



The Impact of Infrastructure Access and Information Technology Use on Open Unemployment Rate in Java

Silvia Kurnia Illahi^{1*}, M. Taufiq², Wiryana Wardaya³

Universitas Pembangunan Nasional "Veteran" Jawa Timur, Indonesia

Corresponding Author: Silvia Kurnia Illahi 21011010158@student.upnjatim.ac.id

ARTICLE INFO

Keywords: Mobile Phone Subscribers, Households with Computers, Internet Users, Open Unemployment Rate

Received : 16, July

Revised : 30, July

Accepted: 24, August

©2025 Illahi, Taufiq, Wardaya: This is an open-access article distributed under the terms of the [Creative Commons Attribution 4.0 International](https://creativecommons.org/licenses/by/4.0/).



ABSTRACT

The Open Unemployment Rate (OUR) serves as a key indicator reflecting labor market performance and regional economic welfare over a given period. This study investigates the impact of mobile phone subscribers, households with computers, and internet users on the open unemployment rate across six provinces in Java, Indonesia. Employing secondary data from Badan Pusat Statistik (BPS) covering the period 2014–2023, this research utilizes panel data regression with a Fixed Effect Model (FEM) approach. EViews version 12 is used for statistical analysis. The results show that mobile phone subscribers have a positive and significant effect on the open unemployment rate in Java. In contrast, households with computers and internet users do not have a significant influence on the open unemployment rate.

INTRODUCTION

Unemployment has consistently emerged as a critical issue in political discourse, particularly in relation to efforts aimed at generating comprehensive employment opportunities. It is an urgent socio-economic problem that is intricately linked to a range of factors, despite displaying non-systematic patterns (Herniwati & Handayani, 2019).

As of 2023, Indonesia was recorded as one of the largest developing countries with a population exceeding 278 million people, ranking fourth globally in terms of population (Badan Pusat Statistik, 2023). This large population presents a significant potential in terms of abundant human resources. However, such potential will only contribute positively to economic development if it is accompanied by the creation of sufficient employment opportunities. When job creation fails to keep pace with the growth of the labor force, unemployment becomes an inevitable consequence.

Unemployment refers to a condition in which individuals within the labor force are not currently employed and are actively seeking work (Aulia et al., 2025). In this context, the Open Unemployment Rate (OUR) serves as a critical indicator in evaluating labor market conditions in a given region. A high OUR reflects an imbalance between the available labor force and the capacity of the labor market to absorb it. Unemployment is not solely driven by low educational attainment, but also by limited skills and a lack of individual capacity to adopt and develop technological capabilities. A lack of adaptability to technological changes and shifting labor market demands acts as a barrier to employment, especially in the era of the digital economy that increasingly demands higher technical and innovative competencies. In Indonesia, unemployment remains a persistent challenge, particularly in light of ongoing global transformations and technological disruptions.

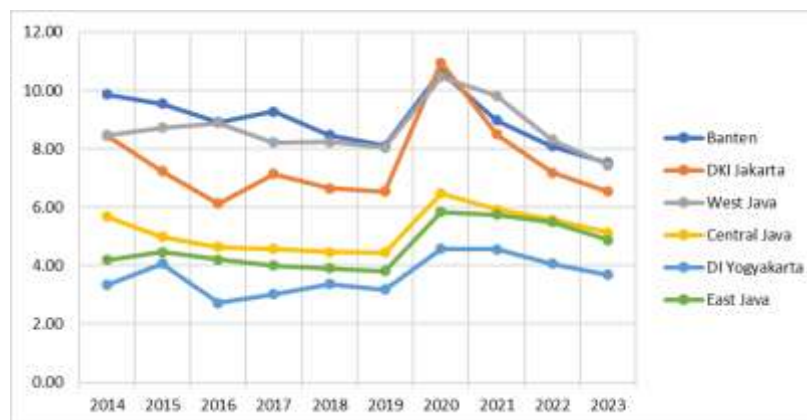


Figure 1. Trends in the Open Unemployment Rate Across Java Provinces, 2014–2023

Source: BPS, 2014-2023 (Result of Data Processing)

It is known that Between 2014 and 2019, the Open Unemployment Rate (OUR) across the provinces of Java remained relatively high and exhibited fluctuating trends, indicating that the labor market had not yet reached full stability. In 2020, all provinces experienced a significant increase in OUR due to

the outbreak of the COVID-19 pandemic in Indonesia, which began in March. The pandemic compelled both national and local governments to implement extensive restrictions on social and economic activities in an effort to curb the spread of the virus. Consequently, the transition to remote work and the accelerated adoption of digital technologies led to shifts in the labor market's skill requirements. The shift in the education system toward distance learning further widened the digital literacy gap, thereby affecting the competitiveness of the labor force in the job market. By 2023, the OUR showed a declining trend in line with the gradual recovery of the national economy and the relaxation of restrictive measures. Nonetheless, structural challenges in the labor market remain unresolved.

