Unequal and Unprotected: Exploring Gender Wage Gap Among Precarious Workers in Indonesia

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Abstract

This paper addresses the persistent issue of the gender pay gap among precarious workers in Indonesia, where women still receive significantly less than their male counterparts. The lack of empirical focus on this problem drives the research. Filling this void, the paper analyses how structures and institutions affect uneven wage formation and gendered labor insecurity. Adopting a quantitative approach, the paper employs the Oaxaca-Blinder decomposition and quantile regressions (using the 2023 SAKERNAS dataset) to decompose wage differentials across the income distribution. The results show that women earn 35.6 percent less than men on average, and that over 70 percent of this gap is not accounted for by observable characteristics, demonstrating the existence of enduring structural discrimination. The disparity is highest at the lower tail of the wage distribution, suggesting a sticky floor effect. These results highlight the need for policy interventions that enhance care protection, implement pay parity, regularize informal work, and promote gender-responsive digital inclusion.

Keywords: Gender Wage Gap, Precarious Workers, Labor Inequality, Oaxaca-Blinder, Quantile regression.

Background

In Indonesia and throughout the world's economies, the gender pay gap is still a major problem. According to the World Economic Forum's 2023 Global Gender Gap Report, there is a significant disparity in the average employment participation rate between men and women, with women's rate at a measly 28.95 percent and women's representation on boards of directors is only at 12.2 percent[1]. The International Monetary Fund (IMF) highlighted in 2018 that gender-based income gaps not only exacerbate income inequality but also hinder economic growth. Indonesia exhibits a rather poor worldwide standing regarding gender equality. According to the World Economic Forum's 2023 survey, Indonesia is ranked 87th out of 146 nations in the global gender gap index, scoring 0.697. Additionally, Indonesia

[1] World Economic Forum, *Global Gender Gap Report 2023*, 2023.

scored 0.666 on the Economic Participation and Opportunity Index[2]. This data highlights the pressing necessity for enhancements in gender equality inside Indonesia, with a specific focus on the economic domain, given the substantial issue of the gender wage gap.

Discrimination in the labor market is defined by the ILO as any distinction, exclusion, or preference, based on race, colour, gender, religion, political opinion, or social origin. These types of discrimination eventually erode or deny any of the principles of equal opportunity and equal treatment in employment[3]. One of the most egregious examples of this prejudice is wage disparity, when women are paid less than men regardless of their ability and how they perform the same job. This aspect is reinforced when men and women with equal worker productivity earn different salaries.

Wage discrimination based on gender is not fully developed in the non-official sector, this phenomenon also occurs in the informal sector. Not only is Indonesia facing a persistent widening gender income gap, but historical evidence from other countries reveals that the gender income gap trend is present in different countries. For example, in Brazil, the informal sector witnesses a larger gender pay gap of 13 percent compared to the formal sector, which portrays a gender pay gap of 5 percent[4]. Studies by Rahman and Al-Hasan indicate that the informal sector, particularly the bottom tenth of the wage distribution, is the primary source of the wage gap in Bangladesh[5]. The global evidence presented here suggests that the gender wage gap in Indonesia's informal sector and precarious jobs should also be a concern, as it requires empirical research and data-driven policy recommendations.

The gender wage gap is one of the most important issues within the context of SDGs, particularly featuring SDG 5 and SDG 8, which were established by the United Nations in 2015[6]. Gender inequality is the theme of Sustainable Development Goal (SDG) 5, an agenda that faces challenges related to the gender wage gap, which aligns with its core objectives. This discrepancy is a compelling example of gender inequality in the workplace, from which men and women are paid differently when they do the same work. Achieving pay equity is not only about fair wages for fair work, it is also critical for the economic empowerment of women as a whole.

This empowerment not only involves being financially independent but also leads to more participation in leadership and decision-making roles, consistent with the broad goals of gender equality. In addition to this, closing the gender wage gap is consistent with the targets of SDG 8, which involves pursuing decent employment and economic growth. The gender wage gap is an impressive barrier to inclusive growth, as it denies women the ability to make meaningful economic contributions. If we can harness this, we'll achieve a more motivated and productive workforce, which is a vital factor for overall economic growth and sustainability.

This study examines the following questions regarding the gender wage gap among precarious workers in Indonesia: Is there a gender wage gap among precarious workers in Indonesia? What factors significantly affect the gender wage gap among precarious workers in Indonesia? Is there a sticky floor phenomenon (larger wage gaps at lower income levels) for precarious workers in Indonesia? This study aims to analyze the disparity in earnings between genders among vulnerable workers in Indonesia, focusing on both the average income and income distribution.

This research is a quantitative study with secondary data sourced from the National Labor Force Survey (SAKERNAS) of Central Statistics Agency (BPS). This source is representative and nationwide in nature with information on employment status, labor force characteristics, and distribution of income. The techniques employed are Oaxaca-Blinder Decomposition to analysis the wage differences and quantile regression to study the distribution of wage gaps at various quantiles.

[2] Forum, *Global Gender Gap Report 2023*.

[3] ILO, *Time for Equality at Work* (2003), 15.

[4] Sarra Ben Yahmed, "Formal but Less Equal. Gender Wage Gaps in Formal and Informal Jobs in Urban Brazil," *World Development* 101 (2018).

[5] Mustafizur Rahman and Md Al-Hasan, "Male–Female Wage Gap and Informal Employment in Bangladesh: A Quantile Regression Approach," *South Asia Economic Journal* 20, no. 1 (2019).

[6] Bappenas, *Menuju 2030 Peta Jalan SDGs Indonesia* (2020).

