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# What Drives Gig Workers' Welfare in Indonesia? Evidence from a Panel Data Regression, 2018–2023

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**Abstract**

The rapid growth of digital technology has driven significant transformations in the labor market, marked by the emergence of the gig economy. While offering flexibility, gig workers is often accompanied by legal uncertainties and a lack of social protection, raising concerns about worker welfare. This study aims to identify the factors influencing gig workers' wages in Indonesia from economic, social, and digital perspectives. The analysis uses panel data from 34 provinces over the 2018–2023 period, sourced from BPS. The analytical method employed is the fixed effect model, corrected using the seemingly unrelated regression approach to address issues of heteroskedasticity and inter-regional correlation. The results show that inflation, human development index, open unemployment rate, ICT readiness, and ICT intensity significantly affect gig workers' wages. ICT readiness has a positive impact, whereas the ICT intensity has a negative effect on wages. Meanwhile, ICT skills do not show a significant influence. This study highlights the need for inclusive digital policies and strengthened worker bargaining power to build a sustainable gig economy ecosystem.

**Keywords:** gig workers, wages, information and communication technology, labor market, panel data regression

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## 1. Introduction

The advancement of digital technology has driven a major transformation in the global employment structure. One of the most significant impacts is the rise of a digital platform-based economy, which has created flexible job opportunities through the gig economy system. The gig economy refers to a labor market dominated by short-term contracts or freelance work, usually facilitated by digital platforms (International Labour Organization, 2021). Actors within the gig economy, known as gig workers, operate under an "on-demand" system, meaning they work only

when companies require labor for specific projects. In Indonesia, the gig economy sector includes various types of work, such as mobility deliveries involving online motorcycle drivers, parcel couriers, food couriers, and services such as design, marketing, and other freelance-based work.

Gig workers enjoy flexibility in terms of time and work location, allowing them to engage in projects aligned with their interests and reach global clients. This flexibility can enhance the performance of service companies due to their rapid response to market demands (Tarigas et al., 2025). However, several challenges and issues must be addressed. Gig workers often face unfair working conditions, including low wages, excessive working hours, and a lack of social protection (Wibowo, 2023). These working conditions reflect insufficient support from a robust labor protection system. Most gig workers operate without basic employment protection and often bear the social and economic risks associated with job loss or workplace accidents (World Bank, 2023). Moreover, declining income has become a critical issue. Tobing (2024) noted that most gig workers in Indonesia earn only between IDR 50,000 to IDR 100,000 per day, figures far below the decent wage standard and insufficient to cover daily basic needs. These conditions indicate that gig workers tend to experience low levels of welfare. According to Todaro and Smith (2020), wages have a positive relationship with welfare, making wages a common proxy for measuring workers' economic well-being.

According to data from BPS in 2023, the average wage of gig workers consistently falls below the provincial minimum wage. This is supported by research from Martindale (2024), which found that gig workers are generally associated with lower wage levels and minimal non-wage benefits, particularly in countries that have not mandated social security contributions or severance pay. Article 88, paragraph (4) of Law No. 13 of 2003 on Labor stipulates that the government sets the minimum wage based on a decent living standard while considering productivity and economic growth. The average wage of gig workers in Indonesia remains below the Provincial Minimum Wage, thus failing to meet the decent standard of living outlined in national labor regulations (Pratomo et al., 2023). This phenomenon also highlights Indonesia's challenges in achieving several Sustainable Development Goals (SDGs), particularly Goal 1 (No Poverty), Goal 8 (Decent Work and Economic Growth), and Goal 10 (Reduced Inequalities) (United Nations Development Programme, 2024). When gig workers do not receive adequate labor protection and minimum wages, these development goals become increasingly difficult to attain. This situation reflects inequality in the wage-setting mechanism, which can be explained through the bargaining theory of wages.

The bargaining theory of wages states that wages are determined by the bargaining power between workers and employers (Davidson, 1898). Mankiw (2013) also asserts that labor wages are influenced by the bargaining power between both parties in the labor market. This power is affected by factors such as skills, labor market conditions, access to information and technology, policy support, and the presence of labor unions. In the gig economy, employment relationships are flexible, individual, and informal, often lacking direct negotiation, resulting in weak bargaining power for gig workers. As a result, the wages they receive are strongly influenced by

external factors such as socio-economic conditions, the quality of human resources, and the ability to adapt to technology.

