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Empirical investigation on sectoral inequality, gender empowerment, education, and income inequality in Indonesia: Dynamic panel approach

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ABSTRACT

Sectoral inequality exemplifies the baseline condition; despite the same significant sectoral growth, high sectoral inequality also leads to high income inequality. This is because sectors with low contributions and sectors with high contributions to regional income will provide very unequal income for the workforce involved in them. Each variable may have a different relationship in the long term. This study aimed to investigate the short-term and long-term effects of Sectoral Inequality, Gender Empowerment Index (GEI), and Average Years of Schooling (AYS) on Income Inequality in Indonesia. The Vector Error Correction Model (VECM), based on panel data for the period 2015–2022, serves as the data analysis method. Each variable requires a different time to influence variations in other variables. The results show that there are no significant effects, either in the short run or in the long run, between Sectoral and Income Inequality. In the long-term, GEI does not affect Income Inequality but has an effect in the short-term. Meanwhile, AYS has a significantly negative effect on Income Inequality in the long-term and short-term. The practical implication of these research findings is that efforts from the government are needed to reduce Sectoral Inequality before encouraging equal distribution of sectoral growth to avoid high income inequality.

Contribution/ Originality: Numerous studies have examined the correlation between income inequality and the growth of economic sectors. This study employs the sectoral inequality variable to assess its impact on income inequality, with sectoral inequality serving as the baseline. When in baseline conditions, there is no inequality; it is hoped that sectoral growth will not increase the gap in labor income between sectors.

1. INTRODUCTION

Income Inequality is a fundamental issue in economic development since the variable generates a disparity between high and low returns. This issue affects both developing and industrialized countries at varying levels. Meanwhile, Central Bureau of Statistics measures the disparity using the Inequality index (Damanik, Zulgani, & Rosmeli, 2018) since Income Inequality has a negative influence on happiness and health (Mdingi & Ho, 2021; Phuc & Ali, 2021). Income Inequality persists despite the rapid economic growth of the Association of Southeast Asian Nations (ASEAN). In 2021, this variable was higher (0.407) in Philippines than in Indonesia (0.379), but lower in Thailand (0.351). Even though some nations have less Income Inequality, resolving the issue remains critical for inclusive and sustainable economic development. Economic progress and growth are expected to increase income since the benefits are exclusively shared by a few (Ferdinand, 2017). In this context, uneven economic growth causes inequality in sectoral contributions. In addition to sectoral growth, sectoral contribution plays a crucial role in

determining income inequality. Sectoral contribution describes the baseline condition; even with the same large sectoral growth, high sectoral inequality will lead to high income inequality. This is because sectors with low contributions and sectors with high contributions to regional income will provide very unequal income for the workforce involved in them. However, according to Sendouw, Saroinsong, and Mantiri (2021). There has not been much research examining the relationship between sectoral inequality and income inequality. Most previous research examines sectoral growth in relation to income inequality (Brida, Carrera, & Segarra, 2020; González Gordón & Resosudarmo, 2019). Moreover, leading sectors have a significant contribution to regional income, but not with lagging sectors (Saputri, 2017).

According to Central Bureau of Statistics (2023) high-productivity sectors have a considerable contribution to Gross Domestic Product GDP. These industries include transportation and warehousing (13.96%), information and communication (7.59%), mining and quarrying (6.12%), commerce and repair (4.85%), and manufacturing (4.64%), with agriculture accounting for the least (1.30%). Industries with high productivity attract more workers due to increased wages (Halim, 2013). Meanwhile, disparity in sectoral productivity has an impact on Income Inequality among households. Sectoral productivity promotes household income, but increased disparities result in unequal distribution. In contrast, tiny productivity gaps lead to more egalitarian income distribution. In March 2023, Income Inequality increased to 0.388 from 0.381 in September 2022, with metropolitan areas experiencing the greatest increase, while rural areas experienced no major changes (Central Bureau of Statistics, 2023).

According to traditional cultural standards, women are responsible for domestic chores (Mufidah, 2004). Men serve as the heads of households and are expected to have significant earnings. The Central Bureau of Statistics shows that 83.13% and 51.89% of men and women work, respectively. Men aged 15 and above employ 78.72%, compared to 49.18% of women. In addition, 37.04% of women are solely responsible for home chores. In March 2023, the population of Indonesia consisted of 50.08% men and 49.92% women. Of the total female population, 65.71% were of working age (Central Bureau of Statistics, 2016). Despite the common perception of women as less significant, gender plays a crucial role in economic growth and acts as a catalyst for development. The economic empowerment of women is a sign of improving development indicators (Padang, 2019). According to Amriani (2023) women and men have unequal access to the labor market. Women desire gender equality to possess equal access and opportunity in the workplace. The National Labour Force Survey (2023) shows that 47.91% of 118 million Indonesian women are working, while 36.97% are homemakers. According to the National Labour Force Survey (2023) men and women account for 6.43% and 6.11% of university graduates, respectively. However, the percentage of individuals without educational certificates remains high at 27.66% and 22.38% for women and men, indicating a lack of educational qualifications (Kompas, 2016). Women with high access to formal employment tend to possess increased incomes, potentially increasing Income Inequality (Aldilla, 2022). However, access to formal employment can reduce Income Inequality within households (Purwaningsih, 2021).

