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DYNAMIC ANALYSIS OF FACTORS AFFECTING POVERTY IN SOUTH SULAWESI PROVINCE: AN ERROR CORRECTION MODEL (ECM) APPROACH

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Abstract: *This study analyzes factors influencing poverty in South Sulawesi Province, focusing on the roles of the Human Development Index (HDI), investment, and the Labor Force Participation Rate (LFPR). A quantitative approach is applied using time-series data on the number of poor residents, HDI, domestic investment, and LFPR over a defined observation period. The analysis employs the Error Correction Model (ECM) to capture both short- and long-term relationships among the variables. The results reveal that, in the long run, HDI has a negative and significant effect on poverty, indicating that improving human development quality sustainably reduces the poor population. In contrast, investment and LFPR show no significant long-term impact on poverty reduction. Likewise, HDI, investment, and LFPR are not significant in the short run. These findings highlight the central role of human development policies as a primary strategy for poverty alleviation in South Sulawesi while underscoring the need to optimize investment and labor force contributions*

Abstrak: Penelitian ini bertujuan menganalisis faktor-faktor yang memengaruhi kemiskinan di Provinsi Sulawesi Selatan dengan fokus pada peran Indeks Pembangunan Manusia (IPM), investasi, dan Tingkat Partisipasi Angkatan Kerja (TPAK). Penelitian menggunakan pendekatan kuantitatif dengan data time series jumlah penduduk miskin, IPM, investasi domestik, dan TPAK selama periode pengamatan tertentu. Analisis dilakukan dengan metode Error Correction Model (ECM) untuk mengidentifikasi hubungan jangka pendek dan jangka panjang antarvariabel. Hasil menunjukkan bahwa dalam jangka panjang IPM berpengaruh negatif dan signifikan terhadap kemiskinan, menegaskan bahwa peningkatan kualitas pembangunan manusia efektif menekan jumlah penduduk miskin secara berkelanjutan. Sebaliknya, investasi dan TPAK tidak berpengaruh signifikan pada pengurangan kemiskinan baik jangka panjang maupun pendek. Ketiga variabel IPM, investasi, dan TPAK juga tidak signifikan dalam jangka pendek.

INTRODUCTION

Poverty is defined as a condition of lack of material resources to meet basic living needs such as food, housing, education, and health, as well as access to various community services. In general, poverty includes a lack of access to economic and social opportunities that can improve the quality of life (Muslim, 2024). Poverty in economic terms, referring to people who are unable to meet basic food and non-food needs, is measured in terms of expenditure (Central Statistics Agency, 2023). Poverty can result in some people choosing to commit acts of crime, fraud and robbery and even murder to be able to meet their living needs. Thus, the problem of poverty has always been one of the main focuses in economic development. In addition, this minimum standard of living will directly affect the level of health, moral life, and sense of self-esteem of those classified as poor.

Nurkse (2006) explained two circles of poverty traps in terms of supply and demand. The supply side explained that the low level of people's income due to low productivity levels leads to low people's ability to save. The low saving capacity of the community causes a low level of capital formation (investment), resulting in a lack of capital and thus a low level of productivity. And so on. Meanwhile, on the demand side, in poor countries the stimulus to invest is very low due to the limited market area for various types of goods. This is due to the very low income of the community due to their low level of productivity, as a result of the limited level of capital formation in the past. This limited capital formation is due to the lack of stimulus to invest capital.

One of the factors that causes poverty is the quality of human resources. The quality of human resources can be seen from the quality-of-life index/human development index. Low HDI will result in low work productivity of the population. To produce quality human beings, efforts are needed to improve the quality of human resources. Human quality can be measured through HDI (Handayani, 2023). Thus, the number of poor people is caused by low income due to low HDI in a region (Sukmaraga, 2011).

In addition to HDI, macroeconomic variables such as investment are also considered important in supporting economic growth which has an impact on poverty reduction. An investment is a commitment of funds, directly or indirectly, to one or more assets in the hope of increasing future wealth (Lutfi, 2010). According to the Classical theory, investment is an expenditure intended to increase people's ability to increase production. So investment is an expenditure that will increase the amount of means of

production in society which will ultimately increase income, so that economic growth increases and in the end poverty will also decrease.