A study by Ali (2025) examining wage determinants in the Canadian gig economy found that variables such as unionization, inflation, immigration, human capital, and the development of information and communication technology significantly affect long-term wages. Furthermore, research by Kolar and Fir (2024) on the determinants of real wages in Estonia and Latvia shows that unemployment rates have a significant negative effect on real wages in both countries, with a stronger impact observed in Latvia than in Estonia. Based on theoretical frameworks and previous studies, this research aims to identify the factors influencing the wages of gig workers in Indonesia. By understanding wage determinants from economic, social, and digital perspectives, the findings of this study are expected to provide a foundation for formulating more inclusive and sustainable labor policies in response to the rapid growth of the digital economy.

## 2. Research method

### 2.1. Data and Data Sources

The data used in this study are secondary data obtained from Badan Pusat Statistik (BPS). All data are structured in panel form, covering the period from 2018 to 2023, with the unit of analysis being 34 provinces in Indonesia, as presented in Table 1.

**Table 1.** Data and Data Sources

| Variable | Description | Unit | Source |
|---|---|---|---|
| Gig Workers' Wages | Average monthly income received by gig workers, proxied through the wages of informal workers in the service sector | Hundred thousand Rupiah | BPS |
| Inflation | Percentage change in the prices of goods and services over a specific period | Percent (%) | BPS |
| Human Development Index | Index measuring human development achievements as a proxy for labor quality | Index (0–100) | BPS |
| Open Unemployment Rate | Percentage of unemployed individuals in the labor force | Percent (%) | BPS |
| ICT Skills (Capability) | The ability of the population to utilize information and communication technology | Index (0–10) | BPS |
| ICT Readiness (Access and Infrastructure) | Readiness in terms of access to and availability of information and communication technology infrastructure | Index (0–10) | BPS |
| ICT Intensity (Use) | The level of information and communication technology utilization by society | Index (0–10) | BPS |

2.2. Analysis Method

The analytical methods employed in this study include both descriptive and inferential analysis using a panel data regression approach at a five percent significance level. The use of panel data is considered relevant in this study as it allows for the combination of information across time (time series) and across regions (cross-section), thereby capturing the dynamics of gig workers' wage development over time and their variations across provinces. The inferential analysis is conducted through the following stages.

1) Panel Data Regression Model Estimation

According to Greene (2012), panel data regression can be analyzed using three main approaches, the Common Effect Model, the Fixed Effect Model, and the Random Effect Model. The key difference among these models lies in the presence or absence of individual effect specification.

a. Common Effect Model (CEM)

The Common Effect Model assumes no variation in characteristics across individuals or over time, implying that individuals behave uniformly across time periods. The model is estimated using the Ordinary Least Squares (OLS) method. The common effect model can be expressed as follows.

$$y_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{1it} \ldots + \beta_p X_{pit} + v_{it} \quad (1)$$

where:

$y_{it}$ : dependent variable for individual *i* in year *t*

$\alpha$ : intercept

$X_{pit}$ : independent variable *p* for individual *i* in year *t*

$\beta_p$ : regression coefficient for variable *p*

$v_{it}$ : idiosyncratic error/disturbance for individual i in year t

b. Fixed Effect Model

The Fixed Effect Model is used when there is individual effect specification that correlate with the independent variables. The model is expressed as follows.

$$y_{it} = (\alpha + \mu_i) + \beta_1 X_{1it} + \beta_2 X_{1it} \ldots + \beta_p X_{pit} + v_{it} \quad (2)$$

where:

$\mu_i$ : unobserved individual effect specification

c. Random Effect Model (REM)

The Random Effect Model is used when individual-specific characteristics are assumed to be random and uncorrelated with the independent variables. The model is estimated using the Generalized Least Squares (GLS) method. The REM model is formulated as:

$$y_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{1it} \ldots + \beta_p X_{pit} + (\mu_i + v_{it}) \quad (3)$$

2) Selection of the Best Model

According to Baltagi (2005), three formal statistical tests can be used to determine the most appropriate panel data regression model, the Chow test, the Hausman test, and the Breusch-Pagan Lagrange Multiplier (BP-LM) test.

a. Chow Test

The Chow test is used to examine the presence of individual effects in the panel data model. The hypotheses are follows.

