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Research Article

Assessing Economic Inclusivity in Sumatra: A Miyazawa Input-Output Table Analysis, 2022

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Abstract: Good development is distinguished by not solely pursuing perpetual growth but also by providing positive impacts that are accessible to every stratum of society. This research aims to determine whether Sumatra's economy in 2022 has yielded equitable income distribution across all layers of society, particularly when examined in-depth in each economic sector. By utilizing Miyazawa's input-output table analysis, we obtained several significant findings. The Manufacturing Industry emerged prominently as Sumatra's financial backbone and critical sector. Furthermore, out of the 17 industries, there are 9 inclusive sectors, 2 of which are vital, namely the Manufacturing Industry and the Transportation and Storage. Lastly, Other Services Activities significantly influence the income of the lower 40 percent bracket.

Keywords: Inclusive; Input-Output Table; Miyazawa; Sumatra
JEL Classification: xxx

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1. Introduction

In the year 2020, following the COVID-19 pandemic, Indonesia's economic growth rate underwent a contraction. Indonesia's central and regional governments embarked on an extensive endeavor to mitigate the impact of the COVID-19 pandemic and facilitate economic recovery. The comprehensive efforts from the regional government and stakeholders in managing the COVID-19 pandemic have yielded outstanding results, exclusively in the Java and Sumatra provinces, which we can see from their contributions to the national economic growth in the year 2022. Badan Pusat Statistik (BPS) noted that throughout the year 2022, provinces in Java and Sumatra collectively contributed 78.52 percent to Indonesia's Gross Domestic Product (GDP) (BPS, 2024b)

The provinces within Sumatra contributed 22.03 percent. This accomplishment coincided with a steady increase in the economic growth of these regions, which are the provinces of Aceh, North Sumatra, West Sumatra, Jambi, South Sumatra, Bengkulu, Riau, Bangka Belitung, Riau Islands, and Lampung, registering a consistent increase of 4.69 percent. Likewise, the economy of all districts and cities within Sumatra has also exhibited notable improvement and recovery (BPS, 2024a).

Sumatra consistently holds the second most significant position in Indonesia's economy after Java. The primary sources of Sumatra's economic growth are trade and agriculture. The economic growth rates in Sumatra's provinces are as follows: North Sumatra (5.01 percent), Riau (4.21 percent), South Sumatra (5.08 percent), Lampung (4.55 percent), Riau Islands (5.2 percent), Jambi (4.66 percent), West Sumatra (4.62 percent), Aceh (4.23 percent), Bangka Belitung Islands (4.38 percent), and Bengkulu (4.26 percent) (BPS, 2024c) .

Its progression reveals that the economic growth rate from 2018 to 2022 exhibited dynamic growth. Following a period of contraction in 2020 due to the COVID-19 pandemic, the economy of Sumatra in 2022 showed relatively vital signs of recovery, resembling pre-pandemic conditions (BPS, 2024c).

Considering Sumatra's crucial role in Indonesia's economic landscape, an in-depth study is needed to determine whether the signs of post-pandemic economic growth recovery are based on principles of inclusive economic development, which ensures equitable participation and benefit distribution among diverse societal segments. It is imperative since everyone must notice inclusive growth from the primary focus of regional economic policies in various developing countries, including Indonesia.

In the context of Sumatra, development economists have yet to research inclusive economic development extensively. On the other hand, policy studies based on data and analytical models (evidence-based and data-driven policy) are gaining attention from researchers, the government, and other stakeholders. Researchers can use an attractive model to explore strong support potentials from economic sectors for regional economies, such as the Miyazawa input-output table. This analysis method is expected to provide new and profound insights into the regional economy's flow of goods and services.

This research explores how the Miyazawa model can be used to understand and promote inclusive development, particularly in Sumatra. The main objective of this study is to determine whether the acceleration of economic growth achieved in 2022 has adhered to the principles of inclusive development and has pursued one of the pillars of action, which is development distribution. This study is critical as it addresses the existing gap in research that evaluates the inclusivity of Sumatra's development and economic recovery after the global pandemic period.

This study addresses the research question: "Does the investment in key sectors contribute to inclusive economic growth within Sumatra?". We will use The Miyazawa input-output table for 2022 to answer this research question. This inquiry is pivotal, as it seeks to unravel the potential of sector-specific investments to act as catalysts for an equitable distribution of economic prosperity, thereby facilitating a broader, more inclusive framework of economic development. To methodically address this research question, the study will leverage the analytical prowess of the Miyazawa input-output table for 2022. This choice of methodology stands as a cornerstone for the analysis, offering a sophisticated lens through which the interconnections and flows between various sectors can be dissected and

understood in depth. By applying this framework, the research intends to dissect the intricate dynamics of how investments targeted toward pivotal sectors could influence the economic fabric of Sumatra, especially from the perspective of promoting inclusivity in economic growth. The goal is to shed light on the strategic relevance of such investments, providing empirical evidence and insights that could guide policymakers and stakeholders in sculpting interventions and policies geared toward achieving sustainable and inclusive economic development within the region. Through this comprehensive examination, the study aspires to contribute to the ongoing discourse on economic strategy and development, particularly in maximizing the benefits of economic growth for a broader population segment.