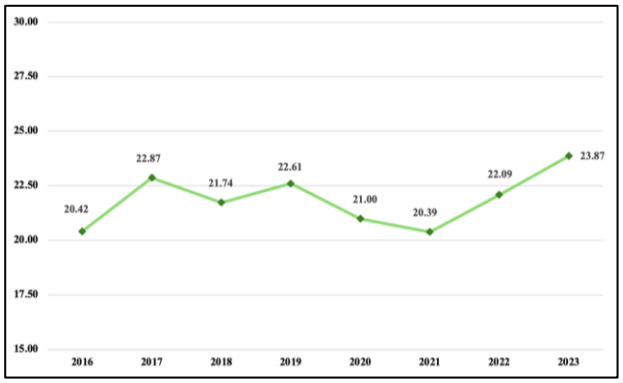

Figure 1. Gender Wage Gap in Indonesia 2016-2023
Source: "Decent Work Indicators in Indonesia", Badan Pusat Statistik 2016-2023.

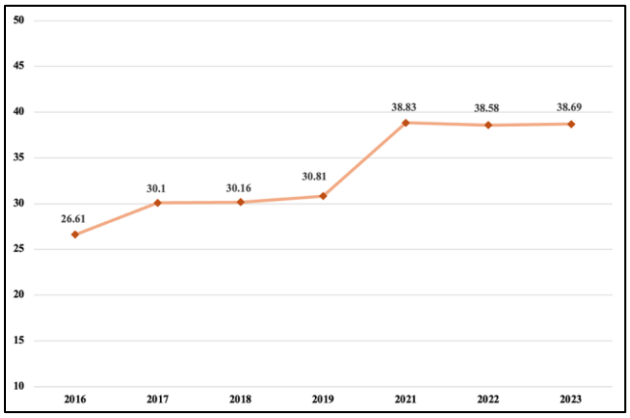

Figure 2. Precarious Employment Rate (PER) in Indonesia 2016-2022
Source: "Decent Work Indicators in Indonesia", Badan Pusat Statistik 2016-2023.

The gender wage gap is a critical measure of labor market fairness and a key indicator of economic well-being. As shown in figure 1, in 2023, data from Decent Work Indicators issued by Badan Pusat Statistik (BPS) recorded that the gender wage gap increased to 23.87 percent from 22.09 percent the previous year. On average, male workers had a monthly salary of IDR 3.47 million, while female workers had a monthly salary of IDR 2.64 million, indicating a gender-based wage disparity. Moreover, the National Labor Force Survey (SAKERNAS) found that women comprised 54.52% of the Indonesian labor force[7]. Such high participation underscores the importance of women in the national economy, despite their still prevailing income discrepancy.

As shown in Figure 2, the precarious employment rate (PER) in Indonesia increased considerably from 2016 to 2023. In 2016, the percentage of precarious workers in Indonesia was 26.61 percent, but by 2022, it had increased significantly to 38.58 percent. The significant increase in precarious workers in the last years shows that around one-third of workers in Indonesia are vulnerable workers.

The wage gap between women and men differs across multiple industries. For instance, there is less wage inequality in jobs belonging to the official sector, such as the civil service, health care, and the education sector[8]. It is, on the other hand, more developed in informal sector jobs such as industrial labor and agriculture, casual employment relationships or in the platform economy.

Theoretically, the gender wage gap can be explained by human capital theory, labor market segmentation, and discrimination theory. According to human capital theory, differences in knowledge, experience, and capabilities are reasons for wage diversity. However, when holding such factors constant, significant wage inequalities frequently remain, indicating discrimination or systems-level equity issues. Segmentation labor market theory considers that women are frequently routed to specific sectors or types of jobs and overrepresented in the informal sector or low-paid work. Discrimination theory also contends that social norms and organisational prejudices support differences in payment between equally productive men and women.

There are few studies on the gender wage gap against precarious workers in Indonesia, which has a large informal sector. The majority of the labor force in Indonesia works in the informal sector. However, few researches have been carried out to acknowledge the mechanisms of this sector and its repercussions over the condition of precarious

[7] Badan Pusat Statistik, "Indikator Pekerja Layak Di Indonesia," 2023.

[8] Emily Murphy and Daniel Oesch, "The Feminization of Occupations and Change in Wages: A Panel Analysis of Britain, Germany, and Switzerland," *Social Forces* 94, no. 3 (2016).

workers, particularly with reference to gender pay gap.

This study contributes to filling the existing research vacuum by examining the gender pay disparity among workers in precarious employment, including those engaged in temporary, casual, or informal labor arrangements characterized by a lack of job security and limited social safeguards. New perspectives on labor market disparities in Indonesia's informal sector and the causes of the gender pay gap among precarious workers will be offered by this discussion. This study provides a deeper understanding of gender based of precarious labor dynamics in Indonesia and provides an empirical basis for developing applicable and fairer employment policies.

Literature Review

The gender pay gap still exists in all countries and all occupations. The Oaxaca-Blinder decomposition is one of the most commonly used techniques to analyze wage differentials, enabling to discriminate between the gap in human capital and the component due to structural factors and to discrimination. Furthermore, studies repeatedly show that a significant proportion of the wage gap cannot be explained by education and experience and therefore, labor markets are diseased with some kind of institutional or structural bias[9][10][11].

The sticky floor and glass ceiling are the two terms that are main aspects when talking about the gender pay gap. In relation to the distributional aspects of the pay gap, these ideas offer valuable insights. The "sticky floor effect" implies that the wage inequality is larger at lower incomes than at upper incomes. However, from the effect on the "glass ceiling," there is evidence that differences increase with salary[12].

The glass ceiling effect, which is highly manifested in several developing countries, has been widely studied. Arumpala et al. (2007) demonstrated the striking variations in the gender wage gap across several countries and at different income levels in both the public and private sectors. The glass ceiling is the pattern of accelerating inequality at the top of the income distribution for women. Under specific circumstances, there is also a noticeable increase in the wage gap at the lowest levels, widely known as the sticky floor phenomenon. Arulampalam et al. (2007) suggest that the differences in childcare and pay determination procedures could explain the observed variation[13].

