

## Do early marriage and socioeconomic conditions shape women's labor force participation in Indonesia?

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### Abstract

Female labor force participation in Indonesia remains influenced by gender norms and regional development disparities. This study analyzes the effects of early marriage, the Gender Empowerment Index, the provincial minimum wage, and the average years of schooling for women on female labor force participation across Indonesia's 34 provinces from 2015 to 2024. Panel data sourced from Statistics Indonesia (BPS) and the Ministry of Manpower were analyzed using a Fixed Effects Model with robust standard errors to control for unobserved regional heterogeneity. The results indicate that the provincial minimum wage has a positive and significant effect on female labor force participation, with a stronger impact outside Java. Conversely, early marriage and the Gender Empowerment Index do not show a significant direct effect, suggesting the presence of indirect mechanisms operating through socio-economic factors. Average years of schooling show a weak negative relationship at the national level but a positive and significant effect within Java. These findings underscore the importance of labor and women's empowerment policies that are tailored to regional characteristics.

Keywords: Women's Labor Force Participation, Early Marriage, Minimum Wage, Gender Empowerment, Indonesia

### Abstrak

Partisipasi perempuan dalam angkatan kerja di Indonesia masih dipengaruhi oleh norma gender dan ketimpangan pembangunan antarwilayah. Penelitian ini menganalisis pengaruh pernikahan dini, Indeks Pemberdayaan Gender, upah minimum provinsi, dan rata-rata lama sekolah perempuan terhadap partisipasi perempuan dalam angkatan kerja di 34 provinsi Indonesia selama 2015–2024. Data panel yang bersumber dari Badan Pusat Statistik dan Kementerian Ketenagakerjaan dianalisis menggunakan Fixed Effect Model dengan standar error robust untuk mengendalikan heterogenitas regional yang tidak teramati. Hasil penelitian menunjukkan bahwa upah minimum provinsi berpengaruh positif dan signifikan terhadap partisipasi perempuan dalam angkatan kerja, dengan dampak yang lebih kuat di luar Jawa. Sebaliknya, pernikahan dini dan Indeks Pemberdayaan Gender tidak berpengaruh signifikan secara langsung, mengindikasikan adanya mekanisme tidak langsung melalui faktor sosial-ekonomi. Rata-rata lama sekolah menunjukkan hubungan negatif yang lemah secara nasional, tetapi berpengaruh positif dan signifikan di Jawa. Temuan ini menegaskan pentingnya kebijakan ketenagakerjaan dan pemberdayaan perempuan yang disesuaikan dengan karakteristik regional.

Kata kunci: Partisipasi Perempuan Dalam Angkatan Kerja, Pernikahan Dini, Upah Minimum, Pemberdayaan Gender, Indonesia

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## 1. Introduction

Women's labor force participation remains one of the most persistent gender gaps in Indonesia's labor market. Despite gradual improvements, the national Female Labor Force Participation Rate (FLFPR) stood at 55.41% in 2024, significantly lower than the male rate of 84.02% (BPS, 2024). More broadly, Indonesia's female labor force participation rate has largely stagnated at around 50 per cent for the last two decades (Cameron et al., 2019), even as the country experienced sustained economic growth, rising educational attainment among women, and declining fertility rates. This paradox suggests that macroeconomic development alone is insufficient to explain women's labor market outcomes, and that structural and socio-cultural factors play a significant role. Quantitative studies have consistently shown a negative association among marriage, childbearing, and female labor force participation, despite Indonesia's structural development changes, including the convergence of the gender gap in education (Setyonaluri, 2013; Widarti, 1998). Furthermore, there is considerable variation across provinces, for example, Bali exhibits a notably higher FLFPR of 70.7%, compared to 49.8% in West Java and 46.3% in Riau (BPS, 2024) underscoring the importance of provincial-level analysis to capture these structural disparities.

Among the structural factors constraining women's labor market entry, social norms and early marriage occupy a central position. Women's labor force participation in the formal sector has largely stagnated over the past two decades, and a wage gap persists between male and female workers, with women earning approximately 59% of their male counterparts with the same level of education (BPS, 2024). This inequality is partly rooted in gendered social expectations that confine women to domestic roles, limiting their access to education and formal employment from an early age. Early marriage accelerates this process: women who marry early exhibit lower labor force participation, are less likely to be formal-sector workers, and are more likely to engage in self-employment or unpaid family work, positions that bear the brunt of income fluctuations and offer limited access to social protection (Cameron et al., 2023). In the Indonesian context, labor force participation is significantly shaped by marital status, with participation patterns differing substantially between unmarried and married women across age groups (Cameron et al., 2019). These findings point to early marriage not merely as a demographic phenomenon, but as a mechanism through which gender inequality in the labor market is reproduced across generations.

The rate of early marriage among women in Indonesia, while remaining a serious concern, has shown a declining trend in recent years. This decline can be attributed to various factors, including changes in legal policies, increased public awareness, and support from the government and international organizations (Psaki et al., 2018). One key policy milestone is the revision of the minimum marriage age in Law Number 16 of 2019, which raised the minimum age for women to marry from 16 to 19 years (Kementerian Pemberdayaan Perempuan dan Perlindungan Anak, 2024). Nonetheless, significant provincial disparities persist, with provinces such as West Nusa Tenggara (17.32%), Jambi (11.41%), and West Sulawesi (11.25%) recording

rates far above the national average in 2023, suggesting that the burden of early marriage remains unevenly distributed across Indonesia's regions.

