Exploring Determinants of Education-Job Mismatch Among Educated Workers in Indonesia

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Abstract

This study examines the determinants of education-job mismatch among educated workers in Indonesia, focusing on factors influencing job matching, over-education, and under-education. Using data from the 2022 National Labor Force Survey (Sakernas), a multilevel multinomial logit regression analysis reveals that age, gender, education level, and regional characteristics significantly affect mismatch outcomes. Older workers are more likely to experience over-education but less likely to face under-education, while women are disproportionately over-educated. Higher education levels increase the likelihood of over-education, reflecting inefficiencies in translating qualifications into appropriate jobs. Regional disparities, such as higher minimum wages and economic concentration in Java-Bali, exacerbate over-education. Sectoral GDP in services and industry is positively associated with over-education, while employment in agriculture reduces mismatch risks. Urban residence improves job matching, but rural areas face higher under-education rates. To address these challenges, targeted policies are needed including enhanced career counseling, vocational training, and stronger collaboration between education providers and industry. Regional development initiatives and gender-equity programs are vital to reducing disparities. Strengthening labor market information systems and digital job-matching platforms can mitigate informational asymmetries, optimize workforce productivity, and foster sustainable economic growth.

Keywords: Education-job mismatch; educated worker; labour force; Indonesia
JEL classification: J24, I26, J31

1.   INTRODUCTION

In Indonesia, the phenomenon of education-job mismatch among educated workers has emerged as a critical issue with profound implications for both individuals and the economy at large. Education-job mismatch occurs when there is a discrepancy between an individual's

educational qualifications and the requirements of their job (Shahidan & Ismail, 2021; Serikbayeva & Abdulla, 2022). This phenomenon is typically categorized into two forms: over-education, where individuals possess higher qualifications than their job demands, and under-education, where their educational attainment is below the job's requirements (Battu & Bender, 2020; Wen & Maani, 2022). Historically, educational systems have emphasized higher education as a path to better job opportunities and economic advancement. However, rapid changes in labor market demands, technological advancements, and the evolving nature of work have increasingly led to situations where the supply of educated labor does not align with job requirements (Mahy et al., 2015; Esposito & Scicchitano, 2020, Hane-Weijman, 2021). This misalignment raises concerns about the efficacy of educational investments and the optimal use of human capital.

Job search theory provides a critical lens for understanding job-education mismatch by examining the processes through which individuals seek and accept employment. Job search theory provides a framework for understanding job-education mismatch. Stigler's early work in the 1960s emphasized how search costs and imperfect information impact labor markets (Stigler, 1962). Job seekers often lack complete knowledge of all available opportunities, while employers do not fully understand each candidate's capabilities. This information asymmetry forces individuals to weigh the costs of job searching—such as time, money, and effort—against the potential benefits of finding a job that better matches their skills and qualifications.

Further contributions by Diamond, Mortensen, and Pissarides in Pissarides (2011), who received the Nobel Prize in Economic Sciences in 2010, expanded on this by introducing the concept of matching frictions. These frictions refer to delays and inefficiencies both job seekers and employers face in finding optimal matches (Pissarides, 2011; Mortensen, 2011). In the context of educational mismatch, these frictions can cause highly educated individuals to accept jobs below their qualification level due to prolonged search times or high search costs, leading to over-education. Conversely, under-education can occur when less qualified individuals take on roles that typically require higher qualifications, as employers might compromise due to an inability to find ideal candidates. Thus, as highlighted by Banerjee & Sequira (2023), job search theory emphasizes how the dynamics of the search process and labor market conditions contribute to educational mismatches, influenced by imperfect information and the costs associated with job searching.
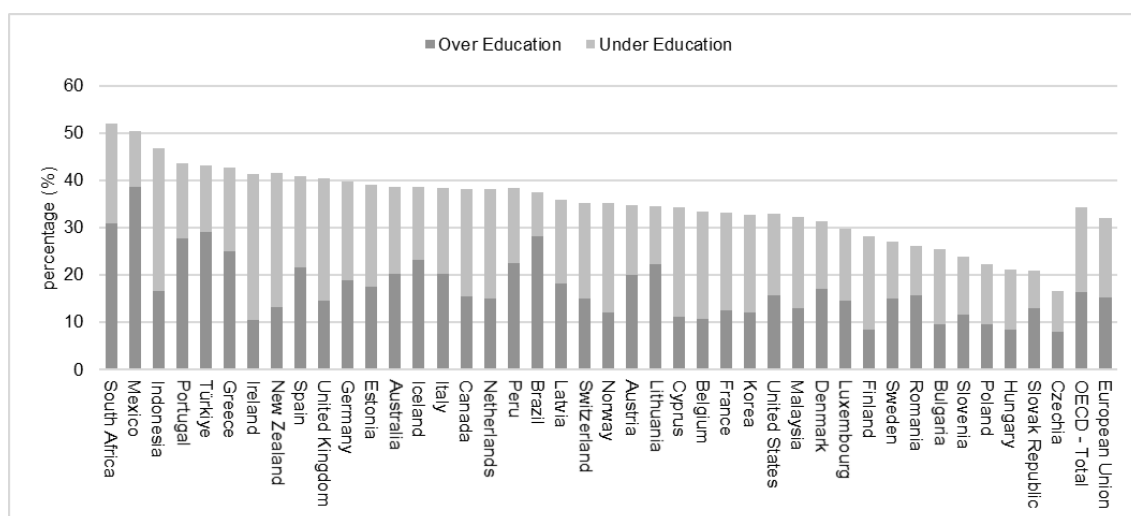
Figure 1. Vertical Mismatch Indonesia compared to OECD and non-OECD countries
Note: Data refer to 2019, with the following exceptions: they refer to 2017 for Korea; to 2016 for Australia; to 2015 for Türkiye; and to 2014 for Brazil; Data Indonesia calculated using National Labour Force Survey 2022
Source: OECD Skills for Jobs Database (2022)

