Gig Workers in Indonesia: Development and Vulnerability

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Abstract

The emergence of the gig economy, accelerated by technological advancements during the pandemic, has become a significant phenomenon in Indonesia. Economic challenges and shifting labor market dynamics have led to an increase in gig work as traditional employment opportunities have diminished. Gig workers, however, face income uncertainty, ambiguous employment status, and inadequate social protection and labor rights. This study aims to analyze the development of the gig economy in Indonesia, examine the determinants of gig workers, and assess the vulnerabilities of gig workers. Using the National Labor Force Survey (SAKERNAS) of August 2022 and analysis through binary logistic regression and Heckman selection bias correction, this research underscores the necessity of accessible social protection for gig workers. The findings call for regulations that recognize the specific rights and needs of gig workers, along with training and skill development initiatives to mitigate their vulnerabilities.

1. Introduction

The phenomenal growth of the gig economy has sparked special interest as it is intricately linked to novel technological development, the internet, and the massive impact of the COVID-19 pandemic. Gig workers are defined as workers who work flexibly and are thus not bound by a long-term work contract with one company or employer (Permana & Izzati, 2023). Rather, they work for various online platforms such as online motorcycle taxis, e-commerce, and food delivery applications. The term "gig" itself has its origin in the entertainment world. Musicians, for instance, are used to performing in "gig" concerts, which means they are not bound by a single label or recording company. Thus, a gig worker has no permanent office or employer. Digital platforms usually serve as mediators whose role is to supervise work and facilitate financial transactions/payments (Figure 1).

The gig economy is developing as a result of a new employment model that is supported by technological changes, globalization, and the weakening role of trade unions. This model also offers an alternative work environment, especially for workers who do not like the "traditional office work model" with notoriously rigid working hours settings (Cini, Maccarrone, & Tassinari, 2022; ILO, 2021). The COVID-19 pandemic has had a significant impact on changes in working hours, and Indonesia is not exempt from that. Several companies have adopted a work-from-home or shift work system to ensure sufficient physical distance between employees.

Figure 1. Triangular relationship models in the gig economy
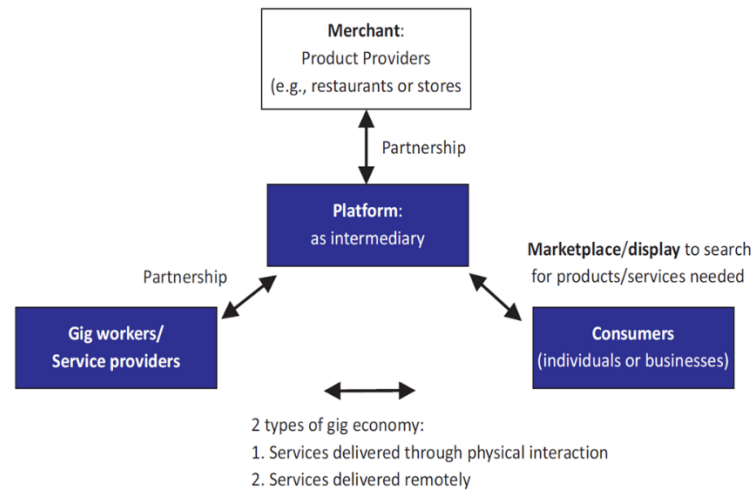
Source: Permana and Izzati (2023)

Permana and Izzati (2023) divided the typology of the Indonesian gig economy into two categories: a location-based gig economy, where work is conducted through face-to-face interaction, but digital platforms help workers and customers interact more efficiently, and an online-based gig economy, where work is carried out without face-to-face interaction (the so-called remote work). Examples include content writers, copywriters, translators, and social media specialists for the first type and accountants, graphic designers, logo designers, game engineers, designers, network analysts, security engineers, and others for the second type. The examples indicate that the development of gig workers can continue to be explored and is not limited to the transportation sector.

