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The Relationship Between Education Inequality, Poverty, and Economic Growth

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Abstract

This study aims to establish the relationship between education inequality, poverty, and economic growth in the 10 Provinces of Sumatra Island 2004-2022. The data used is secondary data sourced from the Badan Pusat Statistik (BPS). The analytical approach employed encompasses the Panel Vector Error Correction Model (PVECM) along with Granger Causality. The findings indicate the presence of both short-term and long-term associations between education inequality and economic growth concerning poverty levels in the 10 Provinces of Sumatra Island. Furthermore, a bidirectional connection is observed between education inequality and economic growth within the 10 Provinces of Sumatera Island. Conversely, a unidirectional linkage is identified between economic growth and poverty in the 10 Province of Sumatera Island. It is anticipated that governmental policies will aim to enhance educational aspects and promote public consciousness regarding education to bolster developmental investments across various regional autonomies at both the Regency/City and Province tiers in Indonesia.

Keywords: Education Inequality, Poverty, Economic Growth, Granger Causality, Panel Vector Error Correction Model.

1. Introduction

Each region will have different priorities in efforts to rejuvenate society in Indonesia. The ongoing revitalization process has triggered many transformations in various development and governance sectors. One important government transformation is the initiation of regional autonomy, which requires exploration, administration and assessment of regional capacity. Therefore, it is very important to formulate appropriate development strategies while considering the potential of the region. The cultivation and empowerment of skilled human resources contributes to sustainable and high-caliber economic progress. On the contrary, strong and sustainable economic progress plays an important role in improving the quality and competence of human resources, thereby generating positive externalities. Increasing individual skills and education levels among workers creates a ripple effect on social productivity, thereby strengthening the sustainability of economic growth.

The poverty level in 10 provinces on the island of Sumatra has decreased significantly over the last 19 years. According to data from the Badan Pusat Statistik (BPS), the percentage of poor people in provinces on the island of Sumatra fell from 18.25 percent in 004 to 8.24 percent in 022. Gross Regional Domestic Product at Constant Prices (PDRB ADHK) 10 Provinces in the island of Sumatra has experienced upward fluctuations over the last 19 years. North Sumatra Province, Riau Province and South Sumatra Province have the highest economic growth, where in terms of economic growth, they are very good in the economic sectors they run. Bengkulu Province and Riau Islands Province had low economic growth over the last 19 years with an average of only reaching IDR 100,000.00 billion. The percentage of poor people and economic growth will hinder all aspects of development planning [1].

Education is also highlighted in the Undang-Undang Dasar (UUD) 1945 as one of the national aspirations. The primary focus in the education sector should be on improving the quality and quantity of educational opportunities, ensuring equal access for all members of society regardless of educational background, geographic location, social standing, or economic status. Nevertheless, the issue of educational inequality remains a major concern across the spectrum of countries - whether developed, developing, or having regional autonomy. The self-directed progress of a region is intrinsically linked to the educational proficiency of its population; as education levels increase, the pool of skilled human capital expands simultaneously.

As stated by [2] educational inequality refers to differences in levels of educational attainment in various regions. Differences in individual access to educational opportunities stem from factors such as geographic, social, and economic circumstances. Used the Gini index coefficient to measure educational inequality, analyzing data on educational attainment across primary, secondary, and tertiary education levels among individuals aged 15 years and over [3].

Provincial education inequality on the island of Sumatra, the education Gini index is in the range of 0.327-0.183. The results of provincial education inequality on the island of Sumatra which are in the

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low category will also have an impact on regional autonomy, especially from regencies/cities and will even impact other remote or rural areas, so education inequality needs to be re-evaluated by the government in order to prevent educational inequality.

Argue that poverty shows unidirectional causality that produces disparities in education, a viewpoint echoed by who argues that educational inequality also leads to poverty [4] [5]. The role of education is considered critical in ensuring progress in human development and societal well-being, while also playing a critical role in reducing injustice and fostering thriving communities. This dynamic sets up a cycle in which poverty and educational deprivation mutually reinforce each other, ultimately impeding access to educational opportunities. According to [6] financial constraints related to poverty can hinder the accessibility of quality education. Households experiencing economic hardship may face challenges in pursuing education, resulting in decreased school enrollment rates. Highlight that widespread poverty among individuals with limited educational attainment perpetuates the cycle of poverty [7].

