

Analysis of the Role of Manufacturing Industry in the Input-Output Economy

*The Role of
Manufacturing
Industry*

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ABSTRACT

This study aims to analyze the structure of the manufacturing industry in Central Sulawesi, emphasizing intersectoral linkages and their contributions to output and gross value added. Using a quantitative approach based on input and output matrices, the study identifies strategic subsectors capable of generating high multiplier effects on the regional economy. The results indicate a shift in subsector dominance from agriculture and wood-based sectors to natural resource-based industries, particularly base metals and energy processing. This shift is accompanied by weakening forward linkages and increasing dependence on upstream sectors, indicating early signs of deindustrialization and limited manufacturing contribution to strengthening the domestic supply chain. The findings also indicate that only a few subsectors are capable of playing dual roles as users and providers of inputs between industries, narrowing the basis for structural transformation. The implication of this condition is the need for an industrial development strategy that encourages sector diversification, strengthens downstream processing, and improves connectivity between key subsectors. This study provides recommendations for policymakers to direct industrial development toward a more sustainable, inclusive, and long-term orientation, in order to encourage equitable and resilient regional economic growth amidst global dynamics.

Keywords: *Economic, Gross Value Added, Input-Output Model, Manufacturing Industry.*

ABSTRAK

Penelitian ini bertujuan untuk menganalisis struktur industri manufaktur di Sulawesi Tengah dengan menekankan keterkaitan antar sektor dan kontribusinya terhadap output serta nilai tambah bruto. Melalui pendekatan kuantitatif berbasis matriks input dan output, studi ini mengidentifikasi subsektor strategis yang mampu menghasilkan efek pengganda tinggi terhadap perekonomian regional. Hasil penelitian menunjukkan terjadinya pergeseran dominasi subsektor dari sektor berbasis pertanian dan kayu menuju industri berbasis sumber daya alam, khususnya logam dasar dan pengolahan energi. Pergeseran ini diiringi dengan melemahnya keterkaitan ke depan dan meningkatnya ketergantungan pada sektor hulu, yang mengindikasikan gejala deindustrialisasi awal dan terbatasnya kontribusi manufaktur terhadap penguatan rantai pasok domestik. Temuan

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juga menunjukkan bahwa hanya sedikit subsektor yang mampu berperan ganda sebagai pengguna dan penyedia input antar industri, mempersempit basis transformasi struktural. Implikasi dari kondisi ini adalah perlunya strategi pembangunan industri yang mendorong diversifikasi sektor, memperkuat hilirisasi, serta meningkatkan konektivitas antar subsektor utama. Penelitian ini memberikan rekomendasi bagi pembuat kebijakan untuk mengarahkan pembangunan industri ke arah yang lebih berkelanjutan, inklusif, dan berorientasi jangka panjang, guna mendorong pertumbuhan ekonomi daerah yang merata dan tangguh di tengah dinamika global.

Kata kunci: *Ekonomi, Nilai Tambah Bruto, Model Input-Output, Industri Manufaktur*

INTRODUCTION

Indonesia, the largest economy in Southeast Asia, boasts extraordinary economic potential, supported by abundant natural and human resources (Prasetyo, 2023). This strategic position provides Indonesia with significant opportunities to strengthen its economic foundations and enhance its global competitiveness. Abundant natural resources, such as energy, mining, and agricultural products, if managed sustainably, can be a driving force for growth. Meanwhile, its large population, the majority of whom are of productive age, is a crucial asset in driving productivity and innovation. However, this potential has not been fully realized due to structural challenges, such as low industrial value-added, regional disparities, and uneven distribution of human resources. Despite Indonesia's numerous advantages, it remains categorized as a lower-middle-income country, with a per capita income of US\$4,919.7 in 2023, far below the World Bank's threshold for a high-income country of US\$11,906. Furthermore, uneven economic growth remains a major challenge for stakeholders. This study aims to examine the structural role of the manufacturing sector and its capacity to support Indonesia's transition to a more advanced and inclusive economy.

