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Empirical Relationship between Gender Equality and Socio-economic Developments: An Error Correction Model

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Abstract

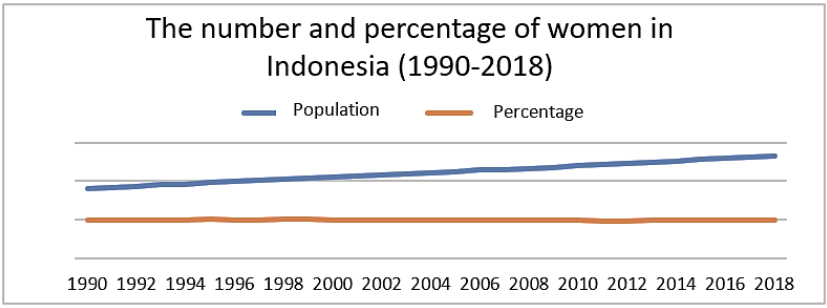
Gender equality is to obtain equal opportunities without gender differences and equality in their rights to feel the results of development. The low gender will trigger injustice, where one gender will be harmed. This form of gender injustice often occurs through stereotyping, labeling, subordination, marginalization, and double burdens, which usually will harm women. This study aims to determine the active contribution of women to the world economy and to see how big the role of women in improving the economy from the political realm is carried out using the ECM-EG approach and sample time series data from 1990-2018 in Indonesia. The results showed positive effects of education, health, and representation in the political field on gender equality. The findings theoretically suggested further research on gender in employment runs by the fast-slow pattern of the legal process of The Law of Diminishing Return (TLDR), which is very influential by the quality of human resources and technological advances as well as the employment opportunities needed by women.

Keywords

Gender Equality, Socio-economic Developments, Women Empowerment, Error Correction Model, Indonesia

1. Introduction

The population is a factor that is quite influential on the economic growth of a country and is a driving force for a country's economy. High population growth should be balanced with the quality of the population and an adequate number of jobs so that the increasing population will become development capital and not a burden on the economy. Adika & Rahmawati (2021) showed that the increase in population not followed by the expansion of employment opportunities would result in high unemployment and a decrease in population productivity.



Source: World Bank processed

Figure 1: Number and Percentage of Female Population in Indonesia

The number of populations every year must experience a sufficient increase so that women continue to receive special attention, especially in the development of health levels, as well as increase the same as men (Boserup et al., 2013). The same level of men and women in education and health will increase productivity, encouraging economic growth (Ranis et al., 2000). Gender inequality is often associated with biological characteristics that women often experience. Women are described as feminine humans who make the impression of being gentle, while men are stronger; this encourages the creation of gender subordination (Falk & Hermle, 2018). Furthermore, it will encourage the creation of different workloads based on the type and put women in burden positions, namely more and longer burdens (Iversen et al., 2020; Beer, 2009). As development subjects, men and women have the same societal roles, positions, and responsibilities.

Meanwhile, inequality and gender inequality cause development to not reach its maximum potential (Sari, 2021). Therefore, this study looks at the relationship between gender and economic growth in Indonesia, given that women's role is currently needed in its development. The topic of the discussion focuses on seeing women's active contribution to the economy and how big the role of women is in improving the economy from the political realm.

2. Literature Review

Gender is a cultural concept that separates roles, behavior, mentality, and sentimental personality between men and women (Archer, 1989; Neculaesei, 2015).

Global Gender Gap Report 2018 found that Indonesia's gender equality level in income is 96, employment is 118, life expectancy is 88, elementary school graduates are 122, and the number of women who enter parliament is 87 (World Economic Forum, 2018). It found a culture and community mindset related to women's position and a fairly high difference between the achievement of benefits and development outcomes for women over men (World Economic Forum, 2018).

In the era of globalization, which has high economic growth, women are active in various aspects of life, especially the economy. Gender equality gives birth to solutions to increase a country's economic growth (Momsen, 2009). Today, the Millennium Development Goals (MDGs) have set gender as a quality goal, where women can improve a creation as a result of producing and giving birth so that the role of women in various aspects of life, especially the economy, cannot be underestimated (Webb et al., 2017).

