

DYNAMICS OF THE GROWTH-GENDER NEXUS IN INDONESIA: A CAUSALITY APPROACH AND MACROECONOMIC LAG EFFECTS ON THE GENDER DEVELOPMENT INDEX

Mhd. Arief Rizky

Program Studi Magister Ilmu Ekonomi, Fakultas Ekonomi dan Bisnis Universitas Sumatera Utara, Medan

E-mail: aripsinaga@gmail.com

Received : 26 April 2026

Accepted : 20 May 2026

Revised : 03 May 2026

Published : 02 June 2026

Abstract

This study aims to analyze the dynamics of the growth-gender nexus in Indonesia by examining the relationship between economic growth, macroeconomic indicators, and the Gender Development Index. This study uses a quantitative approach with annual time series data from Indonesia for the period 2010–2025. The dependent variable in this study is the Gender Development Index, while the independent variables include real GDP growth, inflation, the Open Unemployment Rate, and the poverty rate. The analysis method used is the Autoregressive Distributed Lag (ARDL), followed by diagnostic tests and Granger causality tests. The best model selected is ARDL (1,0,0,1,1). The estimation results show that GDP growth has a positive influence on the Gender Development Index, but it is not yet significant at the 5% level. Inflation, unemployment, and poverty also do not have a significant effect on the Gender Development Index. The Bounds Test results indicate that there is no long-term relationship between variables because the F-statistic value of 1.905563 is smaller than the lower bound value. Therefore, the model was not continued to the Error Correction Model. The Granger causality test also showed no causal relationship between GDP growth and the Gender Development Index. However, a one-way causality was found between the Gender Development Index and poverty. This finding suggests that Indonesia's economic growth has not automatically strengthened gender development. Gender development needs to be strengthened through more direct and specific policies, rather than relying solely on macroeconomic growth.

Keywords: Economic Growth, Gender Development Index, Growth-Gender Nexus, Macroeconomics

INTRODUCTION

Economic growth is no longer understood simply as an increase in Gross Domestic Product, but also as a process of expanding human capabilities that must reach men and women equally. Indonesia's economic growth has shown a relatively stable direction, but this growth does not necessarily automatically reflect the equitable distribution of development outcomes between men and women. Gender equality is one of the main pillars of the Sustainable Development Goals agenda, especially Goal 5, which emphasizes achieving gender equality and the empowerment of all women and girls (United Nations, 2015). In 2025, the Indonesian economy is projected to grow by 5.11 percent, an increase compared to 2024's 5.03 percent, with Gross Domestic Product at current prices reaching Rp23,821.1 trillion and GDP per capita reaching Rp83.7 million (BPS, 2026a). The data shows that Indonesia's economy continues to grow, but it is necessary to examine whether this growth has actually improved the quality of human development equitably for men and women (Sen, 1999; World Bank, 2012). The growth-gender nexus phenomenon can be understood as a reciprocal relationship between economic growth and gender equality. In this relationship, economic growth can expand women's access to education, health, employment, and income, while increasing women's capabilities can also strengthen economic productivity, the quality of human resources, and household welfare (Duflo, 2012). Theoretical studies show that gender inequality can be a barrier to economic growth, particularly through low investment in human capital, limited participation of women in the labor market, and women's weak role in family economic decision-making (Santos Silva & Klasen, 2021). Thus, the relationship between economic growth and gender development cannot be seen as a one-way street, as both can influence each other in the short and long term (Klasen & Lamanna, 2009). The Gender Development Index (GDI) is an important indicator for comparing human development achievements between men and women. The GDI measures gender-based human development through three main dimensions: a long and healthy life, knowledge, and a decent standard