2. Literature Review

The input-output table is a table that contains information about transactions of goods and services among economic sectors, presented in the form of a matrix with rows and columns. Each row represents the allocation of output, while each column displays the use of inputs in the production process. Each cell in these rows and columns indicates the value of transactions of goods and services among economic sectors. In compiling input-output tables, the researcher must fulfill three basic assumptions. The first assumption is homogeneity, meaning each sector produces only one type of goods or services with a uniform input composition and no substitution for inputs from the output of other sectors. The second assumption is proportionality, which means an increase or decrease in the output of a sector will be proportional to the increase or decrease in the input of that sector itself. The third assumption is additivity, meaning the total effect of production activities in various sectors is the sum of the impact of the separate actions of each sector (BPS, 2021).

The Miyazawa input-output model (1968) is an extension of the input-output table, where the wage/salary, received business surplus, and household consumption parts of the primary input and household consumption blocks are grouped based on income groups. Thus, The Miyazawa input-output model can indirectly assist in determining the income distribution in a region's economy. Using this input-output model, economists specializing in development can analyze how alterations in final demand impact the distribution of income.

Input-output analysis is an economic analysis proposed by Leontief (1936). This analysis aims to understand the interdependence among economic sectors and the potential impacts that may arise from changes in one sector on others. This analysis involves identifying and calculating the flow of inputs and outputs among economic sectors. In this context, "input" refers to the raw materials, capital goods, and services needed by a sector in the production process, while "output" represents the production results of that sector. An input-output matrix or table could detail the interrelationship, where each row represents the production output of a sector, and each column represents the inputs required by other sectors. Input-output analysis views the economy as a system with interconnected sectors, where the output from one sector becomes input for different sectors.

According to Miller & Blair (2009), input-output analysis is a framework that examines the interdependence among various economic sectors and its implications for resource allocation, production, and income distribution. Researchers can use it to estimate the economic impact of changes in one sector on other economic sectors.

In practice, input-output analysis is often used for economic planning, impact analysis, forecasting, and economic policy. It can help identify sectors that exert significant influence and those that are responsive to economic growth. The study can also measure the composition of the use and availability of goods and services, providing information that can assist in import policies and import substitution decisions.

Several experts in sustainable development provide definitions of inclusive development. For instance, Gupta et al. (2015) define inclusive development as a process encompassing marginalized people, sectors, and countries in social, political, and economic approaches to improve human well-being, social and environmental sustainability, and empowerment. Furthermore, they found that inclusive development focuses on the social and ecological aspects of sustainable development, mainly as it is crucial for the needs of low-income people.

The classification of inclusivity resulting from an increase in final demand (e.g., due to investment) refers to the World Bank's classification used by BPS (2023) in categorizing income/expenditure inequality levels. In this classification, inequality levels are categorized as 'high' if the share of the bottom 40 percent is below 12 percent, 'medium' if the share of the bottom 40 percent is between 12 - 17 percent, and 'low' if the bottom 40 percent group has a percentage above 17 percent. Therefore, the impact of an increase in final demand in the key sectors of the economy that raise the bottom 40's income is considered inclusive in this study.

Through a literature review, a more comprehensive framework of thought emerges regarding the research direction and limitations of previous literature, enhancing the relevance of this study. Regarding analytical methodologies, a diverse array of methods has been employed in research to analyze economic inclusivity. Notably, the founder of the formulation of the Poverty-Equivalent Growth Rate (PEGR) designed the PEGR to assess the impact of economic growth on poverty alleviation. Several previous studies have utilized the application of PEGR as instrumental in determining the inclusivity of a region's development (Afriliana & Wahyudi, 2022; Hartati, 2021).

Several other studies use input-output tables to understand the inclusivity of development (Danuprawiro & Wiedodo, 2005; Suseno, 2018). On the other hand, some studies used Miyazawa's input-output model to determine the impact of economic sectors on the inclusivity of development (Adyaharjanti & Hartono, 2020; Hardiwan et al., 2019; Riyanto et al., 2020; Victor Firmana & Ari Tjahjawandita, 2016).

The use of panel data analysis is also found in previous studies to understand the correlation between some variables and the inclusivity of development (Afriliana & Wahyudi, 2022; Fitrianasari et al., 2022; Riyanto et al., 2020). In addition to panel data analysis, data analysts use other analysis methods. For example, a study by Nalle et al. (2022) utilized Shift Share, Klassen Typology, and SWOT Analysis to determine the influence of one specific sector (in this case, agriculture) on inclusive development indicators.

