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Gender Gaps and Real Interest Rates in Indonesian Unemployment Dynamics

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ABSTRACT

This study investigates the short- and long-run relationships between male–female gaps in labor force participation and wages, real interest rates, and unemployment in Indonesia. Using annual data for 1991–2023, the analysis employs an autoregressive distributed lag (ARDL) approach and an error correction model to examine long-run relationships and short-run dynamics. The bounds test indicates a long-run relationship among the variables. In the long run, the labor force participation gap is positively and significantly associated with unemployment, while the wage gap has a positive but statistically insignificant coefficient. Real interest rates exhibit a negative and statistically significant association with unemployment. In the short run, the wage-gap coefficient is statistically insignificant. The negative and significant error correction coefficient indicates that approximately 41.65% of deviations from long-run equilibrium are corrected each year. These findings highlight the relevance of disparities in labor force participation and macroeconomic conditions to unemployment dynamics in Indonesia. The study provides an empirical basis for considering barriers to women's labor market participation alongside broader employment conditions when developing inclusive labor market policies.

Keywords: ARDL; Gender gaps; Labor force participation; Real interest rates; Unemployment

INTRODUCTION

Unemployment and unequal access to paid work are related but distinct challenges in Indonesia. A decline in the unemployment rate does not necessarily indicate that women and men have equal opportunities to enter employment, obtain adequate earnings, or remain economically active. People outside the labor force are excluded from the unemployment denominator, while those accepting low-paid or insecure work are classified as employed. Consequently, aggregate unemployment should be examined alongside participation and earnings indicators rather than treated as a complete measure of labor-market inclusion (Fields, 2011).

This distinction matters when interpreting Indonesia's labor statistics. The World Bank unemployment series used in this study is identified as a modeled International Labour Organization estimate (World Bank, 2024a). It should not be treated as interchangeable with a particular February or August national open unemployment rate published by Badan Pusat Statistik (2023). Differences in reference periods and statistical treatment can produce different levels. The analysis therefore concerns the historical series specified for the study, without combining its observations with national survey estimates or subsequently revised downloads.

Gender differences may affect unemployment through several channels. Unequal access to education, recruitment, care services, and suitable jobs can restrict participation and the allocation of workers across occupations. Earnings differences can influence the incentive to seek work and employers' demand for labor. Meanwhile, real financing costs influence investment decisions and the capacity of firms to expand employment. These mechanisms interact, but an aggregate association does not identify which mechanism dominates or whether a policy intervention would produce the same relationship.

Indonesian studies have examined participation, education, and unemployment together (Adianita et al., 2024; Salsabila et al., 2022), while Sukmawati et al. (2023) investigate minimum wages and unemployment in West Kalimantan. These studies motivate attention to labor supply and compensation, but their explanatory variables differ from a male–female participation gap and a male–female earnings gap. Minimum wages, average wages, and gender wage differentials should therefore not be interpreted as equivalent measures. A focused national time-series analysis can complement this literature by distinguishing these concepts explicitly.

This study examines annual observations for Indonesia over 1991–2023 using an autoregressive distributed lag (ARDL) framework. It addresses three questions: Is the participation-gap indicator associated with unemployment in the long run? Is the wage-gap indicator associated with unemployment in the short and long run? How does the real interest rate relate to unemployment after conditioning on the two gender-gap indicators? The objective is to assess these dynamic associations and their policy relevance while separating statistical evidence from causal interpretation. The contribution is a joint empirical treatment of labor-market disparities and financing conditions, rather than a claim that gender differences alone explain aggregate unemployment.

LITERATURE REVIEW

Participation gaps and labor allocation

Labor-force participation is the proportion of the relevant working-age population that is employed or unemployed. A gender participation gap compares the male and female rates, each with its own population denominator. It differs from the shares of men and

women within the total labor force. This distinction is fundamental because a change in the sex composition of the labor force need not represent the same change in participation opportunities (World Bank, 2024b).

A wider participation gap may reflect barriers preventing women from obtaining suitable work. However, the relationship with measured unemployment is theoretically ambiguous. If discouraged workers leave the labor force, recorded unemployment may fall even as exclusion worsens. Conversely, improved access can initially increase job search before employment expands. The empirical question is therefore whether participation disparities covary with unemployment after accounting for the model's dynamics, not whether a larger labor force necessarily raises unemployment.