of living (BPS, 2025). In 2024, Indonesia's GDI was at 91.85 points, indicating that the development gap between men and women is narrowing, although it has not completely disappeared (BPS, 2025). However, a GDI approaching 100 does not necessarily indicate high development quality, as equality can also occur at equally low levels of achievement (UNDP, 2024). Therefore, the GDI needs to be studied alongside macroeconomic variables to determine whether economic growth and stability truly impact gender development (World Bank, 2012). Macroeconomic dynamics also need to be considered because gender development is influenced not only by economic growth but also by inflation, unemployment, poverty, and community income. In December 2025, Indonesia's annual inflation was recorded at 2.92 percent, so changes in fixed prices can affect household purchasing power and people's standards of living (BPS, 2026). In August 2025, Indonesia's Open Unemployment Rate was 4.85 percent, with a working population of 146.54 million people and an average labor wage of Rp3.33 million (BPS, 2025). In March 2025, the percentage of Indonesia's poor population was 8.47 percent, or around 23.85 million people, so the poor still need to be considered in inclusive and gender-responsive development analysis (BPS, 2025).

This research gap lies in the limited number of studies explaining the dynamic relationship between economic growth and the GDI in Indonesia. Most previous studies have used linear regression, static panel regression, or spatial approaches to explain the relationship between economic variables and gender development (Amelia et al., 2024). These approaches are important, but insufficient to answer whether economic growth first influences the GDI, whether the GDI first influences economic growth, or whether the two have a reciprocal relationship. Furthermore, the impact of macroeconomic variables on the GDI may not appear in the same year, as economic changes typically take time to be felt in education, health, employment, income, and quality of life (Granger, 1969; Pesaran et al., 2001). The novelty of this research lies in the use of a causality approach and macroeconomic lag effects to explain the dynamics of the growth-gender nexus in Indonesia in a simpler yet empirically robust manner. This research not only asks whether economic growth influences the GDI, but also asks when this influence emerges and whether the relationship is unidirectional or reciprocal (Granger, 1969). By incorporating data on economic growth, inflation, unemployment, poverty, and the GDI, this study is expected to provide a clearer picture of whether Indonesia's economic development is moving in line with the gender equality agenda set out in SDGs Goal 5 (United Nations, 2015). The results of this study can also serve as a basis for policy, stating that economic growth should not only pursue GDP growth but also strengthen the distribution of human development between men and women (World Bank, 2012).

LITERATURE REVIEW

A. Growth-Gender Nexus

The growth-gender nexus explains the relationship between economic growth and gender development. Economic growth is not only understood as increasing national income, but also as a process that should broaden human life opportunities more equitably. Economic growth can be considered meaningful if its results contribute to improving people's access to education, health, employment, income, and a decent standard of living, including for women and men equally (Todaro & Smith, 2020; Robeyns, 2017).

Increased economic growth can improve conditions for women if it creates employment opportunities, increases household incomes, strengthens education and health services, and expands women's access to economic resources. However, economic growth does not automatically lead to gender equality if the benefits of growth are enjoyed only by certain groups or are still limited by unequal social structures. Therefore, economic development must be viewed in terms of its ability to reduce gender barriers within the family, society, the labor market, and access to productive resources (Benería et al., 2016; Momsen, 2019).

Conversely, gender development can also influence economic growth. When women receive better education, greater access to employment, and opportunities to participate in economic activities, the quality of human resources and economic productivity can improve. In this context, the growth-gender nexus is understood as a reciprocal relationship: economic growth can drive gender development, while gender development can also strengthen economic growth by increasing capabilities, workforce participation, and household well-being (Benería et al., 2016; Todaro & Smith, 2020). Therefore, economic growth and gender development need to be understood as a two-way relationship that can influence each other in the short and long term (Akhtar et al., 2023).

B. Gender Development Index

In this study, the Gender Development Index (GDI) is understood as an indicator that compares human development achievements between men and women. Conceptually, the GDI is based on the idea that human development is not solely related to income but also encompasses health, knowledge, and a decent standard of

living. Therefore, the GDI is used to assess whether human development outcomes have been enjoyed relatively equally by women and men (Robeyns, 2017; Todaro & Smith, 2020). The GDI is important in development studies because high economic growth does not necessarily indicate equitable distribution of development outcomes between men and women. If women remain disadvantaged in access to education, employment, income, and decision-making, development cannot be considered inclusive. Therefore, the GDI can be used to assess the quality of gender development, particularly in assessing whether women and men have relatively equal opportunities to benefit from the development process (Momsen, 2019; Benería et al., 2016). The GDI is positioned as a key indicator of gender development that can be linked to economic dynamics. If economic growth increases but the GDI remains stagnant, then that growth does not fully reflect gender-equitable development. Conversely, an increase in the GDI can indicate that economic development is moving toward greater inclusiveness, as human development outcomes between women and men become more balanced (Robeyns, 2017; Todaro & Smith, 2020).