Although there are no exact and binding definitions of gig workers, a number of studies have been conducted on this particular type of worker. Using the National Labor Force Survey (SAKERNAS) data from 2019, Permana and Izzati (2023) estimated that the number of gig workers in Indonesia had reached 2.33 million people, or 1.7% of the total workforce, who were active in either the transportation sector or other service sectors. A survey conducted by the Center for Employment and Labor Studies at the University of Indonesia in 2020 estimated that there are approximately 10 million gig workers in the country. Predictably, this number

will continue to increase along with the rising number of online platforms present in Indonesia and the growing consumer demand for digital services (El Hajal & Rowson, 2020; van Doorn, 2023).

The gig economy has brought several significant benefits to both individuals and the national economy. One of the advantages is greater flexibility in terms of working hours and jobs. Gig workers have more control over their work schedules, allowing them to adjust their work according to their availability. This flexibility is especially beneficial for people who share responsibilities or activities, such as education or family obligations. Additionally, gig workers have the freedom to choose the type of projects or jobs they want to take on, enabling them to pursue specific interests and skills. Consequently, the gig economy is often touted as providing opportunities for individuals to achieve a work-life balance (Kirven, 2018). Moreover, gig work often offers tremendous opportunities for people to earn additional income. Since gig jobs typically consist of short-term projects or tasks, individuals can engage in multiple jobs simultaneously, thereby enhancing their earning potential.

Nevertheless, the proliferation of gig work carries significant implications that require serious consideration, i.e., the high job-related risks imposed on individuals, workers' vulnerability to exploitation due to the lack of paid leave and clear working hours, and consistency in the quality of output, all of which constitute deep concerns among gig workers. Gig workers are also perceived as susceptible to various predicaments, including income uncertainty (Hafeez, Gupta, & Sprajcer, 2022), ambiguity in employment status or contracts, and a lack of social protection and labor rights (Bajwa, Gastaldo, Di Ruggiero, & Knorr, 2018; ILO, 2023). Additionally, people who engage in such work generally lack fixed schedules and may have to work at different hours throughout the work week, both day and night, leading to overtime issues (Hafeez et al., 2022).

These challenges highlight the need for comprehensive policies and regulations that safeguard gig workers' rights and well-being. This study investigates the vulnerabilities faced by gig workers, thus completing a substantial gap in the literature. Despite the rapid rise of digital technology in Indonesia, there is a lack of comprehensive studies on gig workers, particularly in terms of their vulnerabilities. This study contributes to the literature by conducting a comprehensive study of these elements. By addressing these challenges, the study provides policymakers with useful insights into developing solutions that improve the welfare of gig workers. This study aims to analyze the development of the gig economy in Indonesia, examine the determinants of gig workers, and assess the vulnerabilities of gig workers. Furthermore, this study uses data from the 2022 National Labor Force Survey (SAKERNAS), which examines the period of economic recovery that began after the COVID-19 pandemic and is seen as a springboard for the future development of Indonesian employment.

2. Literature Review

While research on the development of gig workers in the digital era is an interesting topic, studies that comprehensively discuss gig workers in Indonesia remain limited. Globally, the gig economy is represented by a group of workers who have a significant position in the current workforce landscape. Along with technological advances, the growth of the platform-based economy and changes in work patterns and preferences have made gig workers a subject of interest for researchers and governments in this era of economic uncertainty. Therefore, a comprehensive understanding of workers in the gig economy is important.

2.1 Overview of Gig Economy Workers

Gig workers are workers who are engaged in temporary, flexible, and on-demand work mediated through digital platforms. Individuals who are involved in

this type of work tend to work for short periods, are not bound by a single business entity, and are usually called freelance workers (Lord et al., 2022). They are part of the gig economy, which refers to a new phenomenon in the world of employment in which individuals are not offered binding work contracts in the same manner as formal sector workers, and they tend to work independently (Healy, Nicholson, & Pekarek, 2017).