Another variable that was also analyzed was the Labor Force Participation Rate (TPAK). The Labor Force Participation Rate can be one of the economic indicators that affect the poverty rate. The more the labor force is absorbed, the more income increases, which will directly reduce the number of poor people. Therefore, another factor that can affect poverty is regarding the workforce implemented from the Labor Force Participation Level (TPAK). This is supported by a study conducted by Dela Rahma Fauziah, Whinarko Juliprijanto, (2021) who stated that increasing the Labor Force Participation Rate (TPAK) is very important because if there are more people who are not working, it will have an impact on increasing the number of poor people.

South Sulawesi Province is one of the regions in Indonesia that is still facing poverty problems. Despite being one of the provinces that has a fairly good economic growth rate, the poverty rate in South Sulawesi Province is still quite high.

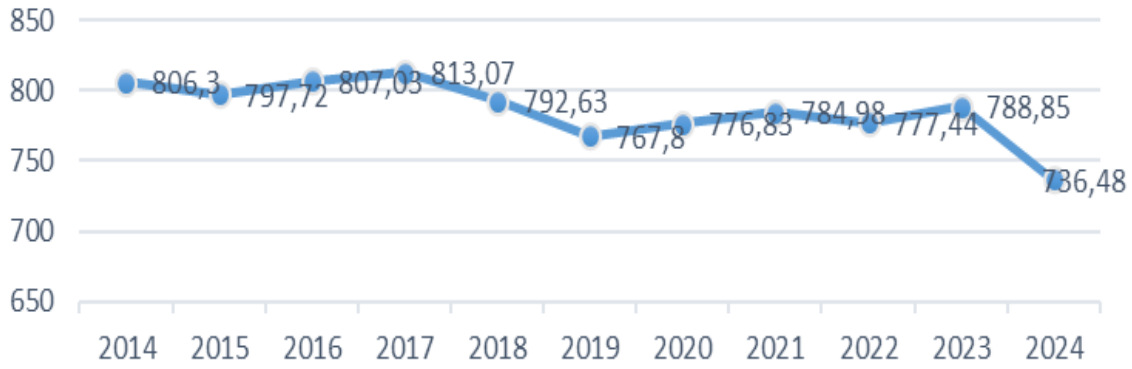

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Figure 1. Total Poor Population of South Sulawesi 2014-2024

Figure 1. shows the development of the number of poor people in South Sulawesi Province during the period 2014–2024. In general, the trend of fluctuations is quite noticeable throughout the period. At the beginning of the period, the number of poor people was recorded at 806.3 thousand people in 2014, then it had decreased and increased again until it reached a peak of 813.07 thousand people in 2017. After that, there was a significant decline until 2019, but the poverty rate fluctuated again in the 2020–2023 period, which may have been influenced by the impact of the COVID-19 pandemic. The most drastic decline was recorded in 2024, where the number of poor people fell sharply to 736.48 thousand people from 788.85 thousand people in the previous year. This sharp decline reflects a significant improvement in socio-economic conditions, which may be the result of the effectiveness of development and social

protection policies implemented by local and central governments. However, this dynamic also shows the importance of maintaining the sustainability of poverty alleviation policies so that the decline is structural and sustainable.

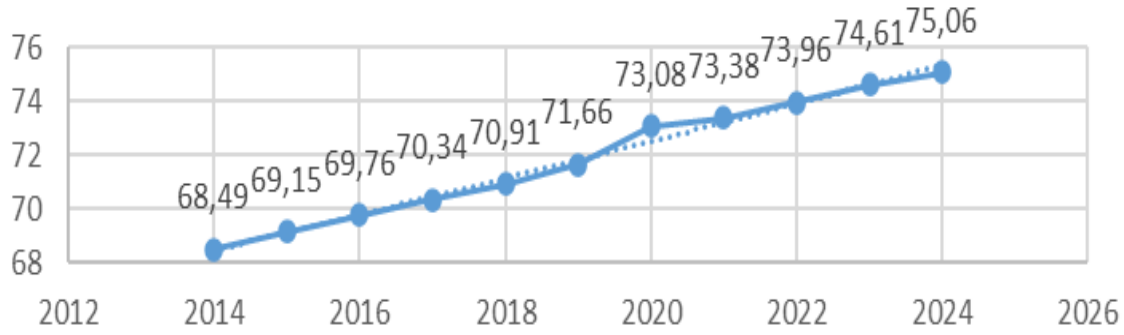

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Figure 2 Human Development Index (HDI) of South Sulawesi

In Figure 2 above, it can be observed that, in line with the poverty reduction trend shown earlier, the Human Development Index (HDI) graph of South Sulawesi Province shows a consistent increase from 2014 to 2024. In 2014, the HDI was at 68.49 and continues to increase every year until it reaches 75.06 in 2024. This increase in HDI indicates progress in the three main dimensions of human development: education, health, and decent living standards. This steady increase may also reflect the efforts of local governments to expand access to basic services and improve the quality of human resources. With the improvement of HDI, it can be assumed that people's quality of life also improves, which in turn has the potential to reduce poverty levels more structurally.

