EcceS:
Economics, Social, and Development Studies
Fakultas Ekonomi dan Bisnis Islam, UIN Alauddin Makassar
Volume 9 Number 2 Ed. December 2022 : page: 150-170 p-ISSN: 2407-6635 e-ISSN : 2580-5570

Inequality; Empirical Study on Sulawesi Island Development

Ecces:
Economics Social and Development

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(Article history) Received: 2022-06-27, Revised: 2022-10-07, Accepted: 2022-12-02

Available online: 2022-12-07, DOI: 10.24252/ecc.v7i1.13382,
Stable URL: http://journal.uin-alauddin.ac.id/index.php/ecc/index

Abstract: Inequality; Empirical Study on Sulawesi Island Development

This study aims to analyze and determine how big the influence of economic growth, population growth, investment growth and the human development index on changes in income inequality in Sulawesi. The novelty of this study is to explore the interrelation of population, investment and human development index (HDI) variables on inequality that occurs in Sulawesi as a whole.The data used in this study is secondary data with the type of panel data, a combination of time series and cross sections from 2010-2020 and 6 provinces in Sulawesi. The method used is the Panel Vector Error Correction Model (PVECM). The results of this study indicate that (1) Changes in Economic Growth have no significant positive effect on changes in Income Inequality, meaning that any increase in changes in Economic Growth can increase changes in Income Inequality in Sulawesi. (2) changes in population have an insignificant negative effect on changes in income inequality, meaning that any increase in population changes can reduce changes in income inequality in Sulawesi. (3) changes in investment growth have a negative and significant effect on changes in income inequality, meaning that any increase in investment changes can reduce changes in income inequality in Sulawesi. (4) changes in HDI have a positive and significant effect on changes in income inequality, meaning that every increase in HDI changes can increase changes in Income Inequality in Sulawesi. (5) Dummy changes have a negative and significant effect on changes in income inequality, meaning that every increase in Dummy changes can reduce changes in Income Inequality in Sulawesi. The implication of this research is that the government needs to increase economic growth and control population growth followed by reducing income inequality, especially in the long term, the government is also expected to increase human resources by creating jobs, decent education and health in order to reduce the problem of inequality in the region. Local governments are expected to be able to formulate investment policies that are more inclusive and oriented towards reducing inequality in Sulawesi so as to create more

equitable welfare.

Keywords: Economic Growth; Population; Investment; HDI; Inequality.

INTRODUCTION

The problem of inequality is a never-ending problem, especially in developing countries (Solt, 2020). This is due to the difference between the upper class, which is so dominant over the economic pie to the low-income community, whose number is actually more than the upper class (Muntaner and Lynch, 2020). As a developing country, Indonesia has abundant and varied potential resources in each region. When viewed from the development process in the category of developing countries, of course, Indonesia has various problems that need to be addressed, in order to realize the welfare of the people in Indonesia. Regarding the issue of income inequality between these regions, over time it has become a barrier in realizing economic development in Indonesia (Sari and Rudi Purwono, 2021).

According to Todaro's idea that the problem of inequality is something that is anomaly, has positive and negative impacts. On the one hand, this inequality can be a trigger for the development progress of a region, making it more competitive, in order to achieve the desired prosperity. On the other hand, extreme inequality can create a sharper gap between high and low income people, so that the economic landscape of a region becomes increasingly unfair and more exclusive, while the goal of development is to create a just economy (Oyvat and wa Gĩthĩnji, 2020).

Based on the existing graph, it shows the Gini ratio by province in Sulawesi in 2010-2020. The Gini Ratio level in Sulawesi is in a fluctuation condition and tends to decrease during 2010 to 2020, this can be evidenced by the presence of several provinces experiencing stable conditions such as North Sulawesi and West Sulawesi Provinces while the Gini Ratio level has decreased, namely Gorontalo Province which recorded a Gini Ratio level. from 2010 it was 0.43 and in 2020 it decreased to 0.40, then followed by Southeast Sulawesi Province with a decrease of 0.39 in 2020 while in 2010 it was previously recorded at 0.42, then South Sulawesi Province experienced The Gini Ratio decreased from 0.40 to 0.39, meanwhile, Central Sulawesi Province experienced a significant decline in the Gini Ratio, from 0.37 to 0.32. The level of Gini Ratio by province in Sulawesi varies, this shows the inequality of economic development in an area that affects the level of community welfare.