Economic development is closely linked to economic growth, encompassing increasing income levels and structural transformation in response to population changes (Lubis et al., 2025). The synergy between these two concepts drives long-term national progress. As outlined in Law No. 3 of 2014, the manufacturing sector is positioned as a key driver of value creation and industrial transformation. The growth of this sector is crucial for increasing GDP and employment, in line with the neoclassical Solow model and Keynesian theory, which emphasize capital, labor, and effective demand as determinants of output (Jones, 2022; Zakaria, 2024). In Central Sulawesi, the manufacturing industry has demonstrated remarkable growth and impact. Regional economic growth peaked at 20.60% in 2018 and rebounded to 11.91% in 2023 after a pandemic-induced slowdown. The province surpassed its own economic growth targets set in the 2021–2026 regional medium-term development plan. The value of manufacturing exports surged from US\$1.56 billion in 2016 to US\$19.39 billion in 2023, demonstrating the sector's growing importance in regional trade. However, high poverty rates and a Gini ratio of 0.304 indicate that income inequality remains a significant issue. The manufacturing sector's contribution to Gross Regional Domestic Product (GRDP) increased sharply from 22.42% in 2016 to 40.37% in 2023. The sector has emerged as a dominant economic driver in the region, but its concentration also raises questions about the need for diversification and inclusive development (Simarmata & Sari, 2022).

The manufacturing industry generates significant added value, creates jobs, and strengthens exports, particularly through high-growth subsectors such as food and beverages (Aura & Efrianti, 2021). Its forward and backward linkages with other sectors drive broader economic activity (Sari & Sasana, 2022; Budiyantri, 2022). The Input-Output approach allows for detailed simulations of the impact of final demand on output and gross value added, which helps policymakers identify strategic subsectors. Increased final demand in the manufacturing sector generates substantial multiplier effects, boosting output and stimulating related industries (Suryaatmaja et al., 2023). However, most previous studies have limited themselves to identifying general sectors, thus lacking detailed analysis of manufacturing subsectors and their measurable contributions to

regional macroeconomic indicators. As highlighted by Solikin (2022) and Firman et al. (2023) the integration of output, GDP, and export analysis within the Input-Output framework remains limited. This study fills a critical gap by identifying key manufacturing subsectors, assessing their linkage structure, and measuring the impact of final demand on gross value added. Unlike previous studies, Ghani and Imansyah (2021), which only identified linkages, this study integrates input-output analysis to evaluate how demand shocks affect macroeconomic indicators in a regional context. This study aims to inform a more targeted, inclusive, and sustainable economic development strategy for Central Sulawesi, with implications for broader regional development in Indonesia.

LITERATURE REVIEW

The Role of Manufacturing Industry in Regional Economic Growth

The manufacturing industry has long been regarded as a central pillar of economic growth, particularly in developing regions where industrialization drives structural transformation. Classical and neoclassical growth theories emphasize the role of capital, labor, and technological progress as key determinants of output (Jones, 2022; Zakaria, 2024). Within this framework, manufacturing contributes through productivity gains, innovation, and export expansion, which in turn stimulate broader economic activity. Keynesian perspectives further highlight the sector's ability to influence aggregate demand via investment, consumption, and international trade, reinforcing its multiplier effects on regional economies (Fatmawati, 2022).

Empirical studies underline the sector's pivotal role in fostering inter-sectoral linkages and generating value added. Input-output analyses reveal how manufacturing creates backward and forward linkages that strengthen trade, services, and agriculture (Leontief, 1985; Pitaloka et al., 2020; Deti et al., 2021; Arifah & Sunarjo, 2021; Sabila et al., 2025). In regions endowed with natural resources, downstream industrialization has been promoted as a means of reducing dependence on raw commodities while encouraging technology transfer and industrial upgrading (Ronalia, 2021; Suryaatmaja et al., 2023). This strategy is consistent with broader development policies aimed at achieving sustainable and inclusive growth (Solikin, 2022; Meirani & Satria, 2024).

Previous studies also emphasize the role of manufacturing in enhancing competitiveness and employment. By producing high-value goods, the sector supports domestic demand and exports, while foreign investment contributes to productivity spillovers and technological diffusion (Harianto & Sari, 2021; Athukorala & Patunru, 2023). Sub-sectors such as food and beverages are often identified as regional growth engines, with strong potential for export performance and job creation (Aura & Efrianti, 2021; Harun et al., 2020). Furthermore, agglomeration effects and industrial clustering amplify the sector's contribution, linking it with tourism, trade, and services to create diversified economic bases (Jannah & Tasriah, 2022; Tanjung et al., 2023; Wibawanindah et al., 2024). The manufacturing industry serves not only as a driver of GDP but also as a catalyst for structural change, investment, and innovation. However, equitable development policies are necessary to ensure that growth derived from manufacturing also addresses regional disparities and social inequalities (Budiyanti, 2022; Gumbau-Albert & Maudos, 2022).