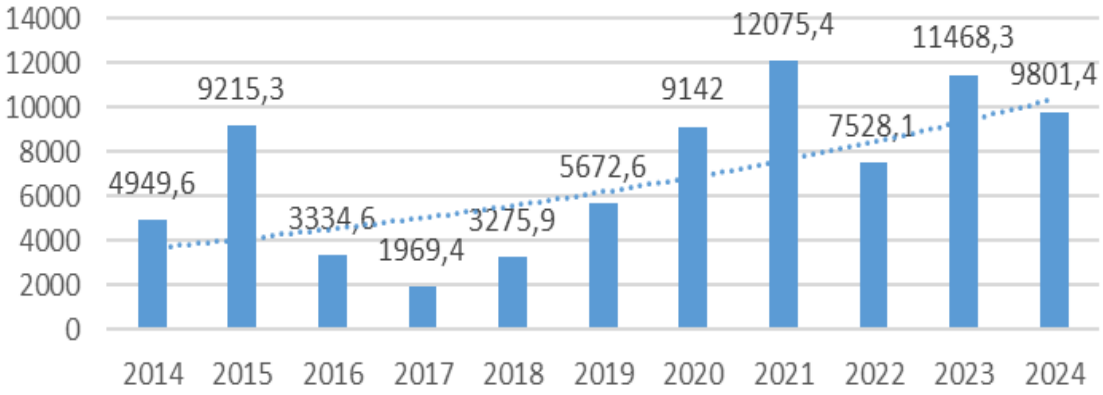

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Figure 3. South Sulawesi Investment

Figure 3. It shows that although the number of poor people in South Sulawesi shows a downward trend, and the Human Development Index (HDI) continues to increase, the Domestic Investment Index (PMDN) chart shows a fluctuating pattern throughout 2014–2024. At the beginning of the period, namely in 2015, investment

experienced a sharp surge to Rp9,215.3 billion from Rp4,949.6 billion in 2014, but then declined drastically to a low of Rp1,969.4 billion in 2017. After that, the trend began to show an increase again until it reached a peak in 2021 of IDR 12,075.4 billion, although it then decreased again in 2024 to IDR 9,801.4 billion. This inconsistency suggests that although investment has increased over the long term, its impact on poverty reduction has not been fully seen.

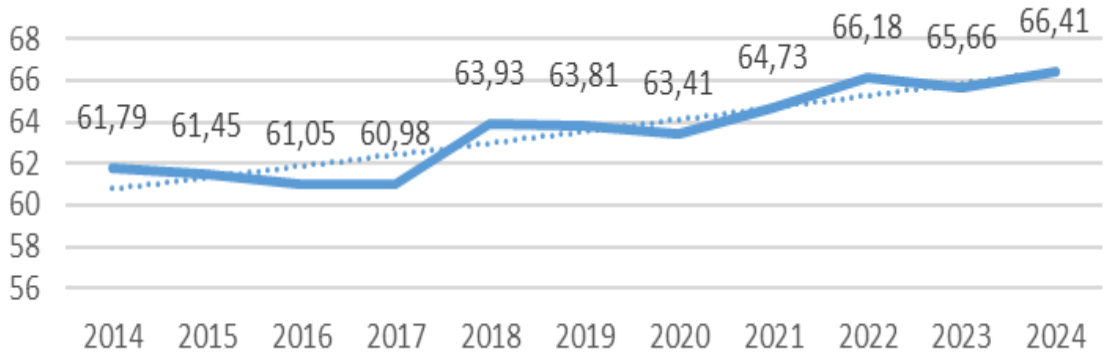

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Figure 4. South Sulawesi Labor Force Participation Rate

From Figure 4, it can be seen that the Labor Force Participation Rate (TPAK) in South Sulawesi from 2014 to 2024 shows a trend that tends to increase, although with fluctuations in some years. TPAK had decreased from 61.79 percent in 2014 to a low of 60.98 percent in 2017. However, since 2018, the labor participation rate has increased significantly to reach 66.41 percent in 2024. This increase in TPAK theoretically shows the potential for increased productivity and employment opportunities in the region. However, the increase in labor force participation is not necessarily directly proportional to the decrease in the poverty rate, as illustrated in the previous data on the number of poor people.