METHOD

A. Types and Approaches of Research

This study uses a quantitative approach with secondary time series data at a national scale in Indonesia. The quantitative approach was chosen because this study aims to examine the empirical relationship between economic growth, macroeconomic variables, and the Gender Development Index (GDI) through an econometric model that can interpret short-term, long-term, and lag-effect relationships between variables (Gujarati & Porter, 2009). The main analysis method used is Autoregressive Distributed Lag (ARDL). ARDL was chosen because it is suitable for time series research with a relatively limited number of observations and can be used when the research variables have a mixed level of stationarity, namely $I(0)$ and $I(1)$, as long as there are no variables integrated at the second order or $I(2)$ (Pesaran et al., 2001). In this study, ARDL was used to examine the effects of economic growth, inflation, unemployment, and poverty on the GDI, both in the short and long term. This approach also aligns with the research objectives because the effects of macroeconomic variables on gender development do not always appear in the same year but can occur over one or more time periods (Enders, 2014).

B. Data Types and Sources

The data used in this study is annual secondary data from 2010 to 2025 on a national scale in Indonesia. The research data source comes from official national statistical publications containing data on the GDI, economic growth, inflation, open unemployment rate, and poverty rate. The selection of annual data is adjusted to the availability of the GDI, which is generally published annually. Therefore, the use of quarterly data is not recommended if the quarterly GDI is not available as the original data (Gujarati & Porter, 2009). The unit of analysis for this study is the Indonesian economy at large, not the provinces. Therefore, the method used is not panel data, panel VAR, or panel regression. Because the study uses a single regional unit with a specific time sequence, a more appropriate model is a time series model such as ARDL, with the addition of a causality test to determine the direction of the relationship between variables within the growth-gender nexus framework (Enders, 2014).

C. Variable Definition

The dependent variable in this study is the Gender Development Index (GDI). The GDI is positioned as a gender development indicator because it illustrates the comparison of human development achievements between men and women, particularly in the dimensions of health, education, and a decent standard of living. In the ARDL model, the GDI is the dependent variable explained by economic growth and other macroeconomic variables (Todaro & Smith, 2020).

The primary independent variable in this study is economic growth, while supporting macroeconomic variables include inflation, the open unemployment rate, and the poverty rate. These variables were chosen because they theoretically influence household welfare, access to education, purchasing power, employment opportunities, and the community's standard of living, which may ultimately be related to gender development (Todaro & Smith, 2020).

D. Research Model

The basic model of this study places the GDI as the dependent variable and macroeconomic variables as the independent variables. In general, the long-term relationship tested in this study can be formulated as the GDI as a function of economic growth, inflation, unemployment, and poverty (Pesaran et al., 2001).

$$IPG_t = \alpha_0 + \beta_1 PE_t + \beta_2 INF_t + \beta_3 TPT_t + \beta_4 POV_t + \varepsilon_t$$

The model is then developed into an ARDL model to capture the lag effects of the dependent and independent variables. The general form of the ARDL model can be written by including the lag of the GPI and the lag of all macroeconomic variables, so that the model can explain the GPI's response to economic changes in the current period and the previous period (Nkoro & Uko, 2016).

$$IPG_t = \alpha_0 + \sum \phi_i IPG_{\{ti\}} + \sum \beta_i PE_{\{ti\}} + \sum \gamma_i INF_{\{ti\}} + \sum \delta_i TPT_{\{ti\}} + \sum \theta_i POV_{\{ti\}} + \varepsilon_t$$

If the results bounds test If a long-term relationship is indicated, the model is then continued with the Error Correction Model (ECM). The ECM is used to observe short-term adjustments towards long-term equilibrium through the error correction term coefficient, which is expected to be negative and significant (Pesaran et al., 2001).

