DETERMINANTS OF FEMALE WORKERS' WAGES IN INDONESIA, 2020–2024

Yulia Nuur Rohmah[1]
Universitas Muhammadiyah Surakarta, Surakarta, Indonesia
b300220099@student.ums.ac.id

Muhammad Anas[2*]
Universitas Muhammadiyah Surakarta, Surakarta, Indonesia
ma912@ums.ac.id[*]

Abstract

Indonesian female workers continue to face gender inequality in the labor market, reflected in the relatively low wages they receive despite their contribution to economic activities. This study aims to estimate the effects of female workers, female labor productivity, females' mean years of schooling, and females' life expectancy on female workers' wages in Indonesia from 2020 to 2024 using panel data regression with a Fixed Effects Model (FEM) approach. The data were obtained from the Central Statistics Agency (BPS) and cover 34 provinces in Indonesia during the 2020–2024 period. The results show that the number of female workers and females' life expectancy have a positive and significant effect on female workers' wages. In contrast, female labor productivity and females' mean years of schooling do not significantly affect female workers' wages. These findings suggest that women's participation in the labor market and improvements in health conditions are associated with higher wage levels. However, variations in female wages across provinces may also be influenced by factors not included in the model, such as industrial composition, urbanization, labor market institutions, regional economic growth, and occupational segregation. Therefore, future research should incorporate these factors to provide a more comprehensive understanding of female wage determination. Strengthening gender-responsive labor policies remains essential to improve the welfare of female workers in Indonesia.

Keywords: Wages, Female Workers, Female Worker Productivity, Females' Mean Years of Schooling for Women, Females' Life Expectancy, Fixed Effects Model

INTRODUCTION

Wages are compensation provided to workers for their contribution to the production of goods and services and serve as the primary source of income for meeting basic needs, including food, education, and healthcare (Ramadana & Rahmaniar, 2023). As a key determinant of workers' welfare, wages are influenced by various economic and social factors, such as education, productivity, health, and gender equality (Aini & Marta, 2025). Workers with better education, skills, and experience tend to earn higher wages because they contribute more effectively to the production process. Consequently, a fair wage system is essential for improving both labor welfare and economic productivity.

One of the factors influencing workers' wages in Indonesia is gender equality. Gender equality refers to the equal rights of men and women to obtain legal freedom, opportunities, and a comparable quality of life (Aniqurrohmah, 2023). It has become a key focus of the global sustainable development agenda, as reflected in the fifth Sustainable Development Goal (SDG 5), which aims to achieve inclusive and sustainable development through women's empowerment (Sudirman & Susilawaty, 2022). Gender equality plays a crucial role in a country's economy because it can enhance productivity and stimulate economic growth. According to Sriharini et al. (2024), equal access to education, training, and employment opportunities improves human resource productivity and contributes to inclusive economic growth. Despite evidence from previous studies demonstrating that gender equality supports productivity and economic development, gender disparities continue to persist in Indonesia.

Table 1
Number of Workers (Million Persons), Productivity (Million Rupiah per Worker), and Wages (Rupiah) by Gender in Indonesia, 2020–2024

Year	Number of Workers		Productivity		Wages	
	Male	Female	Male	Female	Male	Female
2020	81	53	134	206	2,682.06	2,210.13
2021	79	52	143	214	2,675.19	2,228.51
2022	82	53	144	222	2,964.09	2,396.35
2023	85	54	144	225	3,172.24	2,467.04
2024	86	56	150	228	3,243.33	2,604.52

Source: Statistics Indonesia (BPS)
Note: Productivity is calculated by dividing Gross Regional Domestic Product (GRDP) by the number of workers.

Based on Table 1, the Indonesian workforce remains dominated by men, with an average of 83 million workers compared to 54 million female workers. This difference indicates that gender disparities in labor force participation continue to exist. The relatively low female labor force participation rate is influenced by multiple factors, including domestic and childcare responsibilities, social norms that position men as primary breadwinners, wage inequality, limited access to education and job training, and discrimination rooted in socio-cultural traditions (Putri et al., 2025).

Despite lower participation rates, the productivity indicator associated with female workers appears higher than that of male workers. During 2020–2024, average productivity

calculated as GRDP divided by the number of workers reached IDR 219 million per worker for female workers and IDR 143 million per worker for male workers. However, this measure reflects aggregate productivity rather than individual worker productivity. Therefore, the observed difference should not be interpreted as evidence that female workers are inherently more productive than male workers. Variations in sectoral composition, occupational distribution, labor market structure, and regional economic characteristics may contribute to these differences. Nevertheless, the figures indicate that female workers make substantial economic contributions despite their lower labor force participation rates. However, higher productivity does not necessarily translate into higher wages. Statistics Indonesia (BPS) reported that the average wage gap between male and female workers reached IDR 566,070. This disparity is influenced by both observable and unobservable factors, including structural discrimination, gender stereotypes, differences in human capital, work experience, working hours, marital status, household responsibilities, educational attainment, and access to training. In addition, many women remain concentrated in low-paying informal sector jobs (Nasution & Yuniasih, 2022), highlighting the need for stronger labor law enforcement, policy coordination, and protection for female workers, particularly in the informal sector (Nuraeni & Suryono, 2021).