Klasen and Pieters (2015) examine stagnating female labor-force participation in urban India, illustrating why economic development and increased education need not automatically translate into higher participation. In Indonesia, Yuniashri et al. (2022) examine women's employment opportunities across formal and informal sectors in relation to education and residence. Atmasari et al. (2022) consider employment participation among women with toddlers in East Java during the pandemic. These studies direct attention to household circumstances and job characteristics that national aggregate indicators cannot separately identify.

Earnings differences and financing conditions

A gender earnings gap can arise from differences in hours, occupations, experience, productivity, sectoral composition, and unequal treatment. An unadjusted average gap does not isolate discrimination among otherwise comparable workers. UN Women (2020) documents gender pay disparities in Indonesia, while the International Labour Organization (2020) places wage outcomes within a broader discussion of wage-setting institutions and the pandemic. Both perspectives support examining compensation alongside employment, without assuming that an average earnings difference measures only one underlying mechanism.

The relationship between earnings gaps and unemployment need not have a unique sign. Lower remuneration can reduce labor-market attachment, whereas changes in hiring composition can alter the measured gap independently of employment creation. Evidence about minimum wages is informative about wage-setting institutions, but cannot directly validate a coefficient on a gender earnings differential. Sukmawati et al. (2023) report no statistically significant minimum-wage association with unemployment in their West Kalimantan setting. That result concerns a different exposure and should not be interpreted as establishing that gender wage inequality is economically irrelevant. Standard macroeconomic reasoning links higher real borrowing costs to weaker investment demand and potentially lower labor demand, other conditions held constant (Blanchard, 2017). The observed real interest rate also reflects inflation and financial conditions. Buhaerah (2017) studies financial development and economic growth in Indonesia, while Bank Indonesia (2022) provides institutional context for monetary and economic developments. These sources motivate including a financing indicator, but do not establish that its estimated coefficient represents an exogenous monetary-policy effect.

Empirical expectations and study position

The study's initial directional expectations are positive long-run associations between unemployment and each of the participation gap, wage gap, and real interest rate. These expectations are hypotheses to be assessed rather than restrictions imposed on the estimates. A statistically insignificant coefficient provides insufficient evidence to support the corresponding directional hypothesis; a significant coefficient of the opposite sign requires reconsidering the proposed explanation.

The national time-series approach also differs from studies of individual unemployment risks. Sitompul and Athoillah (2023), for example, analyze youth unemployment using labor-force survey data and a logistic specification. Such evidence helps identify heterogeneity that an aggregate model may conceal. The present ARDL analysis complements these studies by examining temporal adjustment, while recognizing that national coefficients cannot be assigned directly to particular women, men, age groups, or regions.

RESEARCH METHOD

Data and variable measurement

The analysis uses annual secondary data for Indonesia covering 1991–2023, corresponding to 33 calendar observations before losses from differencing and lag construction. Secondary-data analysis relies on previously compiled statistical information (Sugiyono, 2019). The study identifies World Bank (2024) data as its principal source and refers additionally to UN Women for the wage-gap measure. The operational definitions are summarized in Table 1. To ensure exact replicability, the complete 1991–2023 dataset, transformation logs, and estimation code are documented and provided as supplementary materials.

Table 1. Variables and Measurement

Variable	Operational definition	Unit and source
Unemployment (U)	Unemployed persons as a share of the labor force	Percent; World Bank modeled ILO estimate
Participation gap (P)	Difference between male and female labor force participation rates	Percentage points; World Bank
Wage gap (W)	Difference between male and female average wage levels	Percentage difference (IDR-based); World Bank / UN Women
Real interest rate (R)	Lending interest rate adjusted for inflation measured by GDP-deflator inflation	Percent; World Bank

The participation-gap definition requires male and female participation rates with consistent age coverage and statistical treatment. A difference between population-specific rates must not be replaced by a difference between male and female shares of total participants. Similarly, an earnings gap requires comparable wage observations, a stated currency unit, and a consistent price base if real wages are used. The interpretation of the two gap coefficients is conditional on these measurement requirements. Source identifiers and transformations must be checked against the estimation data before quantitative policy interpretation.