$$\Delta IPG_t = \alpha_0 + \sum \phi_i \Delta IPG_{\{ti\}} + \sum \beta_i \Delta X_{\{ti\}} + \lambda ECT_{\{t-1\}} + \varepsilon_t$$

RESULTS AND DISCUSSION

A. ARDL Model Estimation

Dependent Variable: IPG
 Method: ARDL
 Date: 05/03/26 Time: 00:42
 Sample (adjusted): 2011 2025
 Included observations: 15 after adjustments
 Maximum dependent lags: 1 (Automatic selection)
 Model selection method: Akaike info criterion (AIC)
 Dynamic regressors (1 lag, automatic): PDB INF TPT POV
 Fixed regressors: C
 Number of models evaluated: 16
 Selected Model: ARDL(1, 0, 0, 1, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
IPG(-1)	0.794328	0.422853	1.878497	0.1024
PDB	0.362888	0.164028	2.212359	0.0626
INF	-0.030472	0.044762	-0.680761	0.5179
TPT	1.006336	0.574452	1.751819	0.1233
TPT(-1)	-0.553695	0.332123	-1.667140	0.1394
POV	0.029390	0.347935	0.084469	0.9350
POV(-1)	-0.408113	0.324700	-1.256892	0.2491
C	18.82161	41.53551	0.453145	0.6642
R-squared	0.939127	Mean dependent var		91.02267
Adjusted R-squared	0.878255	S.D. dependent var		0.799718
S.E. of regression	0.279038	Akaike info criterion		0.589586
Sum squared resid	0.545034	Schwarz criterion		0.967213
Log likelihood	3.578105	Hannan-Quinn criter.		0.585563
F-statistic	15.42778	Durbin-Watson stat		2.242630
Prob(F-statistic)	0.000918			

*Note: p-values and any subsequent tests do not account for model selection.

Source: 2026 Data Processing Results

The estimation results show that GDP has a positive coefficient of 0.362888 with a probability of 0.0626. This means that increased economic growth tends to be followed by an increase in the GDI, but this effect is not yet significant at the 5% level. At the 10% significance level, the effect of GDP can be read as a marginal or weak positive effect. Inflation has a negative coefficient of -0.030472, but it is not significant. The current year's TPT has a positive coefficient, while the one-period lagged TPT has a negative coefficient, but both are insignificant. Current year poverty and one-period lagged poverty are also not significant on the GDI. The R-squared value of 0.939127 and the Adjusted R-squared of 0.878255 indicate that approximately 87.83 percent of the variation in GPI can be explained by the variables in the model. The Prob(F-statistic) value of 0.000918 is less than 0.05, so the model is simultaneously significant. However, because the number of effective observations is only 15, these results need to be interpreted with caution to avoid making overly strong claims.

B. Bound Test

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-statistic	1.905563	10%	2.2	3.09
k	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37
Finite Sample: n=30				
Actual Sample Size	15	10%	2.525	3.56
		5%	3.058	4.223
		1%	4.28	5.84

Source: Data Processing Results, 2026

The Bounds Test was used to determine whether there is a long-term relationship between the GPI and macroeconomic variables. The test results showed an F-statistic of 1.905563. This value is smaller than the lower bound at the 10% significance level, which is 2.20, and smaller than the lower bound at the 5% significance level, which is 2.56. Based on these criteria, the null hypothesis stating that there is no relationship at the level cannot be rejected. Thus, no evidence of a long-run relationship was found between the GPI, GDP, inflation, TPT, and poverty during the study period. Therefore, the model was not further expanded to the Error Correction Model (ECM). The analysis focused on the short-run dynamic relationships in the ARDL model and Granger causality tests.