Figure 1 displays the percentages of over-education and under-education across various countries, with each country represented by two adjacent bars. Over-education is marked by darker bars, while under-education is depicted by lighter bars. South Africa leads the chart with the highest percentage of over-education, reaching nearly 50%, and a notable level of under-education slightly below 30%. Mexico follows with a high over-education rate above 40%, while the under-education rate is less pronounced, slightly above 10%. European countries such as Portugal, Greece, and Turkey also exhibit significant levels of over-education, though their under-education levels vary. Conversely, the European Union as a whole shows a more balanced distribution with moderate levels of both over-education and under-education.

Indonesia is positioned towards the left of the chart, indicating a substantial percentage of over-education, comparable to Mexico and Portugal. Specifically, Indonesia's over-education rate is slightly over 40%, placing it among the top countries in terms of over-education. Its under-education percentage, however, is lower, aligning more closely with countries like Turkey and Greece. This highlights a significant issue of over-education in Indonesia, suggesting that a notable portion of the population may possess educational qualifications that exceed the requirements of their jobs. Compared to countries towards the right of the chart, such as Poland, Sweden, and Hungary, where the levels of over-education and under-education are relatively balanced, Indonesia exhibits a clear skew towards over-education.
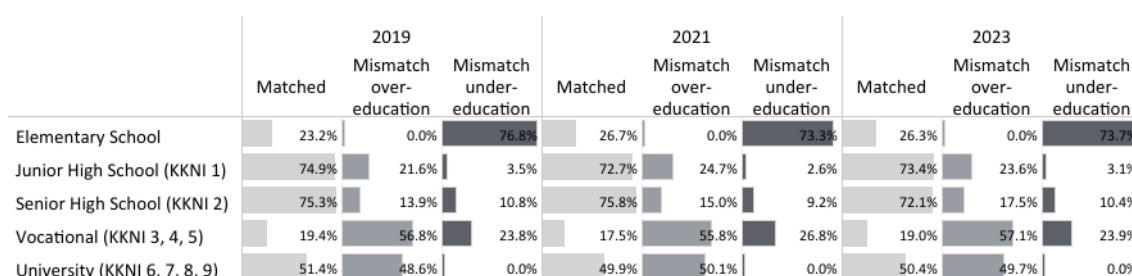
	2019			2021			2023		
	Matched	Mismatch over-education	Mismatch under-education	Matched	Mismatch over-education	Mismatch under-education	Matched	Mismatch over-education	Mismatch under-education
Elementary School	23.2%	0.0%	76.8%	26.7%	0.0%	73.3%	26.3%	0.0%	73.7%
Junior High School (KKNI 1)	74.9%	21.6%	3.5%	72.7%	24.7%	2.6%	73.4%	23.6%	3.1%
Senior High School (KKNI 2)	75.3%	13.9%	10.8%	75.8%	15.0%	9.2%	72.1%	17.5%	10.4%
Vocational (KKNI 3, 4, 5)	19.4%	56.8%	23.8%	17.5%	55.8%	26.8%	19.0%	57.1%	23.9%
University (KKNI 6, 7, 8, 9)	51.4%	48.6%	0.0%	49.9%	50.1%	0.0%	50.4%	49.7%	0.0%

Figure 2. Proportion Education–Job Mismatch by Education of Workers in Indonesia 2019-2023

Source: National Labour Force Survey, processed (2024)