Input-Output Analysis in Assessing Sectoral Linkages and Contributions

Input-Output (IO) analysis, introduced by Leontief (1985), is widely recognized as a fundamental approach for examining inter-sectoral linkages and economic contributions in regional development. By tracing flows of goods and services among industries, IO models reveal the strength of backward and forward linkages, allowing researchers to understand how shifts in demand or investment ripple across the economy (Arifah & Sunarjo, 2021; Lenita & Yanti, 2022; Kiran et al., 2023; Wang, 2024). The Leontief inverse matrix provides a framework to capture these interdependencies, demonstrating

equilibrium dynamics and multiplier effects that underpin regional growth strategies (Meirani & Satria, 2024).

In the context of manufacturing, IO analysis highlights the sector's dual role as both a consumer of upstream inputs and a provider of outputs for downstream industries. Strong backward linkages reflect dependence on raw materials and intermediate goods, while forward linkages indicate the sector's capacity to stimulate other industries through value-added production (Pitaloka et al., 2020). Prior studies in Indonesia identify subsectors such as rubber, plastics, and food processing as key drivers, showcasing their capacity to foster both upstream and downstream synergies (Zahroo, 2022; Firman et al., 2023).

Comparative IO studies also show how structural transformations occur over time. Shifts from agriculture-based linkages to more resource-intensive industries suggest industrial upgrading but may also signal risks of sectoral concentration and vulnerability to global fluctuations (Muchdie & Imansyah, 2019; Haviz, 2022). These findings resonate with broader debates on deindustrialization and the need for sustainable diversification (Wibawanindah et al., 2024). Beyond manufacturing, IO applications extend to policy planning by identifying sectoral gaps, agro-industrial synergies, and downstream potentials, particularly in resource-rich provinces such as Riau and North Sumatra (Ronalia, 2021; Suryaatmaja et al., 2023). Studies in West Sumatra and East Java further underscore the spillover effects of manufacturing on tourism, agriculture, and trade, reinforcing the role of infrastructure and agglomeration in amplifying multipliers (Jannah & Tasriah, 2022; Juansyah et al., 2024; Raharjo & Kusnadi, 2023). Despite limitations such as static assumptions, IO remains an indispensable tool for understanding sectoral linkages and guiding regional economic strategies (Padder & Mathavan, 2022; Ghani & Imansyah, 2021).

RESEARCH METHODS

This study employs a quantitative research method using Input-Output (IO) analysis to examine the interconnections among economic sectors. Linkage analysis is used to assess how manufacturing activities relate to other sectors in Central Sulawesi's economy, with a focus on both forward and backward linkages. Forward linkages refer to how extensively a sector's output is utilized as inputs by other industries, while backward linkages reflect a sector's reliance on input supplies from other sectors. The analysis covers the period between 2005 and 2016 using Input-Output Tables for Central Sulawesi. Input-Output analysis, as introduced by Leontief (1985), is a structured quantitative approach for evaluating the interactions between sectors in an economy. Arifah and Sunarjo (2021) stated that It functions as a General Equilibrium model, offering insights into output requirements, production factors, and the effects of changes in demand and technology. This model can be used to understand the structure of regional or national economies and predict how demand shifts, either from government or private sectors, influence output and value creation. In practice, IO analysis uses a matrix format to present the flow of goods and services among sectors. Meirani and Satria (2024) said that rows show how each sector's output is allocated, while columns illustrate input usage in production. Lenita and Yanti (2022) stated that the Leontief inverse matrix is used to trace how changes in final demand impact total output, income, employment, and gross value added. Forward and backward linkages are measured both directly and indirectly. Pitaloka et al. (2020) stated direct linkages capture immediate interactions, while indirect linkages account for cascading effects throughout the economy. Additionally, IO tables can assess the impact of final demand changes on Gross Value Added (GVA), offering a deeper understanding of a sector's contribution to economic performance.

RESULTS

The following table presents the impact of final demand from various manufacturing industry subsectors on Gross Value Added (GVA) in Central Sulawesi Province for the year 2016. It highlights the contribution of each subsector, measured in billion rupiah and expressed as a percentage of the total manufacturing sector's GVA. This data provides

insights into which industries play the most significant roles in regional economic value creation.