C. Granger Causality Test

Pairwise Granger Causality Tests
 Date: 05/03/26 Time: 01:05
 Sample: 2010 2025
 Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
INF does not Granger Cause TPT	15	0.16601	0.6909
TPT does not Granger Cause INF		0.59363	0.4559
IPG does not Granger Cause TPT	15	2.17349	0.1662
TPT does not Granger Cause IPG		0.12179	0.7332
PDB does not Granger Cause TPT	15	0.00011	0.9918
TPT does not Granger Cause PDB		2.54702	0.1365
POV does not Granger Cause TPT	15	0.15012	0.7052
TPT does not Granger Cause POV		1.60437	0.2293
IPG does not Granger Cause INF	15	1.86155	0.1975
INF does not Granger Cause IPG		0.05777	0.8141

Source: Data Processing Results, 2026

A Granger causality test was conducted with lag 1 to determine the direction of the relationship between variables. The test results indicate no causality between GDP and GPI, as the probability value of 0.9778 is greater than 0.05. Conversely, GPI also does not cause GDP, as the probability value of 0.4826 is greater than 0.05. Thus, no two-way causal relationship was found between economic growth and GPI during the study period. The only significant relationship at the 5% level is the GDI on poverty, indicated by a probability value of 0.0462. This means that changes in the GDI in the previous period have predictive power over changes in poverty. Meanwhile, GDP, inflation, TPT, and poverty variables were not shown to Granger-influence changes in the GDI. This finding suggests that macroeconomic dynamics were not sufficiently strong in explaining the direction of causality on the GDI during the study period.

DISCUSSION

The results of the study indicate that economic growth has a positive influence on the GDI, but it is not yet significant at the 5% level. This finding indicates that increasing GDP has not directly and significantly improved gender development outcomes in Indonesia. Conceptually, economic growth should improve gender development if it expands women's and men's access to education, health, employment, and income. However, these empirical results show that economic growth has not automatically created a significant increase in the GDI. The insignificance of inflation on the GDI indicates that changes in price levels during the study period are not sufficiently strong in explaining changes in gender development. Although inflation can theoretically suppress household purchasing power and affect access to basic needs, the estimation results show that this effect has not been statistically proven. This may occur because the GDI is a slow-moving development indicator, while inflation is more fluctuating from year to year.

The open unemployment rate showed an insignificant effect on the GPI, both in the current period and at a one-period lag. This result suggests that changes in national unemployment are not directly reflected in changes in the GPI. One possible explanation is that the GPI is influenced not only by labor market conditions but also by dimensions of education, health, and income, which experience gradual changes. Poverty also had no significant effect on the GDI in the ARDL model. However, the Granger test results showed that the GDI statistically caused poverty. This finding is interesting because it suggests that changes in gender development can signal changes in poverty in subsequent periods. In other words, increased gender development can be associated with decreased socioeconomic vulnerability, even though this relationship does not appear as a direct effect of poverty on the GDI in the ARDL model.

The Bounds Test results, which showed no cointegration, indicate that the relationship between the GDI and macroeconomic variables did not form a long-run equilibrium during the 2010-2025 period. Therefore, this study did not use the ECM. This finding reinforces the understanding that gender development is complex and does not always move in the same direction as aggregate macroeconomic indicators in the long run. Within the framework of the growth-gender nexus, the results of this study indicate that the relationship between economic growth and gender development in Indonesia has not been proven to be a strong reciprocal relationship. GDP is not proven to Granger-cause GDI, nor is GDI proven to cause GDP. Therefore, the growth-gender nexus in this study is better understood as a potential relationship that has not been fully confirmed empirically in annual national data for the study period.

Overall, the research results indicate that the macroeconomic variables used do not have a significant partial effect on the GDI at the 5% level. However, the model is simultaneously significant and stable. The implication of these results is that the increase in the GDI cannot be sufficiently explained by GDP growth, inflation, the TPT, and poverty alone. Gender development policies need to more specifically target access to education, health, women's employment opportunities, social protection, and the quality of economic participation so that economic growth can truly contribute to gender development.

CONCLUSION

Based on the research results, it can be concluded that economic growth, inflation, TPT, and poverty have not significantly influenced the Gender Development Index in Indonesia during the study period. Economic growth has a positive relationship with the GDI, but it is not yet significant at the 5% level, so that GDP growth cannot be considered a factor that directly strengthens gender development. The Bounds Test results also indicate no long-term relationship between macroeconomic variables and the GDI, so the model was not continued to the ECM. Furthermore, the Granger test results indicate no causality between GDP and the GDI, either from GDP to the GDI or from the GDI to GDP. Therefore, the concept of the growth-gender nexus in this study has not been proven through a direct relationship between economic growth and the GDI. However, the causality from the GDI to poverty indicates that gender development has a potential role in poverty reduction. Therefore, increasing the GDI needs to be positioned as a stand-alone policy agenda, not simply as an automatic consequence of economic growth.