Based on the background of the problem and the data that has been presented, this article will further discuss and analyze the Influence of the Human Development Index (HDI), Investment and Labor Force Participation Rate (TPAK) on Poverty in South Sulawesi Province in the short and long term.

METHOD

This study uses a quantitative approach using secondary data in the form of a time series covering the period from 2009 to 2024. According to Sugiyono (2019), secondary data is data or information that has been collected and processed by other parties, and is available in a ready-to-use form. The variables analyzed in this study include the Human Development Index (HDI), Investment, Labor Force Participation Rate (TPAK) and

Poverty (Number of Poor People) in South Sulawesi Province. All data was obtained from the official publication of the Central Statistics Agency (BPS) of South Sulawesi Province. The selection of dynamic analysis methods using the Error Correction Model (ECM) is based on its ability to explain the dynamic relationship between economic variables in the short and long term. Model estimation is carried out with the help of EViews software.

Stationary Test

Unit root test is a test that aims to enable researchers to find out whether a data has stationarity. Stationarity is important in research that uses secondary data (time series). The Dickey-Fuller unit root test is the name given to the test created by Dickey-Fuller. The Augmented Dickey-Fuller Test (ADF) is then used to perform root unit tests to ensure stationariness. According to statistics, if the probability value of each variable is less than 0.05, then the time series data is considered stationary (Gujarati & Porter, 2013).

Cointegration Test

In this study, the cointegration test was carried out using the Rank Test-Johansen. Where, this test is used to see if there is a long-term relationship (cointegration) between two or more variables, each of which is stationary at the first differentiation. Cointegration shows that although the variables are not stationary individually, there is a linear combination that is stationary, meaning they move together in the long run. (Gujarati & Porter, 2013).

Error Correcton Model (ECM)

The ECM method is used because ECM has the ability to analyze short-term and long-term economic phenomena and examine whether or not the empirical model is consistent with economic theory. In addition, the use of the ECM method in this study is based on research data in the form of a time series which is often not stationary so that it causes dubious regression results or also known as straight regression (Widarjono, 2013).

RESULTS AND DISCUSSION

Results

Stationary Test

Table 1. Stationary Test at *the First Difference level*

Group unit root test: Summary
Series: LN_Y, IPM_X1, LN_INVESTASI_X2, TPAK_X3

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-6.41969	0.0000	4	52
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-5.39367	0.0000	4	52
ADF - Fisher Chi-square	40.2364	0.0000	4	52
PP - Fisher Chi-square	55.3793	0.0000	4	56

Table 1 above shows that the level of significance of the stationary group of the root test group on the observed variable as a whole, the variable is at the level of 1st Difference. Thus, the next cointegration test will be carried out.

Cointegration Test

Table 2. Rank Test (Johansen)

Trend assumption: Linear deterministic trend
Series: LN_Y IPM_X1 LN_INVESTASI_X2 TPAK_X3
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.861917	55.92776	47.85613	0.0073
At most 1	0.663503	28.20914	29.79707	0.0754
At most 2	0.575130	12.96082	15.49471	0.1163
At most 3	0.067421	0.977215	3.841466	0.3229

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

Based on the results of the cointegration test in Table 2 above with the Trace statistical approach, there was cointegration at a significance level of 0.05. This means that there is a long-term balance between variables.

Error Correction Model (ECM)

Table 3. Long-Term ECM Estimation Results

Dependent Variable: LN_Y

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.513807	0.291975	25.73439	0.0000
IPM_X1	-0.021174	0.006815	-3.107079	0.0091
LN_INVESTASI_X2	-0.018090	0.016488	-1.097167	0.2941
TPAK_X3	0.013132	0.009314	1.409889	0.1840

R-squared	0.766396	Mean dependent var	6.699331
Adjusted R-squared	0.707995	S.D. dependent var	0.062929
S.E. of regression	0.034005	Akaike info criterion	-3.712281
Sum squared resid	0.013876	Schwarz criterion	-3.519134
Log likelihood	33.69825	Hannan-Quinn criter.	-3.702390
F-statistic	13.12298	Durbin-Watson stat	1.798180
Prob(F-statistic)	0.000426		

Based on the results of the estimate in Table 3 above, the findings of long-term ECM estimation are displayed. The regression results prove the relationship between the bound variable and the independent variable. The R-Squared value is 0.766396, meaning that independent variables in the model can account for 76.6% of the variation of dependent variables. The HDI coefficient value of -0.021174 indicates a negative influence of HDI on poverty, with a significant threshold of 0.0091 < of α = 5%. Thus, when there is an increase in HDI by 1 point, it will reduce Poverty by 0.021174 or by 2.11%. In contrast to the HDI variable, the Investment variable and the TPAK variable have a significant value greater than α = 5%. This means that in the long term, the variables of investment and TPAK do not have a significant effect on poverty. To find out how the Human Development Index (HDI), Investment and TPAK affect poverty in the short term, the short-term ECM model estimate is carried out as follows.

