Source: Data processed by researchers, 2025.

### **Economic Growth Transformation on Java Island**

The current state of economic transformation on Java Island shows a significant shift in structure from the agricultural sector to the industrial and service sectors. This is evident in the agriculture, forestry, and fisheries sector (sector 1) falling into category 2 (Dependent on Interindustry Demand), meaning that this sector depends on demand from other sectors as suppliers of inputs, indicating that its role as a major driver is declining and it is becoming more of a supporter of industry and services. This position reflects a structural transformation in which primary sectors such as agriculture are losing their dominance as their contribution to Java's GRDP continues to decline, while their dependence on inter-industry demand increases.

Conversely, the manufacturing sector (sector 3) is in Category 4 (Dependent on Inter-industry Supply), indicating that its output is highly needed as input by other sectors, thus becoming a new economic centre with strong forward linkages that drive growth. Service sectors such as real estate (sector 12), education (sector 15), and other services (sector 17) in Category 1 (Generally Independent) play an independent role without high dependence, reinforcing the shift to a service-based economy. Other sectors such as trade (sector 7), information and communication (sector 10), and financial services (sector 11) in category 2 also support this dynamic with stable backward linkages, making the industrial and service sectors dominant in the economic transformation of Java.

Category 3 (Generally Dependent) includes utilities such as electricity, gas and ice production (sector 4), transportation (sector 8), and corporate services (sector 13), while category 4 includes construction (sector 6), accommodation (sector 9), and government (sector 14), illustrating how industry and services are now the main recipients of supplies from agriculture. This pattern is in line with the trend on Java Island, where the primary sector is shifting to the secondary and tertiary sectors, with industry and trade dominating linkages, as seen in this input-output analysis. This transformation is supported by historical data showing a decline in the agricultural base in West, Central and East Java towards an industrial-service base.

### **Impact Analysis/Spread Power**

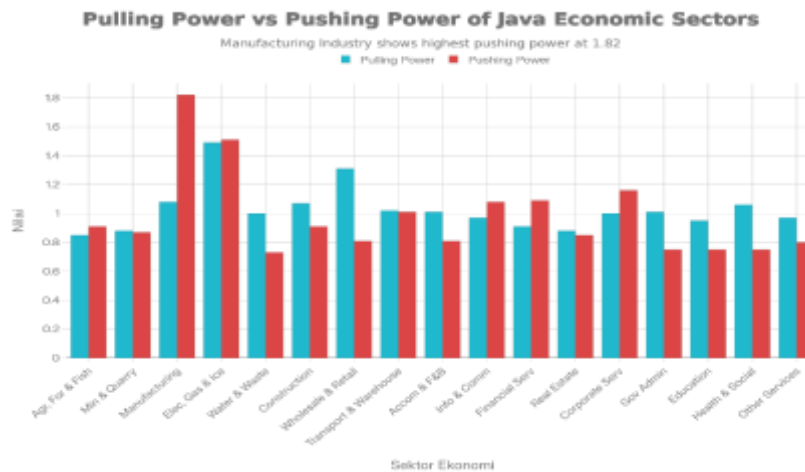


**Figure 2. Spread Coefficient (Pull Power) and Spread Sensitivity (Push Power)**

Source: Data processed by researchers, Excel 2025.

## Dissemination Coefficient (Attractiveness)

Sectors with a dissemination coefficient (attractiveness) value of  $< 1$  are weak in attracting the development of their upstream sectors/industries. These sectors are sector 1 (agriculture, forestry, and fisheries) with a value of 0.85, sector 2 (mining and quarrying) 0.88, sector 7 (wholesale and retail trade, repair of motor vehicles and motorcycles) 0.91, sector 10 (information and communication) 0.97, sector 11 (financial and insurance services) 0.90, sector 12 (real estate) 0.88, sector 15 (education services) 0.95, and sector 17 (other services) with a value of 0.96.

Sectors with a diffusion coefficient (attractiveness) value  $\geq 1$  are strong in attracting the development of their upstream sectors/industries. These sectors are sector 3 (manufacturing) with a value of 1.06, sector 4 (electricity, gas and ice production) 1.47, sector 5 (water supply, waste management and recycling) 1.00, sector 6 (construction) 1.06, sector 8 (transportation and warehousing) 1.04, sector 9 (accommodation and food services) 1.01, sector 13 (business services) 1.00, sector 14 (public administration, defence and compulsory social security) 1.02, and sector 16 (health and social services) with a value of 1.04.

