The Impact of Female Labor Force Participation on Regional Economic and Income Convergence

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Abstract

Research Originality: Women tend to be chosen as the non-labor force, even though they are potential workers who can contribute directly to the economy. Their level of education influences this contribution.

Research Objectives: This research examined the impact of female labor force participation on regional economic and income convergence.

Research Methods: Pooled Least Squares (PLS) and panel data estimation were conducted using cross-sectional data on 472 cities/districts across Indonesia between 2016 and 2022.

Empirical Results: The findings reveal that female labor force participation significantly enhances regional economic growth only when women have at least a senior high school education. However, their contribution to accelerating economic convergence remains suboptimal, as most female workers are elementary school graduates.

Implications: To improve the contribution of the female workforce to the economy, the government should extend compulsory education from 9 to 12 years, expand access to non-formal education for women, and establish a female-friendly labor market through job flexibility and improved childcare access.

Keywords:

childcare; education; labor force; women

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INTRODUCTION

The majority of women in Indonesia are not in the workforce and are regarded as homemakers. However, they can contribute to the economy as laborers. Increasing women's economic participation is necessary to improve their social and economic status. In addition, their participation reduces the gender gap, which leads to overall economic growth. With nearly half of the Indonesian population being women, their contribution to economic activity should be equal to that of men. Education is a significant factor influencing women's contributions to the economy (Altuzarra et al., 2019). As women's education increases, their economic opportunities should also increase. However, Tables 1 and 2 show the opposite; although the education levels of women and men are almost the same, the Female Labor Participation Rate (FLPR) is lower than that of men.

Table 1. Population Demographic Statistics by Gender (%)

Categories	2018			2022			2022-2018	
	Male	Female	Total	Male	Female	Total	Male	Female
A. Population aged 15-64 years old	50.25	49.75	100	50.63	49.37	100	0.38	-0.38
B. Labor force	61.37	38.63	100	61.06	38.94	100	-0.31	0.31
B1. Employed	61.34	38.66	100	61.02	38.98	100	-0.32	0.32
B2. Open Unemployment	61.99	38.01	100	61.82	38.18	100	-0.17	0.17
C. Non-Labor Force	26.39	73.61	100	25.68	74.32	100	-0.71	0.71
C1. School	49.36	50.64	100	48.36	51.64	100	-1.00	1.00
C2. Homemaker	9.79	90.21	100	8.78	91.22	100	-1.01	1.01
C3. Other	63.06	36.94	100	64.54	35.46	100	1.48	-1.48
D. Participation Rate	82.80	51.80	-	83.87	53.41	-	1.07	1.61
E. Proportion of Informal Employment	53.90	61.90	-	55.81	64.25	-	1.91	2.35

Source: Central Bureau of Statistics (2024)

The FLPR increased by 1.61 percent in 2022 compared to 2018, accompanied by a rise in informal employment of 2.35 percent. This increase was greater than that observed in the male labor participation rate and informal employment for men during the same period. This aligns with the increasing number of women who graduate from high school to university and the number of women as homemakers in 2022. They tend to choose to enter the non-labor force category despite being potential human capital for the economy.

This study addresses a critical development challenge in Indonesia: optimizing women's economic potential despite achieving near-parity in educational attainment with men. The topic gains urgency from Indonesia's demographic dividend, where women constitute 49.37% of the productive-age population (Table 1). However, their FLPR

remains 25–27 percent below men's (38.94% vs. 61.06% in 2022). This topic is important due to its significant economic potential. An increase in female labor participation could contribute to Indonesia's GDP. Increasing Indonesia's female labor participation to the G20 target of 58.5% by 2025 could increase annual GDP growth by 0.67 percent, equal to $123 billion by 2025 (Cameron et al., 2018). Other estimates suggest that a 25% increase in female labor participation could add $62 billion to Indonesia's GDP by 2025. Women face persistent structural barriers despite comparable education levels (Table 2). They face occupational segregation into informal sectors (64.25% in 2022 vs. 55.81% for men) and disproportionate domestic roles (91.22% of homemakers are female) (Table 1). Equity and convergence implications emerge in regions of high growth, such as Java and Sulawesi, which have significant inequality (Gini coefficients >0.38) and low gender development indices (Gender Development Index /GDI <91.63), despite robust economic growth (Table 3). Closing gender gaps could accelerate income convergence, as Sala-i-Martin (1996) posited, by redistributing labor productivity gains across regions.

Table 2. Total Productive Age Population by Gender and Education Level (%)

Categories	2018		2022		2022-2018	
	Male	Female	Male	Female	Male	Female
No schooling	2.79	5.97	2.49	4.32	-0.30	-1.65
Not/Not Yet Completed Primary School	12.50	14.77	8.25	9.95	-4.26	-4.83
Primary School (ele)	25.47	25.79	24.56	25.10	-0.92	-0.69
Junior High School (jun)	21.53	20.94	22.87	22.23	1.35	1.29
Senior High School (sen)	29.18	23.54	32.13	27.79	2.95	4.25
University (uni)	8.52	8.99	9.70	10.61	1.17	1.62
Total	**100.00**	**100.00**	**100.00**	**100.00**	**-**	**-**

Source: Central Bureau of Statistics (2024)

The Solow model can be used to show how human capital contributes to the economy. Previous research on this theme has been conducted in China (Chiengmai, 2018; Wu et al., 2022) and Sub-Saharan Africa (Thaddeus et al., 2022). However, prior studies have primarily focused on case studies in specific regions of Indonesia and failed to distinguish between the labor participation rates of women and men. Additionally, they did not examine the effect of the female labor participation rate, stratified by education level, on economic growth and convergence. Therefore, the novelty of this research lies in its analysis of the impact of women's participation rates on economic growth and economic convergence, considering both geographic location and education level.