Suggest that there is a causal relationship between educational inequality and economic growth [8]. The negative influence of educational design on human capital accumulation [9]. According to [10], educational equality emerges as an important determinant in encouraging human capital development, thereby driving increased productivity and growth while shaping income distribution in an economy that depends on the level of economic growth of a particular regional autonomy. Advocates targeting economic policies to not only improve educational standards but also ensure equitable access to education [11]. Thus, mitigating education gaps is an important effort to stimulate economic growth. Argue that the utilization of endogenous growth theory, in which human capital, particularly education, is recognized as a key input in the production function, improves understanding of the mechanisms through which education influences productivity, ultimately strengthening economic performance on a macroeconomic scale [12].

There is a one-way causal relationship between economic growth and poverty [13], [14], [15]. The impact of economic growth on poverty also affects the potential for regional economic growth as a whole. Economic growth plays an important role in reducing poverty levels. The one-way causal relationship of economic growth is used as a proxy for poverty reduction. This means that economic growth can lead to long-term poverty reduction when used as a proxy for poverty reduction. However, previous research by [16], [17], and [18] found inconsistent results between economic growth and poverty in Indonesia, where high economic growth does not always mean low poverty levels. Currently, poverty is a multidimensional development problem. Poverty can be identified through backwardness, helplessness, and high levels of economic inequality as triggers for social inequality [19].

An increase in poverty along with a decrease in economic growth is correlated with a decrease in education levels. Despite the increase in the number of educated individuals, deviations from anticipated outcomes regarding poverty, economic growth, and education persist. In cases where economic growth occurs without associated efforts to reduce disparities in educational access, the situation can exacerbate poverty. Policies designed to reduce poverty must include efforts to raise educational standards and ensure that the benefits of economic growth are inclusive across society. As a result, the importance of education and economic growth in the context of overcoming and reducing poverty is underlined [20]. The implementation of the education strategy is directed at building a sustainable framework to advance education to grow a skilled workforce, thereby encouraging economic growth and reducing poverty in line with sustainable development goals. As noted by [21], gaps in education can lead to the fragmentation of society, hindering economic growth, while poverty hinders access to basic needs such as health care and education, thereby imposing constraints.

Previous research has not extensively investigated the dynamic interactions between educational inequality, poverty, and economic progress. The main objective of this research is to examine and assess the causal relationship between educational inequality, poverty and economic progress in 10 provinces located on the island of Sumatra. This study seeks to ascertain whether there is a causal relationship between educational inequality, poverty and economic growth in 10 specific provinces on the island of Sumatra. This examination is anticipated to yield valuable insights. In particular, it explains the policy implications for government action in education. Moreover, it contributes to the improvement and understanding of endogenous growth theory in the context of economic progress.

2. Research Method

Reference should be written in the APA (American Psychological Association) Referencing Standard. Everything listed in the reference should be referenced in the text.

The type of data used in this research is secondary data in the form of panel data for the 004-2022 period. Panel data consists of 10 provinces on the island of Sumatra. All data is taken from the Badan Pusat Statistik (BPS) and related government institutions. The research data in this study consists of 3 (three) variables, namely: The educational inequality variable (EG) is measured using the Education Gini Index, The poverty variable (POV) is measured by the percentage of the number of poor people which represents the poverty level (units: percent), The economic growth variable (LnGRDP) is measured by the natural

logarithm of Gross Regional Domestic Product at Constant Prices.

The analysis technique in this research is a causality test using the Panel Vector Error Correction Model (PVECM) and Granger causality. The causality test can show whether variables have a two-way relationship or only one direction. If it turns out that these variables have a two-way relationship, it means that these variables influence each other. In other words, there is a causal relationship between variables in the past and current conditions. In the causality test, the data used is panel data because we need to see the influence of the past on current conditions. Furthermore, in the causality test there are no independent variables, all variables are dependent variables. In other words, all variables are endogenous.