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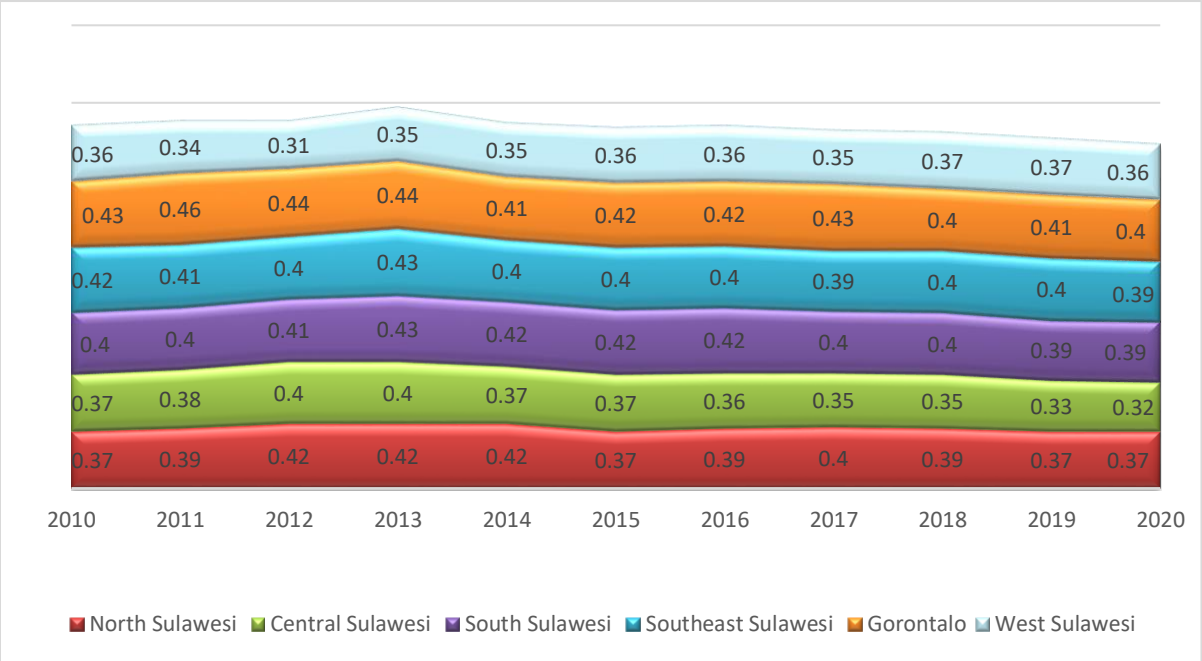
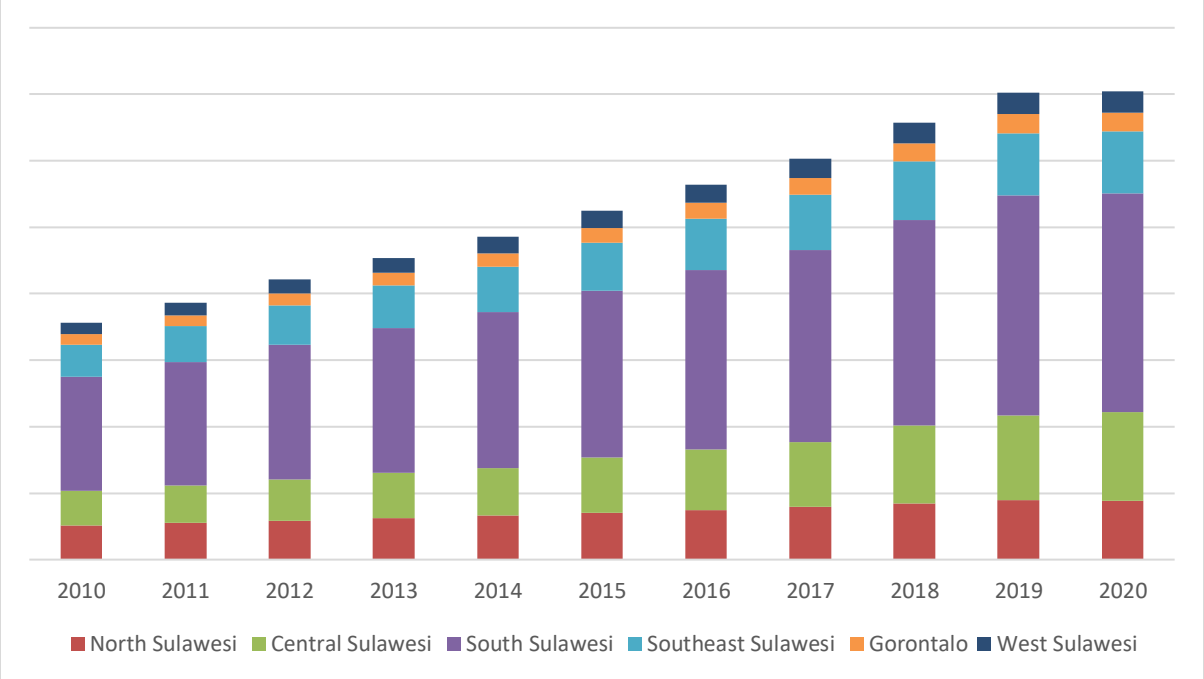
Figure 1. Gini Ratio Level by Province on Sulawesi Island 2010-2020 (year)



Source: BPS Indonesia, 2021

Figure 2. GRDP by Province in Sulawesi 2010-2020 (year)