This study advances the existing literature in three key ways. First, it provides a disaggregated gender analysis within growth models. Unlike prior studies in Indonesia, this research separates the labor contributions of women and men within the Augmented Solow framework, revealing that only women with senior high school education significantly drive

growth (see Table 2). Second, it contrasts with global models (e.g., Chiengmai, 2018) by incorporating education-stratified data, demonstrating that women with only elementary education hinder convergence despite their numerical dominance, and highlights island-level convergence dynamics. Third, it examines the relationship between the FLPR and regional economic disparities, showing that areas with higher FLPR experience faster convergence than high-growth, high-inequality regions such as Java (Gini coefficient of 0.399) (see Table 3).

Table 3. Indicators of Inequality and Women's Contribution in the Economy (%)

Island	Economic Growth		Gini Coefficient		GDI		Women's Income Contribution	
	2018	2022	2018	2022	2018	2022	2018	2022
Sumatera	4.71	4.63	0.325	0.311	91.12	91.55	32.38	32.53
Java	5.75	5.26	0.385	0.399	90.86	91.48	32.59	32.81
Bali-Nusa	2.31	4.95	0.371	0.359	92.23	92.80	38.75	39.15
Kalimantan	4.75	5.29	0.331	0.303	87.05	87.75	31.41	31.14
Sulawesi	8.79	6.27	0.375	0.365	90.73	91.27	31.55	32.11
Maluku-Papua	6.84	9.81	0.363	0.348	82.92	84.15	35.17	35.14
Indonesia	**5.17**	**5.31**	**0.384**	**0.381**	**90.99**	**91.63**	**36.70**	**37.17**

Source: Central Bureau of Statistics (2024)

The Solow model can also be used to examine how the FLPR affects economic convergence. According to Sala-i-Martin (1996), convergence is interpreted as a tendency for economic disparities between regions to narrow over time. This is particularly important given that inequality in Indonesia remains relatively high (Novianti & Panjaitan, 2022). Inequality can be assessed through the Gini coefficient, which is notably higher in high-growth regions such as Java and Sulawesi (see Table 3). Table 3 also indicates a low GDI and a limited contribution of women's income to family income in these high-growth areas. These conditions suggest that women's potential to contribute to the economy has yet to be fully optimized. Therefore, this study analyzes the effect of FLPR on regional economic growth, as measured by two indicators: Gross Regional Domestic Product (GRDP) and income convergence.

METHODS

This research used secondary data, consisting of Gross Regional Domestic Product (GRDP) from the Central Bureau of Statistics (BPS), and investment data from the Indonesia Investment Coordinating Board. Meanwhile, data on the total labor force is calculated from the National Socioeconomic Survey (SUSENAS) from 2016 to 2022. GRDP is a key indicator that measures the total value added generated by all business units in a specific region. This indicator helps policymakers track economic growth and

convergence or divergence among regions. Investment comprises domestic and foreign direct investments, including realized investment values, sectoral breakdowns, and regional distributions. Investment data is crucial for understanding the flow of capital into different regions and sectors, influencing economic growth, job creation, and regional development. Meanwhile, the labor force includes all employed or actively seeking work. This research only focuses on the female labor force.

To estimate the contribution of FLPR to regional economic, this research begins with a version of the Augmented Solow Growth (ASG) model by Mankiw, Romer, and Weil (1992) or the MRW model. This model considers saving rates/investment, population growth, and technological progress as exogenous. There are three inputs: physical capital, human capital, and labor. Due to data limitations, domestic and foreign investment refers to physical capital in this research. Assuming the Cobb-Douglas production function, production at time t is given by:

$$Y = AK^{\alpha}H^{\beta}L^{1-\alpha-\beta} \tag{1}$$

Where Y is output, K is capital, H is human capital, L is labor, and A is technology. Assume that female and male labor force account for the total labor force of an economy $(L_f + L_m = L)$ So, both female and male labor force participation can be incorporated into the model separately as an additional explanatory variable. However, female and male labor is still one entity so that the elasticity will be the same. The Augmented production is as follows:

$$Y = AK^{\alpha}H^{\beta}(L_f + L_m)^{1-\alpha-\beta} \tag{2}$$

Production function in per capita form:

$$\frac{Y}{L} = \frac{AK^{\alpha}H^{\beta}(L_f + L_m)^{1-\alpha-\beta}}{L}\left(\frac{L^{\alpha}}{L^{\alpha}}\frac{L^{\beta}}{L^{\beta}}\right)$$

$$y = \frac{Ak^{\alpha}h^{\beta}(L_f + L_m)^{1-\alpha-\beta}}{L^{1-\alpha-\beta}}$$

$$y = Ak^{\alpha}h^{\beta}\left(\frac{L_f + L_m}{L}\right)^{1-\alpha-\beta}$$

$$y = Ak^{\alpha}h^{\beta}(f + m)^{1-\alpha-\beta} \tag{3}$$

Where $k = K/L$, $h = H/L$, $y = Y/L$, $f = L_f/L$, and $m = L_m/L$.