Even prior to the COVID-19 pandemic, Information and Communication Technology (ICT) had played a critical role in accelerating globalization and enhancing efficiency across multiple sectors. The proliferation of internet access and mobile devices enabled rapid and widespread information exchange. ICT has facilitated digital transformation in finance, trade, education, governance, and the creative industries, although the pace of adoption has varied across countries and sectors. In many contexts, ICT remains complementary to conventional business processes rather than a full replacement.

The profound transformation in human life patterns driven by advances in Information Technology has been particularly evident in recent years, especially within the economic sector. Micro, Small, and Medium Enterprises (MSMEs) have served a strategic role as primary drivers of industrial development in many countries and are increasingly integrated with advancements in information technology. According to the United Nations Industrial Development Organization (UNIDO), MSMEs function as engines of industrial growth globally. Their contribution lies in accelerating economic globalization, generating employment, increasing household incomes, and offering value-added services (UNIDO, 2025).

The persistently high Open Unemployment Rate (OUR) in Java indicates that the region's economic capacity remains suboptimal in providing sufficient employment opportunities. This condition is further exacerbated by a mismatch between the skills possessed by the labor force and the competencies required by the labor market. According to the 2023 Human Development Index (HDI) report, Indonesia ranked 113th globally, reflecting the generally low quality of its human resources. One contributing factor is the limited mastery of competencies in the field of Information Technology (IT). Gatingsih & Sutrisno (2017) emphasize that fostering a positive mindset and mastering IT-related skills are critical elements in developing a high-quality, competitive workforce capable of playing a strategic role in national development.

The technological transformation accompanying globalization has become a critical factor influencing changes in the open unemployment rate, particularly in regions with relatively high levels of technological adoption such as Java. The development of Information Technology (IT) has had both positive and negative effects on the labor force. According to Raza & Raza (2024), the impact of IT adoption on labor depends on the technological maturity of a

country. In the early stages, IT tends to increase unemployment due to the automation of traditional jobs. However, over time, as technological capacity matures, new employment opportunities emerge in technology sectors, the digital economy, and information-driven innovation.

Advances in Information Technology have also directly contributed to the growing penetration of the internet. Today, internet access serves as a critical indicator of IT development, given its role in enhancing market efficiency, opening new economic opportunities, and encouraging broader civic participation. In response to these trends, many countries have expanded their investments in internet infrastructure both wired and wireless including efforts to increase bandwidth capacity to meet the growing and increasingly complex demands of digital communication.

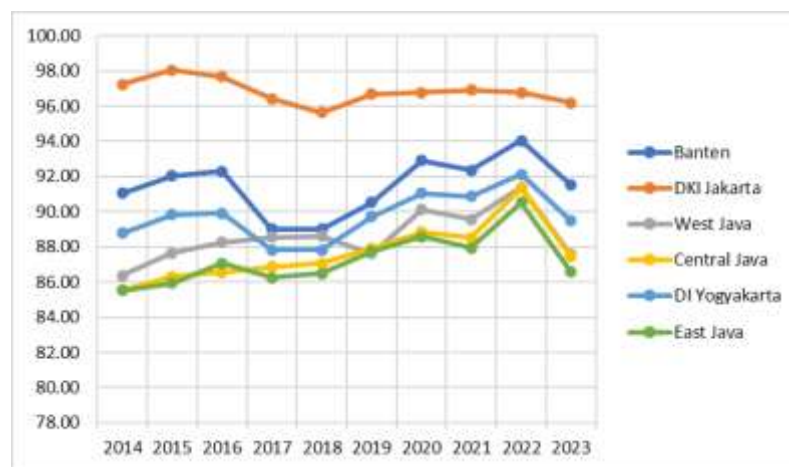


Figure 2. Trends in Mobile Phone Subscribers Across Java Provinces, 2014–2023
 Source: BPS, 2014-2023 (Result of Data Processing)