More specifICly, the Figure 2 compare the percentages of educational match and mismatch (over-education and under-education) across different educational levels (Elementary, Junior High, Senior High, Vocational, and University) for 2019, 2021, and 2023 in Indonesia. Over these years, a consistent pattern emerges where a significant proportion of vocational and university graduates are over-educated for their jobs. For instance, the over-education rate among vocational graduates was around 56.8% in 2019, slightly decreasing to 55.8% in 2021, and then rising to 57.1% in 2023. Similarly, for university graduates, the over-education rate hovered around 50% throughout the period. The under-education rates for vocational graduates showed an increasing trend from 23.8% in 2019 to 26.8% in 2021 but then slightly decreased to 23.9% in 2023. There was no under-education reported for university graduates in any of the years.

For Senior High School graduates, the match rates remained relatively stable, approximately around 75%, with slight fluctuations over the years. Over-education for this group declined from 13.9% in 2019 to 11.0% in 2021 but rose again to 17.5% in 2023. Under-education for Senior High School graduates showed a slight decrease from 10.8% in 2019 to 9.2% in 2021, and a minor increase to 10.4% in 2023. These trends highlight persistent over-education issues at higher educational levels while indicating some improvements and fluctuations in educational alignment for Senior High School graduates. Overall, the data points to an ongoing challenge of aligning educational outcomes with job market demands, particularly for those with vocational and university degrees.

The persistent over-education observed among vocational and university graduates has several socio-economic consequences. For individuals, it often leads to decreased job satisfaction as they perform roles that do not utilize their full skill set or education level, potentially resulting in lower productivity and career dissatisfaction (Frei & Grund, 2022). Financially, these individuals may face a return on investment dilemma, where their educational expenditure does not correspond to their income potential, leading to economic inefficiencies. For employers, this mismatch can mean an inefficient allocation of human resources, where highly educated workers occupy positions that require less skill, potentially stifling innovation and growth (Salas-Velasco, 2021. At a macroeconomic level, over-education can signal a misalignment between the education system and labor

market needs, causing a skills mismatch that affects overall economic competitiveness and growth (Battu & Bender, 2020; Marioni, 2021). Addressing these issues requires better coordination between educational institutions and labor market demands, with a focus on aligning curricula with industry needs and enhancing career guidance to ensure that educational attainment translates effectively into suitable employment opportunities.

Understanding the determinants of job-education mismatch is crucial for addressing labor market inefficiencies and improving educational and employment outcomes. Research shows that factors such as field of study, labor market conditions, individual skills, regional economic conditions, and institutional frameworks significantly influence educational mismatches. Graduates in fields with lower market demand are more likely to experience over-education, while those in high-demand disciplines are less prone to mismatches (Capsada-Munsech, 2024). Regional economic disparities also contribute, with job opportunities varying widely across different areas, influencing the extent of mismatches (Andersson et al., 2018). Additionally, the alignment between educational curricula and market needs, as well as the quality of career guidance, affects how well graduates' qualifications match job requirements (Cleary et al., 2017; Lichy & Khvatova, 2019; Aljohani et al., 2022). Prior studies highlight the need for tailored educational policies and labor market interventions to reduce mismatches and enhance the alignment of skills with job opportunities, leading to better utilization of human capital and improved economic outcomes.

This research aims to explore the determinants of educational mismatch among educated (Senior High School and University graduates) in Indonesia by utilizing microdata. The primary objective is to identify the socio-economic and demographic factors contributing to over-education and under-education within these groups. By analyzing individual-level data, the study seeks to uncover patterns and predictors that explain why graduates experience a misalignment between their educational qualifications and job roles. The implications of this research are significant for policy and practice: it can inform educational policy makers to align curricula more closely with labor market demands, help institutions design targeted career services to better prepare graduates for appropriate job placements, and guide employers in structuring roles and training programs to more effectively utilize the skills of their workforce. Moreover, the findings can contribute to reducing the economic inefficiencies associated with educational mismatch, ultimately leading to improved job satisfaction, higher productivity, and better alignment of human capital with industry needs.

Education-Job Mismatch in Labor Market

Education-job mismatch in the labor market is a pervasive issue with profound implications for individuals, economies, and societies globally. This phenomenon arises when the skills and qualifications possessed by job seekers do not align with the demands of available employment opportunities. These mismatches can occur in various dimensions, including skill levels, fields of study, and geographical locations, creating

inefficiencies and challenges in labor market dynamics. According to the OECD (2020), such discrepancies can lead to underemployment, where individuals are either overqualified or lack the necessary technical competencies required by modern industries. For example, advancements in automation and digital technologies have dramatically altered job requirements, creating a demand for skills in areas like artificial intelligence, data analytics, and cybersecurity. However, many workers, especially those in traditional industries or with outdated skill sets, find themselves ill-prepared for these new roles, exacerbating the education-job mismatch (World Economic Forum, 2021).