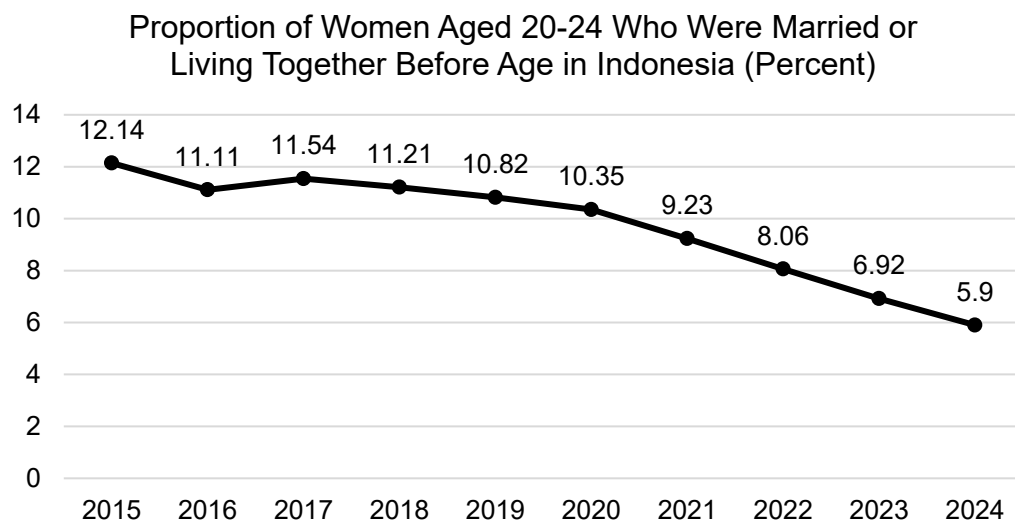


Figure 1. Proportion of Women Aged 20-24 Who Were Married or Living Together Before Age in Indonesia (Percent)  
Source: Badan Pusat Statistik (BPS).

Figure 1 shows the declining trend of the early marriage rate among women in Indonesia from 2015 to 2024. The highest rate was recorded at 12.14% in 2015, declining to 5.9% in 2024. This decelerating trend reflects developments in legal frameworks and shifting societal attitudes in the modern era. Despite this progress, many provinces still reported rates above the national average in 2023, with substantial inter-provincial variation. If the issue of early marriage persists in these regions, it could continue to affect women's labor force participation rates negatively.

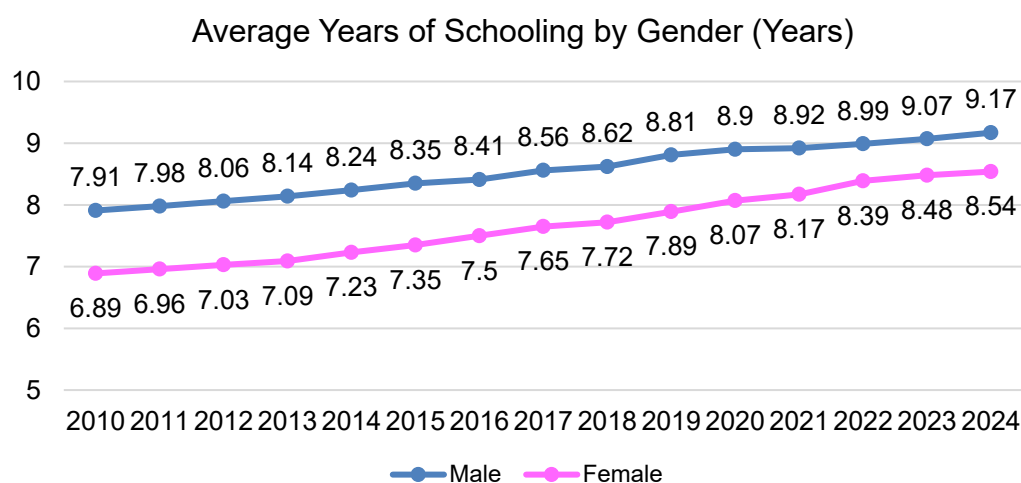


Figure 2. Average Years of Schooling by Gender (Years)  
Source: Badan Pusat Statistik (BPS)

Figure 2 illustrates the average years of schooling in Indonesia from 2010 to 2024, disaggregated by gender. Throughout the entire period, males consistently recorded higher average schooling years than females. In 2010, males recorded 7.91 years

compared to 6.89 years for females. By 2024, the male average increased to 9.17 years, while the female average reached 8.54 years. Although the gender gap in schooling persists, it has gradually narrowed as female educational attainment has grown at a slightly faster rate. The continued gap in average years of schooling between men and women remains relevant to understanding disparities in labor market outcomes, given that education is a key determinant of women's access to formal employment.

The increase in women's education levels in Indonesia has been accompanied by a broader shift in their economic and social behavior. Women are becoming more financially independent and less dependent on men, shifting their priorities regarding marriage and childbearing. This is reflected in the decline in the number of marriages from 2.1 million in 2005 to 1.7 million in 2023, while the number of women working and attending school increased significantly, from 32.5 million to 54.6 million over the same period. This change demonstrates that women are gaining more control over their life decisions, both in their careers and within the household.