Let s_k be the fraction of income invested in capital and s_h in human capital. The evolution of k is governed by:

$$\dot{k} = s_k y - (n + g + \delta)k \tag{4}$$

$$\dot{h} = s_h y - (n + g + \delta)h \tag{5}$$

Where δ is the rate of depreciation of both capital and human capital. L and A are assumed to grow exogenously at rates n and g, which are also constant across districts. Equation (4) and (5) imply that the economy converges to a steady state defined by:

$$k^* = \left[\frac{s_k^{(1-\beta)} s_h^{\beta}}{n+g+\delta}\right]^{(1/1-\alpha-\beta)}$$

(6)

$$h^* = \left[\frac{s_k^{\alpha} s_h^{(1-\alpha)}}{n+g+\delta}\right]^{(1/1-\alpha-\beta)}$$

(7)

Substituting (6) and (7) into the production function in (2) and taking logs, we get an estimating equation as follows:

$$lny = lnA + \frac{\alpha}{1-\alpha-\beta} lns_k + \frac{\beta}{1-\alpha-\beta} lns_h - \frac{\alpha+\beta}{1-\alpha-\beta} \ln(n+g+\delta) + (1-\alpha-\beta)lnf +$$
$$(1-\alpha-\beta)ln\left(\frac{m}{f}+1\right)$$

(8)

Where lny is GRDP at constant price, lns_k is the share of investment to GRDP at a constant price, lns_h is human capital based on the indicator of the number of labor force graduates of elementary/junior high school/junior high school/university or total, $\ln(n+g+\delta)$ Is the growth rate of the labor force and technology depreciation. Based on the MRW model, the value of $g+\delta$ is fixed at 0.05. The variables are the number of female and male labor force members in the productive age group. Human capital and labor force variables are estimated according to the combination of education levels. The best model is selected based on the highest Adj R-squared value, the lowest Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) values, and the coefficient of lnf and lnm are positive. This is because the female and male labor force are expected to contribute positively to economic growth. The term lnA reflects not just technology but resource endowments, climate, institutions, etc. It may differ across districts. We assume that:

$$lnA = \alpha + \epsilon$$

Where α is a constant and ϵ is a country-specific shock. Thus, long income per capita at a given time. We assume that the saving and population growth rates are independent of district-specific factors shifting the production function. That is, s and n are independent of ϵ. Moreover, this implies that equation (8) can be estimated using Ordinary Least Square (OLS), as in the paper of Mankiw et al (1992).

To further analyze the dynamic results of specific labor, the production functions in the classical Solow and MRW models were augmented to account for female and male labor forces separately (Islam, 1995). PLS assumes that an individual's behavior is not different over various periods. This condition is not based on the situation where the condition of each object will be different for each individual and time, so the panel data method is used. Even though this model may not be complete, it can give answers related to the purpose of this research. Assume a Cobb-Douglas production function and follow the Solow growth model; production of I district at time t is given by:

$$Y_{it} = K_{it}^{\alpha} \left(L_{fit}\right)^{\beta} \left(L_{mit}\right)^{1-\alpha-\beta}$$

(9)

Dividing both sides by L_{it} And taking logs, we get an estimating equation as

$$lny_{it} = \alpha lnk_{it} + \beta lnf_{it} + (1 - \alpha - \beta)lnm_{it} \tag{10}$$

Following the ASG model as suggested by Mankiw et al., production of i district at time t is given by:

$$Y_{it} = K_{it}^{\alpha}H_{it}^{\beta}\left(L_{fit}\right)^{\gamma}(L_{mit})^{1-\alpha-\beta-\gamma} \tag{11}$$

Dividing both sides by L_{it} and taking logs we get an estimating equation as

$$lny_{it} = \alpha lnk_{it} + \beta lnf_{it} + (1 - \alpha - \beta)lnm_{it} \tag{12}$$

Equation (12) was estimated using panel data from 2016 to 2022 for 472 districts categorized by island (Sumatera, Java, Bali-Nusa Tenggara, Kalimantan, Sulawesi-Gorontalo, and Maluku-Papua). α is capital (investment) elasticity, β is human capital elasticity, γ is female labor force elasticity, and θ is male labor force elasticity.