Education-job mismatch can take two primary forms: under-education and over-education, each posing distinct challenges for individuals and the labor market. Under-education occurs when individuals possess qualifications and skills that are below those typically required for the jobs they hold (Alattas & Saeed, 2022; Wen & Maani, 2022; Pascual-Sáez & Lanza-Leon, 2023). This form of mismatch often results from factors such as limited access to quality education, inadequate career guidance, or mismatches between educational curricula and evolving job market demands (Cleary et al., 2017; Andersson et al., 2018; Lichy & Khvatova, 2019; Aljohani et al., 2022; Capsada-Munsech, 2024). For example, a person with a high school diploma working in a role that traditionally requires a bachelor's degree may experience underemployment, where their skills and potential contributions are underutilized relative to their educational attainment. Conversely, over-education occurs when individuals hold qualifications and skills that exceed the requirements of the jobs they occupy (Perez & Benito, 2022). This type of mismatch can arise due to oversupply of graduates in certain fields (Biagi et al., 2020), changes in technology (Delaney et al., 2020), or personal career choices (Hamjediers & Schmelzer, 2022). Over-education can result in wage penalties, where individuals earn less than their peers with similar educational backgrounds working in jobs that align more closely with their qualifications.

The labor demand-supply theory provides a foundational framework for understanding the dynamics underlying the phenomenon of education-job mismatch in the labor market (Draissi et al., 2023). At its core, this theory posits that the equilibrium between labor demand (the number of jobs available) and labor supply (the number of workers available) determines wages and employment levels in a given industry or economy. Education-job mismatch occurs when there is a discrepancy between the skills and qualifications possessed by job seekers (labor supply) and those demanded by employers (labor demand). This mismatch can manifest in various ways, including underemployment, overqualification, and skills gaps, all of which impact both individuals and the broader economy

From a labor demand perspective, employers seek workers with specific skills, knowledge, and competencies that align with the requirements of available jobs (Lauder & Mayhew, 2020). Rapid technological advancements, changes in consumer preferences, and shifts in global economic conditions continuously reshape labor demand patterns. For example, the rise of digital technologies has increased the demand for workers skilled in data analysis, artificial intelligence, and cybersecurity, while traditional roles may

experience decreased demand or restructuring (Bongomin et al., 2020; Ciarli et al., 2021). On the supply side, educational institutions and training programs play a critical role in shaping the skills and qualifications of the workforce. However, mismatches can occur if educational offerings do not align with evolving labor market needs or if graduates lack practical experience or specialized training required by employers. This mismatch can result in underutilization of human capital, where individuals may not fully apply their skills or talents in their jobs, leading to lower productivity and job dissatisfaction.

The Determinants and Consequence of Education-Job

Education-job mismatch is influenced by a complex interplay of socio-economic and demographic factors that shape individuals' educational attainment, career choices, and labor market outcomes. Socio-economic determinants such as income level, parental education, and access to educational resources significantly impact individuals' ability to acquire relevant skills and qualifications for the labor market (Aina et al., 2022; De Schepper et al., 2023). Research indicates that individuals from lower-income backgrounds or those whose parents have lower educational attainment may face barriers in accessing quality education and career guidance, which can contribute to mismatches between their skills and the demands of available job opportunities (Illie et al., 2021).

Demographic factors, including gender, race, and ethnicity, also play a crucial role in shaping education-job mismatches. Studies have shown persistent disparities in educational attainment and employment outcomes across demographic groups. For instance, women and minority groups often face systemic barriers in accessing higher education and pursuing careers in fields traditionally dominated by men or majority ethnic groups (Allen et al., 2021). These disparities can result in underrepresentation in high-demand sectors and overrepresentation in low-skilled, low-paying jobs, exacerbating education-job mismatches and perpetuating socio-economic inequalities.

Geographical location is another significant determinant of education-job mismatch, particularly in regions characterized by uneven economic development and varying job market demands. Rural areas, for example, may have limited access to educational institutions offering specialized training or technical skills development programs, leading to mismatches where local job opportunities do not align with the skills possessed by residents (Sitorus & Wicaksono, 2020). This spatial disparity in educational and employment opportunities can hinder economic mobility and exacerbate regional inequalities, as individuals may face difficulties relocating to urban centers where job opportunities are more abundant.

Furthermore, age and stage of career development influence the likelihood of experiencing education-job mismatch (Orr, 2022). Younger workers entering the labor market may encounter challenges in aligning their educational backgrounds with rapidly evolving job requirements, particularly in dynamic sectors such as technology and digital innovation (Goulart et al., 2022). Conversely, older workers may face obsolescence of skills or difficulty in transitioning to new roles that require updated qualifications, contributing to mismatches and potential underemployment.