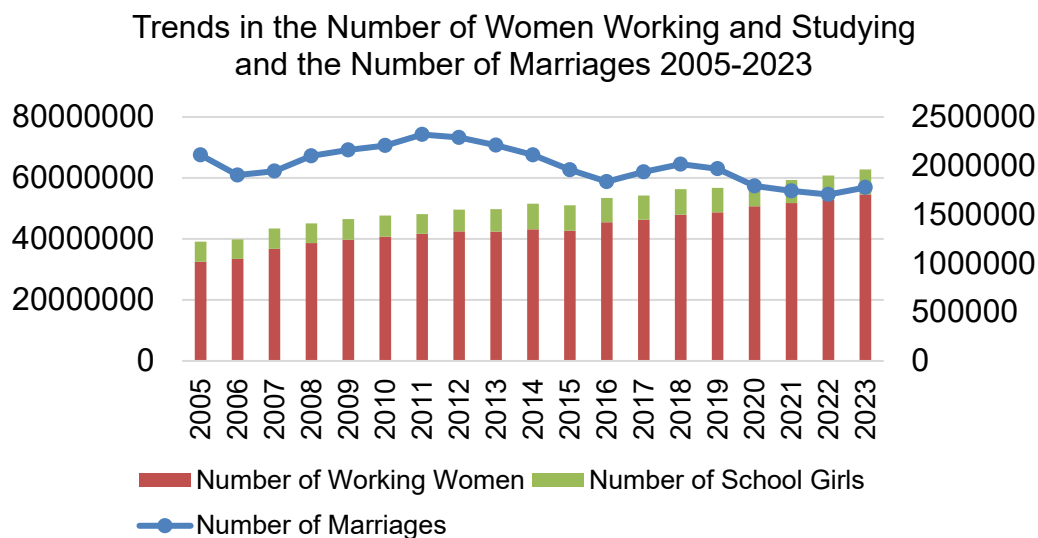


Figure 3. Trends in the Number of Women Working and Studying and the Number of Marriages 2005-2023  
Source: Badan Pusat Statistik (BPS)

Figure 3 presents trends in the number of marriages, working women, and school girls in Indonesia from 2005 to 2023. The number of working women rises steadily from approximately 32.5 million in 2005 to 54.6 million in 2023. The number of school girls also increases overall, from around 6.6 million to over 8.1 million. In contrast, the number of marriages declines over time, falling from approximately 2.1 million in 2005 to around 1.7 million in 2023. The female labor force participation rate continued to increase nationally, ranging from 51% to 54%, potentially influenced by improvements in infrastructure, the adoption of digital technology, and inclusive policies (Annur, 2024; Azmi & Cholily, 2023; Hidayat & Ash Shidiqie, 2024). Taken together, these three converging trends, rising female employment, increasing school enrolment, and declining marriages provide the empirical backdrop against which the relationship

between early marriage and women's labor force participation requires systematic empirical investigation.

The phenomenon of early marriage in Indonesia thus operates through at least two interrelated pathways: it curtails human capital accumulation by interrupting women's education, and it increases domestic obligations that reduce women's availability and incentive to participate in the formal labor market. Becker's (1975) human capital theory provides a foundational framework for understanding this mechanism, women who marry early are effectively diverted from investing in their own productive capacities, with lasting consequences for their labor market outcomes. Taken together, the data on declining early marriage rates and increasing female labor force participation suggest that the government's success in reducing early marriage may open up pathways for women of productive age to enter the labor force. However, further empirical research is needed to test and confirm this relationship rigorously.

A substantial body of literature has examined the relationship between early marriage, socio-economic factors, and women's labor force participation (WPL). Studies on the direct effect of early marriage consistently find a negative association with women's employment outcomes. Dhamija & Roychowdhury (2020) demonstrated that age at marriage significantly shapes women's labor market outcomes in India, with earlier marriage associated with lower participation rates compared to women who marry later. In a related vein, Soler-Hampejsek et al., (2021) showed that child marriage undermines young women's ability to translate educational attainment into paid work, contributing to persistent gender gaps in employment in rural Malawi. Using panel data from the Indonesian Family Life Survey (IFLS), Cameron et al. (2023) similarly found that women who married early exhibit lower labor force participation, are less likely to be formal-sector workers, and are more likely to engage in self-employment or unpaid family work.

Beyond the direct effect of early marriage, scholars have explored broader socio-economic determinants of WPL. Sasongko et al. (2020) employed a panel data approach across 34 provinces in Indonesia from 2014 to 2018 and found that the provincial minimum wage and education level have significantly positive effects on the female labor force participation rate. Consistent with this, studies using panel data from 34 provinces over the period 2020–2024 confirmed that average years of schooling and the provincial minimum wage positively and significantly influence WPL in Indonesia (Susilawati & Perwithosuci, 2025).

Despite this growing body of evidence, several gaps remain in the literature. First, most existing studies on the Indonesian context examine socio-economic determinants of WPL in isolation from early marriage, treating either early marriage or wage and education variables as the primary focus, but rarely integrating all of them within a single analytical model. Second, prior panel data studies in Indonesia are limited in temporal scope, typically covering periods of five years or fewer, which may not adequately capture longer-run structural changes in women's labor market behavior. Third, to the best of the authors' knowledge, no study has simultaneously examined

the role of early marriage alongside the Gender Empowerment Index (GEI), a composite measure of women's political participation, economic decision-making power, and income as a determinant of WPL at the provincial level in Indonesia. This is a notable gap, given that gender empowerment dimensions are theoretically expected to mediate the relationship between early marriage norms and women's entry into the labor force. This study aims to address these gaps by examining the effect of early marriage, the Gender Empowerment Index, provincial minimum wage, and average years of schooling for women on female labor force participation across 34 provinces in Indonesia over the period 2015–2024. Using a panel data regression approach, this study contributes to the literature in three ways: (1) it integrates early marriage into a multi-variable socio-economic model of WPL at the provincial level; (2) it extends the analytical window to a decade-long panel, enabling a more robust assessment of long-run trends; and (3) it introduces the Gender Empowerment Index as an underexplored structural variable in the Indonesian WPL literature.

## 2. Research Method

In this study, the type of data used is secondary data. Secondary data is data that has been previously collected and documented by another party for a specific purpose, which is then reused by the researcher or other parties for further analysis. The data in this study were obtained from official government websites. The data providers included Badan Pusat Statistik (BPS) and Kementerian Ketenagakerjaan Republik Indonesia. Table 1 summarizes the data sources and the operational variables for each variable used.

This study uses a panel data structure design (a combination of cross-sectional and longitudinal/time series). A panel data design (observing the same individuals, firms, or entities over multiple time periods) is highly valued because it merges cross-sectional and time-series data. This approach is crucial because it allows researchers to control for unobserved variables, measure individual-level change over time, and draw more accurate conclusions.