The pull coefficient measures a sector's ability to attract inputs from other sectors that are upstream in its production chain. Sectors with a pull coefficient value of  $\geq 1$  indicate that they have strong links with upstream sectors and can stimulate industrial development due to their large and complex input requirements. The manufacturing and construction sectors have the highest pull coefficient (1.06). This reflects that these two sectors are highly

dependent on inputs from upstream sectors and have a significant influence in stimulating previous economic activities, such as the provision of raw materials, energy, and related services. The electricity, gas and ice production sectors, as well as the water supply, waste management and recycling sectors as basic utilities, also have a coefficient of 1.00, which indicates their fundamental role in providing vital and stable inputs to various other industries. The corporate services sector, the government administration, defence and compulsory social security sector, the health and social services sector, and the transport and warehousing sector also play a major role in driving economic activity, highlighting the importance of support services in strengthening the production and distribution network on the island of Java.

### **Diffusion Sensitivity (Driving Force)**

Sectors with a diffusion sensitivity (driving force) value of  $< 1$  are weak in driving the development of their downstream sectors/industries. These sectors are sector 1 (agriculture, forestry and fisheries) with a value of 0.91, sector 2 (mining and quarrying) 0.88, sector 5 (water supply, waste management and recycling) 0.72, sector 6 (construction) 0.91, sector 9 (accommodation and food services) 0.81, sector 12 (real estate) 0.86, sector 14 (public administration, defence and compulsory social security) 0.75, sector 15 (education services) 0.73, sector 16 (health services and social activities) 0.72, and sector 17 (other services) with a value of 0.79.

Sectors with a diffusion sensitivity (driving force) value of  $\geq 1$  are strong in driving the development of their downstream sectors/industries. These sectors are sector 3 (manufacturing) with a value of 1.82, sector 4 (electricity, gas and ice production) 1.52, sector 7 (wholesale and retail trade, repair of motor vehicles and motorcycles) 1.24, sector 8 (transportation and warehousing) 1.02, sector 10 (information and communication) 1.07, sector 11 (financial and insurance services) 1.08, and sector 13 (business services) with a value of 1.16.

The manufacturing sector, with the highest value-added (1.82), occupies a central position in driving downstream sectors, as its processed products are raw materials and consumer goods that will be used by many other sectors. The electricity, gas and ice production sector remains critical not only as an input but also in driving downstream activities with a value of 1.52, indicating the dependence of downstream sectors on a reliable energy supply. The wholesale and retail trade, motor vehicle and motorcycle repair, transportation and warehousing, information and communication, financial and insurance services, and business services sectors are also important drivers in the value chain. This confirms the role of the service and distribution sectors in expanding product markets and supporting modern economic dynamics in Java.

## Multiplier Analysis

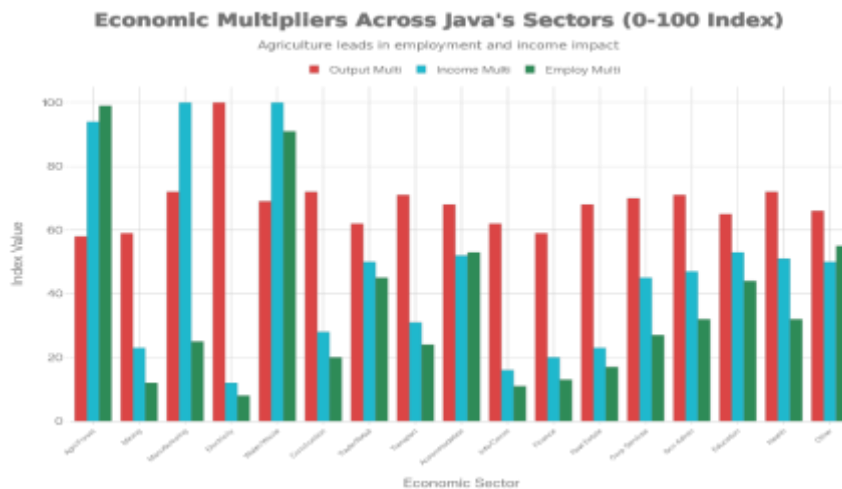


**Figure 3. Multiplier Output, Income, and Employment Opportunities**

Source: Data processed by researchers, Excel 2025.