Granger causality analysis must go through the following stages/procedures: First, unit root test (stationarity). Used to test whether panel data is stationary or not. If the absolute value of the statistic is greater than the critical value, then the observation data shows stationary or rejects the null hypothesis. In this research, the panel data unit root test methods are the Augmented Dickey-Fuller (ADF), Levin Lin Chu (LLC), Im Pesaran Shin (IPS) tests, as well as the Fisher-ADF and Fisher-PP tests. Second, Optimum Lag Length in determining the optimum lag length can use one of the information criteria from the Akaike Information Criterion (AIC), Schwarz Information Criterion (SC) equation. The three Kao Cointegration tests use Dicky-Fuller and Augmented Dicky-Fuller to test cointegration in panel data as in tests using the standard approach adopted in the procedure.

3. Result and Discussion

Educational inequality as measured by the educational Gini index is 0.32 percent and 0.18 percent, respectively. Table 1 also shows that poverty as measured by the proportion of the poor population has increased significantly. The poverty figure in the ten provinces of Sumatra Island is 12.09 percent per year from 004 to 022, with a maximum value of 8.69 percent per year and a minimum value of 4.45 percent per year. During the period 004 to 022, the average regional gross domestic product achievement of ten provinces on the island of Sumatra was 4.49 percent with maximum and minimum values of 6.35 and 1.77 percent respectively. Next Description of Data on Table 1.

Table 1. Description of Data

Statistics	EG	POV	LnGRDP
Mean	0.261795	12.09084	4.495699
Median	0.262000	10.94000	4.715973
Maximum	0.327000	28.69000	6.351809
Minimum	0.183000	4.450000	1.774274
Std. Dev.	0.032161	5.341690	1.131405
Skewness	-0.205713	0.839001	-0.416066
Kurtosis	2.303189	3.232457	2.528983
Jarque-Bera	5.183977	22.71867	7.238207
Probability	0.074871	0.000012	0.026807
Sum	49.74100	2297.260	854.1829
Sum Sq. Dev.	0.195493	5392.861	241.9346
Observations	190	190	190

Table 1 provides an explanation that data that follows a normal distribution and has the Jarque-Bera statistical significance indicator has statistical significance at an alpha of 5% or a p-value <0.05. The dataset consists of 10 provinces on the island of Sumatra, with time series ranging from 004 to 022, resulting in a total of 19 years of observations and 190 panel data units. The econometric model used in both the short and long term to determine the causal relationship between educational inequality, poverty and economic growth in Sumatra province includes Granger causality analysis. The use of Granger causality analysis requires the data used to be consistent and integrated. So the first step in this section is to estimate the stationarity of the data. Next Unit Root Test on Table 2.

Table 2. Unit Root Test

Variabel	Level				1st Difference			
	LLC	Im, Pesaran Shin	ADF-Fisher	PP-Fisher	LLC	Im, Pesaran Shin	ADF-Fisher	PP-Fisher
EG	-0.549 (0.292)	2.586 (0.995)	5.058 (1.000)	6.814 (0.997)	-15.350 (0.000)*	-14.168 (0.000)*	180.658 (0.000)*	272.566 (0.000)*
POV	-6.658 (0.000)*	-3.768 (0.000)*	55.123 (0.000)*	40.151 (0.005)*	-5.826 (0.000)*	-5.708 (0.000)*	69.082 (0.000)*	79.778 (0.000)*
LnGRDP	-2.100 (0.018)*	0.515 (0.697)	11.298 (0.938)	10.992 (0.946)	-12.017 (0.000)*	-8.472 (0.000)*	98.952 (0.000)*	112.478 (0.000)*

Table 2 provides important information regarding unit root tests that can be used to estimate the stationarity of panel data using a variety of methods. After the level-wise test was carried out, all the variables studied were found to be non-stationary or did not reject the null hypothesis which indicated the existence of a unit root. As a result, differential processing emerges as a viable solution for data alignment. After analyzing the first difference data, it was discovered that all variables showed significance at the alpha 5% significance level or p-value < 0.05. This signifies rejection of the null hypothesis and indicates that all first difference

variables are stationary or their unit roots do not have the same order (i.e., integrated, I(1)).

To determine the relationship between variables, the optimal lag length must be determined. Determining the optimal lag length affects the strength of rejecting the hypothesis and causes bias in the estimation results. The following are the results of determining the optimal delay length. The criteria used to determine the optimal delay length can use one of the information criteria in Equations, Akaike Information Criterion (AIC) and Schwarz Information Criterion (SC). Least lag studies are used to determine the optimal lag length that is free from correlation and other regression problems. Based on these results, it shows the number of lags available in Akaike Information Criterion (AIC) line 3. Thus, the optimal number of lag lengths of 3 is used according to the results in Table 3.