Duman investigated the connection between compensation and the type of employment, analysing the gender-based wage gap among temporary, formal, and informal workers in the Turkish labor market. The analysis provides strong empirical evidence of variations in gender wage gaps, not only between workers differentiated by gender, but also those separated by the type of work in which they are engaged. One important observation it makes is that women working in the informal and precarious employment sectors earn significantly less than their male counterparts, indicating that employment insecurity fails to reverse existing gender disparities. This highlights that wage discrimination is intersectional, with both gender and employment determining income. The results highlight the importance of targeted policy measures to reduce labor informality and gender bias[14].

In another study from 2021, Berniell et al. investigated how motherhood affects labor market results in Chile. The study reveals that the arrival of the first child results in a decrease in employment, working hours, and wages for women, but dads' outcomes stay mostly unchanged. Moreover, there is a significant rise in

[9] Christina Boll et al., "The EU Gender Earnings Gap: Job Segregation and Working Time as Driving Factors, no. 5 (2017).

[10] Neeru Gupta et al., "When Pay Equity Policy Is Not Enough: Persistence of the Gender Wage Gap Among Health, Education, and STEM Professionals in Canada, 2006–2016," *Canadian Studies in Population* 49, nos. 3–4 (2022).

[11] Assaf Rotman and Hadas Mandel, "Gender-Specific Wage Structure and the Gender Wage Gap in the U.S. Labor Market," *Social Indicators Research* 165, no. 2 (2023).

[12] Wiji Arulampalam et al., "Is There a Glass Ceiling over Europe? Exploring the Gender Pay Gap across the Wage Distribution," *ILR Review* 60, no. 2 (2007).

[13] Wiji Arulampalam et al., "Is There a Glass Ceiling over Europe? Exploring the Gender Pay Gap across the Wage Distribution," *ILR Review* 60, no. 2 (2007).

[14] Anil Duman, "The Gendered Relationship Between Temporary, Informal Employment and Wages: Evidence from the Turkish Labor Market," *Feminist Economics* 29, no. 4 (2023).

labor informality among working mothers following childbirth, with the impact being less pronounced for women with higher levels of education. The presence of adaptable non-formal employment opportunities serves as a safeguard against the decrease in female workforce participation resulting from maternity. The research proposes that enhancing social welfare benefits and introducing greater flexibility in formal employment could potentially harmonize well-paying occupations with family responsibilities in emerging nations. The results also suggest that informal employment provides the advantage of flexibility in managing both family and work obligations. However, the disadvantage of reduced job opportunities for women in the labor market accompanies it[15].

Rahman and Al-Hasan showed that using quantile decomposition, women experience a more significant wage penalty in the lower deciles of the wage distribution. Rahman and Al-Hasan revealed that most gender wage differentials in the lower deciles of informal employment are much higher. Findings from conditional quantile estimation suggest that formally employed women earn better wages than men in the first decile, but women suffer a wage penalty in higher decilesra[16].

Indonesia's gender wage gap is influenced by various structural and social aspects. A greater proportion of women in the industrial sector increases the wage gap, regardless of the level of national development[17]. Changing patterns in the age gap between spouses and in levels of education achieved by husbands and wives also help to shape relations between the gender in the home [18]. Moreover, women's health insurance and healthcare access are also largely determined by their socioeconomic status, which is indicative of broader contextual disparities in terms of economic capacity[19]. These results imply that not only increases in female labor participation and the education of females, but also the shift of females to higher wage jobs, especially in services, are an important strategy for achieving gender pay equity in developing countries[20].

Methodology and Data

Data and Resource

This study uses SAKERNAS data from August 2023. The SAKERNAS survey is specifically designed to collect data related to labor conditions. The SAKERNAS survey is conducted twice a year, in February and August. The number of samples in the SAKERNAS survey in August 2023 consisted of 300,000 household samples spread across all provinces in Indonesia. The results of the August SAKERNAS survey can present data estimates up to the district/city level. The August 2023 SAKERNAS survey also used the concept of employment based on the 13th and 19th International Conference of Labor Statisticians (ICLS). The questions in this survey refer to the employment concept of the International Labor Organization (ILO) Labor Force Survey (LFS) module[21].

This study relies on SAKERNAS August data because this data has a higher estimation rate. The household survey has very detailed information related to employment such as wages, education, type of work in the household, age of workers, monthly income, etc. This study focuses only on precarious workers in the informal sector. The criteria for precarious workers according to BPS are those who are freelancers, workers with fixed-term contracts (PKWT), and workers with informal contracts. For the wage variable, it is defined as the wage/salary earned by the individual in the last month period from the main job in both money and goods. The dependent variable in this study is the income of precarious workers in the informal sector in the form of natural logarithm (ln). Meanwhile, the independent variables that

[15] Inés Berniell et al., "Gender Gaps in Labor Informality: The Motherhood Effect," *Journal of Development Economics* 150 (May 2021).

[16] Rahman and Al-Hasan, "Male–Female Wage Gap and Informal Employment in Bangladesh: A Quantile Regression Approach."

[17] Agung Dwi Laksono et al., "Health Insurance Ownership among Female Workers in Indonesia: Does Socioeconomic Status Matter?," *BMC Public Health* 22, no. 1 (2022).

[18] Laura Rudkin, "Gender Differences in Economic Well-Being among the Elderly of Java," *Demography* 30, no. 2 (1993).

[19] Ratna Dwi Wulandari et al., "Socioeconomic Disparities in Hospital Utilization Among Female Workers in Indonesia: A Cross-Sectional Study," *Journal of Primary Care & Community Health* 13 (January 2022).

[20] Akiko Terada-Hagiwara et al., *Gender Pay Gap* (Asian Development Bank, 2018).

[21] Badan Pusat Statistik, "Indikator Pekerja Layak Di Indonesia."

will be used are gender, household under 5 years, education, region, type of sector, working hours, work experience, training status, contract status, technological status, and internet usage status at work.

The study utilizes wage as the dependent variable, which refers to the money or material compensation individuals receive monthly, as reported in the SAKERNAS questionnaire. According to the developed analytical framework, Table 1 lists the dependent variables that were employed in the research.