To get a thorough understanding of the dynamics of gig workers, it is necessary to identify several types of jobs that exist in this ecosystem, including rideshare drivers, food delivery workers, online platform workers or freelancers, and creative and arts workers. According to Kerikmäe and Kajander (2022), rideshare drivers are individuals who use their vehicles to transport passengers through a ridesharing application platform. In Indonesia, several ridesharing application platforms also provide food delivery and goods delivery services, e.g., Gojek and Grab, which have recently gained popularity in the country (Yuana, Sengers, Boon, & Raven, 2019). In addition, workers known as freelancers engage in remote gig work through online employment platforms, e.g., Fiverr, Upwork, and Freelance.com (Wood, Graham, Lehdonvirta, & Hjorth, 2019). They state that such platforms connect workers with employers and facilitate the provision of various digital services. How much these workers earn depends on their performance and the rating they get from the person utilizing their services; the higher their rating, the greater their chances of being offered a job, which will affect their access to future job opportunities. Also noteworthy are creative arts workers, the individuals who engage in self-initiated artistic and creative work for professional or nonprofessional purposes, often on a freelance basis (Duarte & Gauntlett, 2022). These workers identify themselves as artists, writers, and photographers and are involved in a variety of creative projects.

Qiao, Huang, and Yeh (2023) explain that several factors influence a person's decision to choose to work as a gig worker, one of which is economic factors. Gig

workers are more likely to come from lower socioeconomic backgrounds and have fewer job opportunities, suggesting that economic considerations play a role in their decision to engage in such work. Additionally, the flexibility factor is a special attraction for these individuals because it allows them to have autonomy over their work, giving them freedom to choose when and where to work and the potential to earn additional income. Azar (2020) also explains that many gig workers prioritize flexibility and autonomy as decisive factors and prime considerations when opting to do such jobs. Gig workers understand there is a trade-off between benefits and flexibility; they decline traditional worker benefits in exchange for desired job flexibility. Having a wide choice of service markets, products, and various types of work is also among the main reasons why people choose to engage in gig work.

Discussions about the risks of gig workers remain lacking. The Indonesian government also has no laws or regulations that specifically address the existence and problems of gig workers. Woodcock and Graham (2020) pinpoint the difference between "traditional" workers and gig workers. Few gig workers have adequate social security coverage because they do not have access to "traditional" job benefits such as health insurance, occupational safety, and pensions. Income uncertainty and instability also haunt them, as they rely heavily on short-term projects or contracts and thus may experience fluctuations in job availability and income. In addition, the potential to control and supervise online platform algorithms is very limited, which forces gig workers to comply with platform algorithms that determine their work assignments and performance evaluations.

A study conducted by Koutsimpogiorgos, van Slageren, Herrmann, and Frenken (2020) demonstrated that the classification of gig workers as contract workers or independent workers can severely impact their rights, social security, and working conditions. Gig workers are also typically denied access to retirement plans, paid leave, paid sick leave, or vacation time. Consequently, sometimes they have to work all the time, which increases their exposure to occupational hazards such as

fatigue and other health problems (Lord et al., 2022). A lack of social protection leaves gig workers vulnerable to financial instability and limited access to essential services. As a result, gig workers often face irregular and unpredictable income streams that make it difficult for them to plan and budget effectively. This fluctuating income causes financial insecurity and difficulty in meeting their basic needs (Koutsimpogiorgos et al., 2020).

2.2 The Growth of Gig Workers

In Indonesia, the development of gig workers was marked by the emergence of digital labor platforms in the mid-2010s; such platforms provide new job opportunities for informal workers in urban areas. Certain sectors in gig economy work, such as motorbike taxis and household work, have presented business opportunities for technology entrepreneurs seeking to digitize these sectors. Such jobs utilize the internet in various ways to find work, especially through digital employment platforms (Octavia, 2022).