We can group previous studies into several categories based on the geographical scope of the areas studied. Some studies are conducted on a national scale (Adyaharjanti & Hartono, 2020; Afriliana & Wahyudi, 2022; Riyanto et al., 2020; Sri Hartati, 2021; Suseno, 2018).

Based on the variables used in several studies and their findings, development economists know that tourism activities, especially domestic tourist spending, can reduce poverty

(Riyanto et al., 2020). In contrast, other research shows that foreign tourist spending can reduce poverty but may increase income inequality simultaneously (Adyaharjanti & Hartono, 2020). These conclusions differ from the findings of Riyanto et al. (2020), which state that tourism sector activities can be used as a policy instrument to address uneven income distribution in society. This finding is reasonable because Riyanto's research includes variables of foreign tourist spending and considers domestic tourist spending. The compilation of these studies also found that Foreign Direct Investment (FDI), government spending on education and health, general investment, and the export of elemental iron and steel can trigger inclusive development in Indonesia.

In addition to the national scope, researchers from different geographical scopes also found the results at lower levels, such as provincial and district/city levels, groups of neighboring provinces, and higher levels, such as cross-country levels. These studies show that government spending on education, inflation, economic openness, and Gross Fixed Capital Formation (GFCF) can increase the potential for inclusive development in provinces in Sumatra (Fitrianasari et al., 2022). However, in West Java, the clean water sector, general government and defense, social and community services, livestock, and plantations are the ones that provide the most significant income multiplier. This result indicates that these sectors have the most significant impact on Java's inclusive development.

3. Methods

By implementing the Miyazawa input-output table analysis method, this study broadly utilizes three types of data: the Indonesian domestic input-output table based on the producer price for the year 2016, version 17 of economic industries/sectors (by using billion Indonesian Rupiah as the unit), data from 2022, Survei Sosial Ekonomi Nasional (SUSENAS), and data from 2022, Survei Angkatan Kerja Nasional (SAKERNAS). The data processing stages to generate the Miyazawa input-output table for Sumatra in 2022 are as follows.

We are processing the Indonesia input-output table for 2016 into the Sumatra input-output table using the Simple Location-Quotient (SLQ) method. SLQ is a method used to estimate regional input coefficients based on Location Quotient (LQ) values (Daryanto & Hafizrianda, 2010). In this study, we apply the SLQ method using the following formula:

$$LQ_i = \frac{x_i/x_t}{X_i/X_t} \quad (1)$$

where x_i is the output value of sector i in the Sumatra region, and x_t is the total output value in the Sumatra region. Meanwhile, X_i is the output value of sector i in Indonesia, and X_t is the total output value in Indonesia. Since the output values per sector for Sumatra are not known, these values are estimated using the ratio of Sumatra's Gross Regional Domestic Product (GRDP) by industry (sector) at current prices for the year 2016 to the total of Indonesia's GRDP by industry at current prices for the same respective year. Additionally, the final demand components for the Sumatra region are based on the 2016 GRDP by expenditure. Once the LQ values are determined, we can calculate the input coefficient for Sumatra according to the following formula:

$$a_{ij}^S = a_{ij}^{INA}.LQ_i \quad \text{for } LQ_i < 1 \quad (2)$$

$$a_{ij}^S = a_{ij}^{INA} \quad \text{for } LQ_i \geq 1 \quad (3)$$

where a is the input coefficient, S refers to the Sumatra region, INA represents Indonesia, and i and j denote sectors i and j. Estimating these technical coefficients can be applied to the input and other components within the input-output table (Miller & Blair, 2009).

Once we obtain the Sumatra input-output table for 2016, we update it to 2022 using the inflation factor method, assuming that the technical coefficients remain unchanged from 2016. In this method, a multiplier factor reflecting the price changes from 2016 to 2022 multiplies all table components. This multiplier factor is common when considering the influence of prices on an input-output table (West et al., 1986). In this study, the multiplier factor for updating the Sumatra input-output table from 2016 to 2022 is the ratio of the GRDP at current prices for Sumatra in 2022 to the GRDP at current prices for Sumatra in 2016, as also done in the research by Ghani & Imansyah (2021). The Sumatra input-output table for the year 2022 is then used to identify key sectors in the Sumatra economy for 2022.

With the updated version of the Sumatra input-output table, the next step is to develop this table in Miyazawa format. One of the advantages of the Miyazawa input-output model is its ability to depict distributional impacts on expenditure groups when there are changes in final demand. The depiction of distributional consequences becomes valuable when policymakers want to simulate the effects of investments made in specific sectors on income increases (wages/salaries) in each expenditure group. Therefore, an expansion of the expenditure groups for the final demand and income groups for the primary input of wages/salaries is needed. Once these expanded expenditures and income groups for consumption and wages/salaries are determined, we incorporate them into the intermediate input matrix.