$H_0: \mu_1 = \mu_2 = \cdots = \mu_N = 0$ (there is no individual effect specification)

$H_1: at\ least\ one\ \mu_i \neq 0,\ i = 1,2,3,\ldots,N$ (there is an individual effect specification)

The test statistic:

$$F = \frac{(SSE_{CEM} - SSE_{FEM})/(N-1)}{SSE_{FEM}/(NT-N-K)} \sim F_{(N-1,NT-N-k)} \quad (4)$$

Apabila $F > F_{(N-1,NT-N-k)}$, the null hypothesis is rejected and FEM is preferred over CEM.

b. Hausman Test

The Hausman test evaluates whether individual effects are correlated with the regressors. The hypotheses are follows.

$H_0: E(\mu_i|X_{it}) = 0$ (no correlation between individual effect specification and regressors)

$H_1: E(\mu_i|X_{it}) \neq 0$ (orrelation between individual effect specification and regressors exists)

The test statistic:

$$W = [\hat{\boldsymbol{\beta}}_{\boldsymbol{FEM}} - \hat{\boldsymbol{\beta}}_{\boldsymbol{REM}}]'[\boldsymbol{Var}(\hat{\boldsymbol{\beta}}_{\boldsymbol{FEM}}) - \boldsymbol{Var}(\hat{\boldsymbol{\beta}}_{\boldsymbol{REM}})]^{-1}[\hat{\boldsymbol{\beta}}_{\boldsymbol{FEM}} - \hat{\boldsymbol{\beta}}_{\boldsymbol{REM}}] \sim \chi^2_{(k)} \quad (5)$$

If $W > \chi^2_{(k)}$, the null hypothesis is rejected and FEM is preferred over REM.

c. BP-LM Test

The BP-LM test checks for the existence of individual-specific variation. The hypotheses are follows.

$H_0: \sigma^2_{\mu_i} = 0$ (there is no variation across individual effect specification)

$H_1: \sigma^2_{\mu_i} > 0$ (there is variation across individual effect specification)

The test statistic:

$$LM = \frac{NT}{2(T-1)}\left[\frac{\sum_{i=1}^{n}(\sum_{t=1}^{T} v_{it})^2}{\sum_{i=1}^{n}\sum_{t=1}^{T} v_{it}^2}\right] \sim \chi^2_{(1)} \quad (6)$$

If $LM > \chi^2_{(1)}$, the null hypothesis is rejected and REM is preferred over CEM.

3) Homoskedasticity and Variance-Covariance Structure Tests

If the selected best model is the Fixed Effects Model (FEM), the Lagrange Multiplier (LM) Test and the $\lambda_{LM}$ Test are conducted to detect the presence of heteroskedasticity and cross-sectional dependence in the panel data.

4) Classical Assumption Tests

When using the Ordinary Least Squares (OLS) as an estimation method, classical assumption tests include normality, homoskedasticity, no autocorrelation, and no multicollinearity. In contrast, when using Generalized Least Square (GLS) or Feasible Generalized Least Square (FGLS), normality and no multicollinearity are required.

5) Model Significance Testing
   To evaluate model fit and explanatory power, the F-test is used for simultaneous testing, the t-test for partial significance, and $R^2$ to assess the proportion of variance explained by the model.
6) Interpretation of Model Estimation Results
   The estimated coefficients are interpreted to understand the direction, strength, and significance of the relationship between the independent variables and gig workers' wages.

## 3. Results and Discussion

### 3.1. Descriptive Analysis

As an initial step in understanding the dynamics of the gig workers' labor market in Indonesia, a descriptive analysis was conducted on the average wages of gig workers in 2023. This analysis aims to identify geographical patterns and potential disparities in the distribution of gig workers' wages across different regions. The following visualization presents a map of the average wage distribution of gig workers in 34 provinces of Indonesia.