The panel data in this study covers 34 provinces in Indonesia over 10 years, specifically from 2015 to 2024. Provinces such as Southwest Papua, South Papua, Central Papua, and Highland Papua were not included in the observations in this study. This is due to their status as relatively new provinces undergoing division. Therefore, data availability for these provinces is inadequate. Here is the regression model for this research:

$$WPL_{it} = \beta_0 + \beta_1 WEM_{it} + \beta_2 GEI_{it} + \beta_3 LN.PMW_{it} + \beta_4 AYW_{it} + \varepsilon_{it}$$

This study includes three types of variables: Dependent, Independent, and Control. In accordance with the objectives of this study, Women's Participation in the Labor Force (WPL) serves as the Dependent Variable. Furthermore, Early Marriage (WEM) and the Gender Empowerment Index (GEI) serve as the core Independent Variables, allowing for their influence on the Dependent Variable. Additionally, there are Control Variables. By controlling for certain variables, the influence of other variables outside



the model can be eliminated. This avoids bias and makes the results more valid and accurate. The control variables in this study include the Provincial Minimum Wage (PMW) and the Average Years of Schooling for Women (AYW). The  $\beta_0$  until  $\beta_4$  shows the coefficient in multiple linear regression is a number that indicates the direction of the relationship and the magnitude of an independent variable's influence on the dependent variable. While, the  $it$  shows the unit observations related to the subject and time or period of the observation. And the  $\varepsilon$  shows or indicates the error terms, the difference between the actual value and the predicted value in the population scope.

Table 1. The Source and The Operational Variables Definitions

| Variables                                | Symbol | Units of Measurement | The Operational Definitions                                                                                                                                                                                                                            | Data Source                                                                 |
|------------------------------------------|--------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| Women's Participation in the Labor Force | WPL    | Percentage           | Women's participation in the labor force is the percentage of women of working age (usually 15 years and older) who are economically active, either working, providing unpaid assistance, or seeking work.                                             | Badan Pusat Statistik (BPS)                                                 |
| Early Marriage                           | WEM    | Percentage           | WEM is a Marriage that takes place before reaching an age that is considered physically and mentally mature. Specifically, Proportion of Women Aged 20-24 Who Were Married or Living Together Before Age 18.                                           | Badan Pusat Statistik (BPS)                                                 |
| Gender Empowerment Index                 | GEI    | Unit                 | GEI is a measure that assesses the level of active participation of women in a region in politics, economics, and decision-making. This figure indicates the extent to which women are given equal access and roles as men in the development process. | Badan Pusat Statistik (BPS)                                                 |
| Provincial Minimum Wage                  | PMW    | Rupiah               | PMW is the lowest monthly wage standard set by the governor and applies to all regencies and cities within a province. The PMW serves as a social safety net to prevent employers from paying workers below the minimum wage.                          | Badan Pusat Statistik (BPS), Kementerian Ketenagakerjaan Republik Indonesia |
| Average Years of Schooling for Women     | AYW    | Years                | AYW is the average number of years spent by women in formal education. Typically measured for the population aged 15 years and older, this figure indicates the number of years of education completed by women in a region.                           | Badan Pusat Statistik (BPS)                                                 |

### 3. Results and Discussion

#### 3.1. Results

##### Descriptive Statistic Analysis

Descriptive statistical analysis is a method used to describe or summarize the characteristics of data in a dataset. This method aims to provide a clear and concise picture of the data without making inferences or generalizations to a wider population.

Table 2. Descriptive Statistics

| Variable | Obs | Mean    | Std. Dev. | Min.   | Max.    |
|----------|-----|---------|-----------|--------|---------|
| WPL      | 340 | 52.62   | 6.81      | 33.09  | 70.63   |
| WEM      | 340 | 10.51   | 4.83      | 0.64   | 23.19   |
| GEI      | 340 | 69.09   | 7.68      | 0.00   | 84.5    |
| PMW      | 340 | 2444264 | 662773.5  | 910000 | 5067381 |
| AYW      | 340 | 8.23    | 1.05      | 5.02   | 11.19   |

The descriptive statistics summarize five key variables across 340 observations. Women's Labor Participation (WPL) has an average value of 52.62 percent, with moderate variation ( $SD = 6.81$ ) and a range from 33.09 to 70.63 percent. Early Marriage (WEM) shows a mean of 10.51 percent, indicating substantial variability ( $SD = 4.83$ ) with values spanning from 0.64 to 23.19 percent.

The Gender Empowerment Index (GEI) reports an average score of 69.09, with a wide range of scores between 0 and 84.5, indicating significant disparities across regions and years. The Provincial Minimum Wage (PMW) exhibits a mean of 2,444,264 IDR with considerable dispersion ( $SD = 662,773.5$ ), indicating large wage differences across provinces. The lowest wage is 910,000 IDR, and the highest exceeds 5 million IDR.

Average Years of Schooling for Women (AYW) has a mean of 8.23 years with relatively low variation ( $SD = 1.05$ ), ranging from 5.02 to 11.19 years. Overall, the data indicate meaningful regional differences in early marriage, women's labor participation, empowerment, wages, and educational attainment.

##### The Best Model Selection Test

Before determining which model to use, there are several steps that must be taken. These steps include selecting the best model. Model selection involves several tests. First, the Chow Test determines which model is better to use, between the Common Effect Model (CEM) and the Fixed Effect Model (FEM). Second, the Hausman Test determines the best model between the FEM and the Random Effect Model (REM). Finally, the Lagrange Multiplier Test determines the best model between the REM and the CEM (Statistikian, 2014).

Table 3. The Best Model Selection Test

| Chow Test |       | Lagrange Multiplier Test |        | Hausman Test |        |
|-----------|-------|--------------------------|--------|--------------|--------|
| Prob. > F | 0.000 | Chibar2                  | 656.20 | Chibar2      | 84.88  |
|           |       | Prob. > F                | 0.000  | Prob. > F    | 0.0000 |

The first test that must be performed is the Chow Test to determine which model is most suitable for use between CEM and FEM. This determination is made by looking at the Prob > F value. If the probability value is less than 0.05, then the FEM model is



better. Based on Table 3, the Prob > F value is 0.000. This means it is less than 0.05, indicating that FEM is more suitable than CEM. Further testing is then needed to determine the best model between CEM and REM.