Table 1. Operational Definition of the Variables

Variable	Definition	Category
Wage	The wage precarious workers earned in the past month is money or goods in natural logarithm form (ln)	Numeric
Gender	Social identity based on roles and norms	0 = Male 1 = Female
Household Status	Household status	0 = Not Head of Household 1 = Head of Household
Education	Last level of education completed	0 = Low 1 = Middle 1 = Upper
Region	Region status	0 = Rural 1 = Urban
Type of Sector	Industry sector	0 = Agricultural 1 = Industry 1 = Services
Working Hours Monthly	Number of hours the respondent worked in the past month	0 = Rural 0 = 1-59 hours 1 = 60-119 hours 1 = 120-174 hours 1 = 175-208 hours 1 = >208 hours
Work Experience	The lag of time an employee has worked for their job	Numeric
Training Status	Status of attending training	0 = Trained 1 = Not Trained
Contract Status	Contract status of the employee	0 = Verbal contract 1 = Fixed-term contract
Technological Status at Work	Technological usage at work	0 = Used technology 1 = Not used technology
Internet Usage Status at Work	Internet usage at work	0 = Used the internet 1 = Not used the internet

This study categorizes the level of education completed by individuals into three distinct categories:

1. The low education level refers to individuals who have yet to graduate from elementary school, those who have completed elementary school and those who have completed junior high school.
2. The middle education level includes the individual who has graduated from senior high school.
3. The upper education refers to individual who have completed higher education includes diploma I/II/III, bachelor's degree, master's degree, and doctoral degree.

Methodology

This research uses two methods of analysis: descriptive analysis and inferential analysis. Inferential analysis in this study used the Oaxaca-Blinder decomposition method and quantile regression. The Oaxaca-Blinder decomposition measures the income gap between genders among precarious workers in the informal sector in Indonesia[22]. This method can also show the causes of the wage gap based on two factors: observed factors (endowment) and unobserved factors (unexplained). Meanwhile, quantile regression is used to see the pattern of income differences between genders in the resulting model based on quantiles.

[22] Tracy L. Regan and Ronald L. Oaxaca, "Work Experience as a Source of Specification Error in Earnings Models: Implications for Gender Wage Decompositions," *Journal of Population Economics* 22, no. 2 (2009).

Decomposition Oaxaca Blinder

There are two components to the breakdown of the average gender pay difference, according to Blinder Oaxaca (1973) and Jann (2008): explained factors and unexplained factors. The term explained factors is typically used to refer to endowment variables or variations in the personal attributes of men and women that cause pay disparities. In contrast, disparities in pay resulting from variables other than variations in personal traits are referred to as unexplained factors. This phenomenon is frequently referred to as labor market discrimination targeting a particular demographic. Discrimination within the labor market refers to instances where individuals of equal productivity are subjected to differential treatment, resulting in disparities in income and job opportunities[23].

Gender discrimination appears when there is a disparity in pay between men and women, despite women having similar levels of work as men do. The formula for the coefficient of discrimination is as follows:

$$D = \frac{\frac{Y_m}{Y_f} - \left(\frac{Y_m}{Y_f}\right)^0}{\left(\frac{Y_m}{Y_f}\right)^0} \quad \text{(3.1)}$$

where:

$\left(\frac{Y_m}{Y_f}\right)$ = observed income ratio of men and women

$\left(\frac{Y_m}{Y_f}\right)^0$ = income ratio of men and women without any discrimination

Thus, the form of the discrimination coefficient in natural logarithm form will be:

$$\ln(D+1) = \ln\left(\frac{Y_m}{Y_f}\right) - \ln\left(\frac{Y_m}{Y_f}\right)^0 \quad \text{(3.2)}$$

because value of $\left(\frac{Y_m}{Y_f}\right)^0$ is unknown, then the estimate of D will be equal to estimation of $\left(\frac{Y_m}{Y_f}\right)$.

The OLS equations of male and female income estimation can be written as follows:

$$\ln Y_i = Z_i'\beta + \varepsilon_i \quad \text{(3.3)}$$

where Z_i' is a vector of individual characteristics and β is a vector of coefficients. Earnings differences can be decomposed into discrimination effect and differences effect in individual characteristics, expressed in the following equation:

$$\ln(G+1) = \ln(\overline{Y_m}) - \ln(\overline{Y_f}) \quad \text{(3.4)}$$

where $\overline{Y_m}$ and $\overline{Y_f}$ is the average income of men and female. From equation (3.4), the natural logarithm of the average income of men and women can be expressed as follows:

$$\ln \overline{Y_m} = \bar{Z}_m'\hat{\beta}_m \quad \text{(3.5)}$$

$$\ln \overline{Y_f} = \bar{Z}_f'\hat{\beta}_f \quad \text{(3.6)}$$

Where:

$\bar{Z}_m'$ and $\bar{Z}_f'$ is the vector of average of variable X for males and females.

$\hat{\beta}_m$ and $\hat{\beta}_f$ is the vector of estimation coefficient.

After that, we substitute equation number (3.4) and (3.5) to equation (3.6), then get new equation:

$$\ln(G+1) = \bar{Z}_m'\hat{\beta}_m - \bar{Z}_f'\hat{\beta}_f \quad \text{(3.7)}$$

if,

$$\Delta\bar{Z}' = \bar{Z}_m' - \bar{Z}_f' \quad \text{(3.8)}$$

$$\Delta\hat{\beta} = \hat{\beta}_m - \hat{\beta}_f \quad \text{(3.9)}$$

then the new equation by substitute equation (3.7), (3.8) and (3.9) is:

$$\ln(G+1) = \Delta\bar{Z}'\hat{\beta}_m - \bar{Z}_f'\widehat{\Delta\beta} \quad \text{(3.10)}$$

Based on equation (3.2), with the assumption that men and women will be treated equally under the current precarious worker wage structure, the equation obtained is:

$$\widehat{\ln\left(\frac{Y_m}{Y_f}\right)^0} = \Delta\bar{Z}'\hat{\beta}_m \quad \text{(3.11)}$$

$$\widehat{\ln(D+1)} = -\bar{Z}_f'\widehat{\Delta\beta} \quad \text{(3.12)}$$

Therefore, the decomposition of the wages gap for precarious workers into the estimated effects of individual characteristic differences and the estimated effects of discrimination or the unexplained component is represented by equations (3.11) and (3.12)[24].