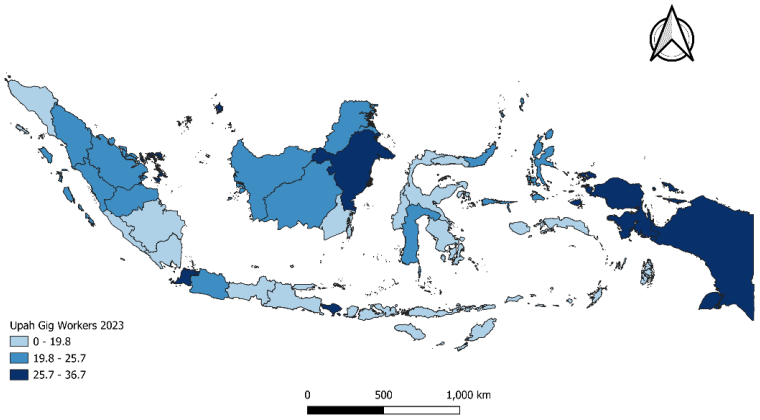


**Figure 1.** Map of Average Gig Workers' Wage Distribution
Source: Processed

Figure 1 illustrates the distribution of average gig workers' wages in Indonesia for the year 2023, categorized into three groups based on wage ranges (in million rupiah). The map shows that regions with the highest wages for gig workers (dark blue) are spread across parts of Kalimantan, Sulawesi, Maluku, and Papua, reflecting a possible high demand or limited labor supply in those areas. Conversely, regions with the lowest wages (light blue) are more dominant in most parts of Sumatra, Java, Bali, and Nusa Tenggara, which may be due to the high labor supply, resulting in lower bargaining power for gig workers. This distribution indicates a geographic disparity in gig workers' wage levels, potentially influenced by factors such as cost of living, access to technology, and the types of gig jobs prevalent in each region.

**Table 2.** Descriptive Statistics of Variables

| Variable | Unit | Obs. | Mean | Min. | Median | Max. |
|---|---|---|---|---|---|---|
| Gig Workers' Wages | Hundred thousand Rupiah | 204 | 20.51 | 10.42 | 19.48 | 41.90 |
| Inflation | Percent (%) | 204 | 3.01 | -0.02 | 2.62 | 7.73 |
| Human Development Index | Index (0–100) | 204 | 71.42 | 60.06 | 71.56 | 82.46 |
| Open Unemployment Rate | Percent (%) | 204 | 5.10 | 1.40 | 4.70 | 10.95 |
| ICT Skills | Index (0–10) | 204 | 6.10 | 4.79 | 6.15 | 7.77 |
| ICT Readiness | Index (0–10) | 204 | 5.96 | 3.38 | 5.84 | 8.31 |
| ICT Intensity | Index (0–10) | 204 | 5.07 | 2.10 | 5.37 | 7.65 |

Source: Processed

Table 2 shows that economic and social conditions during 2018–2023 vary considerably. This can be seen from the variations in wages, HDI, inflation, and open unemployment rates in each region. The wide wage range illustrates that income opportunities for gig workers are not uniform, while variations in HDI and inflation indicate differences in quality of life and economic stability between regions. Differences in unemployment rates also show that labor market pressures are not the same, so the opportunities and challenges faced by gig workers also differ.

Other differences are quite apparent in digital variables, which are important factors in gig economy activities. Variations in ICT Readiness as well as ICT Intensity levels indicate that each province has a different level of digital readiness for gig workers in obtaining orders, accessing platforms, and working optimally. Meanwhile, ICT Skills have a narrower distribution, so basic digital capabilities are relatively similar across regions. Differences in structural aspects such as infrastructure availability and intensity of ICT Intensity are indicators that more clearly distinguish the digital conditions between provinces. Overall, the descriptive table provides an overview that economic, social, and digital factors have different characteristics across provinces.

### 3.2. Inferential Analysis

#### 3.2.1. Estimation of Panel Data Regression Model

The initial step in the inferential analysis involves estimating the panel data regression model using three approaches, the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). The estimation results from these three approaches are presented in Tables 3 to 5.

**Table 3.** Common Effect Model (CEM) Estimation

| Variable | Coefficient | p-value | Decision |
|---|---|---|---|
| C | -0.2140 | 0.9842 | Not Significant |
| Inflation | 0.5382 | 0.0311 | Significant |

| Variable | Coefficient | p-value | Decision |
|---|---|---|---|
| Human Development Index | 0.4798 | 0.0506 | Not Significant |
| Open Unemployment Rate | -0.6882 | 0.0025 | Significant |
| ICT Skills | -2.2120 | 0.0096 | Significant |
| ICT Readiness | -0.4813 | 0.6999 | Not Significant |
| ICT Intensity | -0.4582 | 0.4855 | Not Significant |

Source: Processed

**Table 4.** Fixed Effect Model (FEM) Estimation

| Variable | Coefficient | p-value | Decision |
|---|---|---|---|
| C | -125.2800 | 0.0000 | Significant |
| Inflation | 0.3614 | 0.0006 | Significant |
| Human Development Index | 2.3244 | 0.0000 | Significant |
| Open Unemployment Rate | -1.3916 | 0.0000 | Significant |
| ICT Skills | -1.8777 | 0.4014 | Not Significant |
| ICT Readiness | 2.4673 | 0.0626 | Not Significant |
| ICT Intensity | -3.4438 | 0.0000 | Significant |