In a similar vein, research by Nuraeni (2020) explained that the development of the gig economy has occurred especially in industries such as transportation, skilled labor, creative industries, and business start-ups. This trend is supported by further developments in information technology that have an impact on changes in work relations. Data from the 2021 SAKERNAS show that 77 million out of 131 million members of the workforce work within the informal sector, and the majority of these individuals are gig-economy workers. However, this massive development is overshadowed by major challenges in the context of gig economy employment regulations and law. The current research results show that Employment Law No. 13 of 2003 needs revising to specifically address the shifts in the labor market and to accommodate the changing nature of work in the digital era, as well as provide social protection for gig economy workers. The government should provide a strong legal basis to ensure that workers in the gig economy can improve their skills and receive social benefits, as well as applicable allowances, without burdening

employers. This can be achieved by expanding the existing social protection systems and making these systems more realistic to implement.

2.3 Vulnerabilities of Gig Workers

Bajwa et al. (2018) divide the vulnerability of gig workers into three categories: occupational vulnerability, precarity, and platform-based vulnerability. Occupational vulnerability related to the type of work performed by gig workers is usually specific to the kind of jobs being performed, such as the risk of an accident when working in the transportation sector, including gig workers in the household sector who may face danger when entering unfamiliar premises like a house they have never visited before. Likewise, the health vulnerability faced by gig workers is similar to that faced by precarity workers, including limited opportunities for training and career progression, low wages, minimal job security, and income uncertainty. They might also face health risks related to psychological distress and a lack of health and social insurance coverage. The platform-based vulnerability faced by gig workers impacts worker health and well-being. In line with Woodcock and Graham (2020), the above-mentioned study explains that algorithms created by online platforms determine prices and access to work, making it difficult for gig workers to negotiate prices, especially in the transportation sector.

Taylor, Van Dijk, Newnam, and Sheppard (2023) argue that the vulnerability of gig economy workers is caused by worker misclassification, lack of bargaining power, psychosocial risks, and inadequate management and safety training. In addition, unlimited working hours and low commission rates cause a lack of satisfaction and balance between their work and domestic life. The vulnerability of gig workers varies across generations. While young people, particularly millennials, are more engaged in gig work, older generations also face labor precariousness in the gig economy. Despite the perception that gig work is primarily for youth, the total number of gig workers actually increases in older cohorts, highlighting vulnerability across generations (ILO, 2021).

Moreover, marital status can impact the vulnerabilities of gig workers in various ways. For example, married gig workers may face additional financial responsibilities compared to single workers, which can increase their vulnerability to income fluctuations and job insecurity (Sukanti & Sulistyaningrum, 2022). Additionally, marital status can influence the availability of social support networks for gig workers, with married individuals potentially having more support but also potentially facing more pressure to provide for their families (LPEM FEBUI, 2022). These factors highlight the importance of considering marital status in understanding the vulnerabilities and challenges faced by gig workers in the labor market. Also, gig workers in both urban and rural areas face vulnerabilities related to job security, low earnings, and financial instability. However, the challenges are more pronounced in urban areas due to higher competition and living costs, while rural areas suffer from limited availability of gig opportunities and increased precariousness in employment (ILO, 2021).

Gig workers, who are also often migrants, typically move from rural areas to cities in search of better job opportunities. This migration can be driven by the need to find employment and improve living standards. However, migrants may face challenges such as higher living costs in urban areas. Policymakers are encouraged to provide relevant information about regional labor markets and facilitate affordable living areas to mitigate these challenges (Atmojo & Sulistyaningrum, 2022). Another challenge faced by gig workers is the ability to use digital technology. Workers with digital literacy skills are better positioned to take advantage of opportunities in both formal and informal sectors. The use of the internet and digital technology can lead to higher earnings and better job prospects, particularly for gig workers who often rely on digital platforms for their work (Pratomo et al., 2024).