[23] Joyce P. Jacobsen, "Sex Segregation at Work: Trends and Predictions," *The Social Science Journal* 31, no. 2 (1994).

[24] Ronald Oaxaca, "Male-Female Wage Differentials in Urban Labor Markets," *International Economic Review* 14, no. 3 (1973).

Quantile Regression

Quantile regression allows you to go beyond classic linear regression analysis: Koenker's method is a concrete example and a well-documented statistical procedure. It permits the estimation of correlations at many points along the distribution of the dependent variable. This strategy is particularly useful for investigating income inequalities, such as gender wage inequalities, among precarious workers, and can also be used to estimate the conditional quantile function of income[25]. The standard/generic model $Q(\theta = (Yi|Xi) = Xi\beta\theta$, where $\theta \in (0,1)$ describes the effect of changes in the variables may have on the conditional θth quantile of income, capturing the income gap at different points on the income distribution. This approach can show us whether the gender income gap is larger at the bottom (sticky floor) or the top (glass ceiling) of the income distribution. Recently, advances to the quantile regression approaches include the development of the least quantile shrinkage and selection operator (LQSSO), which integrates adaptive weights and resolves difficulties associated with high-dimensional data[26].

Furthermore, it has also been found by Alejo in 2023 that instrumental variable quantile regression models help to solve endogeneity issues and improve the reliability[27]. Quantile regression models are generalized to handle censored data, e.g., survival times in medical studies. These models provide more accurate explanations of the influence of covariates at various quantiles, demonstrating their flexibility and applicability in a wide range of fields[28]. Additionally, properties of conditional quantiles, such as their translation invariance and validity under continuity, have been extensively studied, which ensures that quantile regression is a nonlinear operator[29]. With such advanced technologies, researchers can better access insight into components of wage differences and design targeted measures to address the gender pay gap.

Result and Discussion

Descriptive Analysis

The findings of this study show that there are differences among the average attributes of the precarious workers by gender. In contrast, although the age on average is 38 for male workers and 37 for female workers, there are significant differences in the levels of income as well as the hours worked per month. The average income of male workers was recorded to be around 70 percent higher than that of females, and they also worked longer hours, 173 hours per month, compared to 148 hours for females. Interestingly, although female workers have a higher level of education, with an average of 10.95 years compared to 9.69 years for male workers, this difference does not significantly impact their income. This finding indicates a possible undervaluation of women's human capital or structural barriers that hinder the economic return on their education investment.

Table 2. Summary Statistics by Gender

	Male	Female
Age	38.57	37.24
Number Household Under 5 Years	0.31	0.25
Income per Month (rupiah)	2,607,302	1,818,353
Work Hours per Month	173.82	148.62
Education (years)	9.69	10.95
Experience (years)	9.57	8.34

Appendix 1 presents a profile of precarious workers in Indonesia in 2023, covering their demographic and employment characteristics. It finds that gender disparities continue to prevail across various dimensions. Although there have been significant advances in human capital

[25] R. Koenker et al., *Handbook of Quantile Regression*, First Edition, ed. Roger Koenker et al. (Chapman and Hall/CRC, 2017).

[26] Alireza Daneshvar and Golalizadeh Mousa, "Regression Shrinkage and Selection via Least Quantile Shrinkage and Selection Operator," *PLOS ONE* 18, no. 2 (2023).

[27] Javier Alejo et al., "A First-Stage Representation for Instrumental Variables Quantile Regression," *The Econometrics Journal* 26, no. 3 (2023).

[28] Akram Yazdani et al., "The Comparison of Censored Quantile Regression Methods in Prognosis Factors of Breast Cancer Survival," *Scientific Reports* 11, no. 1 (2021).

[29] Luciano de Castro et al., "Conditional Quantiles: An Operator-Theoretical Approach," *Bernoulli* 29, no. 3 (2023).

accumulation, women workers continue to experience structural disadvantages in the labor market. For example, women are far more educated than men, with 33.60 percent of female workers having attained a tertiary level of education, compared to 12.72 percent among male workers. However, this educational advantage does not translate into labor market benefits. Most female workers are still concentrated in the services sector (67.42%), which offers lower earning potential and fewer opportunities for career advancement. In contrast, male workers are more evenly spread across agriculture (20.98%), industry (38.06%), and services (40.96%). This occupational segregation illustrates global gendered patterns in which segregated job distribution reinforces both the wage gap and the glass ceiling[30].

Furthermore, evidence indicates that women are more likely to work fewer hours per month: 25.9% of women work less than 120 hours, compared to only 13.4% of men. Only 11.1% of women work over 208 hours per month, compared to 21.2% of men. These trends indicate that women's labor force participation is limited, primarily due to the burden of unpaid domestic and care work. It highlights the restrictions caused by unpaid care work and aligns with the sticky floor effect, whereby the gender pay gap is higher at the lower end of the part-time job market[31]. These constraints are intensified by differences in employment terms, as about 72.75% of female workers have less than 10 years of experience, compared to 66.88% of male workers. Additionally, women are less likely to have a fixed-term contract, indicating high informality and low job security. This reflects broader patterns of limited access to formal sector employment among female workers, particularly those who are less educated or from rural areas[32].