Table 3. Optimum Lag Length Results

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-165.243	THAT	0.004276	3.058965	3.132615	3.088838
1	646.3503	1564.162	1.97E-09	-11.5336	-11.23904*	-11.41415*
2	658.0278	21.86872	1.87E-09	-11.5823	-11.0668	-11.3732
3	672.9955	27.214	1.68e-09*	-11.69083*	-10.9543	-11.3921
4	679.4765	11.43018	1.76E-09	-11.645	-10.6876	-11.2567
5	687.4918	13.69885	1.80E-09	-11.6271	-10.4487	-11.1492
6	699.54	19.93422*	1.71E-09	-11.6825	-10.2832	-11.115
7	707.1984	12.25344	1.76E-09	-11.6582	-10.0379	-11.001
8	717.7291	16.27477	1.73E-09	-11.686	-9.84475	-10.9392

Next, a cointegration test is carried out to ensure that there is a long-term relationship between the variables in the model. For this purpose, the Kao residue integrated test method was used as shown in Table 4.

Tabel 4. Kao Cointegration Test

Cointegration Test	t-Statistic	Prob.
ADF	-2.02308	0.0215
Residual variance	0.000132	
HAC variance	8.60E-05	

The cointegration test data presented in Table 3 shows that the residual cointegration of Kao ADF has statistical significance at alpha 5% or p-value < 0.05, which indicates the existence of a long-term relationship between the variables. The existence of a cointegration relationship indicates causation, even though the direction of causality between variables is not known.

All variables passed the unit root test and the cointegration stage where validity requirements were determined by Granger causality analysis. The next step involves estimating panel vector error correction models (PVECM) to gain important insights into the dynamic causal relationships between educational inequality, poverty and economic growth in both the short and long term. Hypothesis testing uses a critical value of alpha 5% or p-value < 0.05, considering a total of 190 observations and 187 degrees of freedom (obtained by subtracting the number of variables from the number of observations), thus producing a value. of 1.9727. The estimation results of the panel vector error correction model (PVECM) can be seen in Table 4. Next Summary of Panel Vector Error Correction Model (PVECM) Estimation Results on Table 5.

Table 5. Summary of Panel Vector Error Correction Model (PVECM) Estimation Results

Dependent Variable	ΔEG	ΔPOV	$\Delta LnGRDP$	ECT	Summary	
					R-squared	0.297392
ΔEG		3.91739	-9.186358	0.013687	Adj. R-squared	0.246845
		-5.35716	-3.15939	-0.01453	F-statistic	5.883443
		[0.73124]	[-2.90764]*	[0.94209]	Akaike AIC	-6.48762
					Black SC	-6.26684
					R-squared	0.362261
	0.002504		-0.175661	-6.304105	Adj. R-squared	0.31638
ΔPOV	-0.00106		-0.0391	-0.90729	F-statistic	7.89574
	[.35833]*		[-4.49264]*	[-6.94829]*	Akaike AIC	1.781154
					Black SC	2.001934
					R-squared	0.362261
	-0.004528	-0.095531		0.200691	Adj. R-squared	0.31638
$\Delta LnGRDP$	-0.00219	-0.1367		-0.53507	F-statistic	7.89574
	[-2.06882]*	[-0.69884]		[0.37507]	Akaike AIC	1.781154
					Black SC	2.001934

The Panel Vector Error Correction Model (PVECM) estimation results show that of the three models that have been estimated, there is one model that has a long-term causality effect. In the first model estimation, the educational inequality variable as the dependent variable shows that the economic growth variable has a significant influence on educational inequality, while the poverty variable has no influence on educational inequality. This result can be seen from the t test value which is higher than the standard t test

value of 1.9727. Statistically, the increase in economic growth in the previous year came from a coefficient value of -9.186, which means that an increase in economic growth of 1% will reduce educational inequality by -9.18%.