Based on Table 4 above, the results of the short-term Error Correction Model (ECM) estimation, it was found that independent variables such as the Human Development Index (HDI), investment, and Labor Force Participation Rate (TPAK) did not have a significant effect on the change in poverty rate in the short term, as indicated by the probability value of each variable that was above the significance threshold of 5%.

Table 4. Short-Term ECM Estimation Results

Dependent Variable: D(LN_Y)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.003891	0.029733	-0.130868	0.8985
D(IPM_X1)	-0.012371	0.043047	-0.287388	0.7797
D(LN_INVESTASI_X2)	-0.016726	0.011995	-1.394440	0.1934
D(TPAK_X3)	-0.000864	0.009200	-0.093921	0.9270
ECT(-1)	-0.802081	0.325062	-2.467471	0.0332

R-squared	0.542715	Mean dependent var	-0.016046
Adjusted R-squared	0.359802	S.D. dependent var	0.039368
S.E. of regression	0.031499	Akaike info criterion	-3.816518
Sum squared resid	0.009922	Schwarz criterion	-3.580501
Log likelihood	33.62388	Hannan-Quinn criter.	-3.819032
F-statistic	2.967056	Durbin-Watson stat	1.886991
Prob(F-statistic)	0.074255		

However, the coefficients of all variables point in a negative direction, which theoretically indicates that an increase in all three variables tends to lower poverty rates. The most important finding in this model was the significance of the negative error correction term (ECT) (-0.802081) and significant at the 5% level, suggesting that about 80% of long-term imbalances were corrected in a single period. This confirms the existence of a valid long-term relationship between independent variables and poverty. In addition, the R-squared value of 0.5427 indicates that the model is able to explain about 54.3% variation in poverty change.

Classic Assumption Test

After estimating the ECM equation, to ensure that the model used meets certain conditions, so that the results of the analysis obtained are valid and the estimation model is not biased and consistent, a series of Classical Assumption Tests are carried out.

Normality Test

Based on Figure 5 above, it can be seen that the Probability Value is 0.599 > alpha 0.05. This means that the model above passed the Normality Test, where the residual is considered to be distributed Normal.

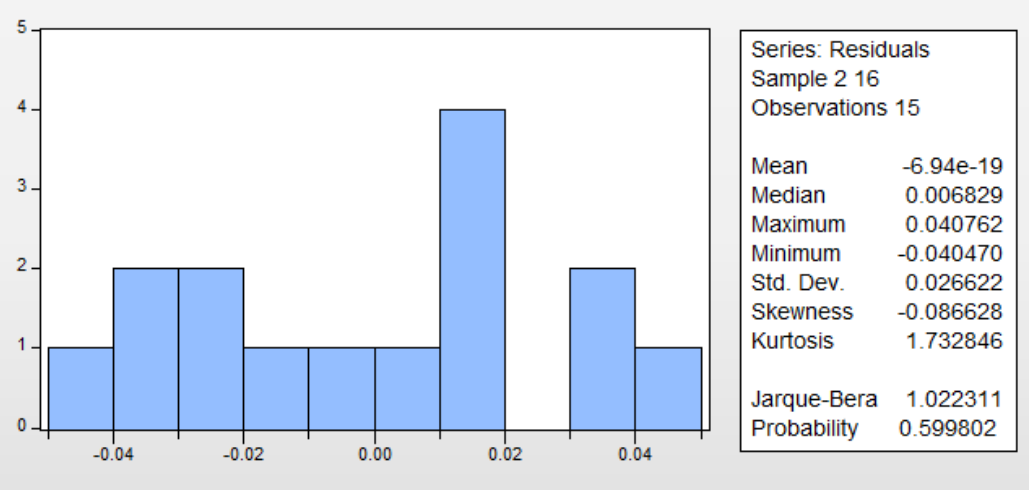

Figure 5. Normality Test Results

Multicollinearity Test

Table 5. explained above that all variables have a Variance Inflation Factors (VIF) value of < 10 (Sig). This means that the model is free from Multicollinearity.