Wages and productivity are closely related variables. Workers with higher productivity generally make greater economic contributions to firms and therefore deserve higher compensation. Marginal Productivity Theory provides the theoretical basis for the relationship between labor productivity and wages. The theory argues that workers are compensated according to the value of their marginal contribution to production. As productivity increases, workers generate greater output and economic value, leading employers to offer higher wages. Therefore, female labor productivity is expected to have a positive relationship with female workers' wages because productive workers contribute more significantly to organizational performance and economic growth. Wahyuni and Pratiwi (2024) found a positive and significant relationship between wages and productivity. This finding is consistent with marginal productivity theory, which states that wage levels reflect the value of labor contributions to output. In other words, the higher a worker's productivity, the greater the opportunity to earn higher wages.

Human capital factors, particularly education and health, also play important roles in determining wage levels because they enhance workers' skills, knowledge, and productive capacity. Higher levels of female education increase opportunities to obtain better-paying jobs. Aini and Marta (2025) found that education has a positive and significant effect on income, indicating that women with higher educational attainment are more likely to earn higher incomes. Likewise, good health improves productivity and work consistency. Puspasari and Handayani (2020) reported that health has a positive and significant effect on labor productivity because healthy workers are able to work longer and generate higher output, which ultimately contributes to higher wages. Therefore, education and health can be regarded as important investments for improving women's productivity and earnings. This relationship is consistent with Human Capital Theory, which views education and health as forms of investment that enhance workers' knowledge, skills, competencies, and productive capacity. Individuals who possess higher levels of education generally have better access to skilled occupations and higher-paying jobs, while good health enables workers to participate more effectively and consistently in economic activities. Consequently, improvements in

female educational attainment and health conditions are expected to increase productivity and strengthen women's earning potential, ultimately contributing to higher wage levels.

Table 2
Average Years of Schooling of Males and Females (Years) and Female Life Expectancy (Years) in Indonesia, 2020–2024

Year	AYS		FLE
	AMYS	AFYS	
2020	9.07	8.32	74.74
2021	9.12	8.42	74.89
2022	9.18	8.58	75.17
2023	9.24	8.70	75.46
2024	9.37	8.87	75.76

Source: BPS

Education and health can be represented by the indicators of Average Years of Schooling (AYS) and Life Expectancy (LE). Table 2 shows that Average Female Years of Schooling (AFYS*)* increased from 8.32 years in 2020 to 8.87 years in 2024, while Female Life Expectancy (FLE) rose from 74.74 years to 75.76 years. The increase in AFYS was supported by the implementation of the 12-year compulsory education policy and more equitable access to education for women, enabling them to pursue longer periods of schooling. Educated women tend to invest more in family education and health, which indirectly contributes to improvements in FLE and supports long-term economic development (Azalia, 2024). Furthermore, increasing life expectancy reflects improvements in public health conditions, which reduce the risk of premature mortality, enhance productivity, and improve the quality of human resources (Wulandari & Nurhayati, 2024).

Despite the improvement in AFYS, the average years of schooling for men remained higher, reaching 9.20 years. This condition indicates that barriers preventing women from pursuing higher levels of education still exist. One contributing factor is the cultural perception that prioritizes male education while viewing women's primary role as household caretakers (Rahmayani, 2021). Female educational attainment has a direct impact on both social and economic development. Azalia (2024) found that women's education has a positive and significant effect on their income contribution, implying that higher educational attainment increases employment opportunities and earning potential. In addition to improving household welfare, educated women are more likely to invest in family education and health, creating multiplier effects that contribute to broader social and economic development in the long run. Therefore, strengthening policies that promote equal access to education for women is essential for improving quality of life, health outcomes, and overall welfare.

Based on Marginal Productivity Theory and Human Capital Theory, female workers' wages can be influenced by both productivity-related and human capital factors. Female labor productivity reflects the economic value generated by workers, while education and health enhance workers' capabilities and efficiency in the labor market. In addition, the number of female workers reflects women's participation in economic activities and may influence labor market dynamics and bargaining power. Accordingly, this study proposes that female labor productivity, female education, female health, and the number of female workers are

important determinants of female workers' wages in Indonesia. Women in Indonesia continue to face gender inequality in education, labor force participation, employment opportunities, and wages, despite exhibiting relatively higher productivity levels. This condition contributes to lower levels of welfare, the concentration of women in low-paid informal employment, and limited access to decent jobs, thereby reinforcing long-term socioeconomic disparities. Research examining the effects of the Female Worker Number (FWN), Female Labor Productivity (FLP), female education, and female health on Female Workers' Wages (FWW) remains limited. Therefore, this study seeks to fill this gap by providing a more comprehensive understanding of gender equality issues and identifying the factors that influence the wages earned by female workers in Indonesia.