A study conducted in Chile showed that during the COVID-19 pandemic, especially in the transportation sector, gig workers had to work without adequate safety gear, e.g., special masks or gloves, which increased their risk of contracting

the virus. In addition, unpaid waiting times further limited their income. In this situation, online platforms tended to waive the employers from any liability and only offer limited emergency funds for workers who contracted COVID-19. As a result, gig workers were forced to maximize their working time, but there was no incentive or support provided by online platforms. These factors ultimately contributed to gig workers' increasing vulnerability during this time (Arriagada, Bonhomme, Ibáñez, & Leyton, 2023).

Training programs in Indonesia like Kartu Prakerja can help mitigate these vulnerabilities by improving skills and employability. Kartu Prakerja is a government-supported training program aimed at improving the skills of individuals. The program offers various types of training, including self-development, entrepreneurship, information and technology, finance, languages, beauty, food and beverages, and arts. Training programs, such as those offered by Kartu Prakerja, are crucial for enhancing the skills and employability of workers. These programs can help gig workers by providing them with the necessary skills to adapt to changing job markets and improve their job prospects. Training in digital literacy, for instance, can be particularly beneficial for gig workers who often rely on digital platforms for finding and performing their work (LPEM FEBUI, 2022).

Economic growth can also create more job opportunities and improve living standards. Indicators of inclusive economic growth include GDP per capita growth, job opportunity rate, and the percentage of the workforce with secondary education level and above. These factors can contribute to reducing vulnerabilities among gig workers by providing a more stable and supportive economic environment (Herdiyati & Ismail, 2022).

Meanwhile, the issue of gig workers' welfare has recently received more attention because they frequently face challenges in terms of economic and social welfare. Considering the profound importance of this issue, it is rather saddening that studies on the well-being of gig workers remain scarce. Keith, Harms, and Long

(2020) proposed a framework and research agenda for understanding health and well-being in the gig economy. Characteristics of the gig economy, e.g., demands and resources, can influence how gig workers work, which in turn affects their health and well-being. The study did not directly present specific results or research findings. Instead, it focused on the proposed framework and characteristics and emphasized the need for further research on the well-being of gig-economy workers.

Lobel (2017) proposed four pathways to the systematic reform of employment law that can potentially guarantee and safeguard gig workers' rights and obligations. This study recognized the changing characteristics and challenges faced by gig workers and the lack of protection afforded to them. It also emphasized the need to consider the welfare and protection of gig workers in a perpetually evolving work environment. However, the study did not provide specific results or findings; rather, similar to the previously mentioned study, it provided a framework and highlighted the importance of addressing gig worker welfare in the context of employment law protection.

For a closer look at the well-being of gig workers, Leenoi (2021) conducted a case study in Thailand. His research results showed that 80% of gig workers in Thailand experience income uncertainty. They also have no security at work because of their poorly defined employment status. This study highlighted initiatives that have been undertaken in Thailand to improve gig workers' working conditions in comparison with those in other countries. Initiative examples include savings plans, paid sick leave, insurance, and platforms that provide opportunities for gig workers to provide feedback on job provider platforms. The recommendations provided aim to improve working conditions for gig workers in Thailand and address issues related to employment status, social security, and wages.

In the case of Indonesia, a study on fair trial work was conducted by Nugroho (2022) in an effort to highlight welfare issues of Indonesian gig workers. The findings showed evidence of low employability on gig platforms, especially

in terms of decent wages, health insurance, and unclear partnership status. These platforms also failed to prove that they pay decent wages and provide protection against employment risks. To address this issue, better regulation and collaboration between the governments, platforms, and gig workers is essential. The rapid growth of the gig economy emphasizes the urgency of the issue of gig workers' well-being, which will continue to increase as the number of gig workers grows worldwide. Therefore, serious attention and joint efforts are needed to find a fair and sustainable solution for millions of gig workers in Indonesia.