The number of active mobile phone subscribers defined as those with active SIM cards, including both postpaid users and prepaid users who have utilized services within the past three months has shown a fluctuating trend across the provinces of Java from 2014 to 2023. This fluctuation reflects both the dynamic evolution of mobile technology and shifting patterns in consumer demand for communication services. In 2023, the highest mobile phone subscription rate was recorded in the Special Capital Region DKI Jakarta at 96.19%, followed by Banten at 91.51% and the DI Yogyakarta at 89.47%. In contrast, the lowest subscription rates were found in East Java at 86.58%, Central Java at 87.44%, and West Java at 87.56%. As mobile phone usage particularly smartphones with internet connectivity continues to grow, society has become increasingly familiar with digital technologies and internet-based services. This trend not only reflects broader digital engagement but also indicates the expanding role of mobile devices in everyday communication, access to information, and digital economic activity.

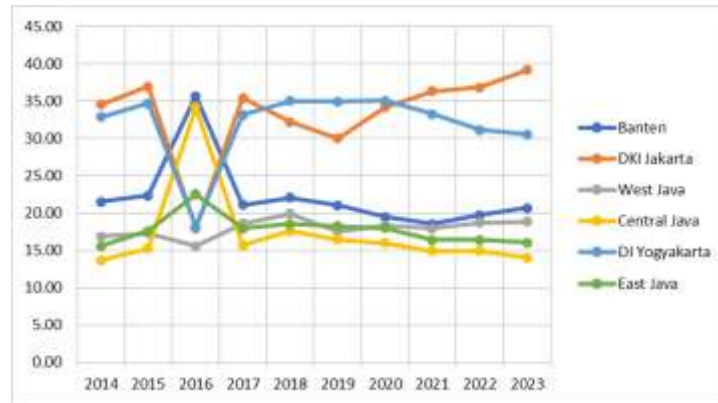


Figure 3. Trends in Households Computers Across Java Provinces, 2014–2023
 Source: BPS, 2014-2023 (Result of Data Processing)

Based on the data presented, the Special Capital Region DKI Jakarta recorded the highest percentage of households owning a computer in 2023 at 39.15%, followed by the DI Yogyakarta at 30.56% and Banten at 20.71%. These high figures are closely linked to the characteristics of these regions as centers of government, education, and industry areas typically supported by adequate digital infrastructure and higher levels of technological literacy. Conversely, during the same period, Central Java reported the lowest household computer ownership rate at 14.05%, followed by East Java at 16.05%, and West Java at 18.85%. These provinces are predominantly composed of rural areas and informal sectors. The low levels of urbanization and limited access to digital devices are among the key factors contributing to the low rate of computer ownership at the household level. This disparity underscores the existence of a digital divide between regions, which can significantly impact residents' access to information, education, and technology-based employment opportunities.

Household computer ownership not only enhances convenience in accessing internet services but also expands its functionality particularly for more complex digital activities such as remote work and data processing. Computers are often shared among family members, allowing a single device to serve multiple users. This, in turn, indirectly encourages more frequent and intensive internet use among household members.

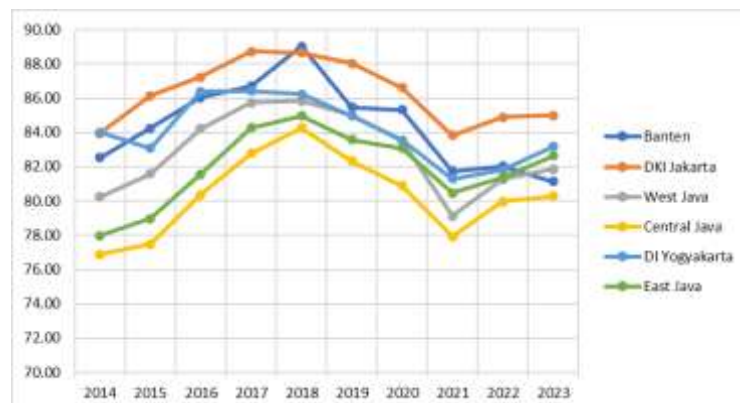


Figure 4. Trends in Internet User Growth Across Java Provinces, 2014–2023
 Source: BPS, 2014-2023 (Result of Data Processing)

As illustrated in Figure 4, in 2023, the Special Capital Region DKI Jakarta recorded the highest proportion of individual internet users in Java at 85%, followed by the Special Region of Yogyakarta at 83.17% and East Java at 82.62%. As the administrative, business, and digital economy hub of the country, Jakarta relies heavily on internet connectivity for a wide range of daily activities. Similarly, DI Yogyakarta, known as an education center with numerous higher education institutions, demonstrates high internet usage driven by academic demands and participation in the creative economy. In contrast, Central Java had the lowest internet usage rate at 80.28%, followed by Banten at 81.15% and West Java at 81.87%. Factors such as a large and diverse population contribute to digital inequality among different social groups, which in turn affects internet usage levels. In Central Java and Banten, disparities in internet access between urban and rural areas may also account for the lower percentages of internet users compared to other provinces in Java.