Education develops high-quality human capital and also supports a healthy company environment, increases productivity, and drives economic growth. Therefore, the concept can foster fair and healthy business practices leading to an increase in income (Rasyiqa, Zamhari, Yahya, Daniyasti, & Fitriani, 2023). Economic research on labor frequently examines the impact on Income Inequality, correlating educational expenditures to salaries. An individual's level of education has a considerable impact on income (Wahyuni & Monika, 2016). The duration of education directly correlates with knowledge and technological skills, thereby influencing income. In contrast, a lack of education might have an impact on income. Limited development funds force a country or region to pursue an uneven development strategy, prioritizing industries capable of becoming the dominant economic sectors. The sustainability of the method results in Income Inequality among households since the top sectors provide high wages to employees. Therefore, sectoral and Income Inequality are directly proportional to each other. Since equitable education throughout society influences access to formal employment, discrepancies in work access can increase inequality. Higher education access for all societal strata fosters more egalitarian access to formal jobs, lowering Income Inequality.

2. LITERATURE REVIEW

Income Inequality is defined as the economic well-being between affluent and poor groups (Baldwin, 1986). This includes differences in income, wealth, education, employment, happiness, and well-being (Andrei & Craciun, 2015). Variations in natural resources and demographic factors cause regional disparities, impacting a region's development capacity. Therefore, each region has distinct ideas of advanced and lagging areas (Sjafrizal, 2012). Income Inequality represents a sharp contrast in social earnings, with the rich becoming wealthier and the poor becoming poorer (Todaro & Stephen, 2013). The distribution shows the sharing of development outcomes among residents. There are various criteria for assessing income distribution equity and measuring inequality, including the Inequality coefficient.

According to the World Bank, Income Inequality is classified as high, moderate, and low when the expenditure of the bottom 40% of the population is less than 12%, between 12% and 17%, as well as surpassing 17% (Central Bureau of Statistics, 2021). Alisjahbana (2012) reported that the variable was a long-term issue necessitating comprehensive and durable policy solutions. The government has established several poverty alleviation programs to enhance Human Resources (HR) quality, as well as increase job prospects and wages. Meanwhile, World Economic Forum (2014) stated that Income Inequality was a key global issue, with significant disparities ranking fourth among the top ten high-priority global Sectoral Inequality. These gaps can jeopardize social and political stability, damage governance, and trigger budgetary crises. The effects limit the labor market, lower wages, and worsen inequality. According to the Asian Development Bank (2012) significant inequality slows economic growth and leads to social tensions, labor strikes, criminality, and a loss of trust in government policies. Inequality can become a "vicious circle," disrupting long-term economic growth and increasing the risk of sliding into the Middle-Income Trap (MIT) without policy changes from the government.

The idea of Unbalanced Growth, introduced by Hirschman and Sirkin (1958) explained the reason economic growth is not consistent across sectors and regions. However, growth disparities can propel total economic progress. Basic assumptions concerning the ratio of unbalanced growth theory and economy can be divided into two sectors: Leading Sector and Lagging Sector. Hirschman and Sirkin (1958) reported that intentionally creating imbalance was a successful approach to promoting economic progress. In countries with limited resources, efficient resource allocation is key, with a focus on prioritizing strategic industries. Pieters (2010) as referenced in Winarni and Hartono (2023) suggested that income inequality and poverty were connected to sectoral structural growth. González Gordón and Resosudarmo (2019) research reported Sectoral Inequality using regression analysis across agriculture, manufacturing, services, and mining. These studies do not take into account the baseline conditions related to sectoral contributions. Therefore, it would be more valuable to consider sectoral inequality in relation to income inequality among households.

Economic development can aggravate Income Inequality by favoring the wealthy over the poor (Soleh, 2015). There is still limited empirical research on economic sectors to improve Income Inequality (Siami-Namini & Hudson, 2019). In this context, productivity growth increases Income Inequality (Fields, 1987), as stated in Winarni and Hartono (2023). These studies also do not consider the baseline conditions in terms of sectoral contributions to regional income.

According to Central Bureau of Statistics (2019) GEI is a measure of women's active participation in economic and political life. The variable demonstrates the significant potential and empowerment of women, particularly in countries where economic opportunities are not fully utilized (Ismail, Mohd Rasdi, & Nadirah, 2011; Kertati, 2021). The literature Chamlou and Karshenas (2016) states that feminization of poverty occurs in areas where women lack empowerment and are often relegated to non-productive activities like home and childcare duties (Pathak & Buche, 2013). The husband's earning determine the household income (Ngono, 2021). Therefore, empowering women is crucial, particularly in poor countries (Hwang & Nam, 2020). The process of empowering women leads to increased freedom (Djodjo, El Oualidi, & Diaw, 2017). Three dimensions, namely economic, social, and political empowerment, typically relate to this (Pathak & Buche, 2013). Economic empowerment refers to the ability to freely participate in

the labor market, while social empowerment emphasizes the importance of institutional capacity in granting women more freedom. Increased women's employment engagement and economic access enhance household income, which is a crucial factor in socioeconomic growth and the reduction of poverty (Awan & Sadia, 2018). Numerous studies have explored the empowerment of women. While the increased participation of women in the labor market can increase household income and reduce poverty, the relationship between these variables and income inequality remains unclear. The correlation between women's empowerment and income inequality remains unclear. If all groups in society have equal access to work, then women's empowerment won't contribute to reducing income inequality. But access to employment is greater for women from low-income households, so this can reduce income inequality