The real interest rate is conceptually distinct from the central bank's policy rate. World Bank metadata define the relevant indicator as a lending interest rate adjusted for inflation measured using the GDP deflator (World Bank, n.d.). It therefore combines information about lending conditions and prices. A negative coefficient on this series cannot, by itself, establish that raising the policy rate would reduce unemployment.

Dynamic specification and estimation

ARDL models describe current outcomes using lagged outcomes and current or lagged explanatory variables. Their error-correction representation separates a conditional

levels relationship from short-run changes. General econometric considerations concerning specification and statistical inference follow Gujarati and Porter (2009) and Widarjono (2018). The bounds-testing framework is developed by Pesaran et al. (2001), with practical estimation and alternative error-correction parameterizations discussed by Kripfganz and Schneider (2023).

Let U denote unemployment, P the participation-gap indicator, W the wage-gap indicator, and R the real interest rate. Let X contain P, W, and R, and let Δ denote the first difference. A general unrestricted error-correction representation is:

$$\Delta U_t = c + \lambda U_{t-1} + \delta' X_{t-1} + \sum_{i=1}^{p-1} \alpha_i \Delta U_{t-i} + \sum_{j=1}^{3} \sum_{k=0}^{q_j-1} \beta_{jk} \Delta X_{j,t-k} + \varepsilon_t. \quad (1)$$

Here, c is an intercept, λ is the coefficient on lagged unemployment, δ contains the lagged-level coefficients of the explanatory variables, α and β represent short-run dynamics, and ε is the disturbance. The selected lag orders determine which differenced terms appear. When a valid conditional levels relationship exists and λ is nonzero, the long-run coefficient vector is obtained as follows:

$$\theta = -\frac{\delta}{\lambda}. \quad (2)$$

The lagged-level coefficients δ are not themselves the normalized long-run multipliers. The analysis treats the coefficients explicitly labeled long run in the estimation results as normalized multipliers. Their interpretation must be checked against the complete output and software parameterization. The selected ARDL order, maximum candidate lags, deterministic specification, and model-selection criterion are necessary for reproducibility; they cannot be inferred uniquely from a table showing only one differenced regressor.

The reported procedure uses augmented Dickey–Fuller tests to assess integration and an information criterion to guide lag selection. Conventional ARDL bounds inference permits I(0) and I(1) variables under its assumptions, but is not valid if relevant variables are I(2). Testing first differences does not make second-difference testing intrinsically inappropriate or create spurious regression. Rather, all level and difference results must establish that the chosen bounds framework is applicable.

Bounds inference and diagnostic assessment

The bounds F-test assesses a joint null of no lagged-level relationship. A statistic above the applicable upper bound supports rejecting that null; a statistic below the lower bound does not support rejection; an intermediate value is inconclusive. Appropriate critical values depend on the deterministic case, regressor count, and sample treatment. Accordingly, the reported bounds are evaluated as presented, with the specification details identified as a necessary verification step.

Residual diagnostics comprise the Breusch–Godfrey test for serial correlation and White's test for heteroskedasticity. The decision threshold is 5%. Failure to reject either null is interpreted as an absence of detected evidence against it, rather than proof that the assumption holds exactly. CUSUM and CUSUM of squares provide complementary graphical assessments of stability.

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RESULTS

Integration and the conditional levels relationship

Table 2 presents the unit root test results for the variables included in the analysis. The null hypothesis of a unit root is rejected for unemployment, the labor force participation gap, and the wage gap after first differencing, with all three tests significant at the 1% level. The real interest rate is stationary in levels, as indicated by a test statistic of −6.070 and a p-value below 0.001. These findings inform the treatment of the variables in the subsequent analysis of short-run dynamics and long-run relationships.

