

A Competing Risks Approach to Analyzing Post-COVID-19 Reemployment among White-Collar Workers: Lessons from Indonesia

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Abstract

Despite the recovery trend in the labor market after the scarring effects caused by the pandemic, the share of white-collar workers remains below pre-pandemic levels. This study aims to analyze the determinants of reemployment among individuals who exited the workforce due to COVID-19, with a specific focus on differences between white-collar and blue-collar workers. We use micro data from the August 2022 National Labor Force Survey (Sakernas) and employ a survival analysis with the Fine and Gray competing risks model to estimate the subdistribution hazard ratio (SHR) for each covariate such as gender, living area, education, and age. The results show that individuals living in urban areas, with post-secondary education, younger age (15–30 years), previous white-collar work experience, and participation in training programs have a significantly higher likelihood of reemployment in white-collar occupations. Conversely, blue-collar reemployment is more likely among those with lower education, rural residence, head-of-household status, previous blue-collar work experience and unmarried individuals. This research emphasizes the importance of investing in human capital and post secondary education for maximizing white-collar jobs reabsorption.

Keywords: competing risks, white-collar, reemployment, human capital

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1. Introduction

The COVID-19 pandemic significantly weakened economic activity, causing many individuals across various countries to lose their jobs and income (Adams-Prassl et al., 2020). It represented the most severe economic shock in Indonesia since the Asian Financial Crisis (Olivia et al., 2020). Economic growth contracted by -2.07% in 2020, after maintaining an average of 5%

growth for the previous two decades. In the labor market, 2.56 million people lost their jobs and 1.77 million temporarily stopped working due to the pandemic in 2020 (BPS, 2021).

One of the Indonesian government's major efforts to restore the economy was the National Economic Recovery (PEN) Program, which included fiscal stimulus for businesses, support for MSMEs, tax incentives, credit restructuring, and interest subsidies to help the production sector remain active and absorb labor (Anggarini & Rakhmanita, 2020). These strategic policies yielded positive results, as indicated by the sharp declines in the unemployment rate and the number of temporary unemployed workers—by 86.88% and 91.76%, respectively—between August 2021 and August 2022 (BPS, 2020). However, behind these positive trends, several labor market challenges persist.

Occupations are generally divided into two major groups: blue-collar and white-collar jobs (Natalia et al., 2024). Blue-collar work typically involves manual labor and the operation of machinery, and it is often associated with lower income levels (Snell & Gekara, 2023). In contrast, white-collar jobs require more complex cognitive skills and tend to offer higher earnings (Söderqvist, 2024). Blue-collar employment is projected to decline in the future as automation and digitalization continue to advance (Arntz et al., 2016). Nevertheless, Indonesia's labor market has remained dominated by blue-collar workers over the past decade.

The proportion of blue-collar workers continues to dominate Indonesia's workforce. In 2019, only 15.09% of workers were employed in white-collar occupations. When the pandemic struck in 2020, this share fell to 13.61%. Although the proportion has gradually increased since then, by 2024 the share of white-collar workers remains below pre-pandemic levels (see Table 1).

Tabel 1. Percentage of White-Collar and Blue-Collar Workers in Indonesia, 2019–2024

Tahun	White-Collar (%)	Blue-Collar (%)
2019	15,09	84,91
2020	13,61	86,39
2021	14,02	85,98
2022	14,03	85,97
2023	14,07	85,93
2024	14,07	85,93

Source: Sakernas 2019-2024 (Processed)

Several studies have examined reemployment among those affected by COVID-19 in Indonesia. Dartanto et al. (2023) found that social capital—such as friendships or family connections—plays an important role in facilitating reemployment. Siddiq & Dokhi (2022) analyzed the determinants of reemployment among people with disabilities affected by the pandemic. Putri (2023) explored the association between the *Kartu Prakerja* program and entrepreneurship during the pandemic. Ningsih & Dokhi (2021) identified factors affecting job loss in Bali Province due to COVID-19. Natalia et al. (2024) investigated the determinants of blue-collar workers' transitions to white-collar occupations.

However, there has been no previous study examining the factors that influence the likelihood of individuals who lost their jobs due to COVID-19 returning to white-collar or blue-collar employment in Indonesia. Therefore, this study contributes to the literature by applying a survival analysis using the competing-risks method to fill this gap. In this model, two competing risks are defined: reemployment in a white-collar occupation, and reemployment in a blue-collar occupation. Individuals who remain unemployed are treated as censored data. Accordingly, this study aims to explore the factors that accelerate reemployment in white-collar occupations after the COVID-19 pandemic.