In the second model estimation, the poverty variable as the dependent variable shows that the variables of educational inequality and economic growth have a significant influence on poverty. This result can be seen from the t test value which is below the standard t test value of 1.9727. Statistically, the occurrence of educational inequality in the previous year comes from a coefficient value of 0.002, which means that a low educational inequality of 1% will increase the percentage of poor people by 0.002%. Likewise, economic growth in the previous year came from a coefficient value of -0.175, which means that an increase in economic growth by 1% will result in a decrease in the percentage of poor people by -0.175%. However, from these results there is a suspicion that significant error correction parameters (ECT) prove that there is a variable adjustment mechanism that influences the long term. The amount of adjustment from short term to long term is -6.304. These results indicate the validity of the long-term balance relationship between variables. This also implies that the previous period's -6.30% shock imbalance reintegrates into the long-run equilibrium in the current period. In other words, there is a long-term influence of educational inequality and economic growth on poverty.

The third model shows the economic growth variable as the dependent variable, showing that educational inequality in the previous year had a significant effect on economic growth. Meanwhile, poverty in the previous year did not have a significant effect on economic growth. This result can be seen from the t test value which is below the standard t test value of 1.9727. Statistically, educational inequality has a coefficient of 0.004, this shows that when educational inequality in the previous year increased by 1%, it would encourage current economic growth of 0.004%.

After looking at the Panel Vector Error Correction Model (PVECM) estimation results in table 4.4 above, the implications of this research model show that there is a two-way relationship between educational inequality and economic growth in provinces on the island of Sumatra where these two variables influence each other. Apart from that, these two variables can be used as dependent or independent variables. Meanwhile, the poverty variable is indicated as the dependent variable, because if you look at the results of the model estimation. The implications of this study model assume that educational inequality and economic growth influence provincial poverty on the island of Sumatra.

After testing the goodness of the model, the stationarity testing, cointegration testing, and Panel Vector Error Correction Model (PVECM) stages were carried out. Next, a Granger causality test was carried out to see whether the variables of educational inequality, poverty and economic growth in the provinces on the island of Sumatra had reciprocal causality or not. The results of the Granger causality estimation can be seen in Table 5. Next Granger Causality on Table 6.

Table 6. Granger Causality

Null Hypothesis:	Obs	F-Statistic	Prob.
POV does not Granger Cause EG	160	4.2281	0.0066
EG does not Granger Cause POV		6.25004	0.0005
LnGRDP does not Granger Cause EG	160	4.37744	0.0055
EG does not Granger Cause LnGRDP		5.73212	0.001
LnGRDP does not Granger Cause POV	160	4.06126	0.0082
POV does not Granger Cause LnGRDP		11.0767	1.00E-06

Based on the results of the Granger Causality test, there were 160 observations obtained, while the probability value was with a critical value at an alpha level of 5%(α=0.05). From these results it was found that there is a two-way causality between educational inequality and poverty. Where there is a variable between educational inequality and poverty which has significant two-way causality, likewise the variable between educational inequality and economic growth has significant two-way causality. Meanwhile, the variable between poverty and economic growth is significant, there is a one-way causality between economic growth and poverty. Poverty is a complex problem caused by economic growth and education, which in turn leads to economic growth and reduced educational inequality.

4. Conclusion

The relationship between educational inequality, poverty and economic growth is three interrelated factors. Based on the panel vector error correction model (PVECM) and Granger causality test, there is a short-term and long-term relationship between educational inequality and economic growth and poverty in the island province of Sumatra. Likewise, there is a two-way relationship between educational gaps and economic growth in the provinces of the island of Sumatra. However, there is a unidirectional relationship between economic growth and poverty in the island province of Sumatra. Historically descriptive economic growth and poverty are usually factors that play an important role in variations in educational inequality. The aim of economic growth is to ensure an increase in national income for the development of education. Apart from that, economic growth can also

improve the standard of living better than before, so that it can make Indonesian people spend more on life necessities, such as education, in the future. Efforts must be made to reduce education gaps and poverty to achieve sustainable economic development. Education plays an important role in improving the quality of human resources, because it can encourage economic and social development which is the ideal of life for a nation to achieve prosperity. Education should be the government's main concern. To improve the quality of education, local governments are recommended to provide and improve supporting facilities and infrastructure evenly in the province of Sumatra Island and in each central/city government. In this way, all levels of society have the opportunity to receive education and ultimately increase productivity and contribute to increased economic growth and poverty reduction.

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