The use of Information Technology enables individuals to access information more efficiently and supports productivity across various economic sectors. Furthermore, it fosters innovation by creating new employment opportunities, particularly within the digital economy and technology-based service industries. As a result, economic growth in the digital transformation era is increasingly driven by the central role of information technology. This is in line with Paul Romer's theory in *The Origins of Endogenous Growth* (Romer, 1990), which posits that technological change does not occur spontaneously but is instead the result of deliberate economic decisions. Through investments in research and development (R&D) and the accumulation of knowledge, economies can continue to evolve and generate new sources of employment.

LITERATURE REVIEW

Macroeconomic indicators of a country can be assessed through the unemployment rate, which reflects the overall economic condition whether the economy is stagnating, expanding, or experiencing a downturn. Unemployment refers to a situation in which members of the labor force are willing to work but have not yet secured employment. It is also defined as individuals of productive age who are either not working or working fewer than two days in the week prior to data collection, and who are actively seeking employment (Gatiningsih & Sutrisno, 2017).

Unemployment typically arises due to a mismatch between the rapid growth of the labor force and the limited availability of job opportunities, leading to low levels of labor absorption (Gatiningsih & Sutrisno, 2017). This condition not only reduces overall productivity and household income but also increases the risk of poverty and various other social issues. In this regard, Gatiningsih & Sutrisno (2017) argue that a decline in a country's economic performance can result from several factors, including technological change.

Technological development has transformed work processes across numerous sectors, requiring workers to adapt. Many traditional jobs have been replaced by more efficient machines, thereby reducing the demand for human labor. Individuals who are unable to adjust to technological advancements face

an increased risk of unemployment. According to endogenous growth theory as proposed by Romer (Juhro & Trisnanto, 2018) technological progress is considered an endogenous variable, shaped by policy and economic decision-making, particularly through investments in research and development (R&D) and the accumulation of knowledge. Similarly, Lucas (Hutami & Riani, 2022) emphasizes that human capital investment serves as a foundational element in productivity growth. In this context, education plays a dual role: it directly enhances labor quality through labor market mechanisms, and indirectly accelerates the adoption and application of new technologies by increasing individuals' adaptive capacity within the economy.

METHODOLOGY

This study employs quantitative statistical analysis using a panel data regression approach, which is an estimation method that analyzes a combination of time series and cross-sectional data (Basuki, 2021). The geographical scope of this research includes six provinces on the island of Java. The period of analysis covers the years 2014 to 2023, utilizing secondary data obtained from Indonesia's Badan Pusat Statistik (BPS) and the International Telecommunication Union (ITU). The analysis was conducted using EViews software version 12. The panel regression model used in this study is specified as follows:

$$Y_{it} = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e_{it}$$

Where:

- Y = Open Unemployment Rate (OUR)
- α = Constant
- β_1 - β_2 = Regression coefficients
- i = Province in Java
- t = Period (2014–2023)
- X1 = Mobile Phone Subscribers
- X2 = Households with Computers
- X3 = Internet Users
- e = *Error Term*

REASERCH RESULT

Table 1. Chow Test Regression Results

| Effects Test | Statistic | d.f. | Prob. |
|--------------------------|-----------|--------|--------|
| Cross-section F | 41.833430 | (5,51) | 0.0000 |
| Cross-section Chi-square | 97.769921 | 5 | 0.0000 |

Source: Eviews 12 (Result of Data Processing)

The cross-section chi-square test produced a probability value of 0.0000, which is below the 5% significance level ($\alpha = 0.05$). Consequently, the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted. Based on this result, the Fixed Effect Model (FEM) is deemed the most appropriate model for the panel data analysis. Following this determination, the next step in the analysis involves conducting the Hausman test.