Increasing the role of women in having a vital meaning in giving birth to equal development partnerships between men and women in various fields of life. Women's contribution to increasing development and economic resilience is very important, and their low contribution to the world of work will trigger sub-optimal economic growth (Loh & Dahesihsari, 2013). The existence of Woman20 and G20 is very good and useful in increasing women's empowerment so that they can become a driving force for the economy towards a more advanced economy (Rimmer, 2017). In addition to participation and contribution to economic activities, women's role in politics currently has a high intensity (Robinson & Bessell, 2002; Davies, 2005). It is evidenced by the increasing number of women who are owned as members of parliament; even now, 30% of women's representation in parliament is not just a formality but a representation of women who should be given more attention (Purwanti, 2015; Prihatini, 2019).

3. Research Methods

3.1. Research Design and Sampling

The population and sample in this study are time series data for the period 1990-2018 from GDP per capita (current US$), Life expectancy ratio to age 65, Female to Male (%), School enrollment rate, primary, female to male (%), Employability, female to male (%), Proportion of seats held in national parliaments, Female to male(%) in Indonesia.

This quantitative research uses secondary data from the publications of statistical institutions, namely the Central Statistics Agency and the World Bank, with the time series type for the period 1990-2018 in Indonesia. The variables used in this study are four independent variables that measure gender equality in health, education, employment, and political participation, while the dependent variable is economic growth.

3.2. Operational Definitions

1) The dependent variable is measured by the natural logarithm of GDP per capita (current US$).

2) The independent variable, namely gender inequality or inequality between men and women, is measured using the following indicators:
   a. Gender equality in the level of health as measured by Life expectancy ratio to age 65, Female to Male (%).
   b. Gender equality in women's education level as measured by the value of School enrollment rate, primary, female to male (%).
   c. Gender equality in the level of women's work participation as measured by the value of Employability, female to male (%).
   d. Gender equality in the level of political participation as measured by the value of the proportion of seats held in national parliaments, Female to male (%)

3.3. Analysis Method

The testing used is firstly using the classical assumption test. The normality test was carried out to see the spread of the data on the tested variables, whether normally distributed or not; the model indicated by normality made the data or variables not normally distributed (Adika & Rahmawati, 2021). The normality test of the data in this study can be done using the Jarque-Berra (J-B) approach if prob. Jarque-Berra > 5% significance level, then the data has passed the normality test. Furthermore, autocorrelation is a condition where a variable that depends on a certain period is correlated with a variable in another period. This test only occurs on time series data. Autocorrelation will cause the variance to be lower and the estimate to be biased, so the model is inefficient and not BLUE (Adika & Rahmawati, 2021). Autocorrelation also makes the value of R2 higher than expected, so the hypothesis using t-statistics and F-statistics will be misleading.

In addition, multicollinearity indicates a correlation between independent variables so that the results of the regression processing produce a large standard error value, the coefficient of determination (R2) remains high, and the F-statistic test is significant even though many variables are not significant. Multicollinearity can be seen from the VIF value greater than 10, where the higher the VIF value indicates greater collinearity (Adika & Rahmawati, 2021).

This study uses an Error Correction Model (ECM) approach that can overcome the blunt regression model that occurs when there is no correlation between ordinary variables, but the resulting regression coefficient is feasible, and the coefficient of determination is high (Agus, 2013; Li et al., 2013). Systematically the basic model used in this study is as follows:

Y = f (R_STA, R_SEP, R_EMPLY, R_PSHNP..... (1)

GDP_CAP = *GDP per capita (current US$)*
R_STA = *Life expectancy ratio to age 65, Female to Male (%)*
R_SEP= *School enrollment rate, preprimary, female (%)*
R_EMPLY = *Employability, female to male (%)*
R_PSHNP = *proportion of seats held in national parliaments, female to male (%)*

Furthermore, the equation is transformed into an econometric model to simplify the analysis. The following econometric models used are:

$$\text{Log GDP\_CAP}_t = \beta_0 + \beta_1 \text{R\_STA}_t + \beta_2 \text{ R\_SEP}_t + \beta_3 \text{ R\_EMPLY}_t + \beta_4 \text{ R\_PSHNP}_t + e_t \ldots\ldots (2)$$

Log GDP_CAP = *GDP per capita (current US$)* period t
β_0 = Constant
$\beta_1, \beta_2, \beta_3, \beta_4$ = coefficient in the long run
t = period (1990-2018)
e = error

To get a short-term estimate, the model used is:

$$\text{DLog GDP\_CAP}_t = \beta_0 + D\beta_1 \text{R\_STA}_t + D\beta_2 \text{ R\_SEP}_t + D\beta_3 \text{ R\_EMPLY}_t + D\beta_4 \text{ R\_PSHNP}_t + \text{ECT}(-1) + e_{t\ldots} \ldots\ldots (3)$$

ECT= *error correction terms*
D= Stationarity Level 1st (*first difference)*

In the ECM model, the ECT coefficient (-1) must range from -1 to 0 to determine whether the ECM model is valid. If valid, continue with long-term and short-term estimates as well as classical assumption tests and statistical tests to get the BLUE (Best Linear Unbiased) estimation regression results.