Source: Processed

**Table 5.** Random Effect Model (REM) Estimation

| Variable | Coefficient | p-value | Decision |
|---|---|---|---|
| C | -48.4613 | 0.0006 | Significant |
| Inflation | 0.3502 | 0.0008 | Significant |
| Human Development Index | 1.4884 | 0.0000 | Significant |
| Open Unemployment Rate | -1.2268 | 0.0000 | Significant |
| ICT Skills | -3.6361 | 0.0092 | Significant |
| ICT Readiness | -3.8436 | 0.9706 | Not Significant |
| ICT Intensity | -1.9200 | 0.0000 | Significant |

Source: Processed

In general, the estimation results indicate that the variables Inflation, Human Development Index, Open Unemployment Rate, and ICT Intensity consistently have a significant effect on gig workers' wages. Meanwhile, the ICT Skills shows varying significance across models, and ICT Readiness does not show a significant effect in any of the three models, indicating that its role in the model remains suboptimal. However, no definitive conclusions can be drawn at this stage, as the best-fitting model has not yet been selected and assumption checks have not been conducted.

3.2.2. Selection of the Best Model

After estimating the models using the three approaches, the next step is to determine which model is most appropriate for the analysis. The model selection begins with the Chow test to assess whether the Fixed Effect Model (FEM) is superior to the Common Effect Model (CEM).

**Table 6.** Model Selection Using the Chow Test

| Test Statistic | df1 | df2 | p-value | Decision | Conclusion |
|---|---|---|---|---|---|
| 33.1280 | 33 | 164 | 0.0000 | Reject $H_0$ | FEM is better than CEM |

Source: Processed

Based on the Chow test results presented in Table 6, the Fixed Effect Model (FEM) is found to be more suitable. This indicates significant differences in characteristics across provinces, making a model that accounts for such differences more appropriate. Subsequently, a comparison between the Fixed Effect Model and the Random Effect Model (REM) is conducted using the Hausman test.

**Table 7.** Model Selection Using the Hausman Test

| Test Statistic | df | p-value | Decision | Conclusion |
|---|---|---|---|---|
| 39.6601 | 6 | 0.0000 | Reject $H_0$ | FEM is better than REM |

Source: Processed

According to the Hausman test results in Table 7, the Fixed Effect Model remains the preferred choice. This implies that interregional differences are not random but fixed, and thus must be accounted for in the model.

3.2.3. Testing the Assumptions of Homoskedasticity and Cross-Sectional Dependence

Before proceeding with the Fixed Effect Model, it is essential to verify that the model meets fundamental assumptions. Two key assumptions tested are homoskedasticity (homogeneity of variances) and cross-sectional dependence (inter-provincial correlation).

**Table 8.** Homoskedasticity and Cross-Sectional Dependence Test Results

| Assumption | Test Method | Test Statistic | p-value | Decision | Conclusion |
|---|---|---|---|---|---|
| Homoskedasticity | LM Test | 176.2600 | 0.0000 | Reject $H_0$ | Residuals exhibit heteroskedasticity |
| Cross-Sectional Dependence | Lambda LM Test | 709.2027 | 0.0000 | Reject $H_0$ | Residuals are correlated across individuals |

Source: Processed

The results shown in Table 8 reveal that both assumptions are violated, as heteroskedasticity and interregional dependence are present. Therefore, to address these violations, the Fixed Effect Model is corrected using the Seemingly Unrelated Regression (FEM-SUR) approach, allowing for more accurate and reliable estimates.

3.2.4. Estimation of the Best Panel Model

**Table 9.** Estimation Results of Fixed Effect Model-SUR (FEM-SUR)

| Variable | Coefficient | p-value | Decision |
|---|---|---|---|
| C | -141.8823 | 0.0000 | Significant |
| Inflation | 0.3642 | 0.0004 | Significant |
| Human Development Index | 2.4943 | 0.0000 | Significant |
| Open Unemployment Rate | -1.3522 | 0.0000 | Significant |
| ICT Skills | -0.9516 | 0.4244 | Not Significant |
| ICT Readiness | 2.1037 | 0.0125 | Significant |
| ICT Intensity | -3.2907 | 0.0000 | Significant |
| R-Squared | | F-Statistic | 52.6044 |
| Adjusted R-Squared | 0.9084 | Prob(F-Statistic) | 0.0000 |