The consequences of education-job mismatches extend beyond individual career outcomes to impact broader economic and social dynamics. Individuals affected by mismatches often experience lower job satisfaction, reduced earnings potential, and higher rates of job turnover. These outcomes not only undermine personal well-being but also contribute to socioeconomic inequalities and hinder upward mobility. From an economic standpoint, mismatches can lead to inefficiencies in resource allocation, lower productivity growth, and diminished competitiveness in global markets.

2. RESEARCH METHOD

This study investigates the factors contributing to educational mismatches among Senior High School and University graduates in Indonesia. It focuses on identifying socio-economic and demographic variables that influence over-education and under-education. By utilizing individual-level data, the research aims to uncover patterns and predictors that explain the misalignment between educational qualifications and job roles, providing a comprehensive understanding of the determinants of educational mismatch.

The analysis is based on individual-level data from the National Labor Force Survey (Sakernas), conducted biannually by Indonesia's Central Statistics Agency (BPS) to collect employment-related information. The February and August Sakernas surveys differ in scope, with the February survey representing provincial and national levels, while the August survey, with a larger sample size of approximately 300,000 households, allows for district-level estimates. This study uses data from the February 2022 Sakernas survey to construct and measure education-job mismatches among educated workers in Indonesia.

For this research, educated workers are defined as individuals aged 15-64 who are currently employed and have completed at least a high school diploma or its equivalent. Military (TNI) and police (Polri) personnel are excluded from the analysis. Applying these criteria, the final sample consists of 50,647 individuals, providing a robust dataset for analyzing educational mismatches.

The data were categorized into three vertical mismatch categories to match workers' educational levels with the required qualifications for their jobs: matched, mismatch over-education, and mismatch under-education. Examples include individuals with elementary education (SD) working in manual labor roles (matched) or those with higher education (e.g., bachelor's degree) working as managers or professionals (matched). Classification of these vertical mismatch categories follows international standards established by the International Labour Organization (ILO) (see ILO, 2018). Details of the variables used in this study are provided in Table 1 below.

Inferential analysis in this study employs Multilevel Multinomial Logit Regression (MMNL). The multilevel multinomial logit model is suitable for analyzing non-binary, discrete dependent variables and control individual and regional characteristics. This study regressors include individual demographic characteristics, labor demand factors (supply-side), labor market conditions, and spatial characteristics.

The dependent variable is an unordered categorical variable indicating individual vertical mismatch status: matched = 1, mismatch over-education = 2, mismatch under-education = 3. The multinomial logit model is formulated mathematically as follows:

$$Prob\left(Y_i = j \mid x_{i1}, x_{i2}, \dots, x_{iJ},\right) = Prob\left(Y_i = j | X_i\right) = P_{ij} = \frac{\exp\left(x'_{ij}\beta\right)}{\sum_{j=1}^{J}\exp\left(x'_{ij}\beta\right)} \dots\dots\dots\dots\dots\dots (1)$$

Where Y_i represents the probability of individual i choice among $j = 1, 2, \dots, J$ available options. Furthermore, Greene (2018) developed a model that accommodates individual characteristics and attributes of choices, where in the context of this study, attributes relate to individual choices concerning labor market conditions, household socio-economic characteristics and provincial variance characteristics. Mathematically, this is expressed as follows:

$$Prob\left(Y_i = j\right) \frac{exp\left(x'_{ij}\beta + w'_i\alpha_j + z'_i\gamma\right)}{\sum_{m=1}^{J}exp\left(x'_{im}\beta + w'_i\alpha_m + z'_i\gamma\right)} \dots\dots\dots\dots\dots\dots (2)$$

Here x'_{ij} represents the attributes related to the choice (labor market conditions and regional characteristics), w'_i denotes variables associated with individual demographic characteristics and $z'_i\gamma$ denotes variables at the provincial level to control variance macro characteristics.

Taking these considerations and adapting from the model by Grilli & Ramphicini (2007), the specification of the multilevel multinomial logit regression model in this study is as follows:

$$Y_i = \beta_0 + \beta_1 X_i + \beta_1 Y_i + \beta_1 Z_i + \beta_1 W_i + \mu \dots\dots\dots\dots\dots\dots (3)$$

Where Y_i is the dependent variable representing vertical mismatch status with three categories: matched, mismatched under-education, and over-education. The independent variables: X_i individual demographic characteristics, Y_i labor demand, Z_i labor market conditions, and W_i regional characteristics. Further operational definitions of these variables are detailed in Table 1 below.