4. Results

Based on the results of data collection from 1982 to 2020, as shown in Table 1, the results showed that for the variables LOG GDP_CAP, R_STA, R_SEP, R_EMPLY, R_PSHNP sequentially, the average data is 3.169415, 1.102414, 0.977524, 0.374521, and 0.158255 with a minimum value of 2.666469, 1.09, 0.948687, 0.252955, 0.086957 and the maximum values are 3.59038, 1.11, 1.039127, 0.56686 and 0.247216. All variables with 29 observations passed the Jarque-Bera data normality test because they had a probability of 0.05.

Testing the stationarity of the data is very important. It should be done because the validity and stability of the data will be things that need to be considered if the data is not stationary. The data will be stationary if the variance value is constant and does not fluctuate systematically during the observation time, which can be known by performing the Augmented Dickey-Fuller (ADF) test. In this ECM model, all variables should be stationary at the same integration test level and not stationary at the same level (Adika & Rahmawati, 2021). However, if the data is not stationary, it will encourage false regression (Adika & Rahmawati, 2021). The results are shown in Table 2.

Table 1: Descriptive Statistics

	LOG_GDP CAP	R_STA	R_SEP	R_EMPLY	R_PSHNP
Mean	3.169415	1.102414	0.977524	0.374521	0.158255
Median	3.060797	1.1	0.973454	0.388646	0.142857
Maximum	3.59038	1.11	1.039127	0.56686	0.247216
Minimum	2.666469	1.09	0.948687	0.252955	0.086957
Std. Dev.	0.304455	0.007863	0.01994	0.069252	0.051779
Skewness	0.143691	-0.444366	1.062211	0.113697	0.329949
Kurtosis	1.553776	1.798964	4.520827	3.656507	1.818981
Jarque-Bera	2.627101	2.697402	8.24818	0.583273	2.211578
Prob.	0.268864	0.259577	0.016178	0.74704	0.33095
Sum	91.91303	31.97	28.34821	10.8611	4.589385
Sum Sq. Dev.	2.595402	0.001731	0.011133	0.134282	0.075071
Observations	29	29	29	29	29

Source: World Bank, Central Bureau of Statistics processed with eviews10

Table 2: Data Stationarity Test (First)

Intermediate ADF test results D(UNTITLED)				
Series	Prob.	Lag	Max Lag	Obs
D(LOG_GDP_CAP)	0.0014	0	5	27
D(R_STA)	0.0021	0	5	27
D(R_SEP)	0.005	4	5	23
D(R_EMPLY)	0.0003	1	5	26
D(R_PSHNP)	0.0015	0	5	27

Source: World Bank, Central Bureau of Statistics processed with eviews10

The unit root test, as shown in Table 2, found that the data variables LogGDP_CAP, R_STA, R_SEP, R_EMPLY, and R_PSHNP are not stationary at the level. Because the test results at the level are not stationary, the testing process is continued at the first difference level. The test results at the first difference level show that the LogGDP_CAP, R_STA, R_SEP, R_EMPLY, and R_PSHNP data are stationary. Thus, the hypothesis was accepted.

Next, the cointegration test was carried out to know the residual value of the model used in the study. Before testing the independent and dependent variables' cointegration, both have the same degree of integration (Adika & Rahmawati, 2021). The regression model with cointegration illustrates that there has been a balance and the independent and dependent variables have an influence in the long run. Ways to determine cointegration in the regression model can use by the Johansen test, bound test, and the Engel-Granger Cointegration Regression Durbin-Watson (CRDW) test (Adika & Rahmawati, 2021). The Engel-Granger test approach was used, with the result being shown in Table 3.

The test results in Table 3 regarding the stationary residue show that the stationary residue is at the level. It found the existence of integration between variables as evidenced by the residual probability value of ADF of 0.0038, which is smaller than 5% alpha. These results showed that there is cointegration between variables and found that there has been a balance between these variables in the long run. Therefore, the hypothesis was accepted.