Source: Processed

The estimation results in Table 9 show that the variables inflation, human development index, open unemployment rate, ICT readiness, and ICT intensity have a significant effect on gig workers' wages, with varying directions of influence. Inflation and human development index have a positive effect, indicating that increases in the cost of living and human quality correlate with higher wages. Conversely, open unemployment rate and ICT intensity have a negative effect, which may reflect high job competition and pressure from digital platforms. Meanwhile, ICT readiness shows a positive effect, indicating the importance of connectivity in supporting gig workers' income. The ICT skills variable is not significant, suggesting that ICT skills have not yet become a key differentiating factor in determining wages in this sector. The Adjusted $R^2$ value of 0.9084 indicates that approximately 90.84% of the variation in gig workers' wages can be explained by the model. This demonstrates that the model has strong explanatory power, and that most wage differences among gig workers across regions can be explained by the factors included in the model, such as macroeconomic aspects, worker quality, and digital infrastructure.

3.2.5. Testing the Assumptions of Normality and Non-Multicollinearity

**Table 10.** Normality and Non-Multicollinearity Tests

| Assumption | Test Statistic | p-value | Decision | Conclusion |
|---|---|---|---|---|
| Normality | 5.0531 | 0.0799 | Fail to reject $H_0$ | Residuals are normally distributed |
| Non-Multicollinearity | < 10 | - | - | No multicollinearity |

Source: Processed

Based on the test results in Table 10, the model is shown to satisfy the basic assumptions. The residuals are normally distributed, and there is no strong correlation among the independent variables. Thus, the regression model is considered valid and reliable for interpretation. Additionally, the Variance Inflation Factor (VIF) values of all independent variables are less than 10, indicating no multicollinearity in the data.

3.2.6. Model Interpretation

After confirming that the regression model meets the basic assumptions and is suitable for use, the next step is to interpret the model estimation results to gain deeper insights into the factors affecting gig workers' wages in Indonesia. This analysis is crucial to understand how macro variables and digital indicators contribute to the well-being of gig workers. Based on the estimation results presented in Table 8, the regression equation for gig workers' wages is as follows.

$$\widehat{Y_{it}} = (-141{,}88^{*} + \alpha_i) + 0{,}36^{*}X1_{it} + 2{,}49^{*}X2_{it} - 1{,}35^{*}X3_{it} - 0{,}95^{*}X4_{it} + 2{,}10^{*}X5_{it} - 3{,}29^{*}X6_{it}$$

Where:

| | |
|---|---|
| Y: Gig Workers' Wages (hundred thousand Rupiah) | $X_3$: Open Unemployment Rate (%) |
| $X_1$: Inflation (%) | $X_4$: ICT Skills |
| $X_2$: Human Development Index | $X_5$: ICT Readiness |
| | $X_6$: ICT Intensity |

Inflation shows a positive and significant effect on the wages of gig workers. This indicates that as the prices of goods and services rise, gig workers' wages also tend to increase. However, this increase is primarily nominal, acting as a response to higher living costs rather than reflecting an actual improvement in real welfare. In a flexible work system without minimum wage protection, gig workers tend to adjust their service rates in response to inflationary pressures. This aligns with findings from Business Wire (2022), which notes that while nominal wages of gig workers increase alongside inflation, they still face economic hardship due to declining purchasing power.

Meanwhile, the Open Unemployment Rate has a significant negative effect on gig workers' wages. This suggests that in regions with high unemployment, the labor market tends to experience an oversupply, including in the informal sector, reducing the bargaining power of gig workers and pushing wages downward. This is consistent with research by Kolar and Fir (2024), which found that unemployment has a significantly negative impact on real wages in Latvia. These findings suggest that the gig economy in Indonesia has not yet effectively absorbed surplus labor and may worsen employment conditions if not supported by responsive macroeconomic policies. Hence, the government must design interventions that not only promote digital job creation but also stabilize wages and strengthen workers' bargaining power in the face of inflation and labor oversupply.

The Human Development Index (HDI) also shows a strong and significant positive impact on gig workers' wages. This supports the findings of Deming (2023), who emphasizes that investments in human capital, including education and cognitive and social skills, significantly contribute to higher worker wages, especially in modern labor markets that increasingly demand multidimensional capabilities. Workers with higher quality human capital are more likely to receive high-value tasks and better compensation. This underscores the importance of improving

HDI not only for overall human development but also for enhancing the bargaining position and productivity of informal platform-based workers.

