



Resilience of Workers Affected by COVID-19 Outbreak in Maintaining Their Jobs, in Which Sector Survives Most Longer?

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Abstract. Employment is one of the areas affected during the covid-19 outbreak. The government of Indonesia has taken numerous measures to restrain the growth rate of covid-19, such as the implementation of social restriction, which leads to a multidimensional problem – the employment problem. Indonesia's unemployment in 2020 has increased compared to 2019. According to Statistics Indonesia, the open unemployment rate in August 2020 is about 1.84 percent higher than August 2019, and from the total working-age population in August 2020, 14.28 percent of them were affected by covid-19. This study aims to investigate the resilience of workers affected by the covid-19 outbreak in maintaining their jobs by comparing the survival rates in the sectors most affected by covid. The methodology used in this research is survival analysis in time resilience of workers affected by the covid-19 outbreak in maintaining their jobs. The conclusion obtained from this study is that the sector significantly influences worker's time resilience (p -value < 0.05). Among the six sectors most affected by covid-19, workers in the construction sector has the highest time resilience compared to 5 other sectors – most survive workers in maintaining their jobs during covid-19 outbreak, followed by the accommodation and food services, other services activities, manufacturing, wholesale and retail trade sectors. The most affected sector for the time resilience of workers during the COVID-19 outbreak is transportation and storage.

1. Introduction

As of 4th September 2021, the Government of Indonesia has reported 4,123,617 people with confirmed coronavirus disease (covid-19) and 16,752 people with confirmed as new cases, which indicates we aren't covid-19 outbreak free yet. Furthermore, the Government of Indonesia has taken numerous measures to restrain the growth rate of new covid-19 cases, such as the implementation of social restriction–was first implemented in April 2020. This policy may be helpful in the health aspect, but limit the mobility of persons in their activity, including social and economic activity, which leads to multidimensional problems as its trade-offs.

From the economic perspective, the covid-19 outbreak has caused many countries to have experienced economic contraction. Based on an interview on 6th April 2021, the Indonesian Minister of Finance reported 170 countries experienced economic contraction due to the covid-19 outbreak, including Indonesia in the second quarter of 2020 [1]. From the social perspective, poverty worsens, evidenced by the increase in the percentage of poor people. In March 2021, Statistics Indonesia reported



that 10.14 percent of people living under poverty—27.5 million people—compared to the condition in March 2020; poverty has slightly increased about 0.36 percentage-points [2].

Due to the covid-19 outbreak and its accompanying policies, economic activity is disrupted because of mobility constraints. In brief, the economy became paralyzed at the macro level. In the employment aspect, in the short-term, people became jobless abruptly or experienced reduction of their working hours while in the long-term these changes will be transformed into labor market shock [3]. As of the second quarter of 2020, lower-middle-income countries have experienced a decline in working hours of about 23.3 percent, reflecting the rising inactivity economy [4]. In Indonesia, the unemployment issue during the covid-19 outbreak was represented by the rise of open unemployment rate and percentage of partial unemployment compared to previously year. In August 2020, the open unemployment rate and percentage of partial unemployment were about 1.84 percent and 3.77 percent higher than August 2019. At same period, 14.28 percent or 29.12 million people of total working-age population were affected by covid-19, estimated 24.03 million people had experienced reduction of their working hours, 1.77 million people temporarily not working, and 2.56 million people unemployed by the covid-19 outbreak[5].

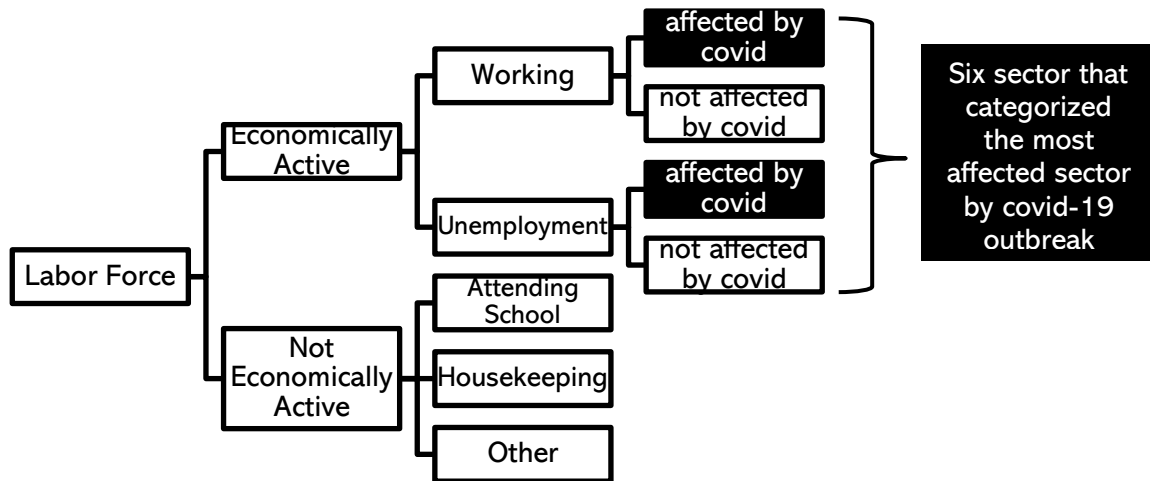
Accommodation and food service activities sector, transportation sector, construction sector, manufacturing sector, wholesale and retail trade sector, and other service activities sector being the most affected in term of income due to the covid-19 outbreak [6]. The pandemic has necessitated a rapid food service transformation and changed people's consumption patterns from dine-in services into delivery and take-out services. It has placed pressure on food service operational systems and food service employees, resulting in a reduction of employees [7]. New normal lifestyle has also shifted mobility patterns in society and impacted transportation as well [8]. In manufacturing, small-sized and medium-sized enterprises has been hit and lead to severe reduction in business operation. Due to restriction, several businesses were forced to close within a particular time, inactive temporarily into closure [9]. In this paper, we would investigate how worker's resilience affected by the covid-19 outbreak in maintaining their jobs. This study attempts in comparing survival rates of workers among most affected sectors which have been hit by the pandemic. We used survival analysis as analysis method in evaluating the time resilience of worker in the labor market during covid-19 outbreak – time resilience of worker in maintaining their jobs.