REVIEW OF LITERATURE

Wu (2023) examined the effect of education on monthly wages in Indonesia using the Ordinary Least Squares (OLS) method. The results indicated that years of formal education, birth year, average educational attainment among the elderly, and urban birth population positively affected monthly wages in Indonesia. Similarly, Aini and Marta (2025), in their study conducted in Indonesia in 2020, found that workers with education above the senior high school level earned approximately 40.4% higher wages than those with a maximum education of senior high school. Male workers earned approximately 52.2% higher wages than female workers. Each additional year of work experience increased wages by 0.01%. Furthermore, workers who participated in training programs earned approximately 7.77% higher wages than those who did not receive training. Workers residing in urban areas earned approximately 24.01% higher wages than rural workers, while married workers earned 19.4% higher wages than unmarried workers.

Furthermore, Huang (2025), in a study conducted in the United Kingdom, found that higher educational attainment, greater work experience, and better health conditions positively influenced wages, whereas female workers earned approximately 14%–20% lower wages than male workers. Regarding the effect of education, workers who completed primary education earned approximately 9.9%–11% higher wages, senior high school graduates earned 16%–18% higher wages, and university graduates earned 46%–54% higher wages than workers without formal education. In addition, healthy workers received a wage premium of approximately 5.9%–6.1% compared to unhealthy workers. The study also revealed that small firms paid lower wages than private companies, part-time workers earned lower wages than full-time workers, and managerial employees earned approximately 27.33% higher wages than workers in other positions.

Prime et al. (2016) employed a Fixed Effects Model (FEM) to investigate wage differentials in urban areas, focusing on educational attainment across metropolitan statistical areas in the United States during 2005–2012. The findings showed that a higher proportion of highly educated residents, local housing costs, and minimum wage policies positively affected wages, whereas the proportion of young workers negatively affected median wages in U.S. metropolitan areas. Similarly, Alcan and Özsoy (2020) found that women with good health conditions earned 6.98% higher wages than those with poorer health conditions, while adequate protein intake increased male wages by 3.97% compared to men whose nutritional needs were not met. In terms of education, the returns to education were greater for women, with university graduates earning 60.6% higher wages and vocational graduates earning

51.4% higher wages than low-educated workers. For men, the wage increase associated with education was only 20.7%. Additionally, marriage increased wages by 20% for men and 12.9% for women. Social security coverage also positively affected wages for both genders, as formal-sector workers earned higher wages than informal-sector workers. However, the effect was stronger for women, reaching 30.9%, compared to only 7.22% for men. Xie et al. (2020) also found that male workers tended to earn higher wages than female workers. At the 25th wage percentile (Q25), male workers earned approximately 17.9% higher wages than female workers in the low-wage group. The largest effect occurred at the median wage percentile (Q50), where male workers earned 26.7% higher wages than female workers. Although the effect remained positive at the 75th and 90th wage percentiles (Q75 and Q90), amounting to 20.9% and 11.6%, respectively, the magnitude of the gender wage gap declined among higher-income groups.

Álvarez and Gutiérrez (2018) conducted a study across 16 European countries during 2008–2011 using a True Random Effects approach. Their findings revealed that university-educated workers earned higher wages than workers with only primary education. Work experience also significantly increased wages, while skilled occupations such as managerial positions received higher wages than unskilled occupations. Moreover, health status, male gender, and permanent employment contracts negatively affected wage inefficiency. Workers with multiple limitations earned lower wages than healthy workers, male workers tended to earn higher wages than female workers, and workers with permanent contracts were more likely to earn higher wages than temporary workers.

Rogayah (2021) analyzed the effect of female labor force participation on real hourly wages in Indonesia during 2002–2018 using a Random Effects model estimated through Generalized Least Squares (GLS). The results showed that GDP per capita and average years of schooling positively influenced real hourly wages. Female labor force participation and poverty rates were also found to significantly affect real hourly wages in Indonesia.

Lamazi (2018) examined the determinants of rural female workers' wages in South Sumatra during 2006–2013 using the Mincerian earnings model. The findings indicated that age, working hours, and educational attainment positively affected rural female workers' wages, whereas employment in the non-agricultural sector negatively affected wages. Female workers who completed primary school earned 20.3% higher wages, junior high school graduates earned 33.1% higher wages, senior high school graduates earned 74.2% higher wages, and workers with tertiary education earned 128.1% higher wages than women who did not complete primary school. Meanwhile, female workers employed in the non-agricultural sector earned approximately 35.6% lower wages than those employed in agriculture. Nurfitri et al. (2025) similarly reported that formal education, workers' age, and working hours positively affected wage levels among informal-sector workers in Bima City in 2023.