ICT Skills, while conceptually essential for success in the digital sector, do not exhibit a significant effect on gig workers' wages. This may indicate that the gig economy in Indonesia has not yet fully recognized digital skills as a determinant of income. Most gig work in Indonesia remains operational (such as transportation and delivery services), which typically does not require advanced digital skills. This finding suggests that improving digital literacy alone is insufficient to enhance gig workers' welfare unless accompanied by a restructuring of platform markets to value worker specialization and capabilities. Graham et al. (2017) also argue that although some workers possess high skills in digital platforms, algorithms and market design often commodify labor, reducing recognition of individual competencies.

ICT Readiness, which includes infrastructure and access to digital tools, has a positive and significant effect on gig workers' wages. Access to internet networks, digital devices, and communication services plays a crucial role in enabling gig workers to find job opportunities, expand market reach, and improve work efficiency. This finding highlights the ongoing challenge of regional digital inequality in promoting inclusive digital economic growth. Thus, policy efforts should prioritize equitable development of digital infrastructure as a prerequisite for income growth in the technology-based informal sector. These results are in line with DeStefano (2016), who found that access to digital infrastructure is a key factor in expanding platform-based job opportunities and enhancing digital inclusion in informal economies.

On the other hand, ICT Intensity (or the level of ICT usage) shows a significant negative effect on gig workers' wages. Although ICT usage is generally considered a driver of economic transformation, this finding indicates that higher ICT penetration in a region can increase competition among gig workers on digital platforms. As a result, service values tend to be compressed due to market mechanisms driven by algorithms and real-time demand, rather than by skill or experience. This aligns with the findings of Graham et al. (2017), which highlight that rising global ICT penetration has led to an oversupply of digital labor, where workers from different countries compete at increasingly lower price points. The dominance of algorithms in digital platforms also creates a condition of atomization, where workers become isolated and are compelled to accept low-paying tasks for fear of losing access to work. This reflects the potential of digital platforms to create unfair market structures if not accompanied by transparency regulations and worker protections. Therefore, policies should not only focus on expanding ICT access, but also on ensuring fairness in its use for all participants in the digital economy.

### 3.2.7. Individual Effects by Province

The individual effect captures the influence of unique, time-invariant characteristics of each province that are not accounted for by the independent variables included in the model. These effects reflect specific regional conditions that may affect the wage levels of gig workers, such as the local economic structure, labor market regulations, or socio-cultural factors that are not

directly measurable. Table 11 presents the estimated individual effects for each province during the observation period.

**Table 11.** Individual Effects by Province

| Province | Individual Effect | Province | Individual Effect |
|---|---|---|---|
| Aceh | -3.8896 | Kep. Riau | 2.9703 |
| Bali | -9.8812 | Lampung | -1.3264 |
| Banten | 6.2381 | Maluku | 2.6565 |
| Bengkulu | -5.6856 | Maluku Utara | 4.1658 |
| DI Yogyakarta | -27.8275 | Nusa Tenggara Barat | -1.2777 |
| DKI Jakarta | -4.9613 | Nusa Tenggara Timur | 1.8058 |
| Gorontalo | -1.5441 | Papua | 28.6071 |
| Jambi | -0.6987 | Papua Barat | 23.5006 |
| Jawa Barat | 2.1635 | Riau | -2.561 |
| Jawa Tengah | -6.4048 | Sulawesi Barat | 1.1202 |
| Jawa Timur | -4.3958 | Sulawesi Selatan | -2.1867 |
| Kalimantan Barat | 8.7708 | Sulawesi Tengah | -1.4078 |
| Kalimantan Selatan | -0.7168 | Sulawesi Tenggara | -4.4015 |
| Kalimantan Tengah | 3.5299 | Sulawesi Utara | -0.7552 |
| Kalimantan Timur | -4.1521 | Sumatera Barat | -3.6636 |
| Kalimantan Utara | 6.3799 | Sumatera Selatan | -1.7908 |
| Kep, Bangka Belitung | -0.1175 | Sumatera Utara | -2.2627 |

Source: Processed

Based on Table 11, it is shown that Papua has the highest individual effect, followed by West Papua and North Kalimantan. This indicates that, even after controlling for macroeconomic and ICT variables, gig workers in these provinces still receive relatively higher wages compared to other regions. This condition is likely driven by three main factors: high cost of living, limited supply of gig workers, and the dominance of large-scale project sectors that typically offer higher compensation for gig-based work. The substantial individual effects in these regions reflect local structural conditions that enhance gig workers' bargaining power, even though these are not directly captured by the independent variables. This aligns with the findings of DeStefano (2016), who noted that gig workers' bargaining power can increase in regions with high demand but limited labor supply.