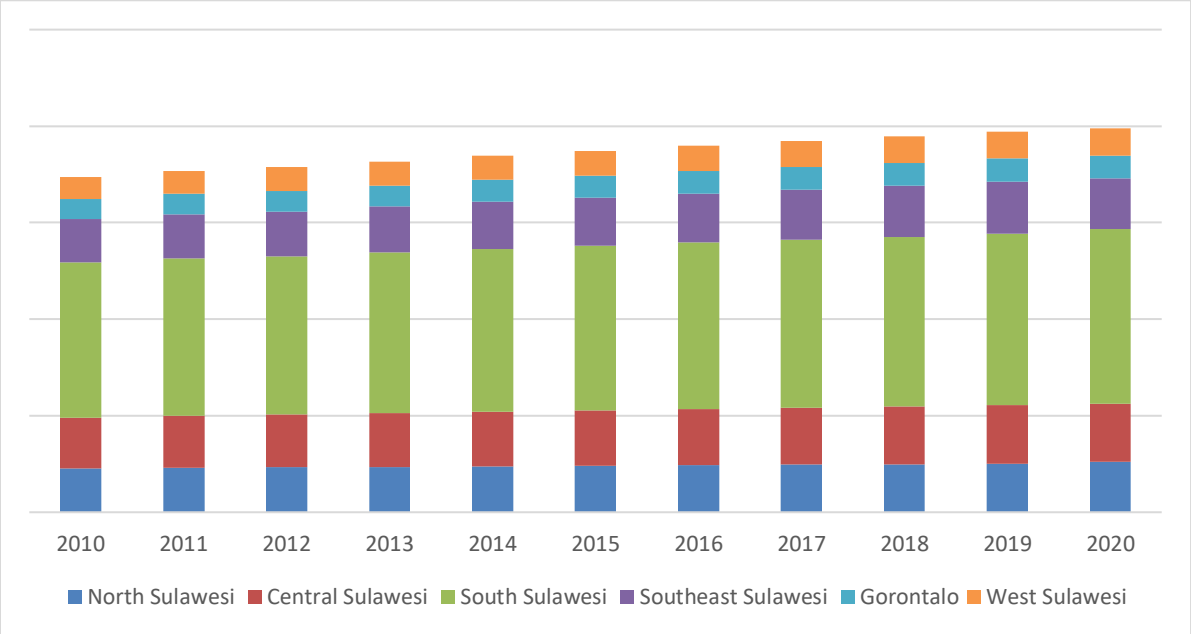
Source: BPS Indonesia, 2021

Economic development, it cannot be separated from the achievement of accelerated economic growth. Economic growth is a barometer of the success of a region's development, which is understood globally. When the economic growth is more accelerative,

it can create governance revenue for a region. This can continue to grow, if economic growth increases, where this situation is accompanied by an increase in output of total real remuneration for the use of production factors, which is greater than the real income of the community in the previous period. The low contribution resulted in uneven economic growth, resulting in income inequality.

Existing data shows that GRDP by province in Sulawesi has increased every year. The data above shows that from 2010 to 2020 in total the highest GRDP was achieved by the Province of South Sulawesi with an GRDP rate of IDR 328,192.82 (Million). The second position was achieved by Central Sulawesi Province with an GRDP rate of Rp.134,152.69 (Million). In the third position is occupied by Southeast Sulawesi Province with an GRDP rate of Rp.93,446.72 (Million). North Sulawesi Province reached the fourth position with an GRDP rate of Rp. 88.126.37 (Million), then the fifth position was achieved by West Sulawesi Province with an GRDP rate of Rp. 32.082.45 (Million) and the lowest position was occupied by Gorontalo Province with an GRDP rate of Rp. 28,422.29 (Million).

Figure 3. Total Population by Province in Sulawesi 2010-2020



Source: BPS Indonesia, 2021

Population is the output of a region in carrying out development and economic growth. The large population can accelerate production activities, production consumption so as to increase aggregate demand. One of the outputs of the population is to produce labor both abroad and domestically. This is because the process of economic development is able to increase the production of goods and services, which has an impact on the

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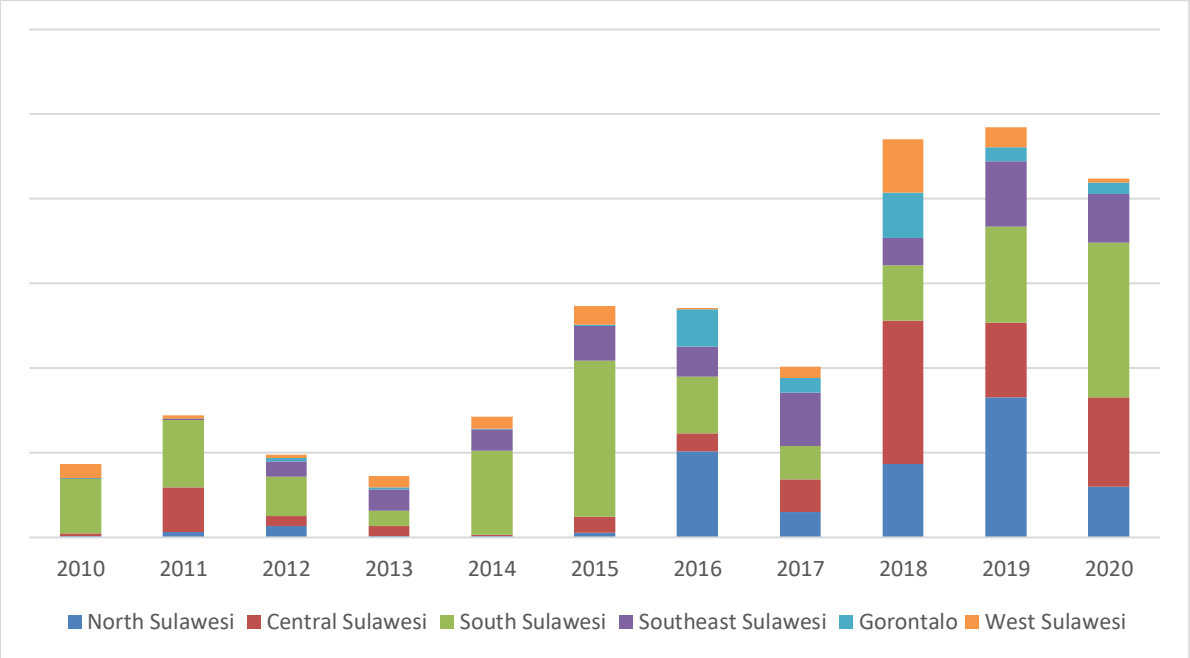
absorption of the labor force. Thus, these workers can get a better income.

Figure 3 shows the increase in the number of people in each region differently. The highest population was achieved by South Sulawesi Province as much as 9,073.51 (Million people), then the second position was occupied by Central Sulawesi Province with a total population of 2,985.73 (Million people), in the third position was occupied by Southeast Sulawesi Province which had a total population of 2,624. ,88 (Million people), then North Sulawesi Province which has a population of 2,621.92, in the fifth position is occupied by West Sulawesi Province with a population of 1,419.23 (Million people), and the lowest position is occupied by Gorontalo Province with a total population of 1171.68 (Million).