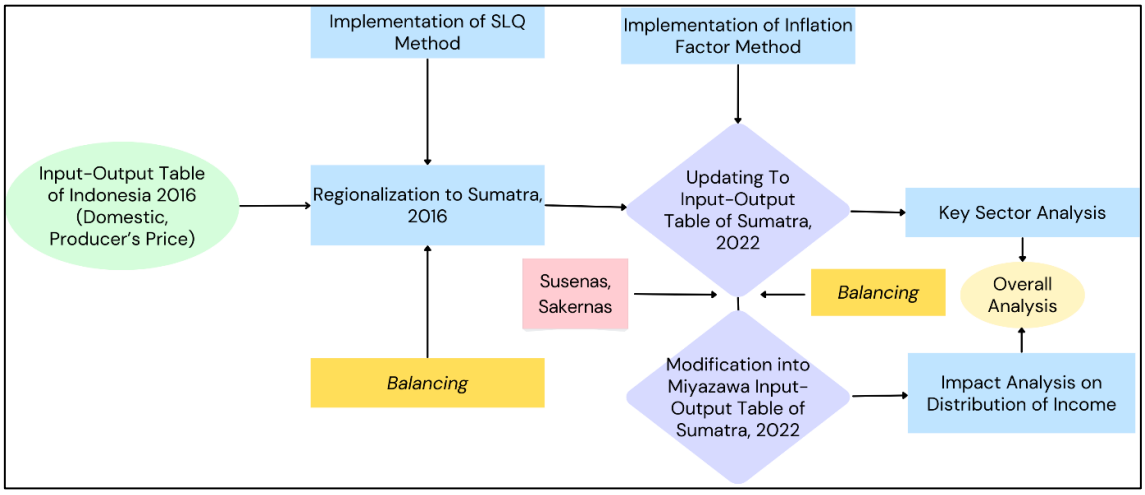

Figure 1. Miyazawa Input-Output Table Analysis Framework for Sumatra, 2022
Source: Authors

Expanding expenditure groups is the most complex stage, wherein Indonesian SUSENAS data is filtered to represent the Sumatra region. We perform a mapping on food and non-food consumption, divided by sectors. It undergoes mapping from the Classification of Individual Consumption According to Purpose (COICOP) to the Classification of Products by Activity (CPA) for alignment. After mapping household consumption into the 17 sectors, the per capita expenditure groups in the SUSENAS data are grouped into the World Bank classification, which is the lowest 40%, middle 40%, and

top 20% per sector. The total consumption per sector is multiplied to the ratio of each expenditure group per sector to break down expenditures per sector into three groups.

Also, this grouping process applies to the SAKERNAS 2022 data using wage/salary and sector variables. When merging expenditure and wage/salary groups into the Sumatra 2022 input-output table, a row and column balancing process is carried out due to the differences in total consumption and wage/salary in these three expenditure groups originating from two different survey sources, once the Sumatra 2022 Miyazawa input-output table is balanced, further analysis can be conducted.

To analyze key sectors, researchers require the calculation of the Index of Forward Linkage (IFL) and Index of Backward Linkage (IBL). A sector is identified as a key sector if it has both IFL and IBL greater than 1 (Daryanto & Hafizrianda, 2010). To obtain the values of IFL and IBL through a simple input-output table, we can use a matrix operation as follows:

$$X = (I - A)^{-1}F \tag{4}$$

where X is the total output matrix (of size n sectors × 1), I is the identity matrix (of size n × n sectors), F is the final demand matrix (of size n sectors × 1), and A is the matrix of input/technical coefficients (of size n × n) obtained from the input-output ratio with total input. The component $(I - A)^{-1}$ represents the Leontief Inverse Matrix, commonly known as the output multiplier matrix. In this study, the Leontief Inverse Matrix used is of an open type, where the focus is on analyzing 17 sectors of industries to obtain the values of IBL and IFL for these 17 sectors.

If $G = (I - A)^{-1}$, then IFL and IBL can be obtained with the following equations:

$$IBL_j = \frac{\sum_{i=1}^{n} g_{ij}}{1/n \sum_i \sum_j g_{ij}} \tag{5}$$

and

$$IFL_i = \frac{\sum_{j=1}^{n} g_{ij}}{1/n \sum_i \sum_j g_{ij}} \tag{6}$$

where IBL_j represents the Index of Backward-Linkage for sector j (column position in the input-output table), IFL_i represents the Index of Forward-Linkage for sector i (row position in the input-output table), and g_{ij} is the component/content of the matrix G. We can consider a sector as a key sector if it has both IBL and IFL greater than 1, as this indicates that the sector is capable of stimulating and meeting higher final demand compared to the average of other sectors (Daryanto & Hafizrianda, 2010).