Table 1. Final Demand Impact of Manufacturing Industry Subsectors on GVA in Central Sulawesi Province 2016 (billion rupiah)

Manufacturing Industry Subsector	I-O Code	GVA	Percent (%)
Coal and Oil Refining Industry	I-12	3,883.88	24.01
Food and Beverage Industry	I-13	2,587.42	15.99
Tobacco Processing Industry	I-14	8.36	0.05
Textile and Garment Industry	I-15	185.53	1.15
Leather, Leather Goods and Footwear Industry	I-16	34.52	0.21
Wood, Wood Products, Cork and Woven Goods from Bamboo, Rattan and Similar Materials Industry	I-17	1,274.39	7.88
Paper and Paper Products, Printing and Reproduction of Recorded Media Industry	I-18	27.30	0.17
Chemical, Pharmaceutical and Traditional Medicine Industry	I-19	56.40	0.35
Rubber, Rubber Products and Plastic Industry	I-20	16.82	0.10
Non-metallic Mineral Goods Industry	I-21	2,571.34	15.89
Basic Metal Industry	I-22	4,919.72	30.41
Metal Products, Computer, Electronic Goods, Optical and Electrical Equipment Industry	I-23	210.01	1.30
Machinery and Equipment Industry N.E.C. (Not Elsewhere Classified)	I-24	-	-
Transportation Equipment Industry	I-25	40.74	0.25
Furniture Industry	I-26	313.90	1.94
Other Manufacturing Industries, Repair Services and Installation of Machinery and Equipment	I-27	48.78	0.30
Total		16,179.12	100.00

Source: BPS Central Sulawesi Province (processed)

Based on Table 1, the basic metal industry (I-22) plays a dominant role in the manufacturing sector of Central Sulawesi Province, contributing 27.25% to total sectoral output and 24.01% to Gross Value Added (GVA). This indicates the subsector's substantial influence on both macroeconomic performance and the region's industrial structure by generating demand for raw materials and capital goods. Such dominance aligns with findings in East Java, where the basic metal industry is also a key economic driver Juansyah et al. (2024), and is consistent with international studies, such as in Macedonia, that highlight this industry's strategic role in GDP, exports, and employment (Gajdzik & Wolniak, 2022). In 2016, the total final demand impact from manufacturing on GVA in Central Sulawesi amounted to Rp16,179.12 billion. The basic metal subsector contributed the most at Rp 4,919.72 billion (30.41%), followed by the coal and oil refining industry (Rp3,883.88 billion or 24.01%), food and beverage industry (Rp2,587.42 billion or 15.99%), non-metallic minerals (Rp2,571.34 billion or 15.89%), and the wood-based industry (Rp1,274.39 billion or 7.88%). Other subsectors contributed less than 5%. Input-Output (I-O) analysis reveals the interconnectedness of sectors and highlights how one industry's activity stimulates others through upstream and downstream linkages. Industries with the strongest upstream interdependencies include rubber and plastics (2.0766), pharmaceuticals and chemicals (2.0168), leather products (2.0061), textiles (2.0015), food and beverages (1.9775), and paper products (1.9423). These figures underscore the central role of the manufacturing sector, particularly basic metals, in driving regional economic growth and structural transformation through sectoral linkages and value creation.

The analysis of forward linkage (FL) reveals that the food and beverage industry hold the strongest position among medium and large-scale manufacturing sectors, with an FL value of 2.1190. This is followed by the basic metal industry at 1.5500, and the wood-

based industry including products from bamboo, rattan, and similar materials, at 1.3886. In fourth place is the non-metallic mineral goods industry (1.3839), followed by the fabricated metal products, computer, electronics, optical, and electrical equipment industry (1.2026). The coal and oil refining industry ranks sixth with a value of 1.1015, and the textile and apparel industry follows in seventh with 1.0777. The rubber and plastics industry comes next with 1.0562, then the paper and printing industry with 1.0530, and finally, the chemical, pharmaceutical, and traditional medicine industry at 1.0485. These findings show that manufacturing subsectors with high forward linkage values have strong downstream integration, enabling them to drive broader economic growth through their multiplier effects. As such, these sectors contribute significantly to reinforcing the national industrial structure. To support inclusive and sustainable development, industrial policies should focus on empowering sectors with high FL values, as they serve as key levers in accelerating structural transformation and economic resilience (Zahroo, 2022).