2. Research method

2.1. Scope of Research

This study utilizes data from the August 2022 National Labor Force Survey (Sakernas), covering all regions of Indonesia. The unit of analysis consists of individuals aged 15 years and above who had lost their jobs due to COVID-19 during the period of February 2020 to August 2022 and were part of the labor force. Respondents were deemed ineligible if the survey did not record their month of job loss. The eligibility flow for sample selection is illustrated in Figure 1.

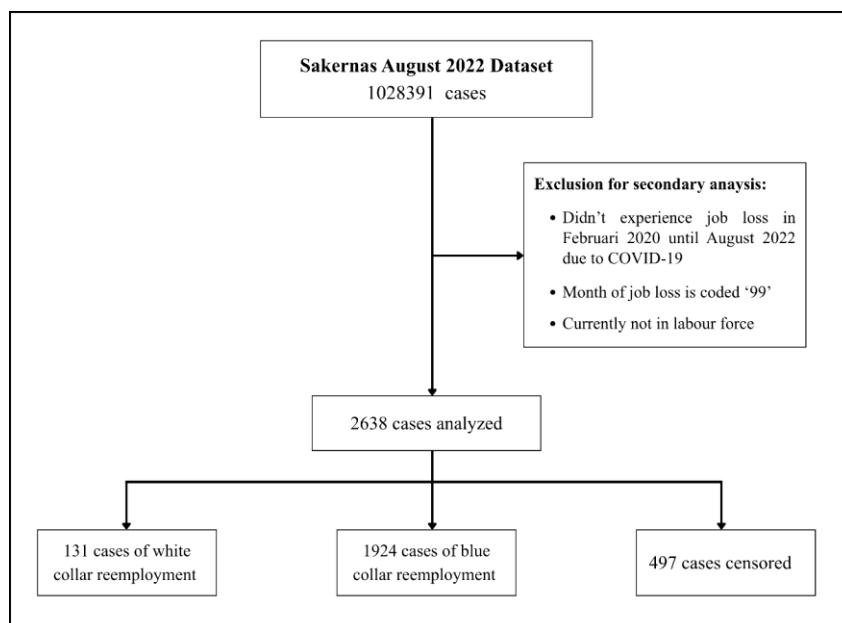


Figure 1. Eligibility flow chart for the secondary analysis of Sakernas August 2022 Dataset

The final analytical sample comprises 2,638 individuals, of which 131 were reemployed as white-collar workers and 1,924 as blue-collar workers. The classification of white-collar and blue-collar occupations was determined based on the first digit of the Indonesian Standard Classification of Occupations (KJI) 1982 code, as presented in Table 2 (Kemenparekraf & BPS, 2024).

Table 2. Classification of White-Collar and Blue-Collar Workers Based on KJI 1982 Codes

Code	Occupation Type (KJI 1982)	Category
1	Professionals, technicians, and related workers	White-Collar
2	Managers and administrative officials	White-Collar
3	Clerical and office workers	White-Collar
4	Sales workers	Blue-Collar
5	Service workers	Blue-Collar
6	Agricultural workers	Blue-Collar
7/8/9	Production operators, transport equipment workers, and laborers	Blue-Collar
X/oo	Others	Blue-Collar

Source: BPS

The response variable in this study is the cumulative incidence of reemployment. The covariates include gender, area of residence, education level, age group, household head status, marital status, previous job type, participation in training or courses, and internship experience within the past year.

Education level is categorized into two groups:

- Higher education (post-secondary education, i.e., diploma and above), and
- Lower education (high school and below, including incomplete schooling or no formal education).

Table 3. Operational Definitions of Research Variables

Variable Name	Notation	Category
Response Variable		
Cumulative Incidence	Y	-
Individual Variables		
Gender	X ₁	Male* Female
Area	X ₂	Urban Rural*
Education	X ₃	Lower Education* Higher Education
Age	X ₄	15-30 31-49* ≥50
Head of Household Status	X ₅	Head of household Not head of household*
Marital Status	X ₆	In marriage* Not in marriage
Past Job Status	X ₇	White-Collar Blue-Collar*
Course/Training	X ₈	Attend training Doesn't attend training*

Variable Name	Notation	Category
Internship in the Last 1 Year	X9	Yes*
		No

Description: *reference category

2.2. Method of Analysis

This study employs both descriptive and inferential analyses. The descriptive analysis aims to provide an overview of the sample characteristics, while the inferential analysis identifies the effects of covariates on the probability of reemployment as white-collar or blue-collar workers. The inferential method used is survival analysis with the competing-risks approach, conducted using Stata 17.