Table 2. Hausman Test Regression Results

| Test Summary | Chi-sq. Statistic | Chi-Sd.d.f. | Prob. |
|----------------------|-------------------|-------------|--------|
| Cross-section random | 9.530282 | 3 | 0.0230 |

Source: Eviews 12 (Result of Data Processing)

Referring to the results of the Hausman test, the cross-section random effect yielded a probability value of 0.0230, which falls below the 5% significance level ($\alpha = 0.05$). As a result, the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted. Accordingly, the Hausman test confirms the Fixed Effect Model (FEM) as the appropriate model for the analysis. Therefore, it is not necessary to proceed with the Lagrange Multiplier (LM) test.

The classical assumption tests constitute a series of examinations conducted prior to performing linear regression analysis to ensure that the regression model employed is capable of producing accurate and reliable estimates. The results of these classical assumption tests are presented as follows.

Table 3. Multicollinearity Test Results

| Variable | Centered VIF |
|---------------------------|--------------|
| C | NA |
| Mobile Phone Subscribers | 1.669825 |
| Households with Computers | 1.622861 |
| Internet Users | 1.424707 |

Source: Eviews 12 (Result of Data Processing)

Table 4. Glesjer Test Results

| Variable | Prob. |
|---------------------------|--------|
| Mobile Phone Subscribers | 0.1097 |
| Households with Computers | 0.7326 |
| Internet Users | 0.6704 |

Source: Eviews 12 (Result of Data Processing)

The coefficient of determination test is conducted to assess the extent to which the independent variables are able to explain the variation in the dependent variable under investigation.

Table 5. Determination Coefficient Test Results (R²)

| | |
|--------------------|----------|
| R-squared | 0.864991 |
| Adjusted R-squared | 0.843813 |
| S.E. of regression | 0.885000 |

Source: Eviews 12 (Result of Data Processing)

Referring to the regression output, the R-squared (R^2) value is 0.864991, or 86.49%. This indicates that the independent variables Mobile Phone Subscribers (MPS), Households with Computers (HWC), and Internet Users

(IU) collectively explain 86.49% of the variation in the Open Unemployment Rate (OUR) across the observed provinces. The remaining 13.51% (note: correct residual portion from 100% – 86.49%) is attributed to other factors not included in the model, which may also influence the dependent variable.

Table 6. f Test Results

| | |
|-------------------|----------|
| F-statistic | 40.84393 |
| Prob(F-statistic) | 0.000000 |

Source: Eviews 12 (Result of Data Processing)

Based on the output results, the calculated F-statistic is 40.84393, while the critical F-table value at a significance level of $\alpha = 0.05$, with degrees of freedom $df_1 (k - 1) = 3$ and $df_2 (n - k) = 56$ (where k represents the total number of variables and n represents the total number of observations), is 2.76943. Since the calculated F-statistic (40.84393) is greater than the F-table value (2.76943), and the probability value of the F-statistic is 0.000000 (which is less than 0.05), the null hypothesis (H_0) is rejected.

This result indicates that, collectively, all independent variables Mobile Phone Subscribers (MPS), Households with Computers (HWC), and Internet Users (IU) simultaneously have a statistically significant effect on the Open Unemployment Rate across the six provinces in Java.

Table 7. t Test Results

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---------------------------|-------------|------------|-------------|--------|
| C | -4.627444 | 9.982073 | -0.463575 | 0.6449 |
| Mobile Phone Subscribers | 0.192714 | 0.087174 | 2.210687 | 0.0316 |
| Households with Computers | 0.020880 | 0.026241 | 0.795725 | 0.4299 |
| Internet Users | -0.081810 | 0.055330 | -1.478583 | 0.1454 |

Source: Eviews 12 (Result of Data Processing)

Based on the results of the t-test, the variable Mobile Phone Subscribers shows a probability value of $0.0316 < 0.05$, and a t-statistic ($2.210687 > t$ -table (2.001717)). This indicates that Mobile Phone Subscribers have a positive and statistically significant effect on the Open Unemployment Rate in the six provinces of Java.

In contrast, the variable Households with Computers has a probability value of $0.4299 < 0.05$, and a t-statistic ($0.795725 < t$ -table (2.001717)). This means that Households with Computers do not have a significant effect on the Open Unemployment Rate in the six provinces of Java.

Similarly, the variable Internet Users yields a probability value of $0.1454 < 0.05$, and a t-statistic ($-1.478583 < t$ -table (2.001717)). Therefore, Internet Users are not found to have a significant impact on the Open Unemployment Rate in the observed provinces.