Modifying a standard input-output table into the Miyazawa form assumes that the components of consumption and income (wages/salaries) are part of the intermediate input (endogenous) components. The modification involves transferring the consumption column and income (wages/salaries) row into the intermediate input matrix. Another difference from the standard input-output table is the separation of consumption and wage/salary components into specific groups (in this study, the classification of the bottom 40 percent, middle 40 percent, and top 20 percent). The Miyazawa (1968) input-output model in a matrix form is as follows:

$$\bar{A} = \begin{bmatrix} A_{n\times n} & C_{n\times q} \\ V_{q\times n} & 0_{q\times q} \end{bmatrix} \tag{7}$$

where $\bar{A}$ is the Augmented Miyazawa Coefficient Matrix, A is the Technical Coefficient Matrix with dimensions of $n \times n$ sectors, C is the Household Consumption Coefficient

Matrix with dimensions $n \times q$ (sectors × expenditure distribution groups), and V represents the Household Income Coefficient Matrix with dimensions of $q \times n$ (income groups × sectors), and 0 is a matrix containing 0 values with dimensions of $q \times q$.

The Leontief inverse matrix representing these effects is required to understand the impact of changes in final demand on income groups in the economic sectors. The Leontief inverse matrix acts as a multiplier for both sectoral and household incomes. The form of the Leontief inverse matrix for the Augmented Miyazawa Coefficient Matrix in Equation (7) is as follows:

$$\bar{B} = \begin{bmatrix} (I - A) & -C \\ -V & I \end{bmatrix}^{-1} \tag{8}$$

if $B = (I - A)^{-1}$, $L = VBC$, and $K = (I - L)^{-1}$ then $\bar{B}$ can be expressed as:

$$\bar{B} = (I - \bar{A})^{-1} = \begin{bmatrix} B(I + CKVB)_{n\times n} & BCK_{n\times q} \\ KVB_{q\times n} & K_{q\times q} \end{bmatrix} \tag{9}$$

where Miyazawa (1968) refers to KVB as the Multi-sector Income Multiplier Matrix, alternatively known as the Matrix Multiplier of Income Formation (abbreviated as MIF in this study), the MIF matrix explains the direct and indirect impacts on income for each group due to each unit increase in final demand in a sector. This matrix is then analyzed to describe the impact of a final order in the economic sectors on income distribution in Sumatra in 2022.

4. Results and Discussion

Based on the BPS data (2024b) on the Gross Regional Domestic Product (GRDP) at current prices by the province in 2022, the Sumatra region has an economic share of 22.03 percent in Indonesia. This proportion, almost a quarter of Indonesia's economy, illustrates the significant role that the Sumatra economy plays in Indonesia's overall economic development.

Within this 22.04 percent share, specific sectors play crucial roles in the Sumatra economy, having relatively larger shares than others. Development economists can consider these sectors as pillars of the economy, where their growth or decline significantly influences the economy in Sumatra. BPS (2024d) indicates that there are at least five sectors with proportions exceeding 10 percent in Sumatra: Agriculture, Forestry, and Fisheries (21.91 percent), Mining and Quarrying (13.35 percent), Manufacturing Industry (20.09 percent), Construction (10.77 percent), and Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles (13.63 percent).

While these key sectors substantially impact the overall economy, their influence on other sectors is also crucial to examine. It is essential to optimize investments or efforts to enhance final demand in other sectors that attract and drive other sectors to advance their economic output. These key sectors play a vital role in a region's economy.

In Figure 2, we can observe that the key sectors in Sumatra in 2022 are sectors with codes C (Manufacturing Industry), D (Electricity and Gas Supply), and H (Transportation and Warehousing). Among these three key sectors in Sumatra, we can consider only the Manufacturing Industry as both key and supporting sector of the economy. This finding implies that investments in this sector not only significantly influence the economy of Sumatra but also attract and drive other sectors to increase their output. The impact of the

other two key sectors is also beneficial in influencing the economy of Sumatra in the post-COVID-19 era. The ease of public mobility, prompted by the loosening of travel restrictions, has played a significant role in the further recovery of the economies of both Sumatra and Indonesia as a whole. Meanwhile, the significance of the Electricity and Gas Supply sector in its connection with other sectors must be considered, given its role in providing electricity and gas.