Table 2. Unit Root Tests

Variable	Tested form	Test statistic	p-value
Unemployment	First difference	−4.912	< 0.001
Labor force participation gap	First difference	−4.499	0.0002
Wage gap	First difference	−4.363	0.0003
Real interest rate	Level	−6.070	< 0.001

Table 3 presents the ARDL bounds test results. The estimation is conducted under Case 3 (unrestricted intercept and no trend) for the optimal ARDL(1,0,1,0) model selected via AIC (maxlags = 4, k = 3, N = 32). The F-statistic of 8.691 (and t-statistic of -5.160) exceeds the upper-bound critical value of 7.061 at the 1% significance level based on Pesaran, Shin, and Smith (2001), leading to rejection of the null hypothesis of no cointegration. This finding indicates a long-run equilibrium relationship among unemployment, the labor force participation gap, the wage gap, and the real interest rate in Indonesia, supporting further examination of their long-run associations and short-run adjustment dynamics. However, the presence of a cointegrating relationship does not imply that every individual regressor has a statistically significant long-run effect, as individual significance is evaluated separately through the estimated long-run coefficients.

Table 3. Bounds Test

Significance	Lower bound I(0)	Upper bound I(1)
1%	5.332	7.061
5%	3.673	5.017
10%	2.988	4.166

Note. F = 8.691. Source: authors' calculations, 2025. Inference is conditional on the applicable deterministic case and critical-value specification.

Long run coefficients and annual adjustment

Table 4 presents the estimated long-run relationships between unemployment and the explanatory variables. The labor force participation gap has a positive coefficient of 0.6933 and is statistically significant at the 1% level. This result indicates that a wider participation gap between men and women is associated with higher unemployment in the long run, holding the other variables constant. The finding highlights the relevance of disparities in labor force participation to unemployment dynamics in Indonesia.

Table 4. Long Run Coefficients

Variable	Coefficient	Std. Error	p value	95% Conf. Interval
Participation gap	0.693	(0.116)	< 0.001	0.454, 0.932
Wage gap	0.032	(0.020)	0.129	-0.010, 0.074

Real interest rate	-0.059	(0.026)	0.032	-0.113, -0.006

Note. Source: authors' calculations, 2025.

The wage gap has a positive coefficient of 0.0319, although the relationship is statistically insignificant (p = 0.129). Thus, the estimation provides insufficient evidence of a long-run association between the wage gap and aggregate unemployment over the study period. The results suggest that participation disparities have a more clearly established statistical relationship with unemployment within the estimated model.

The real interest rate has a negative coefficient of −0.0594 and is statistically significant at the 5% level. A one-percentage-point increase in the real interest rate is associated with a decrease of approximately 0.0594 percentage points in unemployment, holding the other variables constant. This negative relationship differs from the initial theoretical expectation and highlights the importance of considering Indonesia's macroeconomic context when interpreting the relationship between real interest rates and unemployment.

The error correction coefficient is −0.4165 and statistically significant at the 1% level, indicating convergence toward long-run equilibrium. Approximately 41.65% of the deviation from equilibrium is corrected each year. This finding suggests that unemployment adjusts gradually following short-run disturbances, reinforcing the long-run relationship identified by the bounds test.

Table 5 presents the short-run wage-gap coefficient and the error correction term. The change in the wage gap has a positive coefficient of 0.0548 but is statistically insignificant (p = 0.159). This result indicates that short-run changes in the wage gap are not significantly associated with changes in unemployment during the study period. These long-run coefficients represent normalized estimates derived from the ARDL error correction specification

Short run coefficient and model diagnostics

Table 5. Short Run and Adjustment Coefficients

Term	Coefficient	Std. Error	t-statistic	p-value
Error correction term	-0.4165	0.0807	-5.16	0.000
Change in wage gap	0.0548	0.0379	1.45	0.159

Note. ECT is the error correction term. Under ARDL(1, 0, 1, 0), zero-lag variables (TPAK gap, SBR) yield no differenced terms (Δ). Source: authors' calculations, 2026.

The error correction term is negative and statistically significant at the 1% level, indicating that deviations from the long-run equilibrium diminish over time. Its coefficient of −0.4165 implies that approximately 41.65% of the previous year's disequilibrium is corrected within the current year. This adjustment pattern demonstrates gradual convergence toward equilibrium and complements the evidence of a long-run relationship established by the ARDL bounds test.