DISCUSSION

Referring to the panel data regression output, the probability value for the Mobile Phone Subscribers variable across the six provinces in Java is 0.0316, which is lower than the significance level of $\alpha = 0.05$. Therefore, the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted, indicating that mobile phone subscribers have a positive and statistically significant effect on the open unemployment rate in Java during the period 2014–2023. This finding suggests that an increase in mobile phone subscribers is associated with a rise in the open unemployment rate. The empirical results of this study appear inconsistent with endogenous growth theory, which posits that technology functions as an internal factor that enhances productivity and labor market efficiency (Romer, 1994). In theory, technology should improve labor market outcomes through enhanced information quality, expanded socioeconomic networks, and the creation of new job opportunities, especially in the digital and informal sectors (World Bank, 2016). However, several plausible explanations may account for this paradox. Many individuals use mobile phones for online business activities such as dropshipping or digital freelancing. These types of work are often irregular and not officially registered as formal employment, which may cause individuals to be classified as openly unemployed. Moreover, informal or small-scale digital businesses often fall outside the scope of national labor surveys, particularly when the working hours do not meet the minimum reporting threshold (e.g., less than one hour per day). As a result, individuals who are economically active may still be categorized as unemployed.

Additionally, this may reflect a “productivity illusion,” in which the high number of mobile phone users does not necessarily translate into economically productive activity especially among youth or working-age individuals who are not formally employed. These individuals may be in the process of launching online businesses or job hunting via mobile devices, but if they have not yet secured steady income or formal employment, they are classified as unemployed according to labor survey definitions such as those used in the Survei Angkatan Kerja Nasional (SAKERNAS). This finding is consistent with the results of Sumanto et al. (2020), who reported that ICT particularly mobile phone subscriptions had a statistically significant and positive effect on provincial unemployment rates in Indonesia during the 2015–2017 period.

Referring to the panel data regression output, the probability value for the variable Households with Computers across the six provinces in Java is 0.4299, which is greater than the significance level of $\alpha = 0.05$. Thus, the null hypothesis (H_0) is accepted and the alternative hypothesis (H_1) is rejected, indicating that household computer ownership does not have a significant effect on the Open Unemployment Rate in these provinces during the 2014–2023 period.

This finding suggests that ownership of computers (desktops, laptops, and similar devices) has not played a meaningful role in reducing unemployment in Java throughout the study period. In many households, computers are still primarily used for entertainment purposes rather than as tools for job searching, participating in online training, or supporting digital economic activities. In fact,

current technological behavior has shifted increasingly toward mobile devices, such as smartphones, which are more practical and accessible than stationary computers. Smartphones are easier to use for daily productive activities, including online selling, accessing job information, and performing various online-based tasks. This is supported by Pradana (2021), who found that smartphone usage has become more dominant than computer usage in supporting household activities in Indonesia.

Moreover, the generally low quality of human resources, particularly in terms of digital literacy, serves as an additional barrier to maximizing the productive use of computers. Individuals with lower levels of education tend to lack the skills needed to utilize computers effectively for productive purposes. The effect of household computer ownership on unemployment may vary depending on the educational level of the community. In groups with higher levels of education, the presence of a computer at home tends to be utilized productively, such as for enhancing digital skills, accessing labor market information, or engaging in remote work. This condition can expand employment opportunities and reduce the risk of unemployment. Conversely, in communities with lower levels of education, although a computer may be available at home, the ability to operate and utilize it optimally may be limited. Such limitations can diminish the expected positive impact on reducing unemployment due to constraints in digital literacy and the work competencies required in the modern labor market.

According to human capital theory, skills and competencies are critical individual assets for improving productivity and competitiveness in the labor market (Becker, 1994). Therefore, the mere presence of computers as a form of technological investment does not automatically enhance human capital unless accompanied by adequate skills and knowledge to use them productively. As a result, despite the availability of technology, many individuals remain unable to seize employment opportunities due to a lack of digital competencies. This leads to a mismatch between the labor market's demand for tech-savvy workers and the supply of unskilled labor, thereby limiting the effectiveness of technology in reducing unemployment. These findings are further corroborated by Rizka & Wau (2023), who concluded that Information and Communication Technology (ICT), including access to computers, had no significant effect on unemployment rates in member countries of the Organization of Islamic Cooperation (OIC) during the period 2013 to 2021.

Based on the panel data regression results, the probability value for the Internet Users variable across the six provinces in Java is 0.1454, which is greater than the significance level of $\alpha = 0.05$. Therefore, the null hypothesis (H_0) is accepted and the alternative hypothesis (H_1) is rejected. This implies that internet usage does not have a statistically significant effect on the Open Unemployment Rate in these provinces during the 2014–2023 period.