Syafitri et al. (2023) used logistic regression analysis to examine the determinants of female workers' income in the informal sector of East Java in 2020. The results indicated that married women and women living in rural areas were less likely to earn adequate income. Married women had a 0.828 times lower probability of earning adequate income compared to unmarried women, while rural women had a 0.821 times lower probability than their urban counterparts. Conversely, internet literacy increased the likelihood of obtaining adequate income by 1.672 times due to broader market access. In addition, each additional year of

formal education increased the probability of earning adequate income by 1.124 times, while age increased the probability by 1.162 times before eventually declining at older ages. A positive effect of formal education was also identified by Harahap (2024) in West Sumatra in 2020. Workers with permanent employment contracts were 9.1 times more likely to earn wages above the provincial minimum wage than workers without contracts. Similarly, workers with fixed-term contracts were 1.6 times more likely to receive wages above the minimum wage, whereas workers with verbal agreements were less likely to earn higher wages than those with written contracts. Furthermore, male workers were three times more likely than female workers to receive high wages in West Sumatra.

Fard et al. (2018) investigated wage determinants in Iran during 1974–2014 using the Autoregressive Distributed Lag (ARDL) approach. The study found that, in the short run, skilled labor productivity negatively affected wages, while unskilled labor productivity, total factor productivity, and education positively affected wage levels. Similar results were observed in the long run, where skilled labor productivity remained negative, whereas unskilled labor productivity, total factor productivity, and education continued to have positive effects on wages.

Overall, previous studies consistently indicate that education is one of the most important determinants of wages across different countries and labor market settings. Studies conducted in Indonesia (Wu, 2023; Aini & Marta, 2025; Lamazi, 2018; Syafitri et al., 2023) and other countries such as the United Kingdom (Huang, 2025), Turkey (Alcan & Özsoy, 2020), and several European countries (Álvarez & Gutiérrez, 2018) generally report a positive relationship between educational attainment and wages. However, the magnitude of the returns to education varies considerably across countries and demographic groups. For example, university graduates in Turkey experienced wage premiums exceeding 60%, whereas the estimated returns in the United Kingdom were lower. These differences may reflect variations in labor market structures, skill demand, industrial composition, educational quality, and institutional settings. Therefore, the relationship between education and wages remains context-dependent and requires further investigation in different economic environments.

Similar patterns can be observed regarding the effects of health and productivity on wages. Most studies suggest that healthier workers tend to earn higher wages because better health improves productivity, work attendance, and labor market participation (Huang, 2025; Alcan & Özsoy, 2020). Nevertheless, evidence on productivity is less consistent. While marginal productivity theory predicts a positive relationship between productivity and wages, empirical findings vary across countries and worker groups. Wahyuni and Pratiwi (2024) reported a positive effect of productivity on wages, whereas Fard et al. (2018) found that skilled labor productivity negatively affected wages in Iran. These contrasting findings indicate that productivity does not always translate directly into higher wages and may depend on labor market institutions, bargaining power, sectoral characteristics, and wage-setting mechanisms.

Although previous studies have extensively examined the determinants of wages, most focus on general wage levels, income, or gender wage differentials rather than specifically analyzing female workers' wages. In addition, prior studies typically examine education, health, productivity, or labor force participation separately. Empirical evidence that simultaneously investigates Female Worker Number, Female Labor Productivity,

Average Female Years of Schooling, and Female Life Expectancy as determinants of Female Workers' Wages remains limited, particularly in the Indonesian context. Therefore, this study seeks to address this gap by providing a more comprehensive analysis of the factors influencing female workers' wages in Indonesia.

RESEARCH METHOD

This study employed a quantitative research approach using secondary data obtained from Statistics Indonesia (BPS) for the period 2020–2024. The study utilized panel data, which combine cross-sectional and time-series data. The cross-sectional dimension consisted of 34 provinces in Indonesia, while the time-series dimension covered the years 2020–2024. The econometric model used to estimate the effects of the number of female workers, female labor productivity, average female years of schooling, and female life expectancy on female workers' wages is specified as follows:

$$LogFWW_{it} = \beta_0 + \beta_1 LogFWN_{it} + \beta_2 LogFLP_{it} + \beta_3 AFYS_{it} + \beta_4 FLE_{it} + \varepsilon_{it}$$

where:

FWW	:	Female Workers' Wages (rupiah)
β_0	:	Constant
$\beta_1, \beta_2, \beta_3, \beta_4$	:	Coefficient
FWN	:	Female Worker Number (million people)
FLP	:	Female Labor Productivity (million rupiah per person)
AFYS	:	Average Female Years of Schooling (year)
FLE	:	Female Life Expectancy (year)
i	:	*Cross Section* (34 provinces in Indonesia)
t	:	*Time Series* (year 2020-2024)
ε	:	Residual

Panel data regression was estimated using three alternative models: the Common Effects Model (CEM), Fixed Effects Model (FEM), and Random Effects Model (REM). The most appropriate model was selected using the Chow Test and Hausman Test. The selected model was then used to estimate the effects of the independent variables on female workers' wages.

The overall significance of the model was evaluated using the *F*-test. The null hypothesis states that $\beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$, implying that the number of female workers, female labor productivity, average female years of schooling, and female life expectancy jointly have no effect on female workers' wages in Indonesia. The null hypothesis is rejected when the probability value of the *F*-statistic is less than the significance level (α).