The Breusch–Godfrey statistic is 1.370 with p = 0.2419, and White's statistic is 22.67 with p = 0.3051 (Table 6). Neither rejects its respective null at 5%. The results are reassuring for the tested residual properties, although a short annual sample limits the ability of diagnostic tests to detect every relevant departure from the assumptions.

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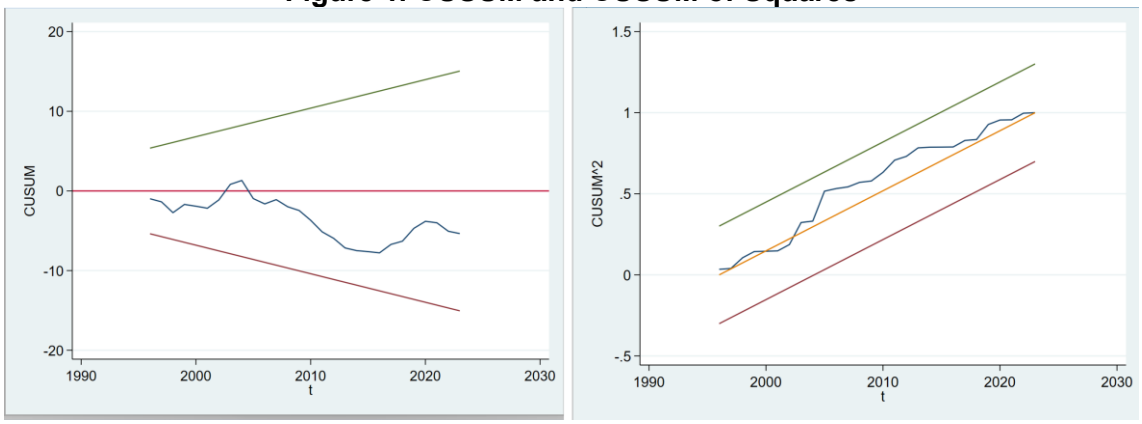
Table 6. Residual Diagnostics

Test	Statistic	p value
Breusch–Godfrey LM	1.370	0.2419
White heteroskedasticity	22.67	0.3051

Note. Null hypotheses are no serial correlation and homoskedasticity, respectively. Source: authors' calculations, 2025.

The CUSUM and CUSUM-of-squares paths remain within the displayed boundaries in Figure 1. This provides no graphical indication of instability under the tests shown. It does not establish that all structural changes during 1991–2023 are absent or that the estimated relationships will remain unchanged outside the sample.

Figure 1. CUSUM and CUSUM of Squares



Note. Left: CUSUM. Right: CUSUM of squares. Source: authors' diagnostic plots, 2025. Boundaries are identified as 5% in the original analysis.

DISCUSSION

Participation inequality and unemployment

The positive and significant long-run relationship between the labor force participation gap and unemployment highlights the relevance of gender disparities to Indonesia's labor market performance. A wider participation gap may reflect persistent barriers to women's economic participation, including household responsibilities, limited access to suitable employment, and mismatches between skills and available jobs. These barriers can restrict the effective utilization of labor and coexist with difficulties in matching workers to employment opportunities. The finding therefore places participation inequality within the broader discussion of labor market access and workforce allocation. Education and household circumstances provide useful context for interpreting this relationship. Adianita et al. (2024) and Salsabila et al. (2022) examine participation alongside education, employment, and human development, illustrating the relevance of workforce characteristics to labor market outcomes. More specifically, Yuniashri et al. (2022) and Atmasari et al. (2022) address women's participation in relation to educational, residential, and household circumstances. Read together, these studies suggest that participation disparities are embedded in both individual opportunities and the conditions under which households allocate time between paid work and domestic responsibilities.

The present study extends this discussion by identifying a significant association between the male–female participation gap and aggregate unemployment over time. From an employment perspective, narrowing participation disparities is most meaningful when accompanied by improved access to productive work. Monitoring male and female

participation rates alongside employment growth and job quality can therefore provide a more complete assessment of progress toward an inclusive labor market.