This result contradicts the initial hypothesis, which proposed that internet usage would have a negative and significant impact on unemployment. The empirical findings suggest that the increasing penetration of the internet has not yet been fully optimized by the population to support productive economic

activities. A significant portion of internet usage remains consumption-oriented, focusing on entertainment and social media, rather than being directed toward skill development or job searching.

Ideally, internet access should enhance connectivity and accessibility to information, training programs, and job opportunities, thereby enabling individuals to align their competencies with the evolving needs of the labor market. The internet also holds potential as a platform for digital innovation and entrepreneurship, where individuals can establish digital-based businesses that create not only self-employment but also employment for others. However, as the OECD (2019) points out, digital access alone does not automatically improve labor welfare unless it is accompanied by relevant digital skills. Individuals with internet access but lacking basic digital competencies such as software operation, online job searching, or digital business management are unlikely to leverage technology to improve their livelihoods.

This situation illustrates what Lucas (1998) refers to as the “technological productivity gap,” where the availability of technology is not matched by efforts to enhance human capital. Without strong human capital development, technologies like the internet become tools of consumption rather than instruments of productivity (Juhro & Trisnanto, 2018). This aligns with the phenomenon of “digital distraction,” in which internet users are more focused on consuming digital entertainment than engaging in capacity-building or employment-related activities (Nasrullah, 2016). In the context of employment, this contributes to the limited effectiveness of internet penetration in reducing open unemployment.

The inefficacy of internet use is also influenced by spatial disparities between urban and rural areas in Java. In remote regions, internet infrastructure remains limited, and many households lack adequate devices or facilities. Low levels of education and digital literacy further exacerbate the issue, preventing many individuals from using the internet productively for purposes such as job searching, online training, or e-commerce. These findings are further supported by Listari et al. (2024), who found that internet usage did not significantly affect youth unemployment in Indonesia during the period 2010 to 2021. This indicates that internet access alone is not sufficient to significantly enhance labor absorption among the youth demographic.

CONCLUSION AND RECOMMENDATION

Mobile Phone Subscribers were found to have a positive and statistically significant effect on the Open Unemployment Rate (OUR) in the six provinces of Java during the 2014–2023 period. This outcome can be attributed to the fact that many individuals use mobile phones for informal employment such as dropshipping, freelancing, or online businesses, which are often irregular and lack stable income. These types of work frequently go unrecorded in official datasets such as the Survei Angkatan Kerja Nasional (SAKERNAS), which requires at least one hour of economic activity per week that produces goods or services. As a result, even if individuals appear busy and engaged in economic activity, they are still classified as unemployed.

Households with Computers were found to have no significant impact on the OUR in the same provinces and time period. This may be due to a shift in public technological behavior from using computers to smartphones, which offer greater flexibility, easier access, and require less technical skill—making them more suitable for everyday use. Unlike computers, which are stationary and often restricted to fixed locations, smartphones can be used anytime and anywhere, further supporting their dominant role in daily digital engagement.

Internet Users also showed no significant influence on the OUR in the six provinces of Java during the study period. Although internet access has become more widespread, its usage remains predominantly consumption-oriented focused on entertainment and social media rather than being leveraged for productive activities such as online learning, job searching, or digital entrepreneurship. Therefore, despite the availability of digital infrastructure, the economic impact of internet usage has not yet been fully realized due to low levels of digital literacy and the lack of essential skills required to utilize technology effectively. As a consequence, the internet serves more as a tool for information consumption and entertainment rather than as an instrument for enhancing productivity or economic well-being.

ADVANCED RESEARCH

Future research is encouraged to adopt a more holistic approach by incorporating additional relevant independent variables, such as digital literacy levels, quality of education, and labor market policies. This approach aims to gain a deeper understanding of the various factors influencing the open unemployment rate. Furthermore, it is recommended to utilize higher-frequency data, such as quarterly or monthly observations, in order to capture the dynamic changes more accurately and respond more effectively to economic events or policy shifts.