Furthermore, the Solow model was used to analyze the impact of the FLPR on the regional economy's convergence speed. The Solow model makes quantitative predictions about convergence speed to steady state. Let y be the steady-state income level per worker given by equation (8), and y(t) be the actual value at time t. Approximating around the steady state, the speed of convergence is given by:

$$\frac{dln(y(t))}{dt} = \lambda[ln(y^*) - ln(y(t))] \tag{13}$$

where $\lambda = (n + g + \delta)(1 - \alpha - \beta)$. Equation (13) implies that:

$$ln\left(y(t)\right) = \left(1 - e^{-\lambda t}\right)ln(y^*) + e^{-\lambda t}\ln\left(y(0)\right) \tag{14}$$

Where y(0) is the income per worker at some initial date. Subtracting ln(y(0)) from both sides:

$$ln\left(y(t)\right) - \ln\left(y(0)\right) = \left(1 - e^{-\lambda t}\right)ln(y^*) - \left(1 - e^{-\lambda t}\right)\ln\left(y(0)\right) \tag{15}$$

We call Equation (15) unconditional convergence. The absolute beta convergence hypothesis is used to test the neoclassical growth model theory that developing regions tend to grow faster than developed regions. The neoclassical growth model states that developing regions grow faster than wealthier regions without requiring other economic characteristics (Barro & Sala-i-Martin, 1992).

Finally, substituting for y:

$$ln\left(y(t)\right) - \ln\left(y(0)\right) = \left(1 - e^{-\lambda t}\right)\frac{\alpha}{1-\alpha-\beta}lns_k + \left(1 - e^{-\lambda t}\right)\frac{\beta}{1-\alpha-\beta}lns_h -$$
$$\left(1 - e^{-\lambda t}\right)\frac{\alpha+\beta}{1-\alpha-\beta}\ln(n + g + \delta) - \left(1 - e^{-\lambda t}\right)\ln\left(y(0)\right) \tag{16}$$

We called Equation (16) as conditional convergence. Conditional convergence looks at the behavior and characteristics between districts. Conducting a conditional beta convergence hypothesis test will yield more significant benefits, namely finding out what determinants affect the level of regional economic growth in the long term by including selected variables that are considered to affect the level of regional economic growth, by including selected variables that affect the level of regional economic growth in the equation. The hypothesis for unconditional and conditional convergence is if the estimate of b is significant and negative. Where $b = -\left(1 - e^{-\lambda t}\right)$ is the coefficient

of the variable ln(y(0)). Then, the speed of convergence to reach a steady state can be calculated as follows:

$$\lambda = -(ln\,(1 + b)\,) * 100 \tag{17}$$

Then, when the speed of convergence has been able to be estimated, the next step is to determine the length of half-time convergence, which means the time needed to eliminate half the gap that occurs through the equation to eliminate half the gap that occurs through the following equation:

$$half\,time = ((-ln\,(0.5))\,/\,\lambda) * 100 \tag{18}$$

RESULTS AND DISCUSSION

The analysis results at the national level show that the female labor force positively affects economic growth if they have at least a junior high school education, similar to the human capital variable. Highly educated women affect development through increased productivity and income (Obiageli et al., 2022). This underscores education's inspiring and hopeful role in breaking the vicious cycle of poverty and inadequate education.

The impact of the female labor force on regional economic varies across Indonesia's islands. It differs significantly, with the most pronounced effect observed on Kalimantan Island, where women who are high school graduates contribute significantly to regional economic (Table 4). In contrast, the impact on the island of Java is relatively small. This variation is influenced by the types of employment available and the accessibility of business opportunities for women, both formal and informal. These factors can enhance family welfare through increased income.

The analysis results presented in Table 4 indicate that the production elasticity of female and male labor factors is greater than that of investment and human capital. An increase in the labor force with at least a junior high school education by 1 percent can lead to a 0.60 percent increase in the economy's total output. The most significant effect among the production factors is attributed to human capital, highlighting that improving the quality of human resources is a crucial factor for the economy, particularly given Indonesia's large population.

This research supports previous studies and theories related to the impact of educational attainment on a country's economic growth. Aprina et al. (2021) underscore the role of domestic investment in education as a crucial determinant of improved economic performance, positing that such investments are essential for recovery following the pandemic. Additionally, Fitriady et al. (2022) confirm that Foreign Direct Investment (FDI), which is influenced by the education system, has a significant impact on the growth of GRDP. Furthermore, Asnawi et al. (2020) explain that the differences in the effects of domestic and foreign investments at the provincial level suggest the existence of regionally defined educational contexts; regions that prioritize improving educational standards tend to derive greater benefits from these investments.

There is an intricate relationship between the three levels of education and regional economic, progressing sequentially from primary to tertiary education, with the latter fostering greater growth (see Table 4). A lack of participation in the education system negatively impacts a country's long-term economic development, suggesting that addressing issues related to fundamental education may enhance growth indicators (Meilisa et al., 2024). Similarly, Dini and Aji (2022) emphasize the significant positive influence of secondary and tertiary education on economic growth across several provinces.

Furthermore, Sabur et al. (2021) explain the relationship between economic growth, poverty alleviation, and education by stating that individuals can escape the cycle of poverty through higher educational attainment, which in turn fosters further economic growth. This relationship illustrates that improved education enhances individuals' economic opportunities and strengthens the overall resilience of the economy. In addition, several studies have attempted to evaluate the impact of educational inequality on economic issues. Liyana (2023) concludes that unequal educational opportunities significantly affect the economy in certain regions, such as South Sulawesi. Mendy and Widodo (2018) provide strong evidence that the demand for qualified human capital with higher education is critical, as it yields the greatest returns on economic growth. Both formal education and informal skill acquisition should be emphasized, as their effects vary across provinces in Indonesia, suggesting the need for province-specific policies.