Figure 4. Gross Fixed Capital Formation by Province in Sulawesi 2010-2020



Source: BPS Indonesia, 2021

Investment is one of the important factors in economic growth, with this investment is expected to encourage economic growth, especially in the long term. Investment can be interpreted as a process of investment in the short term and long term, which aims to increase the economic growth of a region in a sustainable manner. This process symbolizes expenditures that can accumulate capital (capital stock), where the capital has two dimensions, namely physical capital and non-physical capital, such as capital, infrastructure, land, technology and energy. The Investment Growth Value used to measure investment growth is Gross Fixed Capital Formation.

The development of Gross Fixed Capital Formation in every province in Sulawesi

tends to increase every year, meaning that during 2010-2020 investment in Sulawesi can be said to have increased. Investment growth, which usually experiences an increase, tends to affect various factors, both in terms of location conditions, natural resources and human resources in the area. The highest level of investment was achieved by the province of South Sulawesi, while the lowest investment was occupied by the province of Gorontalo during the period 2010 to 2020.

The success of good development can be seen from a multidimensional perspective. One of them is by using the Human Development Index (HDI) indicator. This dimension confirms the three dimensions of life, namely the economic, education and health aspects. The higher the HDI of a region confirms that the region is getting deeper into these three aspects of development. For this reason, most countries are competing to pursue these three aspects of development. Especially in the economic aspect, HDI symbolizes the level of productivity of a region. The higher the HDI level of the region, the more productive, efficient and effective the economy will be. The problem of HDI is the inequality of HDI which results in gaps, where regions with a higher HDI will have quality human resources compared to areas with a low HDI. This causes HDI to be one of the factors that can affect income inequality in a region (Georgescu *et al.*, 2020).

Referring to previous research Olabu and Olilingo (2022) which tries to trace the effect of poverty, economic growth, human development index on inequality on the island of Sulawesi using the Random Effect Model approach, finds that the poverty variable has a significant negative effect on inequality. Meanwhile, the variables, economic growth and human development index, have a significant positive effect on inequality on the island of Sulawesi. However, in contrast to research Mahmud *et al.*, (2022) which examines the effect of the variables of economic growth, unemployment rate, human development index, government spending and agglomeration on inequality in South Sulawesi with regression analysis using the Random Effect Model, which finds that government spending and economic growth have a significant negative effect on inequality, while the unemployment rate and index human development has no effect on inequality. However, the agglomeration variable has a positive effect on inequality. The novelty of this study is to explore the interrelation of population variables on inequality that occurs in Sulawesi in general. Does every increase in population contribute to the inequality that has occurred so far on the island of Sulawesi. In addition, the researcher also tries to explore how the interrelation of investment growth with its contribution in reducing the level of inequality, whether the

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incoming investment is truly exclusive or inclusive to contribute to creating a more distributive and equitable economy.

LITERATURE REVIEW

Martínez-Navarro *et al.*, (2020) Kuznets argues that the problem of inequality has a relationship in the form of an inverted U-curve, where he further explains the relation between income and inequality. In the early phase when the average income per capita of the community is still low, the level of inequality also tends to be lower. However, when the average income of the community increases, inequality will also increase. When the average income per capita rises higher, the level of inequality will decrease. This is underlined by Kusnetz that this interrelation will occur in the long term, where in the long term inequality will decrease. This pattern is called an inverted U-curve by Kuznets, who tries to justify the relationship between income levels and inequality (Le *et al.*, 2020).

In addition, he finds that in low-income countries, it shows that the gap between the rich and the poor is quite sharp, but in contrast to countries that are more prosperous and have higher incomes, the economy tends to get better and the level of inequality decreases. The reduction in the level of inequality in question is not exponential and instant, but the change is assumed to have an impact, in the long term (Baymul and Sen, 2020).

However, this is different from Marx's view that the practice of inequality that occurs is a consequence of the capitalist system which results in the exploitation of capital owners against workers, owners of capital tend to minimize the wages of workers, to get the maximum profit. Workers are not paid according to the amount of work sacrificed by the workers. At the same time, it is workers who create value for an item so that the item is able to generate profits for the owners of capital. This situation illustrates the injustice of workers and Marx calls it a process of exploiting the capitalists to the workers. As a result, inequality will become sharper so that the ideals of creating economic justice are getting further and further away. Inequality that continues to occur has the consequence of decreasing the income level of the lower class so that it can trigger an increase in poverty (Bartels *et al.*, 2021).

Pikkety tries to explain further the phenomenon of inequality that occurs between the two views. What was written by Kuznets was refuted by Pikkety that in fact in the long term, it was found in many countries, from Europe, America to Asia which actually showed sustainable inequality practices. Behind the rate of economic growth accompanied by an increase in income, it is also accompanied by an increase in economic inequality. This is

evidenced by Pikkety through global macroeconomic data starting from the era of the past British empire to the present. He confirmed that behind increasing growth and income, it does not necessarily contribute to reducing inequality. In other words, the economy grows exclusively. The existing economic cake is only enjoyed by a few people. Increases in income and welfare tend to be enjoyed by a certain elite class, which is none other than the capitalist class, as mentioned by Marx (Castro Torres *et al.*, 2022).