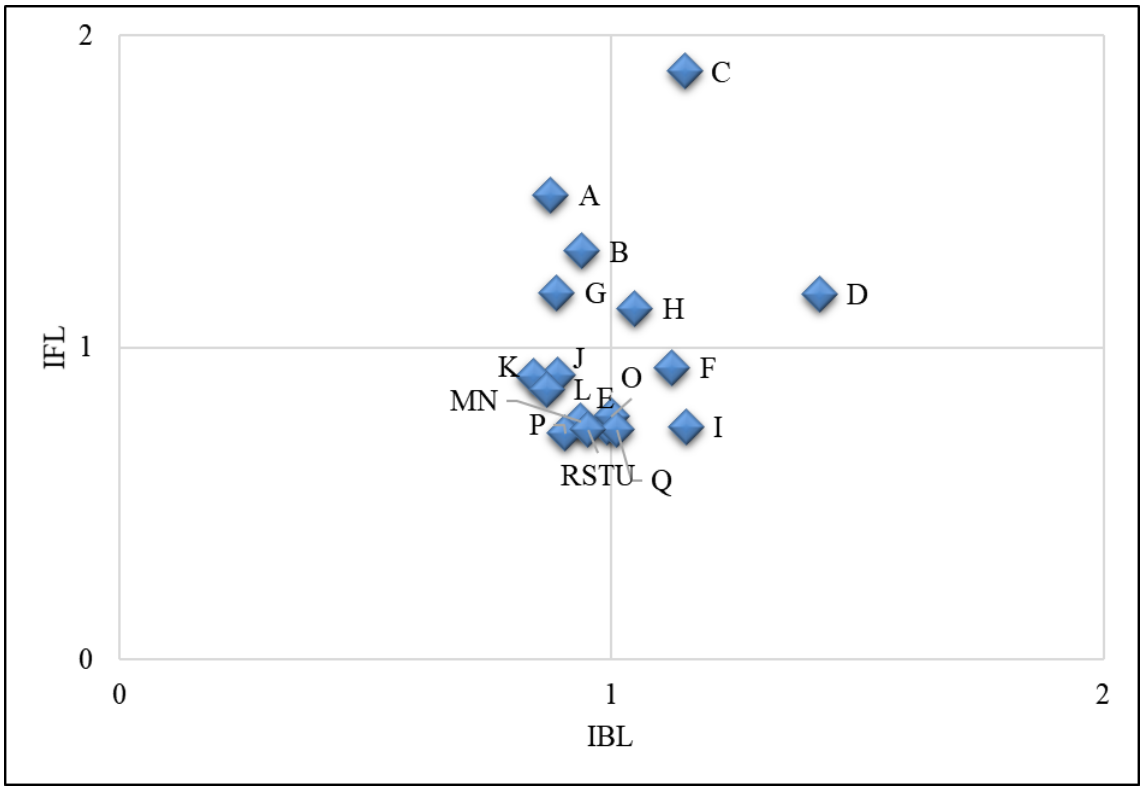

Figure 2. IBL and IFL of 17 Economic Sectors in Sumatra, 2022
Source: Authors' calculation

The increase in final demand (for example, investment) in key sectors, as well as the supporting sectors in the economy of Sumatra, can indeed enhance economic performance. However, its impact on income distribution is crucial to consider as it influences the level of welfare. The inclusivity aspect, which standard input-output table analysis cannot fully explain, can be described using the Miyazawa input-output table. By interpreting the content of the Multiplier of Income Formation (MIF) matrix in Table 1, the first row (sector A) is as follows. Every increase of 1 billion Indonesian Rupiah in final demand in sector A (Agriculture, Forestry, and Fisheries) will generate additional income (wages/salaries) for the bottom 40 percent group by 167.83 million Rupiah, the middle 40 percent group by 217.67 million Rupiah, and the top 20 percent group by 237.33 million Rupiah. The total increase in income resulting from a 1 billion rupiah increase in final demand in sector A is 622.83 million Rupiah. Overall, if there is a 1 billion rupiah increase in final demand in each sector of the Sumatra economy, it would lead to a rise in income for the bottom 40 percent group by 1.72 billion Rupiah, the middle 40 percent group by 2.75 billion Rupiah, and the top 20 percent group by 4.45 billion Rupiah, with a total income increase of 8.92 billion Rupiah. section describes and discusses the results of the analysis. The author can use Tables or

Figures to present the results of the analysis. The description of the analysis and discussion results should be presented coherently and systematically so that it is easy to follow.