Table 4. The Effect of FLPR on Regional Economic (Method: PLS)

Variable	(1) Indonesia $\ln s_h$: sen Inf : jun	(2) Sumatra $\ln s_h$: jun Inf : sen	(3) Java $\ln s_h$: sen Inf : jun	(4) Bali-Nusa $\ln s_h$: sen Inf : jun	(5) Kalimantan $\ln s_h$: uni Inf : sen	(6) Sulawesi $\ln s_h$: sen Inf : uni	(7) Maluku-Papua $\ln s_h$: sen Inf : sen
$\ln s_k$	.089	.101	.13	.063	.08	.054	.053
$\ln s_h$	.571	0.034	.439	1.321	.375	.328	.494
$\ln(n+g+\delta)$	-.391	-0.103	-0.095	-0.153	-0.18	0.04	0.09
Inf	.268	.228	0.039	.209	.553	.309	0.206
$\ln\left(\frac{m}{f}+1\right)$	.029	-.759	-.54	1.129	.604	.504	.037
_cons	15.924	16.785	17.757	15.369	15.954	15.828	15.742
Observations	3,036.00	953.00	786	214	350.00	466.00	267.00
R-squared	0.15	0.20	0.32	0.51	0.19	0.10	0.16
Adj R-squared	0.15	0.20	0.32	0.50	0.17	0.09	0.14
Akaike's Crit	9,336.40	2464.53	1,953.77	442.97	883.33	1,217.71	802.70
Bayesian Crit	9,372.51	2493.69	1,981.77	463.17	906.48	1,242.58	824.22
Implied α	0.05	0.09	0.08	0.03	0.05	0.04	0.03
Implied β	0.34	0.03	0.28	0.55	0.26	0.24	0.32
1- α- β	0.60	0.88	0.64	0.42	0.69	0.72	0.65

p<.01, p<.05, p<.1

ele: primary school; jun: junior high school; sen: senior high school; uni: university

In summary, the amalgamation of these educational currents presents a clear narrative: throughout the provinces of Indonesia, the quality of education, rather than its quantity, serves as the centerpiece for effective growth within the country. Neither traditional learning nor informal skill acquisition can be overlooked. The impact of each varies by province, indicating that educational policy must be adapted to the specific needs of each region. The most crucial aspect of education in Indonesian provinces is not its numerical value but its meaningful existence, as it significantly influences economic growth.

The results of the Partial Least Squares (PLS) method are consistent with those obtained from the panel data method, indicating that the female labor force with at least a junior high school education has a positive impact on economic growth. However, the proportion of the female labor force consisting of junior high school graduates is only 16 percent of the total labor force, despite the existence of a 9-year compulsory education policy in Indonesia. Historical data from 2016 to 2022 shows that, on average, 38 percent of women have an elementary school education, 26 percent have a high school education, and 19 percent hold a university degree. The contributions of the labor force with high school and university education remain minimal, despite their considerable potential in terms of knowledge (Wang & Liu, 2016). Women also make significant contributions and have opportunities to develop skills comparable to those of men; however, this potential has not yet been fully realized. In addition, the tendency of women not to enter the labor market results in their roles in the economy being less than optimal. It is important to note that the roles referred to in this analysis can be quantified when they generate income; however, the study does not account for other roles that women fulfill as homemakers.

The estimation results presented in Table 4 indicate that the value of production elasticity falls between 0 and 1. Therefore, the use of inputs is rational, as the additional use of variable inputs has begun to reduce both average and marginal output. This stage represents a rational phase of production, where an increase in input will lead to an increase in total output, albeit with decreasing returns. The estimated coefficients in Table 5 demonstrate the significant influence of the FLPR on the growth rate of Indonesian districts, showing the strongest associations with sub-education indicators, particularly in secondary and tertiary education awareness. The coefficients associated with the FLPR are predominantly positive across these dimensions, although they vary in size and statistical significance. For instance, the effect size of the coefficient for labor force participation in Java (0.091) and Bali-Nusa (0.09) illustrates the diverse regional growth of the economy influenced by gender relations. This finding is consistent with previous empirical evidence that underscores the necessity of women's economic participation in shaping national economic outcomes. According to Purba (2024), women's roles significantly contribute to economic growth in Indonesia, further supporting these regional findings.