One tool for increasing public knowledge is education. The longer an individual receives formal education, the more knowledge they have. Average years of Schooling show the level of formal education within a community through graduation quality and skill preparation (Soukalová & Gottlichová, 2015). Average years of Schooling, as a form of human capital development, reflect the quality of a region's human resources through Educational levels gained, grades earned, and educational qualifications obtained (Ariutama & Syahrul, 2016). However, there is no correlation between education and inequality. Previous research showed that education can minimize Income Inequality by addressing over-education, the relationship between abilities and education, and discrepancies in academic quality. Meanwhile, government investment in education can reduce wealth inequality (Wahyuni & Monika, 2016). Education influences income, with highly educated individuals earning more money. However, many college graduates are unemployed due to a lack of work possibilities for matching talents and increasing Income Inequality (Anshari, Azhar, & Ariusni, 2019). Education promotes economic growth by increasing access equitably. Unequal access decreases wealth disparities while government investment reduces Income Inequality (Ahmad, 2013).

3. RESEARCH METHODOLOGY

This research used a quantitative descriptive method to aid decision-making. The aim was to investigate the impact of Gender Empowerment Index (GEI), Average Years of Schooling (AYS), and Sectoral Inequality (SI) on Income Inequality (II) by identifying problems, developing models, collecting data, testing solutions, as well as analyzing and interpreting the results.

Secondary data were used in the form of panel data from 34 Indonesian provinces between 2015 and 2022. The data comprised the GEI, AYS, SI, and GI gathered from the Indonesian Central Bureau of Statistics, World Bank, and other pertinent sources. The research examined the independent variables, namely GEI, AYS, and SI, which influenced Income Inequality. The independent variables were GEI, AYS, and Sectoral Inequality.

The hypothesis testing was carried out by comparing data on Gender Empowerment Index, Average Years of Schooling, and Sectoral Inequality to Income Inequality between 2015 and 2022. The approach of research used was Vector Auto Regression (VAR)/ Vector Error Correction Model (VECM). This model was utilized because variables in VAR were dependent on lagged and current values, or both. This provided inclusive and understandable knowledge related to the relationships because not all variables relate to the current time or the same time.

To estimate non-stationary data at the level, we used VECM. Consequently, people commonly referred to the approach as a VAR model for non-stationary time series data. VECM was also known as a restricted VAR model because the concept primarily used a restricted type of VAR. To assess the dynamic properties, many procedures must be considered, including stationarity testing, lag length determination, the Johansen co-integration test, and the causality test. Before estimating the model, we tested methods such as Impulse Response Function (IRF) and Variance Decomposition (Enders, 2015). VECM(p) with a cointegration rank r ≤ k is commonly expressed as follows:

$$\Delta Y_t = \prod Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-1} + \varepsilon_t$$

3.1. Notation

Δ = Difference operator.

Y_{t-1} = Lagged vector of endogenous variables, size nx1.

ε_t = Residual vector, size nx1.

Π = Cointegration coefficient matrix ($\Pi = \alpha\beta'$; α is the adjustment vector, a matrix of size nx1, and β is the cointegration vector, a matrix of size nx1).

β = Cointegration vector (long-run parameter) matrix (nx1).

Γ_i = Coefficient matrix of endogenous variable i, size matrix.

4. RESULTS AND DISCUSSION

Secondary data frequently shows non-stationarity, which can result in erroneous regression and inaccurate estimates. To obtain more precise estimates, the data must be stationary. Therefore, unit root tests using the Augmented Dickey-Fuller (ADF) method were used to process the data.

Table 1. Results of the stationarity test.

Variable	Level		1st difference	
	Prob.	Result	Prob.	Result
GI	0.914	Non-stationary	0.000	Stationary
SI	0.840	Non-stationary	0.002	Stationary
GEI	0.519	Non-stationary	0.001	Stationary
AYS	0.973	Non-stationary	0.000	Stationary

The data in Table 1 are stationary at the first difference level. This finding suggests long-term cointegration between Inequality Index, Sectoral Inequality, GEI, and AYS.

In estimating VAR models, the lag length is crucial for analyzing relationships between variables. This research uses the Akaike Information Criterion (AIC) to select the model with the lowest AIC value. Table 2 shows that Lag 1 has the lowest AIC value. The most common method used to determine lag length is by examining AIC values. Therefore, the optimal influence among variables occurs over 1 period. In this context, Lag 1 is used for estimating parameters in the VECM. This shows that the data from the previous period (t-1) is used to estimate the relationships between the variables. By using Lag 1, this research identifies the effects of the changes in Sectoral Inequality, GEI, and AYS in the previous period on Income Inequality in the current period.

Table 2. Results of the optimal lag test.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	323.172	NA	9.84e-10	-9.387	-9.257	-9.336
1	449.500	234.079*	3.84e-11*	-12.632*	-11.980*	-12.374*
2	460.669	19.382	4.45e-11	-12.490	-11.315	-12.025
3	474.529	22.422	4.80e-11	-12.427	-10.730	-11.755
4	482.020	11.236	6.32e-11	-12.177	-9.958	-11.298
5	492.128	13.973	7.82e-11	-12.004	-9.262	-10.917

Note: *Indicates the optimal variable lag.

Model stability testing includes calculating the unit-roots of the characteristic polynomial equation. The VAR model is considered stable when the roots are inside the unit circle or have absolute values less than 1. Complete unit roots test results are presented in Table 3.

Table 3. Results of model stability test.