To determine the best model between CEM and REM, the Lagrange Multiplier Test is required. This is determined by comparing the P-value (Prob >  $\chi^2$ ) with the 0.05 value. If the value is less than 0.05, then REM is more suitable. Vice versa. Based on Table 3, the Prob > F value is 0.000. This means it is less than 0.05, indicating that REM is more suitable than CEM. After that, further testing is needed to select the best model between FEM and REM.

To determine the best model between FEM and REM, the Hausman Test is required. This is determined by comparing the P-value (Prob >  $\chi^2$ ) with the 0.05 value. If the value exceeds 0.05, REM is more appropriate. Therefore, if the value is less than 0.05, FEM is more appropriate. Based on Table 3, the Prob > F value is 0.0000. This means the value is less than 0.05, indicating that FEM is more appropriate than REM. Therefore, it can be concluded that after passing the three model determination tests, the Chow Test, the Lagrange Multiplier Test, and the Hausman Test, FEM is more appropriate than CEM and REM.

After testing the model, several tests are necessary. These include the Coefficient of Determination ( $R^2$ ), Simultaneous Parameter Test (F), and Individual Parameter Test (P-Value). The goal is to assess the model's ability to explain and influence the dependent variable and to obtain an overview of each independent variable. There are eight models in this estimation result. The first model employs Pooled OLS as a baseline estimation, while the second model applies the Random Effect Model (REM). The third model introduces the Fixed Effect Model (FEM), incorporating all independent variables, Early Marriage (WEM), Gender Empowerment Index (GEI), the natural logarithm of Provincial Minimum Wage (LN.PMW), and Average Years of Schooling for Women (AYW) without robust standard errors. To progressively assess the independent contribution of each main variable, the fourth model retains only WEM as the sole independent variable under FEM, while the fifth model adds GEI alongside WEM. The sixth model is the primary model of this study, combining all independent variables under FEM with robust standard errors to account for potential heteroskedasticity and serial correlation. The sixth model explains approximately 26% of the within-province variation in WPL (Adjusted  $R^2 = 0.2600$ ), with an overall model fit that is statistically significant (Prob > F = 0.0003). To further investigate whether the effect of early marriage on women's labor force participation differs across geographic contexts, the seventh and eighth models replicate the sixth model's specification for non-Java and Java province subsamples, yielding 280 and 60 observations, respectively.

The estimation results across eight models reveal several noteworthy patterns. The Pooled OLS (Model 1) and Random Effect Model (Model 2) serve as baseline references, but both are theoretically insufficient for this data structure given the likelihood of unobserved province-specific heterogeneity, such as local cultural norms,

regional governance quality, and geographic characteristics that are correlated with the regressors. The Fixed Effect Model (FEM), which controls for these time-invariant provincial characteristics, is therefore preferred and forms the basis of Models 3 through 8. The primary model (Model 6) confirms overall model significance (Prob > F = 0.0003) and explains approximately 26% of the within-province variation in women's labor force participation (Adjusted R<sup>2</sup> = 0.2600).

Table 4. The Estimation Result

| Variables               | 1st Model             | 2nd Model              | 3rd Model             | 4th Model             | 5th Model             | 6th Model             | 7th Model                   | 8th Model                |
|-------------------------|-----------------------|------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------------|--------------------------|
|                         | Pool OLS              | Random Effect (RE)     | Fixed Effect (FE)     | Fixed Effect (FE)     | Fixed Effect (FE)     | Fixed Effect (FE)     | Fixed Effect (FE)- non-Java | Fixed Effect (FE) - Java |
| WEM                     | -0.619***<br>(0.0851) | -0.112<br>(0.0821)     | -0.0152<br>(0.0847)   | -0.354***<br>(0.1207) | -0.352***<br>(0.1183) | -0.0152<br>(0.151)    | 0.352<br>(0.1514)           | -0.366**<br>(0.1125)     |
| GEI                     | 0.141***<br>(0.0443)  | -0.0187<br>(0.0355)    | -0.0324<br>(0.0356)   |                       | 0.00597<br>(0.0516)   | -0.0324<br>(0.0359)   | -0.0263<br>(0.3758)         | -0.212*<br>(0.0826)      |
| LN.PMW                  | 3.055**<br>(1.3232)   | 10.74***<br>(1.4106)   | 11.35***<br>(1.5755)  |                       |                       | 11.35***<br>(3.5621)  | 15.87***<br>(3.6416)        | -0.81<br>(1.3582)        |
| AYW                     | -4.100***<br>(0.4395) | -1.947***<br>(0.6464)  | -1.410*<br>(0.7551)   |                       |                       | -1.41<br>(2.0594)     | -2.696*<br>(1.4981)         | 3.677**<br>(0.9152)      |
| Constant                | 38.32**<br>(18.5807)  | -86.39***<br>(17.9857) | -99.87***<br>(19.378) | 56.35***<br>(1.2689)  | 55.91***<br>(3.7268)  | -99.87**<br>(40.2988) | -157.45***<br>(47.5318)     | 51.65**<br>(17.7750)     |
| Observations            | 340                   | 340                    | 340                   | 340                   | 340                   | 340                   | 280                         | 60                       |
| Adjusted R <sup>2</sup> | 0.2116                | 0.2642                 | 0.1792                | 0.0890                | 0.0864                | 0.2600                | 0.2986                      | 0.6250                   |
| Prob > F                | 0.0000                | 0.0000                 | 0.0000                | 0.0061                | 0.0200                | 0.0003                | 0.0010                      | 0.0095                   |
| Robust                  | No                    | No                     | No                    | Yes                   | Yes                   | Yes                   | Yes                         | Yes                      |
| Fixed-Effect (FE)       | No                    | No                     | Yes                   | Yes                   | Yes                   | Yes                   | Yes                         | Yes                      |

Note: \*\*\* (p < 0,01), \*\* (p < 0,05), \* (p < 0,10), Dependent Variable: Women's Participation in the Labor Force (WPL)

The effect of early marriage on women's labor force participation produces one of the most substantively interesting patterns in this study. In the nested model specifications, WEM exerts a consistent and statistically significant negative effect: a one percentage point increase in the early marriage rate is associated with a decrease of 0.354 percentage points in WPL when WEM is entered alone (Model 4, p < 0.01), and this effect remains virtually unchanged at -0.352 when GEI is added (Model 5, p < 0.05). This stability across Models 4 and 5 suggests that the negative effect of early marriage is not confounded by gender empowerment levels, and that these two variables capture distinct dimensions of gender inequality.