## Total Multiplier (Direct and Indirect) Output

If there is an increase in spending (final expenditure) in a sector of 1 billion, then there will be an increase in output in that economic sector of a certain amount. For example, in sector 1 (agriculture, forestry and fisheries), if there is an increase in spending of 1 billion, there will be an increase in output in the economic sector of 1,225.23 million or 1.22 billion. Then in sector 2 (mining and quarrying) by 1,263.37 million or 1.26 billion, sector 3 (manufacturing) by 1,533.31 million or 1.53 billion, sector 4 (electricity, gas and ice production) by 2,116.55 million or 2.11 billion, sector 5 (water supply, waste management and recycling) amounted to 1,444.54 million or 1.44 billion, sector 6 (construction) amounted to 1,530.74 million or 1.53 billion, sector 7 (wholesale and retail trade, car and motorcycle repair) amounted to 1,315.76 million or 1.31 billion, sector 8 (transportation and warehousing) amounted to 1,497.89 million or 1.49 billion, sector 9 (accommodation and food services) amounted to 1,455.43 million or 1.45 billion, sector 10 (information and communication) amounted to 1,405.08 million or 1.40 billion, sector 11 (financial and insurance services) amounted to 1,303.78 million or 1.30 billion, sector 12 (real estate) amounted to 1,268.99 million or 1.26 billion, sector 13 (business services) amounted to 1,442.02 million or 1.44 billion, sector 14 (public administration, defence and compulsory social security) amounted to 1,471.99 million or 1.47 billion, sector 15 (education services) amounted to 1,371.43 million or 1.37 billion, sector 16 (health services and social activities) amounted to 1,500.03

million or 1.50 billion, and sector 17 (other services) saw an increase in output in other sectors amounting to 1,380.80 million or 1.38 billion.

### **Total Multiplier (Direct and Indirect) Income**

If there is an increase in spending (final expenditure) in sector 1 (agriculture, forestry, and fisheries) of 1 billion, there will be an increase in total additional income in the economic sector of 313.63 currency units. Then, if it occurs in sector 2 (mining and quarrying), it will be 76.83 currency units, sector 3 (manufacturing) 92.32 currency units, sector 4 (electricity, gas and ice production) 38.99 currency units, sector 5 (water supply, waste management and recycling) would be 335.11 currency units, sector 6 (construction) would be 92.64 currency units, sector 7 (wholesale and retail trade, repair of motor vehicles and motorcycles) would be 166.35 currency units, sector 8 (transportation and warehousing) at 105.68 currency units, sector 9 (accommodation and food services) at 172.19 currency units, sector 10 (information and communication) at 52.50 currency units, sector 11 (financial and insurance services) amounting to 67.61 currency units, sector 12 (real estate) amounting to 27.42 currency units, sector 13 (business services) amounting to 78.90 currency units, sector 14 (public administration, defence and compulsory social security) amounting to 152.64 currency units, sector 15 (education services) amounted to 176.77 currency units, sector 16 (health services and social activities) amounted to 168.27 currency units, and sector 17 (other services) saw an additional expenditure of 1 billion, resulting in a total increase in additional income in the economic sector of 148.59 currency units.

### **Total Multiplier (Direct and Indirect) Employment Opportunities**

If the additional expenditure (final expenditure) in sector 1 (agriculture, forestry, and fisheries) is 1 billion, there will be an increase in employment opportunities in the economic sector of 24.84 new jobs. Then, if it occurs in sector 2 (mining and quarrying), there will be 2.66 new jobs, sector 3 (manufacturing) 6.06 new jobs, sector 4 (electricity, gas and ice production) 1.75 new jobs, sector 5 (water supply, waste management and recycling) 22.18 new jobs, sector 6 (construction) 5.08 new jobs, sector 7 (wholesale and retail trade, repair of motor vehicles and motorcycles) 11.07 new jobs, sector 8 (transportation and warehousing) 5.96 new jobs, sector 9 (accommodation and food service activities) 13.10 new jobs, sector 10 (information and communication) created 2.34 new jobs, sector 11 (financial and insurance services) created 2.84 new jobs, sector 12 (real estate) created 1.43 new jobs, sector 13 (business services) created 4.28 new jobs, sector 14 (public administration, defence and compulsory social security) with 6.61 new jobs, sector 15 (education services) with 10.80 new jobs, sector 16 (health services and social activities) with 8.05 new jobs, and sector 17

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(other services) resulted in an increase in employment opportunities in the economic sector of 13.38 new jobs.