3. Research Method

The data used in this research are secondary data sourced from the 2022 National Labor Force Survey (SAKERNAS) by the Central Board of Statistics. This survey collects continuous basic employment data and obtains estimates of data on the number of employed/underemployed and other employment indicators, as well as representative developments at the national, provincial, and district/city levels. In addition, the 2022 SAKERNAS also implemented a questionnaire that referred to the concept of employment based on the International Labor Organization (ILO) Labor Force Survey (LFS) questionnaire module. SAKERNAS estimates of employment indicators can be carried out at the district/city level with a sample size of 30,000 census blocks, or approximately 300,000 households that are spread throughout Indonesia.

Following an approach used by Permana and Izzati (2023), gig workers in Indonesia are defined as those who are self-employed in the services sector, which includes transportation and warehousing, information and communications, financial services and insurance, real estate, services companies, educational services, health services, and other services. This category was combined with a question of whether workers use the internet at work and if they use the internet for communication, promotions, and transactions. In this research, a "self-employed"

person is defined as an individual who works or does business by taking economic risks, such as not recovering production expenditures incurred during the operations of the firm, and without employing paid or unpaid personnel. Included in this definition are the kinds of jobs that necessitate technological or specialized knowledge (BPS, 2022).

To analyze the determinants of an individual becoming a gig worker, this research used binary logistic regression analysis using the maximum likelihood estimator method. This method was chosen in order to reduce the possibility of error distribution problems and violations of heteroscedasticity assumptions or non-uniformity of variance. The general binary logistic regression model to determine the determinants of gig workers is in equation (1) below:

$$\text{gig\_worker} = \alpha_0 + \alpha'_1 X_{it} + \varepsilon_{it} \tag{1}$$

where gig_worker is a binary variable consisting of two categories, namely (0) as the reference category, if the worker does not qualify as a gig worker, and (1) if the worker is included in the gig worker category. X_{it} is an independent variable which includes the individual's socio-demographic characteristics, namely generation, marital status, regional classification of residence, level of education, skills, use of Kartu Prakerja (voucher for pre-employment training), migration status, disability status, and business field as well as macroeconomic characteristics of the province where the worker lives, namely the regional digital literacy index and economic growth. To provide a more in-depth and specific analysis, the determinants of gig workers in this study were analyzed specifically according to gender (male and female differences).

Furthermore, to analyze the vulnerability of gig workers in Indonesia, this research focuses on two variables: the income received by gig workers and the excessive working hours experienced by gig workers. The two-stage Heckman estimation method used in this research is specifically for the analysis of gig workers' income. This method makes it possible to consider sample selection bias

as specification error (Heckman, 1979). The dependent variable in this stage is the log of monthly income, while the main independent variable is the dummy variable for gig or non-gig worker status. In the independent variables, marital status and recent migration status are used as instruments in the estimation in the first stage of Heckman's. These two variables are likely to affect an individual's decision to become a gig worker, but have no direct effect on the income of gig workers. The general model used in this research follows the specifications in equation (2) below.

$$\text{log\_income} = \alpha_0 + \alpha_1 gigworker_i + \alpha'_2 X_{it} + \varepsilon_{it} \qquad (2)$$

To achieve more reliable estimation results, robustness checks were performed on the model being constructed. First, for comparison, the income equation is also estimated using Ordinary Least Squares (OLS). Second, income is estimated using a categorical variable. Income categorization is a based on a low pay indicator, which is calculated using the formula 2/3 * median income (BPS, 2022). Income for these categorical variables was estimated using binary logistic regression (logit estimate), with low pay as the reference category.