2. Methodology

2.1. Scope

The data used for this study is the raw data of the National Labor Force Survey (NLFS) February 2021, a panel household survey conducted periodically by Statistics Indonesia. NLFS February 2021 provides information about labor force indicators in Indonesia at provincial level. For this study, we only focus on workers affected by covid-19 in the accommodation and food service activities sector, transportation sector, construction sector, manufacturing sector, wholesale and retail trade sector, and other service activities sector. These sectors are the most affected sector during covid-19 outbreak according to Statistics Indonesia's report [6]. For this study, we used manufacturing sector as control variable due to its highest contribution to the national economy (Indonesia's GDP) of 19.29 percent at second quarter of 2021 [10]. Manufacturing sector also remains the essential sector in absorbing employment, reducing unemployment, and supporting the output gap's quality [11].

Workers affected by covid-19 outbreak in this study are defined by workers had experienced a reduction of their working hours, became temporarily not working, or became unemployed because of the covid-19 outbreak derived from data framework (Figure 1 below). Data framework is adapt from ILO Manual on Concepts and Methods and developed to several specific questions in NLFS February 2021 related to covid-19 outbreak. Time reference used for this study from February 2020 – February 2021. This study applies a statistic inference analysis with survival analysis of time resilience worker affected by covid-19 in maintaining their jobs as outcomes variable and sector as its factor variable.



Source : ILO Manual on Concepts and Methods based on ICLS

Figure 1. Data Framework of Study

2.2. Method of Analysis

To evaluate the resilience of workers affected by covid-19, we use survival analysis as analysis method. We used ‘survival’ packages version 3.2-13 that available in R—contains core survival analysis routines—used to analyze time resilience of workers affected by covid-19. Survival analysis is one of several modeling approaches that concerns describing the relationship between an exposure variable and outcomes variable after controlling the possible confounding and interaction effect of additional variable. The outcomes variable is ‘time to an event’ and there may be censored data. It also measures of effect typically obtained is called a hazard ratio that interpreted similarly as an odds ratio in logistic regression modelling [12].

In survival analysis, there are several developed models in describing survival rates. This study will focus on the Cox-PH model according to the required data we used. The Cox-PH model is a semiparametric model usually written in terms of the survival model denoted by $S(t, X)$ and hazard model denoted by $h(t, X)$ whose parameters are estimated using the Maximum Likelihood approach, resulting formula that can be expressed in equation 1-2[10].

$$\text{Survival Function : } S(t, X) = [S_0(t)]e^{\sum \beta_i X_i} \tag{1}$$

$$\text{Hazard Function : } h(t, X) = h_0(t)e^{\sum \beta_i X_i} \tag{2}$$

Notes

- t : Time to an event (time to lose their job)
- β : Coefficient of cox-regression model
- X_i : Sector

We also classified data into censored and event.

$$\text{Analysis unit } \begin{cases} 0, \text{ censored} \\ 1, \text{ event} \end{cases}$$

where

- censored : Workers that can maintain their job, despite being affected by covid-19 outbreak
- event : Workers that can’t maintain their job due to covid-19 outbreak

Then, we can estimate Hazard ratio (HR) which formula in terms of the regression coefficients by substituting the Cox-PH formula into the numerator and denominator of the hazard ratio expression. This substitution is shown at equation 3. Notice that the only difference in the numerator and



denominator are the X^* 's versus the X 's, also baseline hazard (hazard when exclude treatment in model) will cancel out [10].

$$HR = \frac{h(t, X^*)}{h(t, X)} = \frac{h_0(t)e^{\sum \beta_i X_i^*}}{h_0(t)e^{\sum \beta_i X_i}} = \exp \left(\sum \beta_i (X_i^* - X_i) \right) \quad (3)$$

Based on given objective of this paper and preliminary study [6], we also propose initial hypothesis that workers who works at accommodation and food services has shortest time resilience in maintaining their jobs (most survive worker in labor market) and those who work at wholesale and retail has longest time resilience in maintaining their jobs.