Table 1. Definitions of Variables

Variable	Definition	Measurement
Dependent Variable		
Education-Job Mismatch Status	Vertical mismatch status: alignment between educational level and job qualifications	1 = Matched 2 = Mismatch under-education 3 = Mismatch over-education
Independent Variables: **a) Demographic Characteristics**		
1 Age	Age in last birthday year	Ratio (in years)
2 Gender	Gender consisting of male and female	0 = Female 1 = Male
3 Education Level	Highest education degree completed	Nominal 12 = High School or Equivalent 15 = Diploma / Associate Degree 16 = University Degree
b) Labor Demand		
4 Minimum Wage	Regional minimum wage in 2021	Logarithm of minimum wage (in Indonesian Rupiah)
5 GDPR Agriculture (Province)	Gross Domestic Product (GDP) in the agriculture sector in 2021	Logarithm of GDP in Agriculture (in Indonesian Rupiah)
6 GDPR Industry (Province)	Gross Domestic Product (GDP) in the industry sector in 2021	Logarithm of GDP in Industry (in Indonesian Rupiah)
7 GDPR Services (Province)	Gross Domestic Product (GDP) in the services sector in 2021	Logarithm of GDP in Services (in Indonesian Rupiah)
c) Labor Market Conditions		
8 Employment Sector	Type of employment sector	0 = Informal Sector, 1 = Formal Sector
d) Regional Characteristics		
9 Residential Area	Classification of residential area as village or urban locality to indicate rural or urban	0 = Urban 1 = Rural
10 Regional Location	Classification of regional location based on island	0 = Other Islands 1 = Java-Bali

Source: Author (2024)

3. RESULTS AND DISCUSSION

3.1. Results

Education-job mismatch among educated workers in Indonesia, as revealed by comprehensive data analysis in Table 2, presents a nuanced and multifaceted picture of the labor market dynamics. Among the 50,647 individuals sampled, a significant majority, approximately 64.00%, are currently employed in positions that correspond well with their educational qualifications. This suggests a robust alignment between the skills acquired through education and the requirements of their respective jobs, reflecting an efficient utilization of human capital within the workforce.

However, the data also highlights substantial challenges related to mismatched employment. A notable 27.07% of workers find themselves in roles where their educational attainment surpasses the job requirements. This phenomenon of over-education often leads to underutilization of skills and potential, potentially impacting job satisfaction and economic efficiency. Conversely, 8.93% of individuals are in occupations that demand higher qualifications than they possess, indicating instances of under-education. This mismatch can result in reduced productivity and earnings potential for affected workers, further underscoring the complexities within the Indonesian labor market.

Table 2. Statistics Descriptive

	Matched	Mismatch Over-Education	Mismatch Under-Education	Total
Number of Observation (sample)	32414	13708	4525	50647
	64,00%	27,07%	8,93%	100%
Wage	Rp2.977.801	Rp3.095.042	Rp3.280.780	Rp3.037.761
Age group				
15-24	5.662	2.156	629	8.447
25-34	8.532	4.573	1.201	14.306
35-44	871	3.593	1.235	13.538
45-54	6.744	2.423	1.038	10.205
55-64	2.766	963	422	4.151
Gender				
Male	1.866	861	2.557	29.827
Female	13.754	5.098	1.968	2.082
Education Level				
General High School	17353	4126	2543	24022
Vocational High School	8191	1902	1151	11244
Diploma/Associate Degree	479	1507	831	2817
University Degree	6391	6173	0	12564
Minimum Wage	Rp2.563.980	Rp2.588.612	Rp2.595.974	Rp2.573.505

	Matched	Mismatch Over-Education	Mismatch Under-Education	Total
GDPR Province (in billion IDR)	Rp526.380,1	Rp513.187,2	Rp522.252,0	Rp522.440,5
GDPR Agriculture (in billion IDR)	Rp68.549,8	Rp67.184,3	Rp65.972,2	Rp67.949,9
GDPR Industry (in billion IDR)	Rp238.644,2	Rp228.120,1	Rp238.603,6	Rp235.792,1
GDPR Services (in billion IDR)	Rp247.057,4	Rp245.050,8	Rp245.370,7	Rp246.363,6
Labor Market Conditions				
Informal	13928	5401	1050	20379
Formal	18486	8307	3475	30268
Regional Characteristics				
Urban	21384	9460	3063	33907
Rural	11030	4248	1462	16740
Other Islands	22184	9520	3153	34857
Java/Bali	10230	4188	1372	15790

Source: National Labour Force Survey, Processed (2024)

Age demographics reveal varying degrees of mismatch across different life stages. The 25-34 age group, for instance, shows the highest proportions in both over-education (31.97%) and under-education (8.38%), suggesting a critical phase where skills may not fully align with job demands. Gender disparities also emerge, with males more frequently experiencing over-education (5.67%) compared to females (1.98%). These disparities reflect broader societal and structural factors influencing career trajectories and opportunities for skill utilization among different demographic groups.