### **The Importance of Investment Support, International Trade, Labour Productivity, and Technology in the Structural Model of Economic Growth on the Island of Java**

Barro and Martin's (2004) theory in the structural model of economic growth asserts that long-term growth depends on the accumulation of physical capital through investment, international trade integration, increased labour productivity, and technological progress. This model integrates these factors as conditional convergence inputs, whereby countries or regions with strong foundations are able to achieve higher steady-state growth. On the island of Java, which contributes 57.02% of the national GDP, an input-output analysis of 17 sectors confirms the relevance of this theory. The results show that sectors with diffusion coefficients (pull and push)  $\geq 1$ , high output multipliers, and strong forward-backward linkages are the main drivers.

Investment plays a central role in Barro and Martin's theory as capital accumulation that accelerates growth convergence. Input-output analysis identifies priority sectors with attraction coefficients  $\geq 1$  and high output multipliers, which are capable of attracting upstream supply chains and amplifying total output. The electricity, gas, and ice production sector (sector 4) excels with a pull coefficient of 1.47, an output multiplier of Rp2.11 billion, and a push coefficient of 1.52. This sector also dominates total forward linkages (2.20) and backward linkages (2.12), making it a category 3 'generally dependent' sector—the largest provider of output to other sectors. The manufacturing industry (sector 3) follows with a pull factor of 1.06, an output multiplier of Rp1.53 billion, and the highest push factor of 1.82. Construction (sector 6), transportation-warehousing (sector 8), and accommodation-food and beverage (sector 9) also meet similar criteria. The three key sectors—energy (4), transportation (8), and business services (13, forward linkage 1.68)—drive growth through spill-over effects, in line with the circular economy and technological innovation approaches. Investment realisation data supports these findings. FDI in Java reached US\$ 27,458.4 million (IDR. 914.88 trillion) in 2024, with downstreaming contributing 23.8% (IDR. 407.8 trillion), dominated by minerals (IDR. 245.2 trillion), agriculture (palm oil IDR. 67.1 trillion), and forestry (pulp and paper IDR. 64 trillion). Domestic Direct Investment (DDI) is also on an upward trend, strengthening inter-sectoral linkages and creating jobs. Sector category 2 'dependent on interindustry demand'—agriculture-fisheries (1.12), mining (1.30), trade (1.03), information-communication (1.13), financial services (1.22)—provides downstream inputs, supporting MSMEs and infrastructure. Investment in this sector not only increases direct output but also creates indirect multipliers: for example, energy expansion drives

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manufacturing, which in turn triggers trade. Policies such as circular economy incentives will optimise the impact, ensuring sustainable growth and the welfare of the people of Java.

International trade in Barro and Martin's theory serves as a channel for technology transfer and market access, increasing economies of scale. The analysis highlights sectors with high driving forces for export priorities: manufacturing (sector 3, 1.82), wholesale and retail trade (sector 7, 1.24), information and communication (sector 10), and financial and insurance services (sector 11). Sector 3, in category 4 'dependent on interindustry supply' (1.06), relies heavily on inputs but intensively drives downstream exports. BPS data for 2020-2024 shows a trade surplus for Java: the difference between exports and imports is US\$ 65.13 billion (2020), US\$ 59.49 billion (2021), US\$ 82.79 billion (2022), US\$ 75.02 billion (2023), to US\$ 80.31 billion (2024). Non-oil and gas exports account for >95%, with the manufacturing industry dominating >90%, followed by agriculture and mining. This strengthens Java's economic independence, integrates global value chains, and increases the output-income-employment multiplier. Export facilitation, reduction of non-tariff barriers, and logistics infrastructure will maximise potential. Trade not only expands markets but also increases production efficiency, in line with input-output data showing that inter-sectoral interactions drive stable growth, positioning Java as the national locomotive.