Furthermore, the *t*-test was employed to examine the individual effect of each independent variable on female workers' wages. The null hypothesis states that $\beta_i = 0$ ($i = 1$–4), indicating that each explanatory variable has no significant effect on female workers'

wages. The alternative hypothesis proposes that the number of female workers has a negative effect on female workers' wages ($\beta_1 < 0$), while female labor productivity, average female years of schooling, and female life expectancy have positive effects on female workers' wages ($\beta_2, \beta_3, \beta_4 > 0$). The null hypothesis is rejected when the probability value of the *t*-statistic is less than the significance level (α).

RESULTS AND DISCUSSION

Estimation Results

Panel data estimation was conducted using three alternative approaches: the Common Effects Model (CEM), Fixed Effects Model (FEM), and Random Effects Model (REM). The estimation results are presented in Table 3.

Table 3
Regression Results of CEM, FEM, and REM

Variable	Regression Coefficient		
	CEM	FEM	REM
C	8.844	-4.525	3.011
LOG(FWN)	-0.009	0.161	0.020
LOG(FLP)	0.216	0.063	0.065
AFYS	0.065	0.007	0.073
FLE	-0.016	0.134	0.052
R^2	0.457	0.957	0.357
Prob. *F*	0.000	0.000	0.000
(1) Chow Test Cross-section *F* (33, 132) = 47.096; Prob. *F* = 0.000			
(2) Hausman Test Cross-section random $\chi^2(4) = 72.901$; Prob. $\chi^2 = 0.000$			

Source: Statistics Indonesia (BPS), processed data

After obtaining the CEM, FEM, and REM estimation results, two statistical tests were conducted to determine the most appropriate model for panel data estimation. First, the Chow Test was employed to select between the CEM and FEM. Second, the Hausman Test was used to determine whether the FEM or REM was more suitable. These model selection procedures are essential to ensure that the estimation results are consistent, efficient, and capable of capturing the characteristics of the panel data accurately.

In the Chow Test, the null hypothesis is rejected when the probability value of the *F*-statistic is less than the significance level (α), indicating that the FEM is preferred over the CEM. Conversely, if the probability value exceeds α, the CEM is considered the appropriate model. In the Hausman Test, the null hypothesis is rejected when the probability value of χ^2 is less than α, indicating that the FEM is more appropriate than the REM. Otherwise, the REM is selected. Therefore, these tests provide a systematic basis for identifying the model that best fits the underlying structure of the data.

The results presented in Table 3 show that the probability value of the Cross-section *F*-statistic is 0.000, which is lower than α (0.01). Therefore, the null hypothesis of the Chow

Test is rejected, indicating that the FEM is preferred to the CEM. Similarly, the probability value of the χ^2 statistic is 0.000, which is also lower than α, leading to the rejection of the null hypothesis in the Hausman Test. Accordingly, the Fixed Effects Model (FEM) was selected as the most appropriate model for estimating the panel data in this study. This finding suggests that unobserved individual effects across provinces are correlated with the explanatory variables and should be controlled through the fixed-effects specification.

Table 4
Fixed Effects Model (FEM) Regression Results

Variable	Coefficient
C	-4.525
	(0.001)*
LogFWN	0.161
	(0.003)*
LogFLP	0.063
	(0.146)
AFYS	0.007
	(0.850)
FLE	0.134
	(0.000)*
R^2	0.957
Prob. F	0.000

Note: Values in parentheses indicate *t*-statistic probabilities

*Significant at $\alpha = 0.01$.

Table 4 shows that the probability value of the *F*-statistic is 0.000, which is lower than α (0.01). Therefore, the null hypothesis is rejected, indicating that Female Worker Number (FWN), Female Labor Productivity (FLP), Average Female Years of Schooling (AFYS), and Female Life Expectancy (FLE) jointly affect Female Workers' Wages (FWW) in Indonesia during 2020–2024.

The coefficient of determination (R^2) is 0.957, indicating that 95.7% of the variation in Female Workers' Wages can be explained by Female Worker Number, Female Labor Productivity, Average Female Years of Schooling, and Female Life Expectancy. The remaining 4.3% is explained by other variables not included in the model.

The *t*-test was conducted to determine whether each independent variable individually affects Female Workers' Wages. Based on Table 4, Female Worker Number and Female Life Expectancy have a positive and significant effect on Female Workers' Wages in Indonesia during 2020–2024, while Female Labor Productivity and Average Female Years of Schooling do not have a significant effect. The summary of the *t*-test results is presented in Table 5.