Table 3: Residual Stationary Testing Results (ECT) at Level

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-3.785885	0.0079
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

Source: World Bank, Central Bureau of Statistics processed with eviews10

Further analysis is to examine ECM-EG Model Selection. In the ECM-EG test, the residual coefficient of ECT(-1) must range from -1 to 0 and is significant, so the selection of estimates indicates that the ECM model used is valid with the following formula used:

$$DLogGDP\_CAP_t = \beta_0 + D\beta_1 R\_STA_t + D\beta_2 R\_SEP_t + D\beta_3 R\_EMPLY_t + D\beta_4 R\_PSHNP_t + ECT(-1) + e_t \quad (4)$$

Empirical results, as shown in Table 4, showed that the residual ECT coefficient-value (-1) ranges from -1 to 0, which is -0.340377, and has a significant probability value, which is seen from the probability value of 0.0587, which is smaller than 10% alpha, so the model ECM-EG is valid.

Table 4: ECT Coefficient Test Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECT(-1)	-0.273232	0.137037	-1.993859	0.0587

Source: World Bank, Central Bureau of Statistics processed with eviews10

Table 5: Short-Term and Long-Term Regression

Short Term			**Long Term**		
Variable	Coefficient	Prob.	Variable	Coefficient	Prob.
C	0.025115	0.1256	C	-16.34559	0.0086
D(R_STA)	8.049802	0.1265	(R_STA)	16.74825	0.0031
D(R_SEP)	0.869084	0.4425	(R_SEP)	0.625658	0.6491
D(R_EMPLY)	0.390455	0.1455	(R_EMPLY)	-0.210226	0.6511
D(R_PSHNP)	0.546275	0.4945	(R_PSHNP)	3.277258	0.0002
ECT(-1)	-0.273232	0.0587			

Source: World Bank, Central Bureau of Statistics processed with eviews10

Moreover, estimates in the short and long term were conducted to examine ECM-EG results. The results of the regression processing, as shown in Table 5, show that both in the short and long term, the variables R_STA, R_SEP, and R_PSHNP have a positive effect on GDP_CAP, while the variable R_EMPLY has a positive effect in the short term and negative in the long term.

The results of econometric equations, in the long run, are shown as follows:

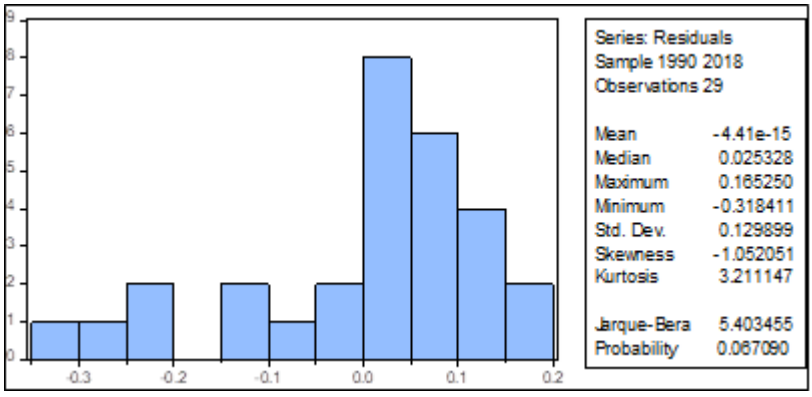
$$\ln\widehat{GDP\_CAP}_t = -16.34559 + 16.74825\ DR\_STA_t - 0.625658\ DR\_SEP_t - 0.210226\ DR\_EMPLY_t + 3.277258\ DR\_PSHNP_t$$

Meanwhile, the results of econometric equations in the short run are as follows:

$$\ln\widehat{GDP\_CAP}_t = 0.025115 + 8.049802 R\_STA_t - 0.869084\ R\_SEP_t + 0.390455 R\_EMPLY_t + 0.546275 R\_PSHNP_t$$

In the short term, no variables have a significant effect, while in the long term, only the variables R_STA and R_PSHNP have a significant effect. Based on the results, every 1 percent increase in R_STA in the long term will increase economic growth by 16.74825 percent. And every 1 percent increase in R_PSHNP in the long term will increase economic growth by 3.277258 percent. At the same time, other variables have no significant effect.

In addition, the classical assumption test aims to see whether the estimation results meet the classical assumptions or not. It should be done because it relates to the conditions of the best linear unbiased estimator (Figure 2).



Source: World Bank, Central Bureau of Statistics processed with eviews10

Figure 2: Data Normality Test Results

Based on Figure 2, the results showed that the data is normally distributed; the prob. value evidence this. Jarque-Berra (J-B) of 0.067090 is more than the 5% alpha significance level. This study conducted an autocorrelation test using the Breusch-Godfrey test (Table 6).