Table 2. Top 10 Highest Backward Linkage Index (IBL) Values for Manufacturing Industry Subsectors in Central Sulawesi 2016

I-O Code	Manufacturing Industry Subsector	Backward Linkage (BL) Index
I-20	Rubber, rubber products and plastic industry	1.2739
I-19	Chemical, pharmaceutical and traditional medicine industry	1.2372
I-16	Leather, leather goods and footwear industry	1.2306
I-15	Textile and garment industry	1.2278
I-13	Food and beverage industry	1.2131
I-18	Paper and paper products, printing and reproduction of recorded media industry	1.1915
I-12	Coal and oil refining industry	1.1359
I-21	Non-metallic mineral goods industry	1.1267
I-25	Transportation equipment industry	1.1176
I-27	Other manufacturing industries, repair services and installation of machinery and equipment	1.0911

Source: BPS Central Sulawesi Province (processed)

Based on the data in Table 2, several manufacturing industry subsectors in Central Sulawesi demonstrate high Backward Linkage (BL) index. It is indicating their crucial role in stimulating upstream sectors within the regional economy. A high BL index reflects strong input dependency on other sectors, suggesting that output growth in these subsectors can significantly impact related industries. The rubber, rubber products, and plastic industry has the highest BL index at 1.2739, highlighting its reliance on a wide range of inputs and its potential to drive upstream economic activity. Following this is the chemical, pharmaceutical, and traditional medicine industry with a BL index of 1.2372, underlining its importance in supplying chemical and medical raw materials across sectors. The leather, leather goods, and footwear industry ranks third with a BL index of 1.2306, indicating its key role in utilizing local and national raw materials. The textile and garment industry, with a BL index of 1.2278, is closely linked to agriculture and chemicals. Meanwhile, the food and beverage industry hold a BL value of 1.2131, relying heavily on agriculture, livestock, and fisheries. In contrast, the machinery and equipment industry (not elsewhere classified) have the lowest BL index at 0.6134, reflecting weak input linkages and limited influence on upstream sector development.

Table 3. Top 10 Highest Forward Linkage Index (IFL) Values for Manufacturing Industry Subsectors in Central Sulawesi 2016

I-O Code	Manufacturing Industry Subsector	Backward Linkage (BL) Index
I-13	Food and beverage industry	1.2998
I-22	Basic metal industry	0.9508
I-17	Wood, wood products, cork and woven goods from bamboo, rattan and similar materials industry	0.8518
I-21	Non-metallic mineral goods industry	0.8489
I-23	Metal products, computer, electronic goods, optical and electrical equipment industry	0.7377
I-12	Coal and oil refining industry	0.6757
I-15	Textile and garment industry	0.6611
I-20	Rubber, rubber products and plastic industry	0.6479
I-18	Paper and paper products, printing and reproduction of recorded media industry	0.6459
I-19	Chemical, pharmaceutical and traditional medicine industry	0.6432

The results of the study in Table 3 show that the food and beverage subsector exhibits the strongest forward linkage coefficient (IFL/ β_i) of 1.2998, indicating that a one-unit increase in production in this subsector results in an expansion of 1.2998 units across all other economic sectors, particularly those utilizing its output. This high FL coefficient reflects above-average responsiveness compared to other sectors in the regional economy. The basic metals industry ranks second with a relatively high sensitivity with an FL index of 0.9508, followed by the wood and wood-based products industry (including cork and bamboo/rattan weaving) at 0.8518. The non-metallic mineral processing sector ranks fourth with an FL value of 0.8489, while metal fabrication, computing, electronics, and electrical equipment manufacturing ranks fifth with a value of 0.7377. In particular, the food and beverage processing subsector serves as an important sector within the Central Sulawesi manufacturing framework, uniquely possessing both backward and forward linkage indices exceeding one.

Comparing the roles of gross value added, output and exports from manufacturing industry in the 2005 and 2016 Input-Output Tables of Central Sulawesi Province, there are significant differences in gross value added between the 2005 and 2016 periods with significant increases. There are also differences in the origin of raw materials used in the manufacturing process during the 2005-2016 period. In 2005, the manufacturing industries that played a dominant role in forming Gross Value Added (GVA), output and exports were wood, wood products, cork and woven goods from bamboo, rattan and similar materials processing industry, also food and beverage industry. These industries had raw materials originating from agriculture, plantation and forestry sectors. However, in 2016, changes occurred in line with the government's downstream manufacturing industry program, where the manufacturing industries contributing the largest gross value added, output and exports were basic metal processing industry, coal and oil refining industry, food and beverage industry, non-metallic mineral goods processing industry, wood, wood products, cork and woven goods from bamboo, rattan and similar materials industry.