METHODS

This type of research is research with a quantitative approach. This approach describes the problem with the form of analysis in the form of numbers starting from collecting interpretations to getting the results obtained. Quantitative data is needed in research to draw conclusions or research results with a view to knowing the influence between two or more variables. This research analysis tool uses regression equation analysis, using the Panel Vector Error Correction Model (PVECM) analysis method. The Panel Vector Error Correction Model (PVECM) method is one of the data analysis methods used for variables that are mutually dependent or often referred to as cointegrating. The researcher uses the PVECM model to analyze whether or not there is an influence of changes in economic growth, changes in population, changes in investment growth and the human development index on changes in income inequality in Sulawesi during the 2010-2020 period.

The PVECM model is an equation model with endogenous variables where each variable is described by its own lag, as well as the present and past values of other endogenous variables in the model (Sella, 2019). The PVECM model is often used because it is able to capture the dynamic relationship between the variables of use that is not limited at the same time but continues over time. This model is also endogenous dynamic because of the shock of other endogenous variables from time to time. This kind of mechanism can be traced through impulse response function (IRF) analysis which allows researchers to analyze the relationships that occur between variables (Ishermawan, 2021).

The PVECM model is considered to be a multivariate time series that treats all variables endogenously allowing us to see what is really going on. This method can avoid parameter bias because it excludes relevant variables and is free from the constraints of various economic theories that often appear.

The PVECM regression equation model used is as follows:

$$\Delta IG_{it} = \beta_0 + \beta_1 \Delta PE_{it} + \beta_2 \Delta PPDK_{it} + \beta_3 \Delta PINV_{it} + \beta_4 \Delta IPM_{it} + \beta_5 Dummy + \varepsilon_{it}$$

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ΔIG : Gini Indeks

B_0 : Constant

ΔPE : Growth

ΔPPDK : Population

ΔPINV : Investment

ΔIPM : HDI

Dummy : Dummy

$B_{1,...}\beta_5$: regression coefficient

i : Province (cross-section data of 6 Provinces in Sulawesi)

t : Year (time series data for the period 2010-2020).

ε : Error term

RESULT AND DISCUSSION

In this study, we will look at the influence of changes in economic growth, changes in population, changes in investment growth and the Human Development Index (HDI) on the Gini Index (IG) in the long and short term. Based on the results of PVECM in table 1, in the long term, statistically, the Economic Growth variable significantly affects changes in the Gini Index positively, thus it can be interpreted that if Economic Growth increases by one percent, the Gini Index increases by 1.61E-06. Meanwhile, Investment Growth significantly affects changes in the Gini Index negatively, which means that if Investment Growth increases by one percent, the Gini Index decreases by 4.76E-09, while Population Growth, HDI and Dummy do not significantly affect the Gini Index.

Based on the results of table 1 Here's an interpretation of the short term:

1). The estimation results in the short term show that the Economic Growth in the previous 2 years did not significantly affect the change in the Gini Index in the current year. 2). The estimation results in the short term show that Population Growth in the previous 2 years does not significantly affect the change in the Gini Index in the current year. 3). The estimation results in the short term show that Investment Growth in the 1st lag significantly affects the change in the Gini Index negatively. It can be interpreted that if Investment Growth increased by one percent in the previous year, the Gini Index decreased by 3.47E-09 percent in the current year. 4). The estimation results in the short term show that the HDI at the 1st and 2nd lags, significantly affects the Gini Index Change in a positive way.

Table 1. Estimation Result PVECM

Long Term			
Variable	Coefficient	Partial t-statistical [1,66864]	Result
DLPE(-1)	1.61E-06	[2.94959]	Significant
DLPPDK(-1)	8.07E-05	[0.87649]	Not Significant
DLPINV(-1)	-4.76E-09	[-3.02441]	Significant
DLIPM(-1)	0.006741	[1.18156]	Not Significant
DLDUMMY(-1)	-2.16E-06	[-1.17052]	Not Significant
Short Term			
Variable	Coefficient	Partial t-statistical [1,66864]	Result
CointEq1	-1.779040	[-7.13363]	Significant
D(DLIG(-1))	0.501203	[2.65598]	Significant
D(DLPE(-1))	9.99E-07	[1.15930]	Not Significant
D(DLPE(-2))	-1.54E-06	[-1.34053]	Not Significant
D(DLPPDK(-1))	-0.000126	[-0.80577]	Not Significant
D(DLPPDK(-2))	-8.64E-05	[-0.76191]	Not Significant
D(DLPINV(-1))	-3.47E-09	[-1.73387]	Significant
D(DLPINV(-2))	-3.37E-09	[-1.15609]	Not Significant
D(DLIPM(-1))	0.015939	[2.07236]	Significant
D(DLPIPM(-2))	0.023293	[3.24062]	Significant
D(DLDUMMY(-1))	-3.29E-06	[-1.30192]	Not Significant
D(DLDUMMY(-2))	-4.81E-06	[-1.74681]	Significant
Adjusted R-Square		0,797045	
F-Statistical		14,41797	

Source: Secondary data output after processing, 2022; (Indri, 2022).

It can be interpreted that if the HDI rose by one percent in the previous 1 and 2 years, the Gini Index would increase by 0.015939 and 0.02392 percent in the current year. 5). The estimation results in the short term show that the Dummy in the 2nd lag significantly affects the Gini Index Change in a negative way. It can be interpreted that if the dummy increased by one percent in the previous 2 years, the Gini Index fell by 4.18E-06

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percent in the current year.

Coefficient of Determination Test (Test-R2)

Based on table 1 the Adjusted R-square value is 0.797045, which means that the variables of economic growth, population growth, investment growth and the human development index are able to explain the variable income inequality in Sulawesi by 79.7%, so it can be said that in the long term 79 .7% of income inequality in Sulawesi can be explained by the model, while 20.3% is explained by other factors not included in the model.