Table 5. The Effect of FLPR on Regional Economic (Method: Panel Data)

Variable	(1) Indonesia	(2) Sumatra	(3) Java	(4) Bali-Nusa	(5) Kalimantan	(6) Sulawesi	(7) Maluku-Papua
	Inh: jun Inf : jun Inm: sen	Inh: jun Inf : uni Inm: uni	Inh: jun Inf : uni Inm: uni	Inh: jun Inf : total Inm: jun	Inh: uni Inf : jun Inm: sen	Inh: ele Inf : jun Inm: jun	Inh: jun Inf : uni Inm: jun
Lnk	.002	.003	0.001	-0.003	-0.001	0.003	0.007
Lnh	.044	.084	.09	.09	.091	0.002	0.014
Lnf	.057	.026	.019	.072	.064	0.015	.048
lnm	.035	.053	.036	0.016	.073	.186	0.053
_cons	16.394	16.371	17.485	15.704	16.55	16.08	14.991
Observations	3116	978	799	226	360	482	270
R-squared	0.034	0.172	0.25	0.459	0.162	0.035	0.069
Adj R2	0.033	0.169	0.246	0.449	0.153	0.027	0.055
AIC	-1427.14	-2273.6	-2154.08	-785.267	-605.236	553.21	-77.806
BIC	-1402.96	-2254.06	-2135.34	-771.585	-589.692	569.922	-63.412
$(\alpha + \beta + \gamma + \theta)$	0.138	0.166	0.146	0.175	0.073	0.186	0.053

Notes: p<.01, p<.05, p<.1
ele: primary school; jun: junior high school; sen: senior high school; uni: university

The positive influence of the FLPR in Indonesia is also evident in other countries, such as China (Chiengmai, 2018; Baerlocher et al., 2021), as well as in member countries of the Organization of Islamic Cooperation (OIC) (Barin et al., 2020). The results indicate a significant contribution of female labor force participation and female education (both secondary and higher) to China's economic growth (Wu et al., 2022). Additionally, there is a positive correlation between the Gender Development Index and average years of schooling with economic growth in the case of Java Island.

Moreover, comparative studies using data from other Organization of Islamic Cooperation (OIC) countries highlight the necessity of increasing female workforce participation and educational levels. This result underscores that enhancing the FLPR is a global imperative for economic development, as countries with higher FLPR have demonstrated notable GDP growth (Barin et al., 2020). This is particularly evident in Java (Sulisto et al., 2023). The research conducted by Sulisto et al. (2023) further illustrates how a strong Gender Development Index, in conjunction with educational attainment, promotes economic growth.

More general contexts also significantly reflect the growing awareness of gender roles in economic sustainability. Verick (2018) observes that access to education is crucial for maximizing labor force contributions, particularly for women. As noted by Kurniawan et al. (2020), policies aimed at enhancing education and aligning women's skills with labor market demands provide a strategic approach to improving economic productivity and addressing key challenges in labor markets.

Regional differences require targeted interventions, even though Indonesia shows encouraging trends in FLPR and educational integration for economic development. Based on the evidence, Indonesia could significantly enhance its economic performance through effective policies aimed at eradicating educational disparities and increasing women's employment opportunities. Several studies, including those by Tsaurai and Ndou (2019), and Mishra et al. (2020), demonstrate that gender equality in labor dynamics significantly influences economic development trajectories across countries. In Indonesia, sustainable economic development largely depends on incorporating gender perspectives and supporting female empowerment through political and financial policies. This approach aligns with global development goals and helps address the fundamental socioeconomic inequities currently present in local labor markets.

The relationship between women's labor force participation and economic development is complex, reflecting changes in economic activity, educational attainment, fertility rates, social norms, and other factors. However, education is a critical means of increasing participation and enhancing the quality of the female labor force. Expanding access to secondary and higher education (Verick, 2018) can empower and motivate women to contribute more effectively to the labor force, thereby driving economic development.

Improving the quality of the labor force can enhance productivity and reduce the gap between the skills of the workforce and the demands of the labor market. Low labor productivity often results in many workers being employed in the informal sector. Additionally, a low level of education leads to low wage levels for laborers and prevents many educated workers from entering the labor market, which increasingly demands high skill levels. However, policies that address both the demand and supply sides of women's labor quality can encourage participation by aligning women's education with appropriate job creation (Omran & Bilan, 2022). This reassures us that, with the right policies in place, we can confidently increase the contribution of the labor force by improving education quality.

Solow's growth theory proposes the concept of economic convergence, wherein declining returns to capital enable poorer economies to grow at faster rates than richer ones, thereby leveling per capita incomes across countries. Recent empirical research employing a Fixed Effect Model (FEM) within the context of Indonesia reveals absolute economic convergence among its provinces (see Table 5). Specifically, the negative coefficient associated with the initial per capita income parameter $(\ln(y(0)))$ in the model indicates that areas with lower starting incomes are indeed catching up to their more affluent counterparts, thereby supporting the predictions of Solow's framework (Leško et al., 2022). With absolute convergence in Indonesia projected to be at 22.03 percent annually, policy interventions aimed at reducing income inequality will have significant implications. This rapid convergence rate underscores the necessity for government involvement in addressing inequalities, as unequal distributions may hinder convergence by promoting adverse backwash effects and diminishing diffusion benefits.

Previous research has demonstrated the critical role that public finance management and governance quality play in influencing economic growth outcomes (Lien, 2018; Johnson & Papageorgiou, 2020).

Furthermore, the empirical results align with the broader theoretical framework articulated by Barro and Sala-i-Martin (1992), suggesting that, depending on regional characteristics such as governance, human capital, and institutional frameworks, convergence can manifest in both absolute and conditional forms (Johnson & Papageorgiou, 2020; Albalate et al., 2021). These studies indicate that while absolute convergence addresses the overall economic development of regions regardless of their specific attributes, conditional convergence necessitates adjustments based on particular variables that influence earning potential and growth dynamics, such as infrastructure investment and educational attainment (Zhang et al., 2019; Wagner & Zeileis, 2019).