REFERENCES

- Aulia, W., Putri, A., & Boedirochminarni, A. (2025). Dinamika Pengangguran Terbuka di Provinsi Pulau Jawa: Analisis Data Panel. In *Jurnal Pustaka Nusantara Multidisplin* (Vol. 3, Issue 2).
- Badan Pusat Statistik. (2023). *Laporan Kependudukan Indonesia 2023*. <https://kependudukan.id/wp-content/uploads/2023/10/BAHASA-LKI-10-Oktober-2023.pdf>
- Becker, G. S. (1994). *Human capital: a theoretical and empirical analysis, with special reference to education* (3rd ed.). The University of Chicago Press. <http://www.nber.org/chapters/c11230>
- Gatiningsih, & Sutrisno, E. (2017). *Kependudukan dan Ketenagakerjaan, Modul Mata Kuliah* (1st ed.). Fakultas Manajemen Pemerintahan IPDN. Available at: <http://eprints.ipdn.ac.id/2402/1/>
- Herniwati, D. P., & Handayani, R. (2019). Analisis Pengaruh Jumlah Penduduk, Pendidikan, Upah Minimum, dan PDRB Terhadap tingkat Pengangguran Terbuka Di Provinsi Jawa Tengah. *DIPONEGORO JOURNAL OF ECONOMICS*, 1(1), 159–169. <https://ejournal2.undip.ac.id/index.php/dje>

- Hutami, R. Y., & Riani, N. Z. (2022). Peran Investasi Modal Manusia dan Modal Fisik dalam Meningkatkan Pertumbuhan Produktivitas Tenaga Kerja di Indonesia. *Ecosains: Jurnal Ilmiah Ekonomi Dan Pembangunan*, 11(1), 30–40. <https://doi.org/10.24036/ecosains.11813057.00>
- Juhro, S., & Trisnanto, B. (2018). *PARADIGMA DAN MODEL PERTUMBUHAN EKONOMI ENDOGEN INDONESIA*. <https://publication-bi.org/repec/idn/wpaper/WP112018.pdf>
- Listari, S. E., Pasaribu, S. H., & Novianti, T. (2024). Pengaruh Perkembangan Teknologi Informasi dan Teknologi (TIK) terhadap Pengangguran Usia Muda di Indonesia. *Desember*, 2024(2), 93–104. <https://doi.org/10.29244/jekp.13.2.2024.93-104>
- Nasrullah, R. (2016). *MEDIA SOSIAL: PERSPEKTIF KOMUNIKASI, BUDAYA DAN SOSIOTEKNOLOGI* (6th ed.). Bandung Remaja Rosda Karya.
- OECD. (2019). *Going Digital: Shaping Policies, Improving Lives*. OECD. <https://doi.org/10.1787/9789264312012-en>
- Pradana, R. S. (2021). PENGARUH AKSES TEKNOLOGI INFORMASI DAN KOMUNIKASI TERHADAP PERTUMBUHAN EKONOMI PROVINSI BANTEN TAHUN 2015-2019. *Jurnal Kebijakan Pembangunan Daerah*, 5(1), 9–23. <https://doi.org/10.37950/jkpd.v5i1.114>
- Raza, F., & Raza, R. (2024). Examining the Interconnections among ICT, Education, and Unemployment Evidence from Selected Asian Economies. *Digital Management Sciences Journal*, 1(2), 79–90. <https://doi.org/10.62854/dmsj.v1i2.6>
- Rizka, & Wau, T. (2023). The Effects of Innovation, IT Advancement, GDP, and Inflation on Unemployment in OIC Countries 2013-2021. *Jurnal Ekonomi Pembangunan*, 21(01), 59–68. <https://doi.org/10.22219/jep.v21i01.24835>
- Romer, P. M. (1990). Endogenous Technological Change. *Journal of Political Economy*, 98(5, Part 2), 71–102. <https://doi.org/10.1086/261725>
- Romer, P. M. (1994). The Origins of Endogenous Growth. *Journal of Economic Perspectives*, 8(1), 3–22. <https://doi.org/10.1257/jep.8.1.3>
- Sumanto, A., Abbas, M. H. I., Rahmawati, F., & Merlinda, S. (2020). Do Technological Developments Reduce Unemployment in Indonesia? *Proceedings of the 4th Padang International Conference on Education, Economics, Business and Accounting (PICEEBA-2 2019)*. <https://doi.org/10.2991/aebmr.k.200305.089>
- UNIDO. (2025). *Information and Communications Technology ICT*. <https://www.unido.org/investing-technology-and-innovation-competitiveness-business-environment-and-upgrading/information-and-communications-technology-ict>
- World Bank. (2016). *World Development Report 2016: Digital Dividends*. <https://openknowledge.worldbank.org/handle/10986/23347>