Simultaneous Testing (F-Test)

F-test is a statistical test that aims to determine the effect of all independent variables simultaneously (simultaneously) on the dependent variable. In eviews, the F-test output can be seen through F-statistics and Prob(F-statistics). F-statistics are also known as Fcount while Prob(F-Statistics) are also called p-values. It is known that the f-table value is 1.86537253 with an alpha level of 10%. It is known that the f-table value is 1.86537253 with an absent level of 10%. Based on table 1, it is known that the F-statistic is 14,41797, which means the F-statistic value is more than the f-table value (14.41797 > 1.86537253), so H0 is accepted, it can be concluded that the independent variables jointly affect the variable dependent.

Partial Test (t-test)

The t-test is a statistical test that aims to determine the effect of the independent variable individually (partial) on the dependent variable. The t-test output can be seen through the t-statistic or probability (p-value). Based on table 1, the t-test analysis compares the t-statistics with the t-table level, where the known value is 1.66864. The following is a description of the partial test based on the PEVCM estimation results: 1). Statistically, the variable of economic growth in the long term has a t-statistic value more than t-table, so that H0 is accepted while in the short term it has a t-statistic value less than t-table, so H0 is rejected. Thus, it can be concluded that economic growth in the long term has a significant effect, while in the short term it has an insignificant effect on changes in income inequality in Sulawesi during the period 2010 to 2020. Statistically, the population variable in both the long and short term has a t-statistic value of less than t-table, so H0 is rejected. Thus, it can be concluded that the population in the long term and short term has no significant effect on changes in income inequality in Sulawesi during the period 2010 to 2020.

2). Statistically, the investment growth variable in the long term has a t-statistic value more than t-table, so H0 is accepted, while in the short term at lag-1 the t-statistic value is more than t-table, so H0 is accepted. Thus, it can be concluded that investment growth in the long term has a significant effect while in the short term it has a significant effect only in the past year on changes in income inequality in Sulawesi during the period 2010 to 2020.

3). Statistically, the HDI variable in the long term has a t-statistic value less than t-table, so H0 is rejected, while in the short term at lags 1 and 2 it has a t-statistic value more than t-table, so H0 is accepted. Thus, it can be concluded that the human development index in the long term has no significant effect while in the short term it has a significant effect in the past 1 and 2 years on changes in income inequality in Sulawesi during the period 2010 to 2020.

4). Statistically, the dummy variable in the long term has a t-statistical value less than t-table, so H0 is rejected, while in the short term at the 2nd lag, the t-statistic value is more than t-table, so H0 is accepted. Thus, it can be concluded that the dummy in the long term has a significant effect while in the short term 2 years ago it has a significant effect on income inequality in Sulawesi during the period 2010 to 2020.

Impulse Response Function (IRF)

The results of the impulse response analysis are carried out to see the current and future impacts of the Gini Index (IG) variable due to shocks or shocks to the variables of Economic Growth (PE), Population Growth (PPDK), Investment Growth (PINV) and HDI. The shock on Economic Growth, Population Growth, Investment Growth and HDI in the first year did not have any impact on the total GI. In the second year period, the PINV shock had an impact of 0.74%, followed by the PE shock with an impact of 0.17%, and the HDI shock of 0.12%, while DUMMY was close to zero, while the IG variable itself and PPDKK received a shock value. the negative ones are -0.002755 and -0.007877. In a period of 11 years, the type of growth that has the greatest impact is investment growth of 0.007375, while those that have a negative impact are economic growth, population growth, investment growth, dummy and Gini Index each of -0.0400615, - 0.035907, 0.014318, -0.00193 and 0.001636.Gini masing-masing sebesar -0,0400615, -0,035907, 0,014318, -0,00193 dan 0,001636.

Forecast Error Variance Decomposition (FEVD)

FEVD analysis of the Gini Index (GI) variable in table 4.12, shows that in the first

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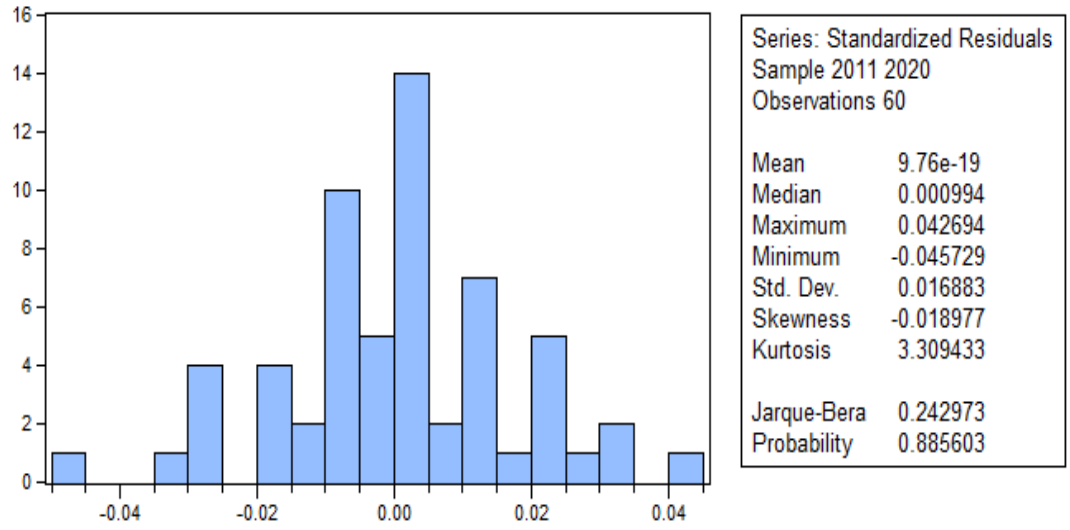
period it is influenced by the GI variable itself by 100 percent. Although the variance contribution fluctuates, the dominant variable in influencing GI is PE with an average contribution of 22.39% annually, followed by Population Growth and Investment Growth, each with an average contribution of 20.98%. and 18.26%, while HDI contributed 4.73% and Dummy contributed 1.16%. From these results, it can be said that during the 11 periods of economic growth, population growth and investment growth contributed the largest and always increased every year, although population growth and investment had decreased in the 10th and 11th periods.