Table 6 found that the data is homoscedastic. It is evidenced by the results of Breusch-Pagan-Godfrey, which show the value of Obs* R-squared 4.516762, which

is greater than the 5% alpha significance. And when viewed from the value of prob. Chi-Square has an alpha significance level of more than 5%, so the data passes and is safe from heteroscedasticity problems. The test results, as shown in Table 7, indicate that the data is safe from multicollinearity conditions. It is evidenced by the VIF value, which is less than 10.

Table 6: Heteroscedasticity Test Results

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	1.106903	Prob. F(4,24)	0.3762
Obs*R-squared	4.516762	Prob. Chi-Square(4)	0.3406
Scaled explained SS	3.420119	Prob. Chi-Square(4)	0.4901

Source: World Bank, Central Bureau of Statistics processed with eviews10

Table 7: Multicollinearity Test Results

Variable	**Coefficient**	**Uncentered**	**Centered**
	Variance	VIF	VIF
C	32.57662	47989.25	NA
(R_STA)	26.01527	46577.59	2.287569
(R_SEP)	1.843931	2596.644	1.042795
(R_EMPLY)	0.210755	44.9855	1.437596
(R_PSHNP)	0.582171	23.69844	2.220045

Source: World Bank, Central Bureau of Statistics processed with eviews10

Next, to examine the coefficient of determination (R2), Table 8 found that the test results in the long term and short term obtained R-Squared values of 0.81796 and 0.322457, respectively. The economic growth variable is influenced by gender equality in health, education, job opportunities, and empowerment. Politics in the long term is 81.8%, while other variables influence 19.8%. Moreover, the effect is 32.2% in the short term, while the remaining 68.8% is influenced by other variables that are not estimated in this study.

Table 8: Results of the Coefficient of Determination

Long Term		**Short Term**	
R-squared	0.81796	R-squared	0.322457

Source: World Bank, Central Bureau of Statistics processed with eviews10

Table 9: F Statistical Test Results

Long Term		**Short Term**	
F-statistic	26.95981	F-statistic	2.094056
F-Table	2.78	F-Table	2.78
Prob(F-statistic)	0.000	Prob(F-statistic)	0.104574

Source: World Bank, Central Bureau of Statistics processed with eviews10

The F statistical test is used to see whether all variables significantly affect the dependent variable if taken collectively. Table 9 showed that the long-term F-arith. is 26.95981, the short-term is 2.094056, and the F-table is 2.78. Thus, the hypothesis stating that the level of gender equality in the fields of health, education, employment, and empowerment affected Indonesia's economic growth from 1990-2018 in the long term was accepted. However, the results cannot empirically prove the hypothesis in the short term.

Lastly, the test examines partial tests (t-test) in the short-term and long-term. Table 10 found that in the short term, the hypothesis is rejected. However, the hypothesis was accepted in examining the effect in the long run. It means that in the long term, there is a significant positive influence between gender equality in the health sector and Indonesia's economic growth from 1990-2018. In the influence of women's education level on economic growth, based on the t-table value and compared with the t-count-value, it found no significant effect in the long and short term of gender equality at the education level on Indonesia's economic growth from 1990-2018. In terms of the influence of women's labor participation rate on economic growth, the results showed that in the short and long term, there is no significant positive effect of gender equality in employment on the level of the Indonesian economy for the period 1990-2018. Lastly, in the influence of women's political participation rate on economic growth, the results showed that there is no significant positive effect in the short term, while in the long term, there is a significant positive effect between gender equality in political empowerment at the level of the Indonesian economy for the period 1990-2018.

Table 10: The results of t-arithmetics

Variable R_STA	**Short Term**	**Long Term**
Value t-arith.	1.588237	3.283638
Table t-value	1.708	1.708
Variable R_SEP	**Short Term**	**Long Term**
Value t-arith.	0.782067	0.460749
Table t-value	1.708	1.708
Variable R_EMPLY	**Short Term**	**Long Term**
Value t-arith.	1.509157	-0.457928
Table t-value	1.708	1.708
Variable R_PSHNP	**Short Term**	**Long Term**
Value t-arith.	0.694699	4.295217
Table t-value	1.708	1.708

Source: World Bank, Central Bureau of Statistics processed with eviews10

5. Discussion

The analysis found that the experience of gender in learning has increased; this will have a significant positive impact in the long term. It is because, through school or education, a person can optimize his potential and have the opportunity to get a better career. As reported by Central Statistics Agency (2017), in urban areas, the

percentage of women enrolled in tertiary institutions is 26.86%, while men are only 22.54%; in rural areas, the percentage of women is higher than men, namely 9.62% while men only 7.36%. Kemenppa (2017) proves that gender experiences in learning are starting to occur; many women have received education and received higher education. Gender equality will also be more established if women realize the meaning of education and self-improvement described in the research of Padang (2019) and Klasen & Lamanna (2009) suggest that better learning for women will encourage women to obtain better economic activities.