Table 5
***t*-Test Results**

Variable	Coefficient	Prob. *t*	Conclusion
LogFWN	0.161	0.003	β_1 is significant at α 0.01
LogFLP	0.063	0.146	β_2 is not significant
AFYS	0.007	0.850	β_3 is not significant
FLE	0.134	0.000	β_4 is significant at α 0.01

The coefficient of *LogFWN* is 0.161, indicating that a 1% increase in Female Worker Number is associated with a 0.161% increase in Female Workers' Wages. Furthermore, the coefficient of *FLE* is 0.134 under a *log-linear* model specification, implying that an increase of one year in Female Life Expectancy increases Female Workers' Wages by approximately 13.4%. The coefficients of *LogFLP* and *AFYS* are not interpreted because they are statistically insignificant.

The regression results indicate that Female Worker Number has a positive effect on Female Workers' Wages. This finding suggests that an increase in the number of female workers contributes to higher wages for women in Indonesia during 2020–2024. As female participation in the labor market expands, women's contribution to economic activities also increases, leading to greater demand for female labor. When firms require more female workers, women have greater opportunities to obtain employment and receive higher wages. Moreover, the increase in Female Worker Number reflects broader employment access and the growing role of women across various sectors of the economy.

Table 6
Number of Workers (Thousands of People) and Female Labor Productivity (Million Rupiahs Per Hours) in Indonesia, 2020–2024

Year	Workers	Productivity
2020	19.758	441
2021	20.826	485
2022	20.842	515
2023	21.413	549
2024	23.085	582

Source: BPS
Note: Productivity is calculated by dividing Gross Domestic Product (GDP) by female working hours

Based on Table 6, the number of female workers in Indonesia showed an increasing trend during 2020–2024. This condition indicates that women's participation and contribution to economic activities have continued to expand over time. The increase in productivity also reflects improvements in the quality of female labor, suggesting that women have experienced progress not only in terms of workforce participation but also in their capacity to generate economic output. Consequently, these developments may strengthen women's role in the labor market and contribute to higher wages and improved welfare for female workers in Indonesia.

However, this finding is inconsistent with the study of Rogayah (2021), which found that female labor force participation negatively affected real hourly wage growth in Indonesia. This discrepancy may occur because many women enter the labor market with relatively low levels of productivity and skills. In addition, economic pressures may encourage women to work without adequate qualifications or preparation. In less-developed provinces, limited educational attainment causes many female workers to be concentrated in informal employment and low-skilled occupations, such as casual labor. Furthermore, domestic responsibilities may restrict women's working hours, thereby limiting their earnings.

Another independent variable found to significantly affect Female Workers' Wages is Female Life Expectancy (FLE), which exhibits a positive effect. Life expectancy is an important component of human capital because it reflects health status and quality of life. Workers with better health conditions tend to be more productive, possess greater work capacity, experience lower absenteeism, and are able to work longer and more efficiently. Good health also enhances workers' physical and mental capabilities, resulting in better performance and encouraging employers to offer higher wages.

This finding is consistent with Huang (2025), who reported that good health has a positive effect on wages. Healthy workers receive a wage premium of approximately 5.9%–6.1% compared to unhealthy workers. Similarly, Alcan and Özsoy (2020) found that women in Türkiye with good health conditions earned wages approximately 6.98% higher than those with poorer health conditions.

Another independent variable whose effect does not support the proposed hypothesis is Female Labor Productivity (FLP), which was found to have no significant effect on Female Workers' Wages in Indonesia during 2020–2024. This result indicates that improvements in female labor productivity have not become a primary determinant of wage formation. One possible explanation is that wage-setting mechanisms are influenced not only by productivity but also by job type, educational attainment, work experience, company policies, and labor market conditions.

The findings suggest that higher productivity does not necessarily translate into higher wages when job quality and wage systems do not adequately reward productivity. Therefore, the analysis of Female Workers' Wages should not focus solely on productivity but should also consider other factors, including occupation, education, work experience, and wage policies.

The final independent variable whose effect is inconsistent with the hypothesis is Average Female Years of Schooling (AFYS), which was found to have no significant effect on Female Workers' Wages. This result indicates that improvements in women's educational attainment do not necessarily lead to higher wages because labor market mismatches between educational qualifications and the jobs entered by women remain prevalent (Sukanti & Sulistyaningrum, 2022). In other words, increases in female education has not been able to increase wages because many women continue to work in informal sectors and low-paying occupations where educational attainment is not the primary basis for wage determination. This condition can be observed in Table 7.

Table 7.
Number of Female Workers in the Informal Sector (Million Persons) and Their Wages (Thousand Rupiah) in Indonesia, 2020–2024

Year	Number of Workers	Workers' Wages
2020	3.02	753.73
2021	2.98	804.46
2022	2.93	869.11
2023	2.86	909.60
2024	3.27	909.46

Source: BPS

Based on Table 7, the number of female workers employed in the informal sector remained relatively high during 2020–2024, ranging from approximately 2.8 to 3.2 million persons. Meanwhile, the wages received by these workers were relatively low. This condition indicates that many women continue to be employed in informal occupations, which are generally characterized by lower productivity, lower earnings, and wage-setting mechanisms that place limited emphasis on educational attainment. Furthermore, female limited access to formal employment means that increased education has not fully increased female workers' wages. Therefore, female workers' wages are influenced not only by educational attainment but also by job characteristics and labor market conditions.