Despite these limitations, women participate in more training programs (34.67%) and utilize technology (66.59%) and the internet (60.32%) more than male workers. These indicators suggest that women possess the capacity to enhance productivity and labor market outcomes. Persistent pay gaps, even among individuals with similar expertise and digital tools, highlight the labor market's entrenched bias against valuing women's labor. For instance, women in training programs and women using technology continue to earn substantially less than men with comparable qualifications. This reflects systemic inequity, where women's abilities and experience yield lower returns[33]. Women receive lower compensation in online labor markets even without overt discrimination or segregation, exposing a broader reluctance to remunerate women's work equitably[34].

Appendix 2 provides further evidence of the persistent gender wage gap between precarious workers in Indonesia, with female-to-male (F/M) earnings ratios falling below 100% in each category. The most pronounced differences were found in lower education levels (54.69), agriculture (56.99), oral contracts (55.97), and 41–50 years of work experience (53.98), indicating that women earn significantly less compared to men with the same working conditions. These differences reflect structural inequities in the labor market, in which women are overwhelmingly employed in informal and low-paid jobs with little social security[35]. Furthermore, this pattern is consistent with more general evidence that feminized work settings, such as work that serves the care-related needs of others, are undervalued within both formal and informal economies, resulting in the continued presence of the gender pay gap[36].

The wage gap remains wide in women's categories, particularly those with the highest human capital indicators. For instance, women

[30] Francine D. Blau and Lawrence M. Kahn, "The Gender Wage Gap: Extent, Trends, & Explanations," *Journal of Economic Literature* 55, no. 3 (2017).

[31] Blau and Kahn, "The Gender Wage Gap: Extent, Trends, & Explanations."

[32] Brian McCaig and Nina Pavcnik, "Informal Employment in a Growing and Globalizing Low-Income Country," *American Economic Review* 105, no. 5 (2015).

[33] Rotman and Mandel, "Gender-Specific Wage Structure and the Gender Wage Gap in the U.S. Labor Market."

[34] Leib Litman et al., "The Persistence of Pay Inequality: The Gender Pay Gap in an Anonymous Online Labor Market," *PLOS ONE* 15, no. 2 (2020).

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with higher education receive only 61.29% of the returns that males earn, while those with training or technology usage earn 68.01% and 72.27%, respectively. It suggests that education and digital skills alone are insufficient to ensure equal pay, as men continue to receive higher compensation for comparable qualifications[37]. Additionally, systemic occupational segregation plays a role in widening inequality as women are over-represented in underappreciated sectors, restricting the potential for economic advancement for women [38]. Moreover, long job experience does not help to eliminate the gap, as gendered roles and caregiver tasks remain barriers to women's chances in both vulnerable and precarious contexts. The findings in this paper emphasize the importance of structural reforms that extend beyond resource accessibility to include the material valuation of women's labor in institutions.

Table 3 shows a significant gender wage gap in Indonesia's three largest employment sectors: agriculture, industry, and services. Agriculture has the lowest female-to-male wage ratio at 56.99%. This is due to high levels of informality, seasonal jobs, and limited wage regulation. These factors affect women disproportionately, especially in remote rural areas. Most women in agriculture are still engaged in unpaid family work or low-wage subsistence jobs, with limited social protection and union support. In the industrial sector, the wage ratio is relatively higher at 74.86%. Still, women remain concentrated in low-value-added manufacturing sectors, such as textiles and food processing. In these industries, women are often employed as temporary workers with limited opportunities for upward mobility. Many are treated as disposable employees. In the service sector, women make up a significant share of the precariat. Sector-wide, their wages only reach 70.41% of men's, pointing to the undervaluation of feminized service work like domestic labor, retail, and caregiving. These phenomena indicate structural problems in the Indonesian labor market, which, due to occupational segregation and poor enforcement of labor protection, continue to reinforce gender wage inequality[39]. This long-run revolution is also consistent with international experience, indicating that sectoral segregation and institutional impediments prevent the achievement of pay equity[40].

Table 3. Mean Wage by Type of Sector

Sector	Male	Female	Ratio F/M
Agriculture	1,828,544	1,042,105	56.99
Industry	2,864,362	2,144,182	74.86
Services	2,766,868	1,948,069	70.41

Regression Analysis

Table 4 shows that gender plays a persistent and significant role in determining the wage gap among precarious workers in Indonesia. Even after controlling for education, experience, and weekly hours worked, women's wages are still only about 35.6 percent lower than those of men, which is a sign of structural gender discrimination[41]. The presence of children under five is associated with a significant wage penalty for women (−8.23%) and a slightly positive wage effect for men (+2.15%), due to the motherhood penalty and the unequal division of household duties (Erosa et al., 2022). This penalty is particularly pronounced in informal work and precarious aspects of decent work, where institutional support for caregiving work is limited and women are disproportionately represented [42]. Regional disadvantage also intersects with gender, with location decreasing women's earnings by 20.1 percent, compared with 9.79 percent for men, and further entrenching spatial and gendered divides in the labor market[43].

Table 4. Regression Result

	All	Male	Female
Gender	-0.356***		
Household Under 5 Years	-0.016***	0.022***	-0.082***

[37] Rotman and Mandel, "Gender-Specific Wage Structure and the Gender Wage Gap in the U.S. Labor Market."

[38] Philip N. Cohen, "The Persistence of Workplace Gender Segregation in the US," *Sociology Compass* 7, no. 11 (2013).

[39] Mary Borrowman and Stephan Klasen, "Drivers of Gendered Sectoral and Occupational Segregation in Developing Countries," *Feminist Economics* 26, no. 2 (2020).

[40] Blau and Kahn, "The Gender Wage Gap: Extent, Trends, & Explanations."

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[42] Terada-Hagiwara et al., *Gender Pay Gap*.

[43] Blau and Kahn, "The Gender Wage Gap: Extent, Trends, & Explanations."