Moreover, educational background plays a pivotal role in shaping mismatch patterns. General High School graduates constitute the largest cohort across all categories, with significant numbers also among university degree holders represented in both matched and over-education scenarios. Economic indicators, such as wage differentials, further emphasize the consequences of mismatch. Individuals in under-education situations earn the lowest average wages compared to their counterparts in appropriately matched or over-educated positions, highlighting the economic implications of skill mismatch in the labor market.

Addressing these challenges requires holistic policy approaches aimed at better aligning educational outcomes with evolving job market demands. Strategic interventions could include enhancing career counseling services, promoting vocational training programs that cater to specific industry needs, and fostering partnerships between educational institutions and employers to ensure curriculum relevance. By mitigating education-job mismatches, Indonesia can potentially optimize its workforce's productivity, enhance job satisfaction, and foster sustainable economic growth in the long term.

3.2 Discussion

Based on the results from the multilevel multinomial logit regression analysis presented in Table 3, several key determinants of education-job mismatch among educated workers in Indonesia can be identified. This analysis provides a nuanced understanding of how demographic, educational, regional, and sectoral factors contribute to the likelihood of workers being appropriately matched, over-educated, or under-educated in their jobs.

Table 3. Multilevel Multinomial Logit Regression Result

	Mismatch Over-Education			Mismatch Under-Education		
	Coefficient	Standar Error	P-Value	Coefficient	Standar Error	P-Value
Variable Independen	β	*Std. err.*	*P>z*	β	*Std. err.*	*P>z*
Age	0,37***	0,02	0,000	0,20***	0,01	0,000
Gender (1 = female)	0,92***	0,04	0,000	0,63***	0,02	0,000
Education Level	-0,76***	0,01	0,000	-0,50***	0,01	0,000
Minimum Wage (Province)	-0,61***	0,21	0,003	-0,44**	0,17	0,010
GDPR Agriculture	-0,14***	0,05	0,003	-0,07*	0,04	0,077
GDPR Industry	0,26**	0,11	0,015	0,25***	0,09	0,004
GDPR Services	0,35*	0,16	0,034	0,29*	0,13	0,028
Formal/Informal (1 = formal)	1,77***	0,04	0,000	0,57***	0,03	0,000
Rural/Urban (1 = rural)	0,17***	0,04	0,000	0,13***	0,03	0,000
Java-Bali/Other Island (1 = Java-Bali)	-0,56***	0,13	0,000	-0,27*	0,11	0,016
Province Variance	0,011		0,004			
Number of Observation	50,647					

*** $p < .01$, ** $p < .05$, * $p < .1$.
Source: Author, Data Processed (2024)

The results of the multilevel multinomial logit regression analysis reveal key factors influencing education-job mismatch in Indonesia, shedding light on demographic, regional, and sectoral dynamics. Age demonstrates a significant relationship with mismatch outcomes, where older workers are more likely to experience over-education ($\beta = 0.37, p < 0.001$) but

less likely to face under-education ($\beta = -0.20, p < 0.001$). This suggests that while older individuals may have the advantage of experience, they also face challenges in securing positions that fully utilize their skills. Similarly, gender plays an important role, as females are significantly more likely to experience over-education ($\beta = 0.92, p < 0.001$) compared to males, while they are less prone to under-education ($\beta = -0.63, p < 0.001$). This underscores persistent gender disparities in the labor market.

Education level also has a critical influence on mismatch outcomes. Higher education levels are associated with a higher likelihood of over-education ($\beta = 0.50, p < 0.001$) and a reduced likelihood of under-education ($\beta = -0.76, p < 0.001$). While this finding highlights the potential oversupply of highly educated workers in Indonesia, it also reflects inefficiencies in translating higher educational qualifications into skill-matched job opportunities. Furthermore, regional factors such as provincial minimum wages ($\beta = -0.61, p < 0.01$) and geographic location (e.g., Java-Bali vs. other islands, $\beta = -0.56, p < 0.01$) significantly affect mismatch outcomes. For instance, higher minimum wages are associated with increased over-education, indicating that wage disparities across provinces may exacerbate skill misalignment.