The empirical data from Indonesia support Solow's theory of economic convergence, which has significant implications for policymaking aimed at reducing inequality and promoting economic development globally. Addressing these factors is crucial for maintaining long-term economic cohesion and ensuring continuous convergence toward higher per capita income levels. The region with the highest absolute convergence speed is Kalimantan Island, while the lowest is Maluku-Papua Island. With a convergence speed of 114 percent per year, the region in Kalimantan Island is projected to reach a steady state within six months. In contrast, the region in Maluku-Papua Island will reach half of the steady state in nearly 17 years if no other variables affect economic growth in the region. Numerous factors influence a region's economic growth, including natural resources, human capital, and capital. The level of ownership and control of each factor also varies by region, prompting further analysis to calculate conditional convergence.

Table 6. Empirical Results of Absolute Convergence

Variable	(1) Indonesia	(2) Sumatera	(3) Java	(4) Bali-Nusa	(5) Kalimantan	(6) Sulawesi	(7) Maluku-Papua
ln(y(0))	-0.198	-0.226	-0.206	-0.292	-0.680	-0.182	-0.0404
_cons	3.212	3.651	3.572	4.485	10.97	2.903	0.631
Obs.	3304	1036	819	252	364	511	322
R-squared	0.0756	0.151	0.230	0.325	0.353	0.0626	0.00406
Adj R2	0.0753	0.150	0.229	0.323	0.352	0.0608	0.000952
AIC	-4361.2	-3356.6	-3347.2	-1027.3	-595.9	134.3	-503.4
BIC	-4355.1	-3351.7	-3342.5	-1023.7	-592.0	138.6	-499.7
speed (%)	22.03	25.66	23.10	34.53	114.0	20.10	4.123
halfLife (years)	3.146	2.701	3.000	2.007	0.608	3.448	16.81

p<.01, p<.05, p<.1
Source: primary data, 2024 (processed)

The conditional convergence analysis in this article focuses on how the female labor force affects the growth of GRDP. In the conditional beta model for Indonesia, the annual convergence speed is estimated at 23.70 percent. This figure indicates that economic growth in developing regions is 23.70 percent higher than in developed regions, and it takes approximately 2.92 years to close the halftime gap between underdeveloped and developed regions.

The female labor force with primary and junior high school education negatively influences GRDP. However, if women attain high school and university education, they can positively impact economic growth, as observed in Kalimantan Island and Maluku-Papua. This phenomenon is also evident in Sub-Saharan Africa (Thaddeus et al., 2022) and Nigeria (Olanrewaju et al., 2021). In contrast, the male labor force, including primary and junior high school graduates, can positively affect economic growth, indicating that the productivity and participation rates of male labor are higher than those of women. Furthermore, the impact of labor on economic growth depends on the capacity of the regional economic system to absorb and productively utilize labor. If the FLPR increases, regional output is expected to rise, assuming that a corresponding rise in labor productivity accompanies this increase.

Previous research conducted in Indonesia indicates that higher educational attainment among women is essential for maximizing their economic contributions. Specifically, primary and junior high education levels often result in less favorable economic outcomes, while higher education (high school and university levels) correlates positively with economic growth (Apire et al., 2023; Sajid, 2021). Studies from regions such as Kalimantan Island and Maluku-Papua support this finding, as they demonstrate that increased educational levels among women enhance their participation in the labor market and contribute to improved economic performance (Iqbal et al., 2021; Aturupane, 2018). The data indicate that while educated males tend to have higher labor force participation rates and productivity levels, women's participation is significantly enhanced through greater educational opportunities (Hasan, 2023; Verick, 2018).

The disparities in labor force participation rates based on gender reflect broader systemic issues. As Klasen (2019) notes, historical differences in economic structures significantly influence women's economic opportunities. An increase in FLPR can lead to output growth, particularly when improvements in labor productivity align with regional economic growth (Umair et al., 2024; Scarborough, 2020). Strategic investments in women's education are critical for promoting equity and fostering economic development, especially in developing countries like Indonesia. The positive correlation between FLPR and economic growth underscores the need for policymakers to enhance educational infrastructure and facilitate women's integration into the labor market to sustain growth trajectories in the long term (Fozia et al., 2022; Mujahid & Zafar, 2022).

Higher education levels correlate with improved human resource quality. High-quality human resources can produce quality goods and services, innovate to enhance production

factors, and exhibit high competitiveness, thereby increasing GRDP. Consequently, when the quality of human resources is elevated, productivity rises, leading to increased income. Enhanced productivity and income can accelerate economic growth. Therefore, barriers to increasing FLPR and promoting women's active involvement in the labor market must be minimized (Bawazir et al., 2022). When women have greater access to secondary education and labor market equality, this leads to a positive impact on the economy (Cabeza-García et al., 2018).