Labour productivity is the essence of the Barro and Martin model, in which improvements in human capital accelerate convergence. Priority labour-intensive sectors: agriculture-forestry-fisheries (sector 1) create 24.84 new jobs per multiplier; water-waste management (sector 5) 22.18 jobs and an income multiplier of 335.11; trade (7) and accommodation (9) >10 jobs. Investment in human resources, Industry 4.0 training, and technology here increases output and welfare. Average productivity in Java is IDR 123.75 million/worker/year (vs. national IDR 89.33 million), but DKI Jakarta peaks at IDR 400.50 million (2024: IDR 421.13 million). West Java is low at IDR 69.04 million (ranked 24th nationally), while Central Java-Yogyakarta are among the 10 lowest. This gap calls for policies to improve vocational education, agricultural infrastructure, technology transfer, digital connectivity infrastructure, and integrated sectoral development. Increased productivity drives efficiency, added value, and positive multipliers, strengthening inter-sectoral linkages for inclusive growth. Collaboration between government, business, and education is key to realising Java as a productive economic centre.

Technology as an exogenous growth driver in Barro and Martin's theory encourages endogenous innovation. Priorities: manufacturing (3), information and communication (10), electricity and gas (4)—with high interconnectivity and large multipliers. These sectors have the potential for digital transformation, supporting smart farming and Industry 4.0. The average ICT Development Index (IP-TIK) for Java is 6.68 (2024, vs. national 6.02): DKI Jakarta

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7.88 (+5.63% from 2020), Yogyakarta 7.36 (+3.81%), Banten 6.46 (+8.34%). The ICT Skills sub-index averages 6.38 (vs. the national average of 6.08): Yogyakarta 7.78, DKI 6.86, with all provinces increasing by 2-4%. This strengthens efficiency, connectivity, and multipliers in 17 sectors. Technology creates an inclusive digital ecosystem and increases global competitiveness. Strategy: R&D research, digital adoption, public-private partnerships to achieve the Indonesia Emas 2045 vision.

## CONCLUSION AND SUGGESTION

Input-output analysis of 17 economic sectors on the island of Java reveals a strong structural growth model. This analysis is based on Leontief's theory (1986), in line with Barro and Martin's theory (2004), in which investment, international trade, labour productivity and technology drive convergence towards high steady-state growth. Contributing 57.02% of the national GDP, Java has transformed from a primary sector to an industrial-service sector, led by key sectors: energy (4), manufacturing (3), transportation (8), and business services (13) with maximum forward-backward linkages and high multipliers. The Rasmussen-Hirschman classification divides four categories. Category 1 (independent): real estate (12), education (15), other services (17) with weak linkages, internal innovation priority. Category 2 (downstream suppliers): agriculture (1, forward 1.32), mining (2), trade (7, 1.80), information-communication (10), finance (11)—support downstreaming. Category 3 (key): electricity-gas (4: forward 2.20, backward 2.12), transportation (8), corporate services (13)—upstream-downstream spillover effects. Category 4 (supply-dependent): processing (3: forward 2.62), water (5), construction (6) remain vulnerable, requiring upstream stabilisation. Pull factor  $\geq 1$ : sector 4 (1.47), sectors 3 and 6 (1.06). Push factor  $\geq 1$ : sector 3 (1.82), sector 4 (1.52). Multiplier of 1 billion expenditure: sector 4 output (2.11); sector 5 income (335.11); sector 1 employment opportunities (24.84). Energy expansion attracts mining, drives manufacturing-trade. FDI investment of IDR 914.88 trillion (2024) prioritises category 3. Export surplus of US\$ 80.31 million strengthens sectors 3-7. Productivity of IDR 123.75 million/worker focuses on labour-intensive industries. IP-TIK 6.68 supports the digitisation of sector 10. Allocation of 60% of category 3 investment; downstreaming 2; stabilisation 4; digitisation 1. Projected 6-7% growth, leading the digital transformation towards an inclusive Indonesia Emas 2045. Optimisation of the multiplier ensures sustainable growth.

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