DISCUSSION

A comparison of Indonesia's Input-Output (IO) tables for 2005 and 2016 reveals a significant structural shift in the interconnectedness of economic sectors, particularly in the manufacturing industry. The key indicator, the Forward Linkage Index (IFL), which reflects a sector's ability to provide inputs to other sectors, has experienced a significant decline (Sutardjo & Tsuyoshi, 2021; Athukorala & Patunru, 2023; Di Domenico et al., 2023; Taufikurahman et al., 2023). In 2005, four manufacturing subsectors had IFL values greater than 1, indicating their important role in supporting downstream sector growth.

However, in 2016, only the food and beverage industry (IO-14) maintained an IFL > 1 . This contraction indicates a weakening role of the manufacturing sector in driving the value chain and indicates signs of premature deindustrialization in the Indonesian economy, as previously identified by researchers (Muchdie & Imansyah, 2019).

The increase in the number of manufacturing subsectors with a Backward Linkage Index (BSI) above 1, from just four in 2005 to fourteen in 2016, indicates a growing dependence on inputs from upstream sectors such as agriculture, forestry, mining, and energy (Shang et al., 2025). This phenomenon reflects a structural shift in the industrial landscape, where the manufacturing sector is no longer a dominant provider of intersectoral inputs, but is instead transforming into a primary consumer of inputs from other sectors. This shift has implications for the manufacturing sector's limited capacity to create broader multiplier effects in the economy, as output flows between sectors become more focused upstream rather than distributed horizontally (Haviz, 2022). With the decline in manufacturing's role as a supplier in the domestic value chain, its potential contribution to economic spillovers, such as technological innovation, supporting sector growth, and increased local value-added, also declines.

The findings of this study reinforce Tregenna's (2016) earlier argument that declining forward linkages and increasing backward dependency are hallmarks of the deindustrialization process experienced by many developing countries. In the Indonesian context, this pattern is reflected in the increasingly narrow composition of the leading manufacturing sector, which shrank from three dominant subsectors in 2005 to just one in 2016. Sectors such as wood products, paper goods, and machinery, which previously played a central role in the national economic structure, have now lost their competitiveness and been pushed out of the strategic industrial map. Currently, only the food and beverage industry remains a leading manufacturing subsector, indicating a narrow concentration within the industrial structure. This narrowing of the industrial base indicates a weak capacity for structural transformation and the manufacturing sector's resilience to external pressures. This is in line with the findings of Wibawanindah et al. (2024), who showed that low domestic industrial competitiveness and high vulnerability to global trade pressures have accelerated the weakening of the national manufacturing sector. This condition not only limits the industry's contribution to long-term economic growth but also reduces opportunities for productive job creation and economic diversification.

The shift in raw material sourcing patterns from agriculture-based in 2005 to resource-based in 2016 represents a fundamental shift in industrialization. While the previous agro-industrial model was more renewable and inclusive, the current reliance on extractive sectors such as oil, gas, and nickel exposes the economy to price volatility and environmental risks (Padder & Mathavan, 2022). This structural shift reflects the global trend in resource-based industrialization but poses long-term threats to sustainability, resilience, and equitable growth. Indonesia must reconsider its industrial development strategy. Strengthening downstream capacity, rebuilding industrial diversity, and enhancing forward linkages are crucial to prevent further deindustrialization.

CONCLUSION

The structure of the manufacturing industry in Central Sulawesi has undergone a significant shift, shifting its dominance toward natural resource-based sectors, particularly base metals. This shift reflects the transformation of the regional economy from agriculture to export-oriented heavy industry. The pattern of linkages between subsectors indicates that most manufacturing industries act primarily as users of inputs, rather than suppliers, thus hindering the widespread distribution of economic benefits. However, some subsector strategies maintain a dual role within the value chain, indicating significant potential for strengthening intersectoral integration. Targeted policies are needed to encourage the strengthening of the local industrial structure, through increasing added value, diversifying leading sectors, and strengthening forward and backward linkages. Human resource development through education, training, and

entrepreneurship is also a key element in supporting sustainable industrial transformation. Synergy between local governments, industry players, and communities needs to be strengthened to encourage supply chain integration and a more equitable distribution of economic benefits. This study is limited by its coverage area and the analysis period. Generalization of the findings should be done with caution, especially when applied to other regions with different economic structures. Future research is recommended to expand the scope spatially and temporally, and integrate institutional, social, and environmental factors to obtain a more comprehensive picture of the dynamics of the manufacturing industry and its contribution to regional and national economic development.

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