Table 5. Multicollinearity Test

Variance Inflation Factors

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	0.000884	13.36551	NA
D(IPM_X1)	0.001853	13.09884	1.504420
D(LN_INVESTASI_X2)	0.000144	1.172436	1.127608
D(TPAK_X3)	8.46E-05	1.343654	1.214786
ECT(-1)	0.105665	1.391620	1.385876

Autocorrelation Test

Table 6. above explains that the Prob. Chi-Square 0.7175 > alpha 0.05. This means that the model above is free from Autocorrelation.

Table 6. Autocorrelation Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.185238	Prob. F(2,8)	0.8344
Obs*R-squared	0.663898	Prob. Chi-Square(2)	0.7175

Heteroskedastic Test

Table 7. above explains that the Prob. Chi-Square 0.4611 > alpha 0.05. This means that in the above model, there are no symptoms of Heteroscedasticity.

Table 7. Heteroskedastic Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.792929	Prob. F(4,10)	0.5559
Obs*R-squared	3.611963	Prob. Chi-Square(4)	0.4611
Scaled explained SS	0.588225	Prob. Chi-Square(4)	0.9644

Discussion

1. The Effect of the Human Development Index (HDI) on Poverty

The results of the study show that HDI has a negative and significant influence on poverty in the long term. The results of this study are in line with the research conducted by Prasetyoningrum (2018), The results of this study show that HDI has a direct and negative effect on the poverty rate with a path coefficient value of -0.71. However, in the short term, HDI does not have a significant effect on poverty. This is in accordance with the opinion of Todaro and Smith (2015) who explain that increasing HDI, especially in the aspects of education and health, contributes to strengthening human capital which is an important foundation in reducing poverty sustainably. In the long term, the increase in HDI reflects the accumulated improvement in the quality of life and productivity of the population which has an impact on increasing income and reducing poverty. However, the short-term effects of HDI on poverty are often insignificant because changes in the education and health dimensions take time to affect the economic conditions of the community (UNDP, 2016). Therefore, although the HDI has shown a negative relationship with poverty, the impact is only felt in the long term.

2. The Effect of Investment on Poverty

The finding that investment has no significant effect on poverty in either the long and short term. These results are in line with research conducted by Fauziah (2021), where investment variables did not have a significant effect on poverty on the island of Java from 2010 to 2019. This can be explained by arguing that not all forms of investment have an inclusive distribution effect on the poor. According to Basri and Hill (2011), investments in developing countries are often capital-intensive and more profitable for the formal sector and highly educated groups. Investment that is not directed at sectors that absorb poor labor, such as MSMEs or agriculture, will find it difficult to reduce poverty rates (World Bank, 2018). In addition, the effects of investment on poverty are highly dependent on the quality of institutions, the effectiveness of redistribution policies,

and connectivity between investment projects and poor households. If these supporting variables are weak, then investment tends to produce economic growth without a significant reduction in poverty.

3. The Effect of the Labor Force Participation Rate (TPAK) on Poverty

The insignificant results of TPAK on poverty in the long- and short-term show that the large number of working populations does not guarantee a reduction in poverty rates. These results are in line with research conducted by Matondang (2024) where TPAK does not show a significant influence on poverty in North Sumatra Province. This also supports the opinion of Fields (2011) who states that the quality of work is much more important than the number of jobs in the context of poverty alleviation. In developing countries, high labor force participation is often absorbed by the informal sector that does not provide living wages, social protection, and job security, thus unable to lift the population out of poverty (ILO, 2019). In addition, low levels of education and skills lead to a mismatch between the labor force and labor market needs, hampering the process of increasing incomes (UNDP, 2016). Thus, employment policy needs to be focused not only on increasing work participation, but also on the creation of productive and quality jobs.

CONCLUSION

Based on the results of research and discussions conducted to analyze the influence of the Human Development Index (HDI), Investment, and Labor Force Participation Rate (TPAK) on poverty in South Sulawesi, several important findings were obtained, including:

1. HDI has been shown to have a negative and significant effect on poverty in the long term, which shows that improving the quality of education, health, and overall living standards can reduce poverty levels in a sustainable manner. However, in the short term, the effect of HDI on poverty is not significant because the impact is cumulative and takes time.
2. Investment does not show a significant effect on poverty reduction, either in the long or short term, indicating that existing investment is not yet inclusive and has not been directed at sectors that directly touch the poor.
3. TPAK has no significant effect on poverty, which shows that the quantity of the labor force has not been balanced with a decent quality of work.

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