On the other hand, the Special Region of DI Yogyakarta shows the lowest individual effect, indicating that gig workers' wages in this province are relatively lower. This situation is likely related to the province's economic structure, which is dominated by a highly competitive informal sector and a large labor force relative to the demand for gig services. As such, DI Yogyakarta illustrates how intense labor market competition in the gig economy can erode income potential. This phenomenon is also supported by the findings of Wood et al. (2019), who

emphasized that intense competition in online labor markets can suppress workers' service rates, especially in areas with high gig economy penetration but limited job diversification.

## 4. Conclusion and Recommendations

This study reveals that the wage dynamics of gig workers in Indonesia are shaped by a complex structural context, encompassing macroeconomic factors, labor quality, and digital advancement. Wage increases should be interpreted with caution, as in some cases they merely reflect adjustments to inflationary pressure rather than actual improvements in workers' quality of life. The findings on the role of the Human Development Index and ICT Readiness underscore that human development and access to digital infrastructure are essential foundations for enhancing the competitiveness of workers in this sector. Meanwhile, the negative impact of unemployment and ICT Intensity suggests an imbalance in the digital ecosystem, where a high number of job seekers increases labor market pressure, and excessive ICT intesity increases competition among workers. ICT Skills were found to have no significant impact, suggesting that digital abilities alone are insufficient without adequate infrastructure or demand. Interprovincial variation indicates that a one-size-fits-all policy is insufficient; instead, adaptive approaches tailored to local characteristics and needs are required to build a fairer and more sustainable gig work system.

The fixed effects model estimation indicates substantial individual variation across Indonesian provinces in shaping gig workers' wage levels. This variation is reflected in the magnitude of the individual effects, which capture the extent to which unobserved heterogeneity and unique provincial characteristics contributes to wage differentials. These effects suggest that provincial-specific structural and socioeconomic factors play an essential role in determining gig workers' earnings beyond observable variables.

Overall, provinces in Eastern Indonesia such as Papua, Papua Barat, and Maluku Utara exhibit relatively high positive individual effects. This pattern implies that regional characteristics such as labor market structure, cost of living, and the dominance of informal sectors exert upward pressure on gig workers' wages. In contrast, many provinces in Western Indonesia display lower or even negative individual effects, including the DI Yogyakarta, Bali, and Bengkulu. Despite being more economically developed with stronger infrastructure, these provinces experience downward wage pressures, potentially due to higher labor supply competition, stronger formal sector dominance, and more standardized wage structures.

The sharp contrast between the Western Indonesia Region and the Eastern Indonesia Region highlights persistent structural disparities. Western Indonesia Region tends to exhibit lower individual effects due to more competitive and regulated labor markets, resulting in more standardized gig worker wages. Meanwhile, Eastern Indonesia Region demonstrates higher positive effects, reflecting economic structures that rely more heavily on informal employment

and limited formal labor absorption. These findings underscore the need for region-specific policy interventions to address imbalances in gig worker welfare and earnings potential

Based on the findings regarding the heterogeneity of individual effects across provinces and the dynamics of gig workers' welfare, the government should implement wage-protection policies that account for macroeconomic conditions and the structural characteristics of the digital labor market while simultaneously reducing disparities between the western and eastern regions of Indonesia. Priority should be given to accelerating digital infrastructure development to expand access to platform-based employment opportunities and improve the efficiency of digital labor matching, thereby enhancing potential earnings and welfare outcomes. In provinces with negative individual effects such as DI Yogyakarta, Bali, and Bengkulu stricter regulation is required to govern platform work arrangements, including minimum compensation standards, social protection mechanisms, and controls to prevent excessive labor supply. Conversely, in provinces with strong positive effects such as Papua and West Papua policy efforts should focus on strengthening digital skills development and expanding market access to maintain the sustainability of gig-work opportunities. Future research should also refine the measurement of gig-worker welfare using more comprehensive indicators such as the ability to meet basic needs, income stability, and the effectiveness of working hours to obtain a more holistic understanding of quality of life in the digital labor economy.

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