To address the issue of excessive working hours experienced by gig workers, the binary logistic regression (logit) method with a general model, as in equation (3) below, was used in this research.

$$\text{excessive\_hours} = \alpha_0 + \alpha_1 gigworker_i + \alpha'_2 X_{it} + \varepsilon$$

$$(3)$$

where excessive working hours = 1 if they are working more than 48 hours per week, while excessive working hours = 0 if they are working less than or equal to 48 hours per week. Similar to the income equation, to estimate the working hours, regression analysis with the OLS approach (working hours as a continuous variable) was also employed for comparison.

As the main independent variable, gig worker is a dummy variable consisting of two categories, with (0) as the reference category (if the worker is not included in

the gig worker category) and (1) if the worker is included in the gig worker category. Furthermore, X_{it} is a control variable consisting of generation, gender, marital status, regional classification of residence, level of education, skills, use of pre-employment cards, current migrant status, disability status, and business field, as well as macroeconomic characteristics of the province where the worker lives, namely the digital literacy index, region, and economic growth. Control variables are further explained below:

a. Personal characteristics of workers, including generations divided into Boomer Generation (ages 57–76 years) (as the reference), Generation X (ages 42–56 years), Generation Y (ages 26–41 years), and Generation Z (ages 15–25 years), male or female (gender group), marital status, area of residence divided into urban and rural areas, and workers' level of education (university graduate, yes or no).

b. Experience of the respondents covers whether workers have previous work experience, participate in government training programs, i.e., the pre-employment card program (Kartu Prakerja), and their current migrant status. Participants in the pre-employment card program must meet certain qualifications, including not currently pursuing formal education, in search of work, employees who have been laid off, or employees who need to improve their work competency, such as workers who have been laid off, and unpaid workers, including micro and small business actors.

c. Disability status serves as a proxy for individual health issues. Disability is described as the inability to perform particular activities as a normal person would, which is caused by an impairment or limitations associated with age and society.

d. Sectors of workers is a dummy variable consisting of the main service sectors of categories, i.e., transportation and warehousing, accommodation, food & beverage service, and other services (as the reference).

e. The digitalization index variable is the Indonesian digital literacy index, which assesses workers' strengths and weaknesses in digital skills and knowledge and provides an overview of conditions and opportunities in each region of the country. The index consists of four components: digital skills, digital ethics, digital safety, and digital culture.

f. This study also adds an economic growth variable, where the GDP growth rate is based on constant prices in each province (in percent). This variable is used to look at regional economic conditions.

4. Results and Discussion

4.1 Characteristics of Gig Workers

Cross-tabulation results of worker characteristics reveal several contrasting characteristic differences between Indonesian gig and non-gig workers. Young millennials (ages 26–41 years) and Generation Z (ages 15–25 years) workers dominate the proportion of gig workers. Meanwhile, in non-gig jobs, older workers, namely, members of the boomer generation and Generation X, dominate the structure of non-gig workers by generation. Furthermore, the dominance of urban workers among gig workers is greater than the dominance among non-gig workers. These two characteristics resonate with several previous studies which state that gig work is closely related to young people and those living in urban areas (ILO, 2021; Wheatley, 2021). Apart from these two characteristics, gig workers in Indonesia are predominantly men, married, not university graduates, have work experience, do not participate in the training program (such as Kartu Prakerja), are not categorized as recent migrants, and are not experiencing disability. A full description of those characteristics is presented in Table 1.

Table 1. Characteristics of gig and non-gig workers in Indonesia, 2022 (percent)

Characteristics	Gig Workers	Non-Gig Workers
Generation		
Boomer	5.3	15.93
Gen-X	29.37	33.21
Gen-Y / Millennials	48.2	36.44
Gen-Z	17.13	14.43
Gender		
Female	39.74	38.91
Male	60.26	61.09
Marital Status		
Unmarried	30.44	26.65
Married	69.56	73.35
Area of Residence		
Rural	23.43	46.65
Urban	76.57	53.35
Graduate from University		
No	82.94	88.12
Yes	17.06	11.88
Work Experience		
No	36.16	43.59
Yes	63.84	56.41
Kartu Prakerja Participation		
No	93.33	97.44
Yes	6.67	2.56
Disability		
No	94.58	97.66
Yes	5.42	2.34
Recent Migrant		
No	96.07	97.29
Yes	3.93	2.71