Root	Modulus
-0.235	0.235
0.170	0.171
-0.052 - 0.0882	0.102
-0.052 + 0.0882	0.102

Based on the results, all moduli have absolute values less than 1 since the model is stable. Further analysis, such as IRF and Forecast Error Variance Decomposition (FEVD), can be conducted when a VAR model is stable.

Granger Causality test is used to assess the bidirectional or one-directional relationship of the variables. This analysis procedure includes comparing probability values with a critical threshold of 5%. The causal relationships between variables are considered to exist when the probability value is less than 5%. Conversely, there is no causal relationship between the variables when the probability value exceeds 5%. Complete Granger causality test results are presented in Table 4.

Table 4. Granger causality test results.

Null hypothesis	F-statistic	Prob.
Sectoral inequality has no granger causality on inequality index	1.273	0.260
Inequality index has no granger causality on sectoral Inequality	0.968	0.326
GEI has no granger causality on inequality index	0.226	0.635
Inequality index has no granger causality on GEI	1.741	0.188
AYS has no granger causality on inequality index	0.264	0.608
Inequality index has granger causality on AYS	6.024	0.015*
GEI has granger causality on sectoral inequality	5.090	0.025*
Sectoral inequality has no granger causality on GEI	2.007	0.158
Null hypothesis:	F-statistic	Prob.
AYS has no granger causality on sectoral inequality	3.0126	0.084
Sectoral inequality has no granger causality on AYS	0.916	0.340
AYS has no granger causality on GEI	0.021	0.886
GEI has no granger causality on AYS	0.544	0.461

Note: *Denote significantly at α =0.05.

Based on Table 4, there is a one-way Granger causality relationship between the Inequality Index and AYS, as well as between GEI and Sectoral Inequality. We conduct cointegration testing to determine the presence of long-term equilibrium, which involves assessing the similarity of movements and stability of relationships between variables. This research employs the Johansen Cointegration Test as the cointegration test. When the hypothesis values of the Unrestricted Cointegration Rank Test (Trace) and Max-eigenvalue are met, an equation is said to be cointegrated. With probability values below 0.05, variables are cointegrated. Complete Johansen cointegration test results are presented in Table 5.

Table 5. Johansen cointegration test results.

Hypothesized	Trace	Prob.	Max-eigen	Prob.
No. of CE(s)	Statistic	Critical value	Statistic	Critical value
None	308.532	0.000	125.612	0.000
At most 1	182.921	0.000	83.967	0.000
At most 2	98.953	0.000	55.475	0.000
At most 3	43.479	0.000	43.479	0.000

Johansen Cointegration tests for Inequality Index, Sectoral Inequality, GEI, and AYS suggest that the probability values are less than 0.05. Therefore, there is cointegration or long-term linkages between the variables. IRF aims to observe the impact of shocks or disturbances received by a variable. Examining the IRF graph reveals a

positive response from the variable experiencing the shock when the curve is above the equilibrium point. Conversely, the variable shows a negative response when the curve is below the equilibrium point.

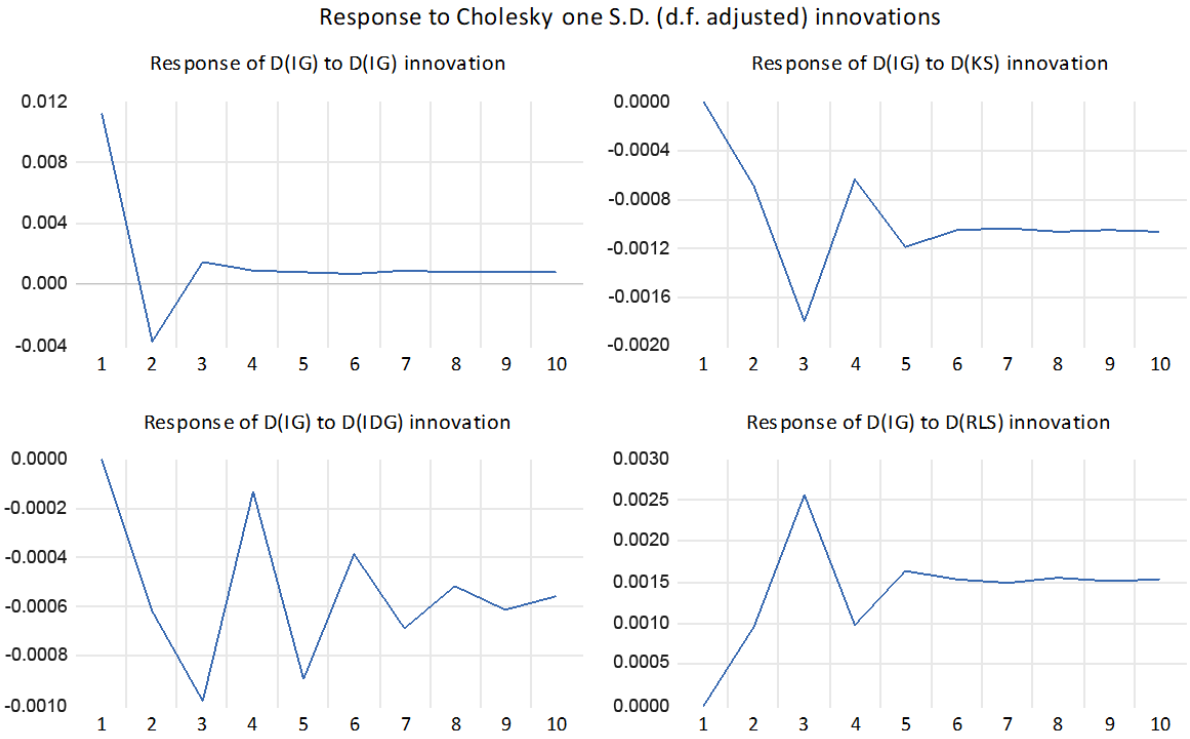

Figure 1. Impulse response function.