Survival analysis is a statistical method that examines the time until an event occurs for the first time within an observation period (Kleinbaum & Klein, 2012). A competing risk is defined as an event whose occurrence precludes or alters the probability of the primary event of interest. In this context, the appropriate estimate of the probability of failure is represented by the cumulative incidence function (Coviello & Boggess, 2004).

At the inferential stage, the Fine and Gray regression model was used to test whether each covariate significantly affects the likelihood of the primary event while accounting for the presence of competing events. The model is expressed as follows:

$$\lambda_j(t|X) = \lambda_{0j}(t) \exp(X^T \beta_j) \quad (1)$$

Where,

$\lambda_j(t|X)$: subdistribution hazard for event j at time t , given covariate X
 X : vector of covariates
 β_j : regression coefficient
 $\exp(\beta_j)$: subdistribution hazard ratio (SHR)

An SHR greater than 1 indicates a higher cumulative incidence for that category relative to the reference group, while an SHR less than 1 suggests a lower cumulative incidence (Lau et al., 2009). In this study, two scenarios were analyzed:

1. The main scenario—reemployment as a white-collar worker is set to be the main event, with reemployment as a blue-collar worker treated as the competing event.
2. The reverse scenario: reemployment as a blue-collar worker is set to be the main event, with white-collar reemployment as the competing event.

3. Results and Discussion

3.1. Overview of the Characteristics of Reemployed White-Collar and Blue-Collar Workers

This study analyzed 2,638 individuals from the Sakernas August 2022 dataset, consisting of 75.21% men and 24.79% women. The detailed characteristics of the eligible sample are presented in Table 4.

Table 4. Characteristics of the Eligible Sample from Sakernas August 2022 Dataset

Variable	Whole Sample	Not Reemployed (Censored) n (%)	Reemployed	
			White-Collar n (%)	Blue-Collar n (%)
Gender				
Male	1,984	367 (18.50)	131 (6.60)	1,468 (74.90)
Female	654	130 (19.88)	86 (13.15)	438 (66.97)
Area				
Urban	1,948	390 (20.02)	179 (9.19)	1,379 (70.79)
Rural	690	107 (15.51)	38 (5.51)	545 (78.99)
Education				
Lower Education	2,298	425 (18.49)	131 (5.70)	1,742 (75.81)
Higher Education	340	72 (21.18)	86 (25.29)	182 (53.53)
Age				
15-30	1,030	243 (23.59)	114 (11.07)	673 (65.34)
31-49	1,264	192 (15.19)	92 (7.28)	980 (77.53)
≥50	336	55 (16.37)	11 (3.27)	270 (80.36)
Head of household status				
Head of household	1,337	156 (11.67)	90 (6.73)	1,091 (81.60)
Not head of household	1301	341 (26.21)	127 (9.76)	833 (64.03)
Marital status				
In marriage	1,673	195 (11.66)	130 (7.77)	1,348 (80.57)
Not in marriage	965	302 (31.30)	87 (9.02)	576 (59.69)
Past Job Status				
White-collar	377	92 (24.40)	117 (31.03)	168 (44.56)
Blue-collar	2,261	405 (17.91)	100 (4.42)	1,576 (77.66)
Course/training				
Participating	797	148 (18.57)	103 (12.92)	546 (68.51)
Not participating	1,841	349 (18.96)	114 (6.19)	1,378 (74.85)
Internship in the last 1 year				
Yes	40	11 (27.50)	7 (17.50)	22 (55.00)
No	2,598	486 (18.71)	210 (8.08)	1,902 (73.21)

Source: Sakernas August 2022 (Author's compilation)

From the gender perspective, job losses due to COVID-19 were predominantly experienced by men. This may be because blue-collar jobs, which require physical presence at the workplace, were more vulnerable to pandemic-related restrictions compared to white-collar jobs. When social distancing policies were enforced, many blue-collar sectors were forced to halt operations (Schröder et al., 2020). Traditionally, blue-collar occupations are male dominated (Torre, 2019), which explains why more men experienced job loss during the pandemic.