3. Result

Workers who work in certain sectors tend to be able to stay in their jobs or even be forced to leave their jobs –could not maintain their jobs– during covid-19 outbreak. The time a worker becomes unemployed due to the covid-19 outbreak or we stated as time resilience of workers is the unit of analysis for this research. We analyze the time resilience of workers affected by covid-19 in maintaining their jobs with survival analysis shown in Table 1, which provides some key information. First, six sectors most affected by covid-19 statistically significantly affect the time resilience of workers affected by covid-19 in maintaining their job. Both simultaneously and partially test give same result of p-value $< \alpha$ ($\alpha = 0.05$).

Second, we could generate a model-based survival analysis modeling to explain how the main sector might affect the time resilience of workers during the covid-19 outbreak in maintaining their jobs. For this study, we get the hazard equation of time resilience expressed in equation 4. A positive coefficient on a variable means that the risk toward the time resilience of workers is smaller than the control variable (manufacturing sector). On the other hand, a negative value means that the risk is greater than the control variable.

$$h(t, X) = e^{0.63x_{construction} - 0.09x_{wholesaleretail} - 0.17x_{transportation} + 0.43x_{accommodation\ food} + 0.15x_{other}} \quad (4)$$

According to our result, this study reject initial hypothesis. Workers who work in accomodation and food services has not shortest time resilience in maintaining their jobs. We find that among six sectors affected by covid-19, workers in the construction sector has the longest time resilience in maintaining their job during covid-19 outbreak–most survive workers in labor market, followed by the accommodation and food services, other services activities, manufacturing, wholesale and retail trade sectors. The most affected sector for the time resilience of workers during the covid-19 outbreak is transportation and storage. Some interesting findings from the analysis are as follows.

- The time resilience of workers affected by covid-19 in the accommodation and food service activities sector in maintaining their jobs is 1.54 times longer than those who work in the manufacturing sector. In line with that, the foodservice operational system changes as a form of adaptation to changes in people's consumption patterns, from a dine-in to a takeaway/delivery system. A person's perceived trust and beliefs positively influence consumer attitudes toward the use of online food delivery services. It refers to a person's assessment of the risk of a covid-19 outbreak [13].
- The time resilience of workers affected by covid-19 in the construction sector in maintaining their jobs is the longest, with hazard values of almost 1.89 times compared to manufacturing sector. It means the workers who survive the most in maintaining their jobs are those who work in the construction sector. Starting from a drastic decline in demand in manufacturing sector, causing the amount of production to decrease. Thus, the enterprise will reduce the number of employees as a trade-off of its business operations continuity. Meanwhile, the construction sector is still operating, although it may not be as good as the sectors outside the six affected sectors. Manufacturing is more vulnerable during the corona period than construction. In line with ILO Report, construction sector has great potential to stimulate recovery because its ability to create jobs. A variety of market



segments are involved, including architecture and design, equipment and materials manufacture, transportation and energy and waste management [14].

- Among six sectors, the workers affected by covid-19 in the transportation and warehousing sectors are who are most not survive. In line with that statement, many restrictions apply to the transportation sector during the covid-19 outbreak, including reducing passenger capacity, the lockdown of an area, the many requirements for travellers (health screening, documents as travel requirements). In addition, from the individual side, there is a reluctance to travel. In terms of warehousing, the number of goods using warehouse services before the export or import of goods decreases. Another research also figure out that workers in the transportation sector were 20.6 percent more likely to be unemployed because of the pandemic than workers in non-transportation industries [15].

Table 1. Coefficient in Survival Model of Time Resilience

Num	Risk Factor from sector	β	HR	CI (95%) of HR		p-value
				Lower	Upper	
3	Manufacturing(control)					
6	Construction	0.636738	1.890304	1.8798	1.9009	<2e-16***
7	Wholesale and Retail Trade	-0.095009	0.909365	0.9049	0.9138	<2e-16***
8	Transportation and Warehousing	-0.171986	0.841991	0.8366	0.8475	<2e-16***
9	Accommodation and Food Service Activities	0.433252	1.542265	1.5345	1.5501	<2e-16***
17	Other Services Activities	0.157847	1.170987	1.1639	1.1781	<2e-16***
Model validity						
Concordance			0,569 (se = 0.013)			
Likelihood Ratio Test			98,569		<2e-16***	
Wald Test			105,056		<2e-16***	
Score (Logrank Test)			108,350		<2e-16***	
Significant codes Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1						

Source: NLFS February 2021

4. Conclusion and Recommendation

Survival analysis can be used in analyzing the time resilience of workers. This study concludes that among workers in the six sectors affected by covid-19, workers in the transportation and storage sector had the lowest survival rate. On the other hand, workers in the construction sector had longest time resilience in maintaining their jobs or we can conclude they have highest survival rate at labor market during covid-19 outbreak. However, what needs to be emphasized here that in this study we do not include other sectors which are not most affected by COVID-19. In addition, this study is limited to the exposure variable only, which is the sector where workers work; in fact, there are many other possible exposure variables which also affect the time resilience of workers during the covid pandemic, such as educational background and gender. Future research could be conducted by overcoming the limitations of this study.

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