However, this finding is inconsistent with the results of Wu (2023), who found that years of formal education have a positive effect on wages in Indonesia. Similarly, Nurfitri et al. (2025) reported that formal educational attainment positively influences the wages of informal-sector workers in Bima City in 2023. These findings are based on the premise that higher levels of education improve workers' skills, competencies, and employment opportunities, thereby increasing their earning potential. Consistent with this argument, Álvarez and Gutiérrez (2018) found that workers with university education earned higher wages than those with only primary education. Likewise, Prime et al. (2016) showed that the proportion of highly educated individuals had a positive effect on median wages across metropolitan areas in the United States during the period 2005–2012.

CONCLUSION

Wages are an important instrument for maintaining workers' welfare and represent compensation for the labor, skills, and contributions provided by workers in the production process. Fair wage levels play a crucial role in meeting daily needs and motivating workers to improve their productivity. This study aims to estimate the direction and magnitude of the effects of Female Worker Number (FWN), Female Labor Productivity (FLP), Average Female Years of Schooling (AFYS), and Female Life Expectancy (FLE) on Female Workers' Wages (FWW) in Indonesia during the 2020–2024 period.

To achieve this objective, panel data regression analysis was conducted using the Fixed Effects Model (FEM), which was selected as the most appropriate estimation model. The results indicate that Female Worker Number and Female Life Expectancy have positive and significant effects on Female Workers' Wages in Indonesia during 2020–2024. In

contrast, Female Labor Productivity and Average Female Years of Schooling were found to have no significant effect on Female Workers' Wages.

Based on these findings, the government is encouraged to strengthen policies aimed at improving the quality of female labor through the expansion of formal employment opportunities, enhanced labor protection, and the implementation of fair wage systems free from gender discrimination. In addition, efforts to improve human capital should focus on expanding access to healthcare services and improving women's quality of life, as healthier workers tend to be more productive and are more likely to receive higher compensation. Expanding access to education, job training, and women's empowerment programs is also essential to increase women's opportunities to obtain decent employment and higher wages. Through policies that promote gender equality, better health outcomes, and improved labor quality, the welfare of female workers in Indonesia is expected to improve sustainably.

REFERENCES

Aini, R., & Marta, J. (2025). Kesenjangan upah gender sektor informal di Indonesia. MedRep: *Media Riset Ekonomi Pembangunan*, *2*(3), 846–859. https://medrep.ppj.unp.ac.id/index.php/MedREP/article/view/278

Alcan, S., & Özsoy, O. (2020). Relation between health and wages in Turkey. *Panoeconomicus*, *67*(1), 111–126. https://doi.org/10.2298/PAN170120011A

Álvarez, A. R., & Gutiérrez, C. R. (2018). The impact of health on wages: Evidence for Europe. *European Journal of Health Economics*, *19*(8), 1173–1187. https://doi.org/10.1007/s10198-018-0966-2

Aniqurrohmah, S. F. L. (2023). Kesetaraan gender dan nilai-nilai yang terkandung di dalamnya menurut hak asasi manusia. JURDIKUM: *Jurnal Dunia Ilmu Hukum*, *1*(2), 50–56. https://doi.org/10.59435/jurdikum.v1i2.170

Azalia, A. N. F. (2024). The impact of educational attainment and professional on women's income contribution in Indonesian human resource management. *Benefit: Jurnal Manajemen dan Bisnis*, *9*(2), 75–85. https://doi.org/10.23917/benefit.v9i2.6808

Fard, H. A., Jalaee, S. A., & Ardakani, S. B. F. (2018). A study on the effect of productivity on the wage level, with emphasis on the productivity of skilled and unskilled labor. *Accounting*, *4*, 93–100. https://doi.org/10.5267/j.ac.2018.1.001

Harahap, E. F. (2024). Faktor-faktor yang menentukan tingkat upah di Sumatra Barat. *Jurnal Menara Ekonomi*, *10*(2), 408–432. https://jurnal.umsb.ac.id/index.php/menaraekonomi/article/view/5298

Huang, S. (2025). Education and labor market outcome-wage equation estimation with QLFS data. *Academic Journal of Business & Management*, *7*(2), 64–71. https://doi.org/10.25236/ajbm.2025.070209

Lamazi. (2018). Analisis faktor-faktor yang mempengaruhi upah pekerja. *Jurnal Ecoment Global*, *3*(2), 183–197. https://doi.org/https://doi.org/10.35908/jeg.v3i2.479

Nasution, R., & Yuniasih, A. F. (2022). Analisis kesenjangan upah antargender di kawasan Timur Indonesia pada masa sebelum dan saat pandemi. *Aspirasi: Jurnal Masalah-Masalah Sosial*, *13*(2). https://doi.org/10.46807/aspirasi.v13i2.3272