However, a particularly striking finding emerges when comparing the nested models with the full model. In both the full FEM without robust standard errors (Model 3) and the full robust FEM (Model 6), the coefficient of WEM becomes statistically indistinguishable from zero ( $\beta = -0.0152$ , p > 0.10). This attenuation suggests that the effect of early marriage on WPL is partially mediated, or suppressed by the control variables, most notably LN.PMW and AYW are included simultaneously. In other words, early marriage's negative influence on women's labor market entry may operate primarily through its downstream effects on women's wages and educational attainment, rather than through a direct pathway independent of these factors.

The Gender Empowerment Index does not achieve statistical significance in any of the national-level models (Models 2, 3, 5, and 6), suggesting that at the aggregate provincial level, cross-province variation in gender empowerment does not independently predict changes in women's labor force participation once other socio-

economic factors are controlled for. This is a noteworthy null finding: it implies that composite empowerment indices may obscure the specific channels, education, wages, political representation through which empowerment operates, and that these channels are better captured by the more specific variables in the model.

The subgroup analysis, however, reveals a more nuanced picture. In the Java subsample (Model 8), GEI carries a negative and marginally significant coefficient ( $\beta = -0.212$ ,  $p < 0.10$ ). This counter-intuitive negative sign warrants careful interpretation: in provinces with already high levels of economic development and women's market integration, as is characteristic of Java a higher GEI score may paradoxically reflect greater representation of women in political and decision-making roles without a commensurate increase in broad-based labor market participation, particularly in rural or peri-urban areas within the same province.

The natural logarithm of the provincial minimum wage is the most consistently significant and economically substantial predictor of WPL across national-level models. In the primary model (Model 6), a 1% increase in the provincial minimum wage is associated with an increase of approximately 11.35 percentage points in women's labor force participation ( $p < 0.01$ ). This large and robust positive effect persists across Models 2, 3, and 6, and is even larger in the non-Java subsample (Model 7:  $\beta = 15.87$ ,  $p < 0.01$ ).

The Java subsample (Model 8), however, reveals a notable exception: the coefficient for LN.PMW is negative and statistically insignificant ( $\beta = -0.81$ ,  $p > 0.10$ ). This divergence between Java and non-Java provinces constitutes one of the most substantively interesting findings of this study. A plausible explanation lies in the labor market structure of Java: with higher baseline wages and a more formalized labor market, marginal increases in the minimum wage in Java may generate labor demand-side constraints, particularly in labor-intensive industries that reduce net employment opportunities for women, partially offsetting the supply-side incentive effect that dominates in less developed non-Java provinces.

The effect of average years of schooling for women on WPL is negative and statistically significant in the Pooled OLS ( $\beta = -4.100$ ,  $p < 0.01$ ), REM ( $\beta = -1.947$ ,  $p < 0.01$ ), and FEM without robust standard errors ( $\beta = -1.410$ ,  $p < 0.10$ ), but loses significance in the primary robust model (Model 6:  $\beta = -1.41$ ,  $p > 0.10$ ). The negative sign, which persists across multiple specifications, appears counterintuitive given human capital theory's prediction that education should raise women's labor market participation.

This pattern, however, is consistent with findings in the existing literature on Indonesia. Higher female educational attainment at the provincial level may reflect a composition effect: as more women complete secondary and tertiary education, a greater share may temporarily exit the labor force to pursue further education or shift their reservation wage upward, choosing to wait for formal employment that matches their qualifications rather than accepting informal work. This is particularly relevant in

the Indonesian context, where the majority of available employment for women remains in the informal sector.

The subgroup analysis reveals a sharp geographical reversal: in non-Java provinces, AYW retains a negative and significant effect ( $\beta = -2.696$ ,  $p < 0.10$ ), consistent with the national pattern, while in Java provinces the coefficient flips to a positive and significant 3.677 ( $p < 0.01$ ). This sign reversal is arguably the most striking finding of the geographical analysis. In Java — where formal labor markets are more developed, service-sector employment is more abundant, and returns to education are more tangible, higher female educational attainment translates into greater labor force participation. In contrast, in non-Java provinces, where formal employment opportunities remain scarce and poorly matched to educated workers' expectations, higher education may instead defer women's labor market entry.

### **3.2. Discussion**

#### **Provincial Minimum Wage as the Dominant Driver of Women's Labor Force Participation**

The findings confirm that the provincial minimum wage (LN.PMW) is the strongest and most consistently significant predictor of women's labor force participation across national-level models, with a 1% increase in the minimum wage associated with an 11.35 percentage-point increase in WPL in the primary model (Model 6). This supply-side incentive mechanism reflects the logic that higher minimum wages raise the opportunity cost of remaining outside the labor force, drawing women, particularly those in lower-income households into paid employment.