Driven by the reasons put forward by Harahap & Rejekiningsih (2014), it was reported that the ratio of the average length of schooling had a significant positive effect on economic development in Central Java Province. It is because learning trains humans to master and overcome the complexities of economic development but also acts as a lever to improve it (Neamtu, 2015). The increase in the ratio indicates that the learning gap between women and men continues to be low (Arifin, 2020). Inequality in the field of learning in RLS (*rentabilitas, likuiditas, solvabilitas*) has had a positive and significant impact on the economic development of East Java Province from 2009–2018; this situation proves that RLS is increasing (symptoms of learning are shrinking), approaching the increase in the economy (Rahmawati & Hidayah, 2020).

In terms of employment, the results of the analysis that has been carried out show that increasing gender equality in the field of employment will have a positive impact in the short term and a negative one in the long term. The female labor force participation rate (TPAK) is a dimension used to estimate the involvement of women in the employment sector (Padang, 2019). The results of this study are also supported by research carried out by Qarina & Wahab (2021) with a case study of problems in South Sulawesi, which found that the inequality ratio of the labor force participation rate is significant and has a positive influence on economic development. Inequality in the workforce is still a scourge that needs attention because women's participation is still quite low, and there is still an assumption that women are better off doing housework and raising children (Infarizki et al., 2018).

Gender equality in employment encourages economic development in East Java Province (Rahmawati & Hidayah, 2020). A study by Padang (2019) found that the LFPR variable had a positive and insignificant effect on GRDP per capita in Indonesia from 2011-2017, but the ratio of the labor force participation rate to the gross regional product does not show a significant effect. It means that any increase in the labor force participation ratio in an area will not always increase its gross regional product, especially in the short term.

An increase in the ratio between women and men means a reduction in the gap between men and women in employment (Arifin, 2020). The gender equality ratio in employment had a negative and insignificant impact on the economic development of East Java Province from 2009–2018 due to the unavailability of employment opportunities that could accommodate both male and female workers equally (Rahmawati & Hidayah, 2020). So, in the end, it will increase the number of dependencies and reduce or become a burden on the economy if it is not balanced with the provision of adequate employment. In addition, if examined further, the effect of gender equality is strongly influenced by the fast or slow process of The Law

of Diminishing Return (TLDR), which is strongly influenced by the quality of human resources and technological advances as well as the number of jobs capable of absorbing male and female workers.

Based on the results of the analysis, it can be explained that the level of gender equality in the field of political participation and empowerment will have a positive and significant impact in the long term. It is because the widespread presence of women in government and leadership can share aspirations for young women to improve their educational attainment (Beaman et al., 2012). omen as leaders tend to prioritize investment in public goods, so the position of women is very important in improving people's welfare (Chattopadhyay et al., 2010).

The results of this study are supported by Beaman et al. (2012), who reported that women in the legislative realm could make comprehensive laws and regulations in defending their people to improve welfare. It is further explained in Chattopadhyay et al. (2010) research were female heads of state tend to improve the quality of SDM or the HDI of their population compared to male heads of state. With the increase in HDI, it will be accompanied by an increase in state income. Based on Abdurrahman & Tusianti (2021), using multiple linear regression models and research in 514 districts/cities, the participation of women in parliament, women as experts or professionals, and women who have careers as entrepreneurs can increase significantly. HDI in Indonesia, in turn, will have a positive influence on economic development. So, the participation and contribution of women in the political sphere will provide positive results for the economy.

6. Conclusion

Based on the research results, the results showed that the level of gender equality in health, education, employment, and political participation together affected the level of economic development in Indonesia from 1990-2018 in the long term. Where gender equality in the health sector and political participation in the long term have a positive and significant impact on economic development, which means that if there is an increase in life expectancy and the level of women's participation in parliament, it will further encourage economic development in Indonesia. On the other hand, gender equality in education and employment has no significant effect on economic growth in Indonesia, both in the long and short term.

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