Nuraeni, Y., & Suryono, I. L. (2021). Analisis kesetaraan gender dalam bidang ketenagakerjaan di Indonesia. *Nahkoda: Jurnal Ilmu Pemerintahan*, *20*(01), 68–79.

https://doi.org/10.35967/njip.v20i1.134

Nurfitri, U., Salmah, E., Handayani, T., Harsono, I., & Astuti, E. (2025). Analisis faktor-faktor yang mempengaruhi tingkat upah pekerja usaha informal di Kota Bima year 2023. *Ganec Swara*, *19*(4), 1256–1269. https://jurnal.yalamqa.com/index.php/gara/article/view/398

Prime, P. B., Grimes, D., & Walker, M. B. (2016). Exploring wage determination by education level: A U.S. Metropolitan statistical area analysis from 2005 to 2012. *Economic Development Quarterly*, *30*(3), 191–202. https://doi.org/10.1177/0891242416628995

Puspasari, D. A., & Handayani, H. R. (2020). Analisis pengaruh pendidikan, kesehatan, dan upah terhadap produktivitas tenaga kerja di Provinsi Jawa Tengah. *JDEP: Jurnal Dinamika Ekonomi Pembangunan*, *3*(1), 65–76. https://doi.org/10.14710/jdep.3.1.65-76

Putri, A., Fardani, M., Ignasha, N., Farliana, N., & Chairunisa, N. A. (2025). Pengaruh gender terhadap tingkat partisipasi angkatan kerja (TPAK) pada provinsi di Indonesia year 2023. JEP: *Jurnal Ekonomi dan Pendidikan*, *22*(1), 25–33. https://doi.org/10.21831/jep.v22i1.83693

Rahmayani, M. (2021). Persepsi masyarakat terhadap pentingnya pendidikan tinggi untuk kaum perempuan. *Sosains: Jurnal Sosial dan Sains*, *1*(9), 1031–1038. https://doi.org/https://doi.org/10.59188/jurnalsosains.v1i9.169

Ramadana, S. W., & Rahmaniar. (2023). Penundaan pembayaran upah pekerja. *Jurnal Riset Hukum, Ekonomi Islam, Ekonomi, Manajemen dan Akuntansi*, *2*(2), 80–87. https://jurnal.stisalhilalsigli.ac.id/index.php/jhei/article/view/182/146

Rogayah, S. (2021). Tingkat partisipasi angkatan kerja perempuan dan upah riil: Analisis tingkat provinsi di Indonesia. *Jurnal Ekonomi dan Kebijakan Publik*, *12*(1), 57–69. https://vs-jurnal.dpr.go.id/index.php/ekp/article/view/1982

Sriharini, Al Fajar, A. H., Mudfainna, Syamraeni, & Sari, N. (2024). Peran kesetaraan gender dalam meningkatkan produktivitas SDM dan pertumbuhan ekonomi. *Journal Tafkirul Iqtishodiyyah,* *4*(2), 18–29. https://www.ejournal.stisdulamtim.ac.id/index.php/JTI/article/view/112

Sudirman, F. A., & Susilawaty, F. T. (2022). Kesetaraan gender dalam tujuan pembangunan berkelanjutan (SDGs): Suatu literatur sistematis. *Journal Publicuho*, *5*(4), 995–1010. https://doi.org/10.35817/publicuho.v5i4.41

Sukanti, N., & Sulistyaningrum, E. (2022). Mismatch effect between education, workers, and occupations on the labor market in Indonesia. *Southeast Asian Journal of Economics*, *10*(3), 103–133. https://so05.tci-thaijo.org/index.php/saje/article/view/262487

Syafitri, W., Fitanto, B., Setyanti, A. M., & Izza, N. (2023). Income determinants of women in East Java's informal labor market: Microdata approach. *Jurnal Ilmu Sosial dan Humaniora*, *12*(3), 582–592. https://doi.org/10.23887/jish.v12i3.68965

Wahyuni, D., & Pratiwi, D. T. (2024). Pengaruh kompensasi dan kepuasan kerja terhadap produktivitas kerja karyawan pada PT. Haki Alam Karya Indrapura Kabupaten Batu Bara. JRPP: *Jurnal Review Pendidikan dan Pengajaran*, *7*(1), 1052–1056. https://journal.universitaspahlawan.ac.id/index.php/jrpp/article/view/24939

Wu, J. (2023). The effect of education on monthly wage in Indonesia. *Advances in Economics, Management and Political Sciences*, *50*(1), 214–223.

https://doi.org/10.54254/2754-1169/50/20230587

Wulandari, E., & Nurhayati. (2024). Determinan Life Expectancy di Indonesia. *Jurnal Ekonomi Trisakti*, *4*(1), 217–224. https://doi.org/10.25105/jet.v4i1.18676

Xie, M., Huang, Z., & Zang, W. (2020). The inequality of health-income effect in employed workers in China: A longitudinal study from china family panel studies. *International Journal for Equity in Health*, *19*(1), 1–15. https://doi.org/10.1186/s12939-020-01211-6