This result contrasts with several prior studies. Arranz & García-Serrano (2025) explain that minimum wages make it increasingly difficult for young people to enter the labor force by raising the financial burden on companies, which leads employers to hire only highly capable workers. Addison & Ozturk (2012) similarly found that minimum wages reduce employment levels among working-age women in OECD countries. Several studies conducted in Indonesia also found that increases in minimum wages negatively affect overall employment absorption (Yanda et al., 2022). Gumata & Ndou (2020) offer a complementary explanation: minimum wages do not automatically reduce job availability but can increase worker productivity in line with efficiency wage theory, resulting in fewer workers being hired because productivity needs are met with a smaller workforce. Nonetheless, the findings of this study are consistent with other evidence showing positive effects. Audilla & Rachmawati (2025) found that minimum wages positively affect employment absorption in Central Java, while Iregui-Bohórquez et al. (2024) found that higher minimum wages increase women's labor force participation in Colombia. A positive effect is also observed among urban female workers in Egypt (Krafft, 2026).

A particularly important finding emerges from the geographical subgroup analysis. In non-Java provinces (Model 7), the positive effect of minimum wage on WPL is even larger, consistent with the national pattern. In Java provinces (Model 8), however, the coefficient reverses to negative and becomes statistically insignificant. This divergence

reflects the structural difference between these two regional contexts. In non-Java provinces, where labor markets are less formalized and baseline wages are lower, minimum wage increases provide a powerful supply-side pull that encourages women to enter the workforce. In Java, where minimum wages are already considerably higher, and labor-intensive industries concentrate female employment, marginal wage floor increases may generate labor demand-side constraints that reduce net job availability for women even as the minimum wage rises. This finding suggests that minimum wage policy is not a one-size-fits-all instrument for promoting female labor force participation in Indonesia, and its effectiveness is contingent on the underlying structure of regional labor markets.

### **Early Marriage and Gender Empowerment Index: Insignificant at the Provincial Level**

The findings show that early marriage (WEM) and the Gender Empowerment Index (GEI) do not significantly affect women's labor force participation in the primary full model (Model 6). The insignificance of WEM in the full model, however, should not be interpreted as an absence of effect. The nested model analysis reveals a meaningful pattern: WEM exerts a consistent and statistically significant negative effect when entered alone (Model 4) and when combined with GEI (Model 5), but this effect attenuates to near-zero once LN.PMW and AYW are included simultaneously in the full model. This pattern is consistent with a partial mediation mechanism: the effect of early marriage on WPL operates not through a direct independent pathway, but through downstream socio-economic channels, particularly wages and educational attainment that are absorbed by the control variables. This interpretation aligns with Becker's (1975) human capital theory, which posits that early marriage interrupts women's investment in their own productive capacities, with consequences that manifest in lower wages and shorter schooling durations rather than in a direct reduction of labor supply. Provinces with high early marriage rates tend to simultaneously exhibit lower minimum wages and lower female educational attainment, meaning that controlling for these variables absorbs much of what WEM would otherwise capture.

These results differ from several prior studies at the individual or country level. Assaad et al., (2017) found that early marriage has a significant impact on women's involvement in various types of work in Tunisia. Dhamija & Roychowdhury (2020) similarly showed that women who marry at a younger age in India tend to have lower labor force participation compared to those who marry later, partly due to household responsibilities and traditional gender roles. Tumsarp & Pholphirul (2020) have identified several factors influencing married women who choose to work, including low education, not being the head of the household, and having fewer household members. The contextual difference between these studies and the present findings is likely attributable to the level of analysis: individual-level studies can isolate the direct biographical effect of early marriage on a woman's own employment trajectory, whereas provincial-level panel data aggregate this effect across heterogeneous populations, making it harder to detect unless the mediating variables are excluded



from the model. This has a direct policy implication: reducing early marriage rates alone, without simultaneously addressing wage floors and educational access, is unlikely to yield significant direct gains in aggregate women's labor force participation at the provincial level.

Regarding GEI, the absence of significance at the national level suggests that composite empowerment indices may obscure the specific channels through which gender empowerment operates, education, income, and political representation which are more precisely captured by the disaggregated variables already included in the model. This contrasts with Iregui-Bohórquez et al. (2024), who explain that national policies can generate empowerment and social change for married women, thereby increasing their labor force participation, and with Dahlum et al. (2022), who show that women's political representation can indirectly increase women's likelihood of participating in the labor force by opening greater access for female workers. Both studies suggest that gender empowerment has an indirect effect on WPL, which is consistent with the interpretation that GEI's influence is mediated by more specific socio-economic variables rather than operating as an independent direct predictor.

The Java subsample (Model 8), however, reveals a more nuanced picture: GEI carries a negative and marginally significant coefficient ( $\beta = -0.212$ ,  $p < 0.10$ ), suggesting an empowerment paradox in more economically developed provinces. In Java, higher GEI scores may reflect women's representation in political and managerial decision-making roles without a commensurate improvement in broad-based labor market participation. Empowerment gains in Java appear to be concentrated among a relatively small segment of highly educated, urban professional women, while the majority of working-age women in peri-urban and rural areas within the same provinces remain constrained by persistent social norms and care responsibilities. This finding underscores the risk that aggregate empowerment measures can mask deep intra-provincial inequality in women's economic opportunities (World Economic Forum, 2023).

### **Average Years of Schooling: A Negative Relationship with Geographic Reversal**

The findings show that average years of schooling for women (AYW) has a negative relationship with women's labor force participation at the national level, though this effect is only marginally significant in the full model without robust standard errors (Model 3) and loses significance in the primary robust model (Model 6). This negative direction contrasts with several prior studies that generally find a positive influence of education on women's labor participation. Cantika (2019) revealed that education, age, and wages collectively and positively influence female labor absorption in East Java. Heath & Jayachandran (2016) similarly show that higher education among women encourages more women to enter the labor market.