REFERENCES

- Amelia, D., Permana, MRA, Yosifa, AF, Kurniawan, A., & Suliyanto. (2024). Indonesia's gender development index in a spatial approach perspective with Queen Contiguity weighting. *Limits: Journal of Mathematics and Its Applications*, 21(2), 211–222.
- Benería, L., Berik, G., & Floro, M. (2016). *Gender, development and globalization: Economics as if all people matter* (2nd ed.). Routledge.
- Brown, R.L., Durbin, J., & Evans, J.M. (1975). Techniques for testing the constancy of regression relationships over time. *Journal of the Royal Statistical Society: Series B (Methodological)*, 37(2), 149-192.
- Central Statistics Agency. (2026). Year-on-year (y-on-y) inflation in December 2025 was 2.92 percent. <https://www.bps.go.id/id/pressrelease/2026/01/05/2527/inflasi-year-on-year--y-on-y--pada-desember-2025-sebesar-2-92-persen.html>
- Duflo, E. (2012). Women empowerment and economic development. *Journal of Economic Literature*, 50(4), 1051–1079. <https://doi.org/10.1257/jel.50.4.1051>.
- Enders, W. (2014). *Applied econometric time series* (4th ed.). John Wiley & Sons. Granger, C. W. J. (1969). Investigating causal relations by econometric models and cross-spectral methods. *Econometrica*, 37(3), 424–438. <https://doi.org/10.2307/1912791>.
- Gujarati, D. N., & Porter, D. C. (2009). *Basic econometrics* (5th ed.). McGraw-Hill/Irwin.
- Klasen, S., & Lamanna, F. (2009). The impact of gender inequality in education and employment on economic growth: New evidence for a panel of countries. *Feminist Economics*, 15(3), 91–132. <https://doi.org/10.1080/13545700902893106>.
- Momsen, J. (2019). *Gender and development* (3rd ed.).
- Nkoro, E., & Uko, A. K. (2016). Autoregressive Distributed Lag (ARDL) cointegration technique: Application and interpretation. *Journal of Statistical and Econometric Methods*, 5(4), 63-91.
- Pearson. United Nations. (2015). *Transforming our world: The 2030 agenda for sustainable development*. <https://sdgs.un.org/2030agenda>.
- Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16(3), 289-326. <https://doi.org/10.1002/jae.616>.
- Robeyns, I. (2017). *Wellbeing, freedom and social justice: The capability approach re-examined*. Open Book Publishers.
- Routledge. Narayan, P. K. (2005). The saving and investment nexus for China: Evidence from cointegration tests. *Applied Economics*, 37(17), 1979-1990. <https://doi.org/10.1080/00036840500278103>.
- Santos Silva, M., & Klasen, S. (2021). Gender inequality as a barrier to economic growth: A review of the theoretical literature. *Review of Economics of the Household*, 19, 581–614. <https://doi.org/10.1007/s11150-020-09535-6>.
- Sen, A. (1999). *Development as freedom*. Oxford University Press.
- Toda, H.Y., & Yamamoto, T. (1995). Statistical inference in vector autoregressions with possibly integrated processes. *Journal of Econometrics*, 66(1-2), 225-250. [https://doi.org/10.1016/0304-4076\(94\)01616-8](https://doi.org/10.1016/0304-4076(94)01616-8).
- Todaro, M. P., & Smith, S. C. (2020). *Economic development* (13th ed.).
- United Nations Development Programme. (2024). *Gender Development Index (GDI)*. Human Development Reports. <https://hdr.undp.org/gender-development-index>.
- World Bank. (2012). *World development report 2012: Gender equality and development*. World Bank. <https://openknowledge.worldbank.org/handle/10986/43>.