Residual Normality Test

The normality test is used to determine the distribution of the data, whether it is normally distributed or not. In this study, the normality test used the Jarque-Bera test (JB-test) using the residual value. The results of the analysis show that the Jarque-Bera value is 0.242973 with a probability of 0.885603. Prob. Jarque Bera (0.885603) is more than 0.05, thus it can be concluded that the data is normally distributed.

Figure 5. Normality Residual Test



Source: Secondary data output after processing, 2022; (Indri, 2022).

Multicollinearity Test

Multilinearity test was used to determine whether or not there was a relationship between independent variables in the study. The results of the analysis show that the correlation coefficient between the independent variables is < 0.80 which means that there is no multicollinearity problem in each independent variable.

Table 2 Multicollinearity Test

Variabel	DL(PE)	DL(PPDK)	DL(PINV)	DL(IPM)	(DUMMY)
DL(PE)	1.000000	0.375781	0.790568	0.144917	0.186501
DL(PPDK)	0.375781	1.000000	0.548846	0.105275	-0.062654
DL(PINV)	0.790568	0.548846	1.000000	0.263301	0.181567
DL(IPM)	0.144917	0.105275	0.263301	1.000000	0.413808
(DUMMY)	0.186501	-0.062654	0.181567	0.413808	1.000000

Source: Secondary data output after processing, 2022; (Indri, 2022).

Heteroscedasticity Test

A data can be said to be free from heteroscedasticity problems if the probability value of the independent and dependent variables is greater than = 0.05. Based on the results of the heteroscedasticity test, the p-value of the independent variable shows a value that is more than the alpha level (0.05), it can be concluded that this data is not affected by the heteroscedasticity problem

Table 3 Heteroscedasticity Test

Dependent Variable: RESABS

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PE)	-5.57E-07	4.23E-07	-1.317612	0.1932
D(PPDK)	-3.37E-05	3.84E-05	-0.877749	0.3840
D(PINV)	1.03E-09	9.33E-10	1.106763	0.2733
D(IPM)	0.008611	0.006004	1.434174	0.1573
DUMMY	-2.73E-07	2.47E-07	-1.105463	0.2739

Source: Secondary data output after processing, 2022; (Indri, 2022).

The Effect of Economic Growth on Income Inequality in Sulawesi

Based on the PVECM estimation results show that economic growth has a significant effect on income inequality. While partially in the long term economic growth has a positive and significant effect on income inequality in Sulawesi, this can be interpreted if economic growth increases by one percent, income inequality increases by 1.61E-06, while the

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estimation results in the short term show that the variable economic growth in the first lag it has a negative effect, meaning that if there is an increase of 1 percent in the previous 1 year it will increase income inequality by 9.99 percent while in the second lag it shows a negative effect, meaning that if there is an increase of 1 percent in the previous 2 years it will reduce income inequality by 1.54 percent in the current year. This shows that during the period 2010 to 2020 economic growth only has a significant positive long-term effect on changes in income inequality, thus it can be interpreted that any increase in economic growth in the long term is followed by an increase in income inequality in Sulawesi. Testing the results of this study is not in accordance with the hypothesis which states that economic growth has a negative effect on income inequality in Sulawesi. This research is relevant to research Febrianto (2017) where the results of the study indicate that economic growth has a positive effect on income inequality between districts/cities in East Java Province. This is in line with Pikkety's view that the doctrine of economic growth, which can reduce inequality in the long term, is factually contradictory. This is due to development that pursues exclusive growth alone (Bhambra, 2021; Chancel *et al.*, 2021; Chancel and Piketty, 2021; Díaz Pabón *et al.*, 2021; Kulkarni and Gaiha, 2021; Lachmann and Brandon, 2021; Michalos and Hatch, 2021; Sánchez-Ancochea, 2021; Yun, 2022). However, this goes against the view Kuznets (1955) that in the long term, inequality will be further reduced along with economic growth.

The Effect of Population on Income Inequality in Sulawesi

In the long term the population has a positive but not significant effect on changes in income inequality in Sulawesi, this can be interpreted if the population increases by one percent, the change in income inequality increases by 8.07E-05. While the estimation results in the short term show that the population variable in the first and second lags has a negative effect. This means that if there is an increase of 1 percent in the previous 1 and 2 years, it will reduce income inequality by 0.01 percent and 8.64 percent in the current year. This shows that during the period 2010 to 2020, the population does not show a significant influence on income inequality, when viewed from both the short and long term.

Testing the results of this study is not in accordance with the hypothesis which states that economic growth has a positive effect on income inequality in Sulawesi. This research is relevant to research Anggina and Artaningtyas (2017) where the results of the study indicate that population growth has no effect on the inequality of income distribution in the Regency/City of the Special Region of Yogyakarta in 2007-2014. This view contradicts Todaro's view in his research which states that in the context of developing countries, the

high rate of population growth, accompanied by inflation that is not followed by an increase in output of goods production and incoming investment, results in inequality (Sudswong *et al.*, 2021).