Several contextual factors explain this apparent divergence. As Awomi & Shafuda (2026) notes, higher education raises women's job expectations and standards, which may reduce their willingness to accept informal employment. This is particularly relevant in Indonesia, where more women work in the informal than formal sectors,



and where educational requirements are generally not necessary for informal work (BPS, 2024). Kim & Williams (2021) further explain that women tend to have weaker bargaining power in the labor market, making them less likely to secure formal employment even with higher qualifications. For married women, the husband's education and income level also matter: the higher the husband's earnings, the slower the wife's entry into the labor force, reducing women's economic necessity to work regardless of their own educational attainment (Olu-Owolabi et al., 2020). Tumsarp & Pholphirul (2020) add that married women more often work in the service sector, which relies on domestic skills that do not require high educational levels, further weakening the link between formal education and labor market entry.

The geographical subgroup analysis reveals a sharp and theoretically significant reversal. In non-Java provinces (Model 7), AYW retains its negative and significant effect, consistent with the national pattern described above. In Java provinces (Model 8), however, the coefficient reverses to a positive and strongly significant. This sign reversal is arguably the most striking finding of the geographical analysis. In Java, where formal labor markets are more developed, service-sector employment is more abundant, and returns to education are more tangible higher female educational attainment translates directly into greater labor force participation because formal employment opportunities are sufficiently aligned with educated women's qualifications and wage expectations. In non-Java provinces, where formal employment remains scarce and poorly matched to educated workers' expectations, higher education instead defers women's labor market entry as they wait for suitable formal employment rather than accepting informal work below their reservation wage. This finding carries a significant policy implication: investments in female education must be accompanied by parallel investments in formal job creation and labor market development in non-Java regions if they are to translate into meaningful gains in women's labor force participation.

### **Synthesis: Geographic Heterogeneity as a Central Policy Insight**

Taken together, the subgroup analysis across Java and non-Java provinces reveals that the determinants of women's labor force participation in Indonesia are not spatially uniform. The effects of minimum wage, education, and gender empowerment all differ, and in some cases reverse in sign between these two geographic contexts. This geographic heterogeneity reflects the deep structural divide between Java's more formalized, industrialized, and service-oriented economy and the more agrarian, informal, and wage-scarce economies of non-Java provinces. National-level panel estimates, while informative, mask important regional dynamics that carry distinct policy implications. Policies designed to increase women's labor force participation must therefore be calibrated to the specific labor market conditions of each region, rather than applied uniformly across Indonesia's highly heterogeneous provincial landscape.

#### 4. Conclusion

This study examined the effect of early marriage, the Gender Empowerment Index, provincial minimum wage, and average years of schooling for women on female labor force participation across 34 provinces in Indonesia over the period 2015–2024, using a panel data regression approach with Fixed Effect Model estimation. The analysis yields four principal conclusions.

First, the provincial minimum wage is the most robust and consistently significant determinant of women's labor force participation at the national level. A higher minimum wage raises the opportunity cost of remaining outside the labor force, generating a strong supply-side incentive for women to enter paid employment. This finding holds across multiple model specifications and is particularly pronounced in non-Java provinces, where labor markets are less formalized, and baseline wages are lower. In Java provinces, however, the minimum wage effect reverses in direction and loses significance, reflecting demand-side constraints in more formalized labor markets where wage floor increases may reduce net employment opportunities for women in labor-intensive industries.

Second, early marriage does not exert a statistically significant direct effect on women's labor force participation in the full model, but its influence is evident in the nested model specifications. The attenuation of the early marriage coefficient once wages and education are controlled for suggests that early marriage operates primarily through indirect pathways, by curtailing women's educational attainment and limiting their access to higher-wage employment rather than through a direct and independent reduction of labor supply. This partial mediation finding implies that policies targeting early marriage must be implemented alongside complementary interventions in education and wage policy to produce meaningful aggregate gains in women's labor force participation.

Third, the Gender Empowerment Index does not significantly predict women's labor force participation at the national level, suggesting that composite empowerment measures may obscure the specific channels through which empowerment operates. The exception is in Java provinces, where a negative and marginally significant GEI effect points to an empowerment paradox: measured empowerment gains are concentrated among a narrow segment of highly educated, urban professional women and do not translate into broad-based improvements in labor market participation across the general female population.

Fourth, the relationship between average years of schooling and women's labor force participation is negative at the national level, reflecting a reservation wage effect whereby higher educational attainment raises women's expectations for formal employment in a context where formal job opportunities remain insufficient, particularly in non-Java provinces. The geographical subgroup analysis reveals a striking reversal in Java, where higher female education is associated with significantly greater labor force participation, underscoring that the returns to education are contingent on the absorptive capacity of regional labor markets.

Taken together, these findings highlight geographic heterogeneity as a central feature of women's labor market dynamics in Indonesia. The determinants of female labor force participation differ substantially between Java and non-Java provinces, with the effects of minimum wage, education, and gender empowerment all varying, and in some cases reversing across these two contexts. This spatial heterogeneity has a direct policy implication: interventions designed to increase women's labor force participation must be regionally calibrated rather than uniformly applied. In non-Java provinces, priority should be given to raising minimum wages alongside expanding formal employment opportunities and improving the quality of women's education. In Java provinces, where wage floors are already relatively high, policy attention should shift toward addressing demand-side constraints in female-dominated industries and ensuring that empowerment gains are distributed beyond the urban professional class.

This study is not without limitations. The use of provincial-level aggregate data precludes inference about individual-level mechanisms and may mask intra-provincial heterogeneity in women's labor market experiences. The panel period of 2015–2024, while longer than most prior Indonesian studies, does not capture the structural shifts that preceded this window, including the effects of earlier industrial transformation and pre-2015 marriage law provisions. Furthermore, the Gender Empowerment Index as measured by BPS may not fully capture the multidimensional nature of women's empowerment, and future studies would benefit from incorporating more granular empowerment measures, such as women's intra-household decision-making power and mobility autonomy alongside the macro-level variables examined here. Future research should also consider dynamic panel estimation approaches, such as the System GMM, to account for the potential persistence of women's labor force participation over time and to address residual endogeneity concerns that fixed effect estimation alone cannot fully resolve.

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