Based on Figure 1, the impulse responses show movements converging toward equilibrium points in each inter-variable influence model. (1) The response of the Inequality Index to the fluctuating changes tends to be positive over the last ten periods. This is depicted by the positive response of the Index in the first to tenth periods since the IRF curve is above the equilibrium line. Therefore, the response tends to have a positive impact when there are fluctuations. (2) The response of Inequality Index to fluctuating changes in AYS tends to be negative over the last ten periods. This is depicted by the negative response of AYS in the first to tenth periods since IRF curve is below the equilibrium line. Therefore, when there are fluctuations in AYS, the response tends to have a negative impact on Inequality Index. (3) The response to changes in GEI shows a fluctuating pattern. In the first to sixth periods, a negative response is depicted in IRF graph below the equilibrium line. Therefore, changes in GEI have a negative impact on Inequality Index. (4) The response of Inequality Index to fluctuating changes in AYS tends to be positive over the last ten periods.

This is depicted by the positive response in the first to tenth periods since IRF curve is above the equilibrium line. Therefore, when there are fluctuations in AYS, the response tends to have a positive impact on Inequality Index. FEVD analysis aims to provide information about the proportion of shock impacts in the current period and in future periods. The results of the FEVD analysis are presented in Table 6.

Based on Table 6, Inequality Index is subjected to significant changes in the self-influence from the first to the tenth period. In the first and second periods, Inequality Index has 100% and 98.73% influences, respectively. From the third to the ninth period, this influence fluctuates but remains relatively high. Finally, in the tenth period, the influence of Inequality Index was 79.37%.

The analyzed period maintained a dominant influence despite fluctuations.

Table 6. The results of FEVD analysis.

Period	S.E.	D(IG)	D(KS)	D(IDG)	D(RLS)
1	0.011	100.000	0.000	0.000	0.000
2	0.012	98.730	0.346	0.277	0.647
3	0.012	91.773	2.452	0.892	4.883
4	0.012	90.997	2.678	0.890	5.435
5	0.012	88.245	3.467	1.356	6.932
6	0.012	86.334	4.051	1.414	8.202
7	0.013	84.467	4.592	1.656	9.285
8	0.013	82.666	5.139	1.768	10.427
9	0.013	80.991	5.634	1.935	11.440
10	0.014	79.367	6.123	2.060	12.450

AYS tends to fluctuate from the early to the tenth period of the research. In the second period, AYS exerts an influence of 0.35%. This influence increases in the third and fourth periods to 2.45% and 2.68%, respectively. However, in the fifth period, the influence of AYS on Inequality Index increases to 3.47%. The contribution shows a tendency to increase up to the tenth period, reaching 6.12%.

The effects of GEI tends to increase from the early to the tenth period. Even though the variable does not contribute in the first and second period, GEI is influenced by 0.28%. The contribution shows an increasing trend up to the tenth period, reaching 2.06%.

The contribution of AYS to Inequality Index shows a significant increase from the second to the tenth period. In the first period, AYS does not influence Inequality Index but has a 0.65% influence in the second period. Subsequently, the contribution continues to increase in each subsequent period. By the third and tenth periods, the influence of the variable increases to 4.88% and 12.45%, respectively. Therefore, AYS plays an important role in influencing Inequality Index.

VECM is an econometric analysis tool used to identify the behavior of short-term variables influenced by the long-term counterparts. To assess the relationship between short-term and long-term variables, the t-statistic should be compared with the critical t-value from the table. There is a significant impact or influence between the variables when the t-statistic exceeds the critical t-value.

Table 7. Estimation results for long-term relationships.

Variable	Coefficient	t-table	t-statistic	Result
Sectoral inequality	0.167	1.968	1.668	Not significant
GEI	0.001	1.968	1.531	Not significant
AYS	-0.030	1.968	-2.210	Significant

Table 7 shows that there is a long-term relationship between Inequality Index and AYS. However, Sectoral Inequality and GEI do not influence the Inequality Index since the t-statistic values are less than the critical t-value.

Table 8. Estimation results for short-term relationships.

Variable	Coefficient	t-table	t-statistic	Result
Inequality index	0.067	1.968	1.010	Not significant
Sectoral inequality	0.167	1.968	1.916	Not significant
GEI	0.001	1.968	2.007	Significant
AYS	-0.030	1.968	-2.896	Significant

Based on Table 8, AYS has a significant negative impact on Income Inequality, while GEI has a significant positive impact on Income Inequality. However, there are no significant effects between Sectoral and Income Inequality.

Testing the relationship between Income Inequality in period t and period (t-1) allows the capturing of autoregressive effects in the short term. Understanding short-term dynamics is crucial for identifying the influence of changes or fluctuations in Income Inequality. Since the system moves toward long-term equilibrium, VECM designs this model to capture short-term adjustments. The use of lags (such as Lag 1) also enables an understanding regarding the adjustment of Income Inequality in the short term in response to existing imbalances. Even though long-term relationship testing focuses on the equilibrium, short-term testing is essential for examining the effects of variables. This testing provides a comprehensive view of dynamic interactions between variables.