The Effect of Investment Growth on Income Inequality in Sulawesi

Investment is one indicator that results in inequality in development or economic growth. Based on the theory of Harrod-Dommar which explains the existence of a positive correlation between the level of investment and the rate of economic growth. Based on the results of PVECM, it shows that the investment growth variable in the long term has a negative and significant effect on changes in income inequality in Sulawesi, this means that if investment growth increases by one percent, the Gini index decreases by 4.76e-09. Based on the estimation results in the short term, investment growth variables in the first and second lags have a negative effect. This means that if there is an increase of 1 percent in the previous 1 and 2 years, it will reduce income inequality by 4.76 percent and 3.37 percent in the current year. This shows that during the period 2010 to 2020, in the long term investment growth was followed by a decrease in income inequality, while in the short term 1 year ago the increase in investment growth was followed by a decrease in income inequality this year. The results of this test are in accordance with the hypothesis which states that investment growth has a negative effect on income inequality in Sulawesi. This research is not relevant to the research Royan *et al.*, (2019), where investment has a positive effect on Income Inequality in the Regency/City of West Nusa Tenggara Province.

Effect of Human Development Index (HDI) on Income Inequality in Sulawesi

The estimation results show that in the long term the human development index (HDI) has a positive but not significant effect on changes in income inequality in Sulawesi, this means that if the human development index increases by one percent, income inequality will increase by 0.006741. Meanwhile, the estimation results in the short term show that the Human Development Index variable in the first and second lags has a positive effect. This means that if there is an increase of 1 percent in the previous 1 and 2 years, it will increase income inequality by 1.59 percent and 2.33 percent in the current year. This shows that during the period 2010 to 2020 in the short term the human development index has a positive and significant effect on changes in income inequality, thus it can be interpreted that every increase in HDI will be followed by an increase in income inequality in Sulawesi. Testing the results of this study is not in accordance with the hypothesis which states that the human development index has a negative effect on income inequality in

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Sulawesi. This research is not relevant to the research results Masruri (2016) where the human development index has a negative effect on income inequality between regions in Central Java Province in 2011-2014.

The Effect of Dummy on Income Inequality in Sulawesi

Based on the results of PVECM, it shows that the Dummy variable in the long term has a negative but not significant effect on changes in income inequality in Sulawesi, this can be interpreted if the dummy increases by one percent in the past 1 year, income inequality decreases by 2.16E-06. Meanwhile, the estimation results in the short term show that the dummy variables in the first and second lags have a negative effect. This means that if there is an increase of 1 percent in the previous 1 and 2 years, it will reduce income inequality by 3.28 percent and 4.18 percent in the current year. This shows that during the 2010-2020 period the dummy had a significant short-term effect in the past 2 years, which means that the increase in the dummy in the past 2 years will be followed by a decrease in income inequality in Sulawesi this year. To see the difference between a dummy with a category code of 0 for the highest and 1 for the lowest. Based on the results of the PVECM dummy has a difference in the past 2 years.

CONCLUSION

Based on the results of the analysis of the effect of Economic Growth, Population Growth, Investment Growth and Human Development Index on Changes in Income Inequality in Sulawesi in 2010-2020, the following conclusions are obtained: 1). Changes in Economic Growth are indicated by the value of GRDP at Constant Prices by province in Sulawesi during 2010-2020. In the long term, this variable has a positive and significant effect on changes in income inequality, which means that every increase in changes in economic growth will be followed by increasing changes in income inequality.

In the short term, changes in Economic Growth have a positive but not significant effect in the past 1 year, while in the past 2 years there has been an insignificant negative effect on changes in income inequality, which means that any increase in changes in Economic Growth in the past one year will be followed by increasing changes in Income Inequality in Sulawesi. now, whereas in the past two years, every increase in economic growth will be followed by a decrease in income inequality in Sulawesi today. 2). Changes in Population are indicated by the number of inter-provincial population in Sulawesi during 2010-2020. In the long term, this variable has a negative but not significant effect on changes in income inequality, which means that every increase in population change will be

followed by a decrease in income inequality in Sulawesi in 2010-2020.

Meanwhile, in the short term, changes in Population have a negative effect in the past one and two years but are not significant on changes in income inequality, which means that every increase in population changes during the past one and two years will be followed by a decrease in income inequality in Sulawesi today. 3). Changes in Investment Growth as seen from the value of inter-provincial PMTB in Sulawesi Island in 2010-2020. In the long term, changes in Investment Growth have a negative and significant impact on changes in income inequality, which means that every increase in investment changes will reduce changes in income inequality in Sulawesi in 2010-2020. In the short term, changes in Investment Growth have a negative effect in the past year but are not significant, while in the past two years, they have a negative and significant effect on changes in income inequality, which means that every change in Investment Growth during the past year will be followed by a decrease in income inequality changes while every increase in changes in investment growth in the past two years will reduce the change in Income Inequality in Sulawesi today. 4). Changes in the Human Development Index as indicated by the HDI values between provinces in Sulawesi during 2010-2020. In the long term, changes in HDI have no significant positive effect on changes in income inequality, which means that any increase in changes in the Human Development Index will be followed by increasing changes in income inequality in Sulawesi in 2010-2020. Meanwhile, in the short term, changes in HDI have a positive and significant effect on changes in income inequality, which means that every increase in changes in HDI during the past one and two years will increase changes in income inequality in Sulawesi today. 5). Simultaneously changes in economic growth, changes in population, changes in investment growth and changes in the Human Development Index have a significant effect on changes in income inequality in Sulawesi.

Based on the conclusions outlined on the effect of economic growth, population growth, investment growth and HDI on income inequality in Sulawesi in 2010-2020, the implication of the research is that the government needs to increase economic growth and control population growth followed by reducing income inequality, especially in the long term. In the long term, the government is also expected to be able to increase human resources by creating jobs, proper education and health in order to reduce the problem of inequality in a region. which increases.

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