Table 1. Transposed MIF Matrix of Sumatra in 2022

Code	Bottom 40%	Middle 40%	Upper 20%	Total
A	0,16783	0,21767	0,23733	0,62283
B	0,05213	0,11514	0,20536	0,37263
C	0,09076	0,14173	0,21670	0,44919
D	0,03798	0,08808	0,16155	0,28761
E	0,10724	0,12821	0,17537	0,41082
F	0,07749	0,20469	0,19734	0,47952
G	0,12508	0,19153	0,27949	0,59610
H	0,07853	0,14401	0,18038	0,40293
I	0,15286	0,18824	0,25726	0,59837
J	0,07509	0,12118	0,18194	0,37821
K	0,06164	0,16743	0,40681	0,63588
L	0,02206	0,05350	0,10207	0,17763
MN	0,08482	0,16947	0,34171	0,59600
O	0,10872	0,21330	0,45194	0,77396
P	0,17079	0,23537	0,50437	0,91053
Q	0,09959	0,17117	0,32172	0,59247
RSTU	0,20673	0,19647	0,22876	0,63196
Total	1,71934	2,74718	4,45011	8,91663

Note: The accuracy of the numbers after the decimal point is made to five digits to facilitate interpretation
Source: Authors' calculation

Table 1 shows the magnitude of the income impact due to the increase in final demand in each sector in Nominal terms. However, we should analyze the previously explained income distribution impact in proportion (share) to understand the distribution of its effects on each income group. Table 2 shows the percentage of component values in the MIF matrix.

Table 2. Distribution of the Values of the Transposed MIF Matrix for Sumatra in 2022

Code	Bottom 40%	Middle 40%	Upper 20%	Total
A*	26,95	34,95	38,10	100,00
B*	13,99	30,90	55,11	100,00
C**)	20,21	31,55	48,24	100,00
D*)	13,20	30,62	56,17	100,00
E	26,10	31,21	42,69	100,00
F*	16,16	42,69	41,15	100,00
G*	20,98	32,13	46,89	100,00
H*)	19,49	35,74	44,77	100,00
I	25,55	31,46	42,99	100,00
J	19,85	32,04	48,11	100,00

K	9,69	26,33	63,98	100,00
L	12,42	30,12	57,46	100,00
MN	14,23	28,43	57,33	100,00
O	14,05	27,56	58,39	100,00
P	18,76	25,85	55,39	100,00
Q	16,81	28,89	54,30	100,00
RSTU	32,71	31,09	36,20	100,00
Total	19,28	30,81	49,91	100,00

Note: * supporting sector(s), *) key sector(s), **) both supporting and key sector(s)
Source: Authors' calculation

The share impact of sector A (agriculture, forestry, and fisheries) on the bottom 40 percent income group is significant, although it is still smaller than other groups. Similarly, other supporting sectors, such as sector G (Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles), contribute a 20.98 percent share of income impact. Other supporting sectors provide impact shares below 20 percent for the bottom 40 percent group. Furthermore, sector C (Manufacturing Industry) has a relatively significant percentage of income impact, approximately 20.21 percent (compared to the average share impact on the bottom 40 percent, which is 18.89 percent). Sector H (Transportation and Warehousing) has an income impact share of 19.49 percent, which is still above the average share impact on the income of the bottom 40 percent. Meanwhile, key sector D (Electricity and Gas Supply) has a relatively small share value (13.20 percent).

Linking this to the World Bank's classification, as employed by BPS (2023b) for categorizing levels of income/expenditure inequality, then we can consider the impact of an increase in final demand from supporting sectors to create income impact with low inequality (categorized as inclusive in this study) is in sectors A (Agriculture, Forestry, and Fisheries), G (Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles), and C (Manufacturing Industry). Meanwhile, the impact of an increase in final demand on key sectors that leads to inclusive improvements is in Sector C (Manufacturing Industry) and Sector H (Transportation and Warehousing).

The final analysis of the MIF matrix's share values involves sorting the share values in the bottom 40 percent group to identify sectors in which we could intervene to increase their output, focusing on inclusivity for this bottom 40 percent group. Figure 3 shows the results of the sorted share.