Sectoral Inequality does not affect Income Inequality due to several factors, including the significant structural shift of the Indonesian economy from agriculture to industry and services over the years. Since more productive sectors grow faster than others, this shift tends to increase overall income and reduce Income Inequality. Additionally, economic diversification has helped to spread risks and reduce dependence on specific sectors. Over the long term, this has aided in balancing income across sectors. Sectoral Inequality has a limited short-term impact on Income Inequality. First, labor mobility between industries is relatively limited. Several workers struggle to migrate from one sector to another due to skill mismatches, which reduces the flow of inequality. Second, the Indonesian government routinely offers subsidies and adopts programs to stabilize incomes in specific sectors. These methods can reduce the impact of Sectoral Inequality on income. Third, Sectoral Inequality is frequently influenced by geographical considerations. Disparities in infrastructure development, educational access, and economic opportunity between urban and rural areas are more severe than specific sectors. Therefore, Sectoral Inequality has no short-term impact on Income Inequality. Better access to education and skills training is critical since improved skills allow workers to more readily transfer between industries, lowering the impact of Sectoral Inequality. Finally, the Indonesian government continues to adopt development policies aimed at reducing inequality between sectors and regions by investing more equitably in infrastructure, education, and health. These variables explain the reason Sectoral Inequality has no long-term effect on Income Inequality.

The Gender Empowerment Index has no long-term effect on Income Inequality but has an increased influence in the short term. Several factors explain the reasons GEI has a limited effect on Income Inequality. For starters, labor market dynamics and economic structures tend to adjust. The addition of more women to the workforce led to a decrease in average pay, reducing the impact on Income Inequality. Second, Income Inequality is influenced by a variety of external and structural factors, including technology, globalization, economic policy, and labor market changes. Third, ingrained social and cultural norms can still affect the career choices and opportunities accessible to women, limiting the impact of GEI on Income Inequality in the long term. Ngono (2021) & Li (2022) conducted long-term research that is consistent with these results. However, Hwang and Nam (2020) found that GEI had a favorable impact on income inequality. In the medium term, the positive influence of GEI increases Income Inequality. Therefore, women have greater access to education, employment, and decision-making opportunities. Empowered women can participate more actively in the labor market and earn more money. However, this increases income gaps because several women may remain in the informal sector with low earnings or encounter job discrimination.

Economic and social policies that fail to redistribute income can deepen inequality. Unequal access to economic opportunities and education for women from different regions or social groups may increase the differences. Therefore, GEI signifies progress in the empowerment of women, and the dynamics lead to short-term rises in income Inequality. In the short term, these results were consistent with Naveed and Wang (2023) where there was a positive effect of GEI on income inequality. However, Ngono (2021) found no significant impact of the variable on Income Inequality. Average Years of Schooling has a negative impact on Income Inequality in long and short-term. Different reasons are responsible for the negative effects of AYS on Income Inequality. Education is considered a tool to reduce Income Inequality. In complex social and economic realities, the concept can increase Income Inequality. Therefore, we expect education policymakers to prioritize equalizing access and enhancing the quality of education, thereby ensuring the system fosters social mobility for all societal segments. These considerations form the basis for the

negative effects of AYS on Income Inequality in the long and short-terms. However, educational advancements increase income inequalities due to the following phenomena: (1) Unequal Access to Education between community groups, (2) Disparities in Education Quality across various institutions suppliers; (3) In the modern economy, technological advancements often widen income gaps between skilled and unskilled workers. This can increase demand for high-paying jobs among skilled workers while marginalizing and underpaying unskilled counterparts. Additionally, education can enhance the income level of highly educated individuals, but without equitable job opportunities, inequality may persist. These results contrast Lee and Lee (2018) and Munir and Kanwal (2020) stating a positive impact of education on Income Inequality.

5. CONCLUSION AND RECOMMENDATION

In conclusion, there was no significant influence between Sectoral and Income Inequality in the long and short-term. GEI did not affect Income Inequality in the long-term but a significant positive impact was reported in the short-term. Finally, AYS negatively affected Income Inequality in both long and short-term.

In the long term, effective income redistribution policies can serve as a solution to reduce Income Inequality. Various methods, such as progressive taxation, targeted social assistance programs, social security enhancements, and economic safety nets for the less privileged, can achieve this. The implementation of equitable development policies throughout Indonesia is important to reduce regional disparities and enhance economic parity across regions. In the short term, key sectors should maintain stable incomes through subsidies and other policies to mitigate Sectoral Inequality by improving infrastructure and enhancing labor mobility. Even though GEI does not influence Income Inequality in the long term, the positive impact in the short term suggests several strategic steps. First, the concept strengthened short-term economic empowerment policies such as skills training and financial assistance for women. Second, the concept promotes gender equality in the workplace to guarantee equal wages and opportunities. Thirdly, we develop family-friendly policies to assist women in managing their work and responsibilities. Fourth, we should improve women's equal access to education and skills training. Lastly, we must enhance collaboration among the government, private sector, and civil society to address structural barriers to economic empowerment.