Job losses were also more prevalent in urban areas than in rural ones, indicating that urban workers were more exposed to pandemic-related disruptions. In contrast, employment in rural areas—dominated by the agricultural sector—was relatively unaffected by social distancing measures because food production needed to continue (Ragasa et al., 2022; ILO, 2021). However, the number and proportion of individuals reemployed in white-collar positions were higher in urban areas, reflecting the concentration of skilled occupations in cities.

Regarding education, job losses were dominated by individuals with senior high school education or below. This phenomenon can be explained by the fact that those with higher education are more likely to hold white-collar jobs, which were relatively resilient during the pandemic because such roles could be adapted to remote work arrangements (Schröder et al., 2020). Furthermore, individuals with higher education levels also exhibited a greater likelihood of being reemployed as white-collar workers.

In terms of age group, individuals aged 50 years and above were significantly less likely to experience job loss compared to younger groups (15–30 and 31–49 years). This pattern reflects Indonesia's labor force composition, which is dominated by people aged 15–49 years (BPS, 2022). The highest proportion of white-collar reemployment occurred among the 15–30 age group. This aligns with the common practice of Indonesian companies setting a maximum age limit of 30 years for job applicants (Prasetyo et al., 2024).

With respect to marital status, more job losses were observed among married individuals. However, those who remained unemployed until the end of the study period were more likely to be unmarried, consistent with Fariyah & Utomo (2024), who found that unmarried individuals tend to be more vulnerable to unemployment.

Individuals whose previous occupation was white-collar showed the highest proportion of reemployment in white-collar jobs (31.03%). However, 44.56% of them transitioned to blue-collar jobs, and 24.40% remained unemployed. Table 5 presents the detailed characteristics of individuals who were formerly white-collar workers. The main characteristics of those who transitioned to blue-collar employment were: male, lower education level, married, aged 31–49 years, and head of household. This finding supports the argument that social norms and family responsibilities encourage men, especially household heads, to return to work quickly to provide for their families (Lee, 2022). Since white-collar jobs generally require higher qualifications and younger age, those unable to meet such criteria are often compelled to accept blue-collar jobs instead (OECD, 2024; Prasetyo et al., 2024).

Table 5. Characteristics of the Ex-White-Collar Workers Reemployment

Characteristics		Returned as White-Collar	Transitioned as Blue-Collar	Unemployed
Gender	Male	65	119	57
	Female	52	49	35
Education	Lower Education	54	114	57
	Higher Education	63	54	35
Marital Status	In marriage	74	113	38
	Not in marriage	43	55	54
Age	15-30	57	68	46
	31-49	55	85	36
	≥50	5	15	9
Head of household status	Head of household	46	91	28
	Not Head of household	71	77	64

Source: Sakernas Agustus 2022 (Author's compilation)

In terms of participation in courses or training programs, most respondents who lost their jobs due to COVID-19 had not attended any training. Among those who did, the proportion of white-collar reemployment was higher. This aligns with the human capital theory: training enhances individual skills and competencies, thereby improving access to skilled occupations (OECD, 2021; Natalia et al., 2024).

Out of the total 2,638 samples, 217 individuals (8.23%) experienced the main event (reemployment in white-collar jobs), 1,924 individuals (72.93%) experienced the competing event (reemployment in blue-collar jobs), and 497 individuals (18.84%) remained unemployed. Figure 2 illustrates the distribution of time-to-event for both white-collar and blue-collar reemployment.

Both the main and competing events show that most reemployment occurred within the first 6–7 months, indicating a strong urgency among job seekers to return to work. This aligns with Mavridis (2015), who found that unemployment lowers subjective well-being, motivating individuals to find work more quickly.

Among blue-collar workers, over 350 individuals found new employment within just one month after losing their previous jobs. This reflects the economic necessity to maintain daily living, which pushes many to accept any available work (Yamali & Putri, 2020). Venancio et al. (2024) also argue that many individuals choose blue-collar jobs as a means of survival rather than remaining unemployed.