	All	Male	Female
Education			
Middle Education	0.081***	0.081***	0.091***
Upper Education	0.191***	0.215***	0.150***
Region	-0.134***	-0.098***	-0.201***
Type of Sector			
Industry	0.141***	0.165***	0.058***
Services	-0.156***	-0.153***	-0.158***
Working Hours Monthly			
60-119	0.437***	0.407***	0.440***
120-174	0.926***	0.820***	0.981***
175-208	1.108***	0.978***	1.217***
>208	1.163***	1.053***	1.235***
Work Experience	0.008***	0.008***	0.008***
Training	0.031***	0.035***	0.028***
Contract Status	0.430***	0.395***	0.523***
Technology Usage Status	0.106***	0.117***	0.067***
Internet Usage Status	0.079***	0.073***	0.098***
Constant	13.22***	13.31***	12.83***
Observations	73,572	46,673	26,899
R squared	37.39	29.23	35.86

Standard errors in parentheses
** p < 0.1, ** p < 0.05, *** p < 0.01*

The regression result also indicate that levels of education and working time have positive effects on wage increases. However, these factors do not significantly reduce the wage differences between the two genders. Women with higher education (β = 0.150) and those working more than 208 hours per month (β = 1.235) continue to experience lower returns compared to men. Notably, access to fixed-term contracts and digital tools is more beneficial for women's wages. The influence of contract status is stronger for females (β = 0.523) than for males (β = 0.395). The use of technology raises women's earnings by 6.7%. These findings suggest that digital inclusion and formal employment relationships may help alleviate the wage gap. These results support the findings of a previous study, which showed that formalisation of employment and digital inclusion increase women's wages, especially in precarious labor markets where they are overrepresented[44]. More generally, the regressions show that inequality will persist, even if women do as much work and for as many hours as men. This is because the reasons behind the disadvantage are not based solely on qualifications. Thus, there is a need for a policy to specifically target structural and institutional issues.

Oaxaca Blinder Decomposition Analysis

According to the Oaxaca-Blinder decomposition results in Table 5, the full unexplained gender wage gap in precarious workers in Indonesia is 47 percent, with 22.3 percent being explained by observable characteristics, including education, sector, and work hours. The remaining 77.7 percent are an unexplained factor, which suggests underlying systemic discrimination and devaluation of female labor in the market. This gap is especially pronounced at the bottom of the wage distribution, with the 20th percentile wage gap being 71.5%, which might indicate the presence of a sticky floor effect in which women at the bottom end of the wage scale appear to earn lower wages than other such women in other wage groups. Further, the unexplained gap persists even when women have the same qualifications and work profiles, leading to inferences of systemic discrimination and institutional bias in wage-setting mechanisms[45]. This also shows up most strongly at the bottom of the wage distribution, suggesting the existence of a sticky floor effect, where women in low-wage employment are disproportionately exposed to deep-seated structural barriers.

[44] Marina Bonaccolto-Töpfer and Giovanni Bonaccolto, "Gender Wage Inequality: New Evidence from Penalized Expectile Regression," *The Journal of Economic Inequality* 21, no. 3 (2023).

[45] Blau and Kahn, "The Gender Wage Gap: Extent, Trends, & Explanations."

Table 5. Deceomposition Oaxaca-Blinder Result

	overall	*q20*	*q40*	*q60*	*q80*	*q99*
Gender Gap	0.470***	0.715***	0.526***	0.346***	0.217***	0.280***
Composition Effect (Explained)	0.105***	0.239***	0.201***	0.095***	0.028***	-0.094***
Structure Effect (Unexplained)	0.365***	0.476***	0.326***	0.251***	0.189***	0.373***
Explained						
Household Under 5 Years	-0.000***	-0.004***	-0.006***	-0.003***	-0.003***	-0.006***
Middle Education	0.012***	0.007**	0.026***	0.019***	0.011***	0.002
Higher Education	-0.052***	-0.004	-0.042***	-0.046***	-0.060***	-0.125***
Industry	-0.029***	0.036***	0.028***	0.008*	-0.010**	-0.019
Services	-0.043***	-0.008	0.078***	0.076***	0.065***	0.042**
Working Hours	0.113***	0.267***	0.201***	0.095***	0.053***	0.022**
Monthly Group Region	-0.003***	-0.005***	-0.006***	-0.004***	-0.004***	-0.006***
Work Experience	0.009***	0.005***	0.010***	0.008***	0.012***	0.024***
Training	-0.002***	-0.001	-0.003**	-0.002**	-0.002**	-0.012***
Contract Status	-0.035***	-0.046***	-0.074***	-0.049***	-0.029***	-0.007*
Status of Technology Usage	-0.003***	-0.002*	-0.002**	-0.001*	-0.001	0.002
Status of Internet Usage	-0.004***	-0.007***	-0.009***	-0.005***	-0.004***	-0.010***

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The Oaxaca results suggest that working hours contribute most to the explained part of the gender wage gap, especially in the lower part of the wage distribution, for instance, at the 20th percentile with $\beta = 0.267$. This contradicts the idea that women want to work fewer hours after giving birth because part-time work or casual work limits women's earning capacity. On the other hand, the effect of higher education on the wage gap is consistently negative, with a larger influence at the upper quantiles, such as $\beta = -0.125$ at the 99th percentile, which suggests that the earnings of more prosperous Individuals become less unequal when increases in years of education occur. However, these benefits are hampered by the fact that women continue to receive lower returns on education and experience than men, which reflects persistent structural discrimination in the labor market[46]. Furthermore, fixed-term contracts and digital access to digital tools have negative coefficients in the decomposition, indicating that formalizing the employment relationship and digital inclusion can reduce wage gaps[47]. Rather, until we also tackle the systemic undervaluing of women's work, such interventions are only partial answers to the continuing problem of wage inequality.

Quantile Regression Analysis

The result of the quantile regression in Figure 4 indicates that there are relatively high sticky floor effects among precarious workers in Indonesia, as they are concentrated at the low end of the wage distribution, where the gender wage gap is the highest. Workers at the 10th–40th quantile earn about 60–70% less, and female workers at even higher quantiles earn 20–30% less. This indicates that women in lower-income households account

[46] Rotman and Mandel, "Gender-Specific Wage Structure and the Gender Wage Gap in the U.S. Labor Market."