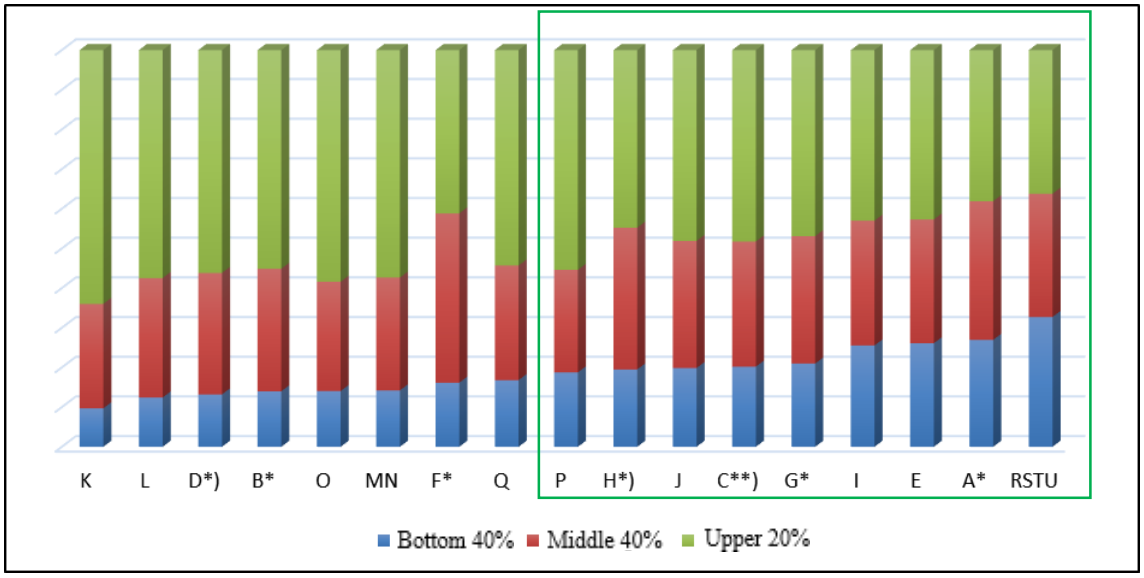

Figure 3. * supporting sector(s), *) key sector(s), **) both supporting and key sector(s). The green box in the image indicates sectors with an inclusive income impact
Source: Authors' calculation

Figure 3 shows that the sector RSTU (Other Services) provides the most considerable share impact on income for the bottom 40 percent, even exceeding the value for the middle 40 percent. This result implies that investment in this sector will significantly impact the bottom 40 percent compared to investing in other sectors (for the same bottom 40 percent group). The second-largest sector regarding share impact on income for the bottom 40 percent is sector A (Agriculture, Forestry, and Fisheries). As one of the supporting sectors of the economy (although not a key sector), investment in this sector not only stimulates the economy in Sumatra but also has an income impact, especially on the bottom 40 percent. This phenomenon is reasonable considering that we often find the livelihoods of the lower-middle-income population in this sector.

The sector sequence in Figure 3 can serve as a basis for interventions to increase sectoral final demand that is inclusive for each group. Additionally, priorities can be combined with considerations of the sector's contribution to the gross regional domestic product (GRDP) and the classification of key sectors, ensuring that the adopted policies fulfill sustainability and inclusive aspects.

5. Conclusions and Recommendations

Good development is oriented towards continuous growth (sustainable) and broadly impacts all layers of society (inclusive). Income is the community's receipt as a reward for its role in the economic activities. Investing in either supporting and/or key sectors is still incomplete without considering their income distribution. The limited research that explicitly examines inclusivity of income impact, particularly in Sumatra, is one of the backgrounds of this study.

After implementing the Miyazawa input-output table analysis for 2022, we can conclude that the key sectors of the economy in Sumatra in 2022 are sectors C (Manufacturing Industry), D (Electricity and Gas Supply), and H (Transportation and Warehousing). Of these three key sectors, only sector C (Manufacturing Industry) plays a key role as a supporting sector of the Sumatra economy. Investment in both the key and the supporting sectors can be carried out in these several sectors, namely sector A (Agriculture, Forestry, and Fisheries), sector C (Manufacturing Industry), sector G (Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles), and sector H (Transportation and Warehousing).

Also, increasing investment in the RSTU sector (Other Services) may provide the most considerable share impact on income for the bottom 40 percent of the population. Furthermore, increasing investment in sector C (Manufacturing Industry) as a supporting and key sector also has a significant share impact on income for the bottom 40 percent of the population. Sectors A (Agriculture, Forestry, and Fisheries) and G (Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles) also have a similar effect to sector C (Manufacturing Industry). The difference is that sectors A and G are less effective in driving other sectors to increase output in Sumatra's economy.

Based on the research findings, here are some suggestions and policy recommendations for regional governments, especially in Sumatra, as well as stakeholders, including investors. First, strengthen support for the growth of sector C (Manufacturing Industry) because our result proves that the Manufacturing Industry, as a supporting and key sector, also provides a significant and tangible share impact on the income of the bottom 40 percent of the population. Regional governments in Sumatra should always collaborate with the central government to provide continuous incentives and facilities for developing the Manufacturing Industry. This collaboration policy may include tax exemptions, providing adequate infrastructure, and skilled workforce training. Regional governments should also collaborate with industries to enhance the competitiveness of Sumatra's products in the national and international markets.

Second, regional governments should actively promote investment diversification for inclusive regional development. In addition to Sector C, regional governments should also support investments in Sector A (Agriculture, Forestry, and Fisheries), Sector G (Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles), and Sector H (Transportation and Warehousing) even though the significance of their impact is not equal to investment in Sector C. This policy can help Sumatra to reduce its dependency on a single economic sector while simultaneously improving economic resilience.

Third, to maintain inclusive regional development policies in Sumatra, the development should be focused on empowering the bottom 40 percent. Efforts to invest in and develop the RSTU sector (Other Services) need to be continuously promoted, mainly focusing on enhancing the welfare of the bottom 40 percent. Training and skill education programs can help this group become more actively involved in the economy.

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