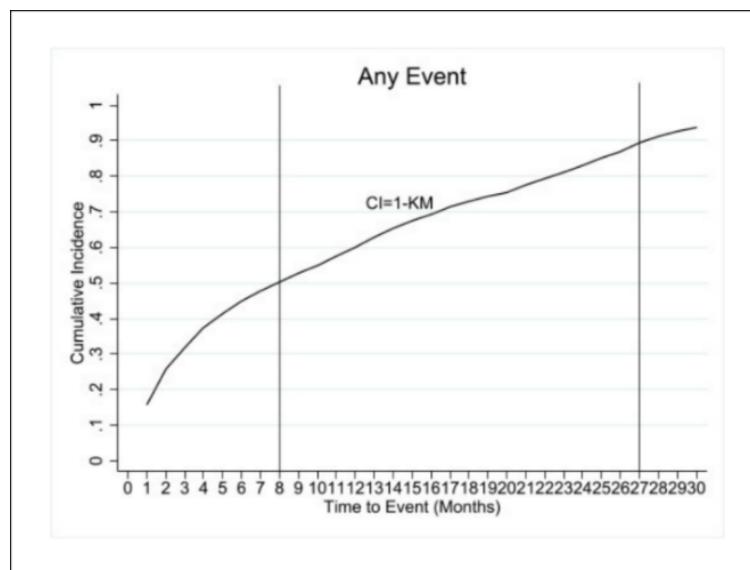


Figure 3. Cumulative incidence of any event

Figure 3 presents the cumulative incidence curve for all events. The curve shows that by the eighth month, 50% of the sample had been reemployed—either in white-collar or blue-collar jobs. By the 27th month, this proportion reached 90%.

3.2. Determinants of Time to White-Collar Reemployment

In the inferential analysis, Fine and Gray subdistribution hazard regression was used to identify significant covariates. Two models were estimated—one for the main event (white-collar reemployment) and another for the competing event (blue-collar reemployment). Table 6 presents the full regression results. For white-collar reemployment, the significant covariates were area of residence, education level, age group, previous occupation, and training participation.

Individuals residing in urban areas had a 1.52 times higher likelihood of white-collar reemployment compared to rural residents. This supports the ILO (2021.) finding that urban labor markets offer more medium- to high-skill job opportunities.

Individuals with post-secondary education had a 2.12 times higher chance of reemployment as white-collar workers compared to those with lower education. This is consistent with Huertas & Raymond (2024), who found that longer education duration is positively associated with job quality. Agusalim et al. (2025) also concluded that low education level is one of the main characteristics of low-wage workers.

Workers aged 15–30 years were 1.54 times more likely to obtain white-collar jobs than those aged 31–49 years, while those aged 50+ had a 0.53 times lower chance. This supports Prasetyo et al. (2024), who noted that many job listings in Indonesia impose a maximum age limit of 30 years, reducing opportunities for older applicants.

Individuals whose previous job was white-collar had the highest SHR value—5.53 times higher than those from blue-collar backgrounds. White-collar jobs typically require advanced skills such as management, administration, and digital proficiency. Prior experience in these areas provides the expertise employers seek, thereby increasing the likelihood of reemployment in similar roles (Lestari Widarni & Bawono, 2021).

Respondents who had participated in training were 1.34 times more likely to be reemployed in white-collar jobs, consistent with Niati et al. (2021), who reported that training improves individual performance and career development.

3.3. Determinants of Time to Blue-Collar Reemployment

For the competing event (blue-collar reemployment), the significant determinants were area of residence, education, head of household status, marital status, and previous occupation. Individuals in urban areas had a 0.88 times lower likelihood of blue-collar reemployment compared to rural residents, reflecting the concentration of blue-collar opportunities in rural and peri-urban regions (ILO, 2021).

Respondents with post-secondary education had a 0.70 times lower chance of blue-collar reemployment, suggesting that higher education increases the tendency toward white-collar jobs—consistent with human capital theory, which emphasizes that knowledge and skill accumulation enhances labor market competitiveness (Lestari Widarni & Bawono, 2021).

Heads of households were 1.31 times more likely to be reemployed as blue-collar workers than non-heads of households. This supports Lee (2022), who found that breadwinners feel a stronger compulsion to find any available work, even if it is physically demanding or lower paying.

Those who were not in marriage were 1.35 times more likely to reenter blue-collar jobs than married individuals. Marriage entails greater family responsibilities, leading married individuals to prefer stable and lower-risk employment such as white-collar jobs (Ahituv & Lerman, 2011).

Individuals whose previous occupation was white-collar had a 0.47 times lower likelihood of blue-collar reemployment. This suggests that prior professional experience and specialized skills are more conducive to reemployment in white-collar positions (Lestari Widarni & Bawono, 2021).