[47] Bonaccolto-Töpfer and Bonaccolto, "Gender Wage Inequality: New Evidence from Penalized Expectile Regression."

for the highest level of wage discrimination, especially in the informal and low-wage employment sectors where institutional protections are at their lowest. These findings are largely consistent with the results of the Oaxaca–Blinder decomposition, which indicate that the unexplained (structural) component of the wage gap is largest at the bottom of the distribution, for instance at the 20th quantile with 47.6% unexplained factor, suggesting that these disparities cannot be attributed to observed characteristics alone. The weak roles of education, hours of work, and experience in reducing the wage gap at low quantiles underscore the importance of structural policy measures, such as strengthening wage regulation, formalizing nonstandard employment, and providing social protection to women in low-paid work[48].

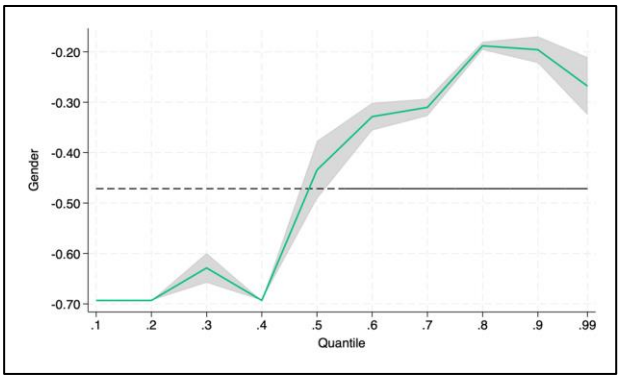

Figure 3. Quantile Regression Result

The empirical evidence shows entrenched gender-based differences in the vulnerable labour market of Indonesia. For each analytical dimension, women's earnings are consistently lower than those of men, even though they have more education and are more engaged in training and digital technology. Descriptive evidence points to continuing gender occupational segregation as well as shorter working hours among female workers, suggests an unfair distribution that limits access to higher-paying jobs. The regression results confirm that gender remains one of the most significant determinants of wage differences, even after controlling for education, experience, sector, and work intensity. According to the Oaxaca–Blinder decomposition, most of the wage differential remains unexplained by observable characteristics, suggesting that structural and institutional discrimination may be at play in the underrepresentation of women's work. Quantile regression also reveals a substantial sticky floor phenomenon, where wage inequality is more pronounced among women with low incomes and those in informal work. On the whole, the results picture gender wage discrimination as a long-standing structural trait of the Indonesian labour market.

Conclusion and Recommendation

Conclusion

This study aims to explore the extent and reasons behind the gender pay gap among precarious workers in Indonesia, focusing on both the magnitude and distribution of wage differences. Although there have been advances in human capital and digital inclusivity, this study analysis reveals that the gender pay gap remains high in Indonesia's precarious labour market. Even after controlling for education, experience, working hours and employment characteristics, women earn 35.6 percent less than men on average. The wage gap among low-income women is over 70% unexplained by observed characteristics. That is, this sticky floor effect, as this paper might call it, signifies that at the lower end of the pay scale, where women work under informal conditions and in low-paying jobs that lack security, structural discrimination is even more widespread. Even after controlling for women with equal or better qualifications as well as workload and information access (digital), their returns to education are still lower than men's.

The results also show how much care duties reduce the money women make. There is specific evidence that female workers in Indonesia face a greater wage penalty for having young children, with 15 percent lower wages. The "motherhood effect" is still alive and well. Although women benefit more from formal contracts, tertiary education, and technology usage, these gains are insufficient to offset the broader confining features. Moreover, it is not right that we should enjoy such privileges whenever we do. These results underscore the point that addressing gender inequality requires more than simply increasing female labor force participation, it

[48] Blau and Kahn, "The Gender Wage Gap: Extent, Trends, & Explanations."

involves institutional change which in turn recognizes and puts a value on the labor contributions of women's household work.

The study contributes to the literature by presenting current empirical evidence on gender wage disparity among precarious workers. This segment often slips through the cracks in national labor surveys. It aims to combine human capital, institutional, and structural perspectives on pay inequalities. From this result, a richer interpretation can be derived about the gendered labour market dynamics in developing economies like Indonesia.

However, this study has some limitations. The definition of precarious work used by SAKERNAS excludes vulnerable groups in freelance, gig, and various other informal employment, even if they are formally contracted by registered employers. It also lacks critical variables, such as employment underpinning care responsibilities, occupational segregation, and social protection coverage, which are essential to fully capture the gender pay gap.

Future research should utilise richer and gender-sensitive datasets. These include time-use surveys as well as administrative records, to reflect better the complexity of unpaid work in relation to employment trends. Further intersectional and spatial analyses are needed both within and across sectors and regions. These will reveal the more profound structural disparities which guide evidence-based policy making.

Policy Recommendations

Gender-based wage inequality in precarious employment requires a two-pronged approach: to protect unregulated workers through systemic reforms and to empower women by creating favorable conditions. Among the most actionable and feasible policy options is increasing access to parental leave and care-related social protection for women in precarious work. One direct way to reduce the motherhood penalty is by extending national social assistance and employment insurance schemes to precarious workers, especially women, in Indonesia. Mobile childcare and community daycares need to be made a priority, particularly in areas with high concentrations of vulnerable female labor.

In addition to the above, the government needs to implement the equal pay for equal work law, apply labor laws fairly across all sectors. Systematic wage reviews and mandatory transparency rules, along with incentives for employers with women-friendly policies, can mitigate to reduce gender-based wage discrimination. These standards need to be included in national labor codes and made applicable to the reality of informal labor. Finally, long-term strategies should be implemented to strengthen women's bargaining power through increased participation in digital skills training and opportunities for ongoing learning. However, digital inclusion must be complemented by labor market reform that recognizes and values the skills and work of women equally. Without reorientation to these system changes, Indonesia continues to be vulnerable to a repetition of women's work skills and contributions being systematically degraded.

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