Employment type and sectoral characteristics also significantly impact mismatch outcomes. Formal employment increases the likelihood of over-education ($\beta = 1.77, p < 0.001$), reflecting credential inflation in Indonesia's formal job market. Sector-specific effects further reveal that workers in the service and industry sectors are more likely to experience over-education compared to those in agriculture. This is evident from the positive coefficients for GDPR Industry ($\beta = 0.26, p < 0.05$) and GDPR Services ($\beta = 0.35, p < 0.05$), suggesting that workers in these sectors face challenges in matching their qualifications to job requirements.

These findings align with the job search theory posited by Stigler (1962) and later expanded by Pissarides (2011), which highlights the role of search frictions and imperfect information in labor market mismatches. Younger workers, facing higher search costs and information gaps, are more likely to accept jobs below their qualification level, resulting in over-education. Conversely, older workers may accept mismatched positions due to job-specific capital and decreased job mobility. In the context of Indonesia, where information asymmetry in labor markets persists, this dynamic is particularly relevant for younger workers entering the workforce.

Gender disparities observed in the findings echo the systemic barriers faced by women in Indonesia's labor market. As highlighted by Allen et al. (2021), occupational segregation and limited access to leadership roles disproportionately affect women, pushing them into positions below their qualification level. This issue is exacerbated in Indonesia by cultural norms and gender biases in hiring practices, which restrict women's career advancement and contribute to over-education. Addressing these disparities requires targeted policies to improve women's access to higher-level positions and reduce occupational segregation.

Education mismatch in Indonesia reflects broader structural issues in the alignment between the education system and labor market demands. As suggested by Mahy et al. (2015) and Esposito and Scicchitano (2020), the rapid expansion of higher education in Indonesia

has not been matched by proportional growth in skill-intensive jobs. This mismatch is evident in the over-education of university and vocational graduates, as seen in similar contexts in developing economies transitioning to service-based and industry-based sectors. To address this, educational institutions need to strengthen collaboration with industries to ensure curricula reflect current and future labor market needs.

Regional disparities further exacerbate mismatch issues, with rural areas and non-Java-Bali regions experiencing higher under-education rates. This aligns with findings by Mishra et al. (2023), which highlight the role of geographic inequalities in limiting access to quality education and diverse job opportunities. In Indonesia, rural areas face constraints in infrastructure and industrial development, leaving workers with limited opportunities to utilize their skills effectively. Policies promoting regional investment and education infrastructure are critical for addressing these disparities and fostering a more equitable labor market.

Lastly, the sectoral differences in mismatch outcomes reflect Indonesia's ongoing structural transformation. As Rodrik (2013) and Acemoglu and Restrepo (2020) note, transitions to more technologically advanced sectors like services and industry create temporary mismatches due to skill gaps. In Indonesia, the agricultural sector has traditionally absorbed a significant portion of the labor force, but the shift to service-oriented industries has not been accompanied by adequate upskilling initiatives. Addressing this issue requires a focus on vocational training and continuous education programs tailored to the demands of emerging sectors.

4.   CONCLUSIONS

In conclusion, the determinants of education-job mismatch among educated workers in Indonesia are multifaceted and deeply interconnected. Age and gender are significant factors, with younger workers and women more likely to experience over-education due to structural barriers and informational asymmetries in the labor market. While higher levels of education are often perceived as advantageous, they do not always translate into appropriate job matches, frequently resulting in over-education. Regional economic disparities and sectoral characteristics further complicate the dynamics of mismatch, underlining the need for targeted and localized policy interventions.

To address these challenges effectively, several policy recommendations tailored to the Indonesian context are proposed. First, strengthening career counseling and guidance services within educational institutions is essential. Providing students with comprehensive labor market information, including in-demand skills and employment trends, will enable them to make more informed decisions regarding their education and career paths. Additionally, promoting vocational training and lifelong learning programs, particularly in sectors undergoing rapid technological advancements, will help bridge the gap between educational qualifications and job market requirements. Collaborations between educational institutions and industry stakeholders to align curricula with industry needs and the implementation of work-integrated learning programs will further equip graduates with practical skills and reduce both over-education and under-education.

Addressing regional disparities is particularly critical in Indonesia. Targeted regional development programs aimed at creating job opportunities in rural and underdeveloped areas are needed to reduce under-education and enhance job matching outcomes in these regions. Sector-specific strategies to foster innovation and skills development in agriculture, industry, and services should also be prioritized. These initiatives can align labor supply with demand, ensuring a more effective utilization of human capital.

Gender disparities in job matching require targeted interventions. Policies that promote gender equity, flexible work arrangements, and leadership opportunities for women can help address the higher incidence of over-education among female workers. In addition, enhancing labor market information systems to provide accurate, timely, and accessible data on job vacancies, skill requirements, and employment trends will reduce informational asymmetries and improve the overall efficiency of the job-matching process. Developing digital job-matching platforms tailored to Indonesia's labor market conditions can further support this effort.

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