The following recommendations are proposed with the significant negative effect of education on Income Inequality in both the long and short-term. First, equitable access to high-quality education is ensured through scholarships or financial aid programs. Second, there is a need to enhance education quality to bridge the gap between affluent and underprivileged institutions by strengthening facilities, teachers, and curricula in marginalized areas. Third, practical skills education relevant to market needs is crucial to prepare graduates for better employment opportunities. Fourth, job opportunities for higher education graduates must be increased by enhancing growth in sectors that require skilled labor and entrepreneurship. Finally, technological integration should be promoted to improve education quality and accessibility, preparing students for necessary digital skills. For the government, it is best to replace the unbalanced growth strategy with balanced growth for all sectors. Efforts are being made to ensure that there are no lagging sectors by increasing productivity in all sectors so that labor income in all sectors is relatively even.

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REFERENCES

Ahmad. (2013). *Education spending and inequality reduction*. Jakarta: Economic Studies Press.

Aldilla, R. (2022). Participation of female workforce in family income in Sungai Pinyuh District, mempawah regency case study at PT. Kalimantan Kelapa Jaya. *Jurnal Pembangunan dan Pemerataan*, *11*(2), 1-69.

Alisjahbana, A. (2012). *Gini ratio in Indonesia in the last five years*. Jakarta: Bappenas.

Amriani, N. R. (2023). *Gender-based determinants of labor force participation rates in Indonesia*. Unpublished Doctoral Dissertation, Universitas Hasanuddin.

Andrei, A., & Craciun, L. (2015). Inequality and economic growth: Theoretical and operational approach. *Theoretical and Applied Economics*, *22*(1), 177-186.

Anshari, M., Azhar, Z., & Ariusni, A. (2019). Analysis of the influence of education, provincial minimum wages and capital expenditures on income inequality across provinces in Indonesia. *Jurnal Ecogen*, *1*(3), 494-502. https://doi.org/10.24036/jmpe.v1i3.4990

Ariutama, I. G. A., & Syahrul. (2016). Var panel analysis: Education level, health level, and income inequality in Indonesia. *Info Artha*, *1*, 1-16.

Asian Development Bank. (2012). *Title of the report*. Manila: Asian Development Bank.

Awan, A. G., & Sadia, R. F. (2018). Female participation in labor force and its impact on household and national income: Evidence from Pakistan. *Global Journal of Management, Social Sciences and Humanities*, *4*(4), 773-784.

Baldwin, J. (1986). Economic development and income inequality: A review of the literature. *Journal of Economic Development*, *11*(2), 123-145.

Brida, J. G., Carrera, E. J. S., & Segarra, V. (2020). Clustering and regime dynamics for economic growth and income inequality. *Structural Change and Economic Dynamics*, *52*, 99-108. https://doi.org/10.1016/j.strueco.2019.09.010

Central Bureau of Statistics. (2016). *Indonesia in Figure*. Retrieved from https://www.bps.go.id/id/publication/2016/06/29/7aa1e8f93b4148234a9b4bc3/statistik-indonesia-2016.html

Central Bureau of Statistics. (2019). *Indonesia in Figure*. Retrieved from https://www.bps.go.id/id/publication/2019/07/04/daac1ba18cae1e90706ee58a/statistik-indonesia-2019.html

Central Bureau of Statistics. (2021). *Indonesia in Figure*. Retrieved from https://www.bps.go.id/id/publication/2021/02/26/938316574c78772f27e9b477/statistik-indonesia-2021.html

Central Bureau of Statistics. (2023). *Indonesia in Figure*. Retrieved from https://www.bps.go.id/id/publication/2023/02/28/18018f9896f09f03580a614b/statistik-indonesia-2023.html

Chamlou, N., & Karshenas, M. (2016). *Women, work and welfare in the Middle East and North Africa: The role of socio-demographics, entrepreneurship and public policies*. London: Imperial College Press.

Damanik, A. M., Zulgani, Z., & Rosmeli, R. (2018). Factors influencing income inequality through economic growth in Jambi Province. *E-Jurnal Perspektif Ekonomi Dan Pembangunan Daerah*, *7*(1), 15-25. https://doi.org/10.22437/pdpd.v7i1.4533

Djodjo, G. E., El Oualidi, M. N., & Diaw, A. (2017). Measuring women's empowerment: A theoretical essay based on entrepreneurial typology. *Repères et Perspectives Economiques*, *1*(1). https://doi.org/10.34874/IMIST.PRSM/RPE/8628

Enders, W. (2015). *Applied econometric time series*. New York: John Wiley and Sons.

Ferdinand, N. (2017). Analysis of the impact of economic growth on income inequality and poverty in South Africa: The case of Mpumalanga Province. *International Journal of Economics and Financial Issues*, *7*(4), 254-261.

González Gordón, I., & Resosudarmo, B. P. (2019). A sectoral growth-income inequality nexus in Indonesia. *Regional Science Policy & Practice*, *11*(1), 123-139. https://doi.org/10.1111/rsp3.12125

Halim, J. H. (2013). *Sectoral productivity analysis on poverty levels and income inequality in Central Java*. Unpublished Thesis. Semarang: Diponegoro University. Semarang. Indonesia.

Hirschman, A. O., & Sirkin, G. (1958). Investment criteria and capital intensity once again. *The Quarterly Journal of Economics*, *72*(3), 469-471. https://doi.org/10.2307/1882237

Hwang, H., & Nam, S. J. (2020). Differences in multidimensional poverty by gender and age of homeowners in South Korea. *Penelitian Terapan dalam Kualitas Hidup, 15*(2), 147-165.

Ismail, M., Mohd Rasdi, R., & Nadirah, A. J. A. (2011). Gender empowerment measure in political achievement in selected developed and developing countries. *Gender in Management: An International Journal, 26*(5), 380-392.