Table 7. Empirical Results of Conditional Convergence

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Indonesia	Sumatra	Java	Bali-Nusa	Kalimantan	Sulawesi	Maluku-Papua
	Inh: jun Inf : ele Im: tot	Inh: ele Inf : jun Im: tot	Inh: uni Inf : ele Im: jun	Inh: jun Inf : tot Im: ele	Inh: jun Inf : uni Im: ele	Inh: sen Inf : ele Im: tot	Inh: ele Inf : sen Im: sen
ln(y(0))	-.211	-.262	-.274	-.465	-.86	-.187	0.002
Lnk	-0.001	0.002	.001	-0.001	-0.001	-0.013	.006
Lnh	-0.004	-.051	.018	.037	.052	0.118	.069
Lnf	-.033	-.015	-.027	0.042	.092	-0.085	0.018
lnm	.161	.141	.01	-.029	-.114	.092	-.07
cons	3.475	4.191	4.756	7.274	14.023	3.145	0.022
Obs.	3117	978	799	226	360	482	272
R-squared	0.084	0.173	0.278	0.422	0.488	0.083	0.086
Adj R2	0.083	0.169	0.274	0.409	0.481	0.073	0.069
AIC	-3999.91	-3299.67	-3303.766	-934.176	-661.78	152.301	-418.146
BIC	-3969.68	-3275.24	-3280.349	-917.074	-642.349	173.19	-400.117
speed (%)	23.70	30.38	32.02	62.55	196.611	20.70	
halfLife (year)	2.92	2.28	2.16	1.11	0.353	3.35	

p<.01, p<.05, p<.1
Source: primary data, 2024 (processed)

Recent studies have closely examined the relationship between human resource quality and educational levels. Higher-quality human resources associated with greater educational attainment contribute to increased economic production and innovation. This trend reflects the growing competitiveness of products, which stimulates the upward trajectory of GDP. Effective human resource management in educational institutions is crucial, as it significantly enhances the quality of education and aligns it with societal needs (Rawis et al., 2024; Karoso et al., 2024; Darimus & Hanif, 2023; B et al., 2023). As the quality of human resources in education improves, the learning environment also benefits, leading to more effective learning outcomes. A workforce that is economically empowered and capable of producing high-quality goods and services relies on this

development (Alvi et al., 2021; Qutni et al., 2021). For instance, the application of total quality management in educational settings has demonstrated that systematic approaches to regulating educational quality can enhance learning outcomes, thereby producing more competent and competitive graduates (Ikhsannudin & Pakpahan, 2021; Purwanto & Madhakomala, 2023). Additionally, including women in the workforce significantly boosts output and economic activity.

Studies indicate that increasing access to secondary education can help lower barriers to female labor participation, thereby contributing to gender equality in the workforce (Nuryanto & Pambuko, 2019; Bình, 2021; Destari, 2023). Research emphasizing the necessity of equitable educational opportunities for women supports the economic benefits of increasing female participation, enhancing skills, and diversifying the labor pool in various ways (Pratikno et al., 2022; Guomin, 2023; Tazliqoh, 2023). The production and economic growth depend on the quality of human resources, which is significantly influenced by educational performance. Reducing barriers to women's employment participation and improving access to education can enable societies to experience notable changes in economic performance and quality of life (Subaidi et al., 2021; Kumaravelu & Suresh, 2021). Therefore, policies that prioritize the development of human capital are essential for defining economic progress.

CONCLUSION

Female labor force participation contributes to economic growth, particularly when women have a senior high school or higher (university) education. Education has proven to be the most important factor, as higher levels of education enhance human resources, thereby increasing production and economic development. However, the impact of FLPR on economic development varies across different regions. Despite its large population, FLPR in Java is not yet fully realized, whereas it has a more significant impact in Kalimantan.

Under absolute income convergence, less developed areas grow faster than more developed ones; however, the speed of convergence varies. Kalimantan shows rapid convergence, while Maluku-Papua faces structural gaps and progresses more slowly. FLPR among individuals with lower educational attainment (elementary or junior high school) hampers the growth of GRDP per capita, highlighting the demand for quality female workers. Research has demonstrated that enhancing women's capacity and increasing funding for education can accelerate growth and reduce regional disparities.

To enhance the contribution of FLPR to economic development, the government should reform the 9-year compulsory education policy and extend it to 12 years. In addition to formal education, the government should provide broader opportunities for women to access non-formal education. Support, participation, and the fundamental involvement of all stakeholders, including the community and local government, are essential for creating a labor market that is conducive to women workers. Implementing job flexibility and increasing access to childcare can help achieve this goal.

Formal jobs that are friendly to women should be created, and adult women, especially those without a completed education, should obtain greater skill development. Community-based learning and employment policies should be supported. Kalimantan and Papua require specific plans to involve highly educated women more actively. Intervention strategies should focus on local elements such as job access, culture, and the economy. Educational programs should be adapted to meet the demands of the job market. Establishing partnerships with businesses can facilitate job placement for newly graduated women. It is also essential to enhance teacher capacity, improve management quality, and elevate the overall standards of educational institutions. Such efforts are crucial for enabling digital-based educational innovations to reach women living in remote areas. Future research should analyze the factors influencing women's decisions to enter the workforce.

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