Interpreting the wage gap and interest rate findings

The wage gap exhibits positive but statistically insignificant coefficients in both the short and long run. This pattern suggests that its relationship with aggregate unemployment is less clearly established than that of the participation gap during the study period. Wage differences concern the earnings of employed workers, whereas unemployment reflects the availability of work among individuals participating in the labor market. These distinct dimensions help explain why wage inequality and unemployment may not display a strong direct relationship at the aggregate level.

The wage-gap findings also warrant consideration of workforce composition. Differences in occupation, working hours, employment status, and sectoral distribution can influence average male and female earnings. Aggregate wage measures combine these characteristics, potentially obscuring relationships that are more apparent within particular worker groups. The distributional concerns discussed by UN Women (2020) and the International Labour Organization (2020) consequently remain relevant to understanding earnings inequality and the quality of employment.

The negative and significant real-interest-rate coefficient differs from the conventional expectation that higher financing costs weaken investment and labor demand (Blanchard, 2017). Interpreting this result requires attention to the distinction between real lending rates and monetary policy decisions. Real interest rates incorporate movements in both nominal lending rates and inflation. Periods of rising inflation and weaker employment conditions could therefore generate an inverse relationship between real interest rates and unemployment.

This interpretation situates the finding within the interaction between financial conditions and the real economy. Bank Indonesia (2022) provides a broader context for these monetary developments, while Buhaerah (2017) examines the relationship between financial development and economic growth. The estimated association suggests that the employment implications of real interest rates should be considered alongside inflation, credit conditions, and economic activity.

Implications for employment policy

The findings highlight the importance of integrating gender inclusion into employment policy. Expanding access to affordable care services, improving job-relevant training, and promoting transparent recruitment are relevant priorities for addressing barriers to women's participation. Complementary efforts to expand productive employment opportunities would help translate greater participation into sustained employment. Progress can be assessed through changes in employment entry, retention, earnings, and working hours for both women and men.

Pay equity also remains an important dimension of inclusive employment. More detailed earnings information, distinguishing hourly wages from monthly income and accounting for occupation and employment status, would strengthen the assessment of wage disparities. Such information would support policies addressing unequal remuneration while improving understanding of differences arising from workforce composition.

Finally, the real-interest-rate finding emphasizes the value of coordinated analysis of monetary conditions and employment outcomes. Assessing interest rates together with inflation, investment, credit availability, and labor demand would provide a stronger basis for policy formulation. Taken together, the results point toward an employment agenda

that combines broader access to work, attention to earnings disparities, and a stable macroeconomic environment.

CONCLUSION

This study investigates the short- and long-run relationships between male–female gaps in labor force participation and wages, the real interest rate, and unemployment in Indonesia over 1991–2023 using an ARDL framework. The findings indicate a long-run equilibrium relationship among the variables. A wider labor force participation gap is positively and significantly associated with unemployment, highlighting the relevance of participation disparities to Indonesia's labor market performance. The wage gap has a positive but statistically insignificant coefficient in both the short and long run, while the real interest rate exhibits a negative and significant long-run association with unemployment. The error correction coefficient indicates that approximately 41.65% of deviations from equilibrium are corrected each year, suggesting gradual adjustment following short-run disturbances.

These findings contribute to understanding unemployment by considering participation inequality alongside macroeconomic conditions. They highlight the importance of improving women's access to productive employment through measures addressing care responsibilities, skills development, and recruitment barriers. Efforts to promote equitable earnings remain relevant to improving employment quality, while the interest-rate finding calls for an integrated assessment of inflation, credit conditions, and labor demand.

Future research could extend the analysis by incorporating economic growth, investment, and sectoral employment to better explain the relationships identified in this study. Provincial and individual-level analyses would also help reveal differences across regions and worker groups, providing a more detailed basis for policies that promote inclusive employment in Indonesia.

LIMITATION

The annual sample contains only 33 calendar observations before lag losses, limiting precision and the complexity of feasible specifications. The operational identity and units of the gender-gap series require verification, especially the distinction between participation rates and labor-force shares and between wage levels and employment-status indicators. The full lag order, effective sample, level unit-root tests, standard errors, and bounds-test specification are not documented in the reported tables. These omissions limit reproducibility and the assessment of statistical reliability.

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DECLARATION OF CONFLICTING INTERESTS

We confirm that there are no conflice interest in this study.

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