Table 6. Multivariate Analysis for Time to Formal Reemployment and Time to Informal Reemployment, Using a Fine and Gray Competing-risks Method to Obtain a Subdistribution-Hazard Ratio

Covariate	White-collar		Blue-collar	
	SHR Ratio	P Value	SHR Ratio	P Value
Gender				
Male*				
Female	NS		NS	
Area				
Urban	1.52 (1.07–2.15)	0.02	0.88 (0.80–0.96)	0.01
Rural*				

Covariate	White-collar		Blue-collar	
	SHR Ratio	P Value	SHR Ratio	P Value
Education				
Lower Education*				
Higher Education	2.12 (1.53–2.93)	0	0.70 (0.60–0.82)	0
Age				
15–30	1.54 (1.17–2.03)	0.00	NS	
31–49*				
≥50	0.53 (0.28–0.98)	0.00	NS	
Head of household status				
Head of household	NS		1.31 (1.19–1.44)	0
Not head of household*				
Marital status				
In marriage*				
Not in marriage	NS		1.35 (1.22–1.51)	0
Past Job Experience				
White Collar	5.53 (4.06–7.52)	0	0.47 (0.40–0.56)	0
Blue Collar*				
Course/training				
Attend Training	1.34 (1.00–1.78)	0.049	NS	
Doesn't Attend*				
Training				
Internship in the last 1 year				
Yes*				
No	NS		NS	

4. Conclusion, Limitations, and Future Research

The results of the Fine and Gray regression model indicate that for the risk of reemployment in white-collar occupations, the significant covariates include area of residence, education level, age group, previous work experience, and training participation. Meanwhile, for the risk of reemployment in blue-collar occupations, the significant determinants are area of residence, education level, head-of-household status, marital status, and previous occupation.

Education level was found to be a significant factor in both models. Individuals with post-secondary education were more likely to be reemployed as white-collar workers, while those with senior high school or lower education were more likely to reenter blue-collar employment. This finding reinforces the notion that education is a key driver of labor market mobility and determines access to high-skill jobs.

The government needs to invest more heavily in developing human capital by providing free training programs and implementing policies that increase the average years of schooling. This effort aligns with Asta Cita number 4 of the Prabowo–Gibran administration, which emphasizes strengthening human resource development in science, technology, education, health, and sports, as well as promoting equal opportunities for all segments of society. By improving education and skill levels, the workforce will be better equipped to enter *white-collar* jobs, which

tend to be more sustainable amid technological advancements and offer higher levels of welfare. Such policies not only enhance the competitiveness of the national labor force but also support the structural transformation of the economy toward higher value-added sectors.

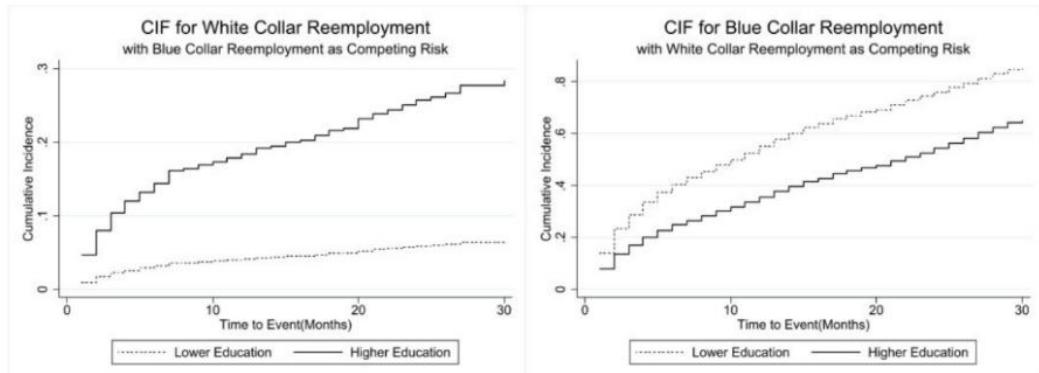


Figure 4. Comparison of Cumulative Incidence of White-Collar and Blue-Collar Reemployment by education, estimated using competing risks models

This study has several limitations arising from the cross-sectional nature of the data used. The August 2022 Sakernas dataset does not allow confirmation that the current job reported by respondents is indeed their first employment after job loss. This limitation may also lead to an overestimation of unemployment duration. In addition, a considerable number of cases had to be excluded due to missing or invalid information on the month of job loss (coded as “99” for “don’t remember”).

For future research, it is recommended to use longitudinal data when available. Such data would enable a more comprehensive analysis of labor market dynamics, particularly regarding transitions between unemployment and reemployment, as well as movements between white-collar and blue-collar occupations. Longitudinal designs would also allow for better estimation of reemployment duration, career mobility patterns, and post-pandemic labor resilience in Indonesia. It could be worthwhile to explore regional differences if the data are sufficient.

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