Kertati, I. (2021). Analysis of the gender development index (GDI) and gender empowerment index (IDG) of Surakarta city. *Public Service and Governance Journal, 2*(01), 1-11. https://doi.org/10.56444/psgj.v2i01.1960

Kompas, H. (2016). *Kompas daily newspaper.id.* Retrieved from https://databoks.katadata.co.id/datapublish/2022/03/09/lulusan-perguruan-tinggi-lebih-banyak-perempuan-ketimbang-laki-laki

Lee, J. W., & Lee, H. (2018). Human capital and income inequality. *Journal of the Asia Pacific Economy, 23*(4), 554-583.

Li, Y. (2022). *The impact of female empowerment on income inequality-evidence from 96 countries.* Paper presented at the Proceedings of the 2022 International Conference on Mathematical Statistics and Economic Analysis (MSEA 2022). 727-732.

Mdingi, K., & Ho, S.-Y. (2021). Literature review on income inequality and economic growth. *MethodsX, 8*, 101402. https://doi.org/10.1016/j.mex.2021.101402

Mufidah, C. (2004). *Paradigma gender.* Jakarta Indonesia: Bayumedia Publishing.

Munir, K., & Kanwal, A. (2020). The impact of education and gender gaps on income and income inequality in South Asian countries. *Jurnal Internasional Ekonomi Sosial, 47*(8), 1043-1062.

National Labour Force Survey. (2023). *Central bureau of statistics.* Retrieved from https://www.bps.go.id/en/publication/2023/12/22/ffb3e2d42b94d727d97e78d8/the-national-labor-force-survey-booklet-august-2023.html

Naveed, A., & Wang, C. (2023). Innovation and labour productivity growth moderated by structural change: Analysis in a global perspective. *Technovation, 119*(C), 1-10. https://doi.org/10.1016/j.technovation.2022.102554

Ngono, J. F. L. (2021). Financing women's entrepreneurship in Sub-Saharan Africa: Banking, microfinance and mobile money. *Sejarah Tenaga Kerja, 62*(1), 59-73. https://doi.org/10.1080/0023656x.2020.1851666

Padang, D. M. (2019). Analysis of the influence of gender equality on economic growth in West Sumatra. *Jurnal Kajian Ekonomi Dan Pembangunan, 1*(3), 969-976. https://doi.org/10.24036/jkep.v1i3.7724

Pathak, S. S. G., & Buche, W. M. (2013). The influence of gender institutions on women entering entrepreneurship. *Jurnal Internasional Perilaku & Penelitian Wirausaha, 19*, 478-502.

Phuc, N. C., & Ali, N. M. (2021). An inquiry into the nexus between energy poverty and income inequality in the light of global evidence. *Energy Economics, 99*, 105289. https://doi.org/10.1016/j.eneco.2021.105289

Pieters, J. (2010). Growth and inequality in India: Analysis of an extended social accounting matrix. *World Development, 38*(3), 270-281. https://doi.org/10.1016/j.worlddev.2009.09.006

Purwaningsih, V. T. (2021). Women and the welfare of informal sector households in Indonesia. *Jurnal Ekonomi Indonesia, 10*(1), 43-54.

Rasyiqa, D., Zamhari, A., Yahya, M., Daniyasti, N., & Fitriani, A. (2023). The role of entrepreneurship in the era of globalization in advancing the economy in Indonesia. *Jurnal Multidisiplin Indonesia, 2*(6), 953-953.

Saputri, R. G. C. (2017). The influence of sectoral productivity and GRDP rate on the level of income inequality in Central Java in 2006–2015. *Jurnal REP (Riset Ekonomi Pembangunan), 2*(1), 103-112.

Sendouw, R. H., Saroinsong, F. B., & Mantiri, J. (2021). *Development priorities based on sectoral analysis to reduce inequality in Indonesia.* Paper presented at the International Conference on Social Sciences (349-352). Atlantis Press.

Siami-Namini, S., & Hudson, D. (2019). The impacts of sector growth and monetary policy on income inequality in developing countries. *Journal of Economic Studies, 46*(3), 591-610. https://doi.org/10.1108/jes-08-2017-0243

Sjafrizal. (2012). *Regional and urban economics.* Jakarta, Indonesia: Raja Grafindo Persada.

Soleh, A. (2015). Economic growth and poverty in Indonesia. *Ekombis Review Jurnal Ilmiah Ekonomi dan Bisnis, 2*(2), 197–209.

Soukalová, R., & Gottlichová, M. (2015). The impact of effective process of higher education on the quality of human resources in the Czech Republic. *Procedia-Social and Behavioral Sciences, 174*, 3715-3723. https://doi.org/10.1016/j.sbspro.2015.01.1104

Todaro, M. P., & Stephen, C. S. (2013). *Economics development in third world.* Boston. USA: Harlow, Essex Pearson Education Limited.

Wahyuni, R. N. T., & Monika, A. K. (2016). The influence of education on labor income inequality in Indonesia. *Jurnal Kependudukan Indonesia, 11*(1), 15-28.

Winarni, D. T., & Hartono, D. (2023). Impact of sectoral growth on income inequality and poverty in Indonesia: Analysis using social accounting matrix and micro-simulation. *Jurnal Kebijakan Ekonomi, 18*(1), 1-12. https://doi.org/10.21002/jke.2023.01

World Economic Forum. (2014). *The global competitiveness report 2014-2015.* Geneva: World Economic Forum.