In terms of gig workers' income, a constant pattern emerges across all sectors. Overall, gig workers earn better income than non-gig workers and other groups of workers. However, when we specifically examine gig workers in the transportation and warehousing sectors, it is clear that their income is much lower. This indicates increased vulnerability of gig workers in that sector. This is quite visible since the majority of workers in this sector are gig workers for online transportation platforms. Furthermore, this description highlights income vulnerability when compared to Indonesia's average minimum wage of 2.72 million rupiah in 2022.

Table 2. Mean value of gig workers' income by sector, 2022 (rupiahs)

Sector	Mean Value of Income		
	All Workers	Gig Workers	Non-Gig Workers
Transportation and Warehousing	2,906,007	2,600,328	3,073,814
Accomodation and Food & Beverage Service	2,485,023	2,506,244	2,480,471
Other Services	2,594,731	2,656,708	2,589,429
All Sector	2,602,608	2,628,645	2,599,748

4.2 Gig Workers' Determinants

Generally, in the model for all workers and the specific model for male and female workers, there is a similar direction of influence from gig workers' worker characteristics. A full description of the characteristics is shown in Table 3. When compared with the boomer generation, Generation Z workers have the strongest tendency to become gig workers. Moreover, gig work is a type of work that offers flexibility (Allon, Cohen, & Sinchaisri, 2022; Peetz, 2019). This condition is suitable for the characteristics of Generation Z members, who prefer to work freely and possess better digital abilities compared to other generations (ILO, 2021; Mahato, Kumar, & Jena, 2021).

Table 3. Determinants of gig workers in Indonesia, 2022

	All Models		Males		Females	
	Coef.	Odds Ratio	Coef.	Odds Ratio	Coef.	Odds Ratio
Generation						
Gen-X	0.792***	2.209	0.697***	2.007	0.973***	2.646
Gen-Y / Millennials	1.209***	3.516	0.996***	2.708	1.568***	4.797
Gen-Z	1.203***	3.332	0.929***	2.533	1.591***	4.908
Married	-0.122***	0.885	-0.142***	0.868	-0.163***	0.850
Urban	0.878***	2.407	0.910***	2.484	0.840***	2.317
University	0.300***	1.350	0.324***	1.383	0.179***	1.196
Experience	0.291***	1.337	0.310***	1.364	0.320***	1.378
Kartu Prakerja	0.553***	1.738	0.511***	1.667	0.598***	1.819
Recent Migrant	0.118***	1.125	0.132***	1.141	0.117***	1.124
Disability	-0.365***	0.694	-0.373***	0.688	-0.366***	0.693
Sector						
Transportation and Warehousing	1.840***	6.297	2.018***	7.527	0.911***	2.487
Accommodation and Food & Beverage Service	0.748***	2.113	0.802***	2.231	0.610***	1.841
Digitalization Index	1.684***	5.386	2.023***	7.558	1.254***	3.506
Economic Growth	-0.031***	0.969	-0.039***	0.961	-0.020***	0.980
Constant	-10.175***	0.000	-11.324***	0.000	-8.762***	0.000
No. of Observations	498,451		296,056		202,395	
Pseudo R^2	0.1031		0.1306		0.0746	

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Married workers are less likely to become gig workers. This finding agrees with Hill's (2021) research, which showed that gig workers were mostly single/unmarried workers. The uncertainty of employment continuity and financial stability in the form of income guarantees deter married workers from engaging in gig work.

With regard to the characteristic of area of residence, workers who live in urban areas show positive and significant estimation results. These estimation results

support the findings of Wheatley (2021), which showed that gig work was concentrated in urban areas. In the Indonesian context, there is a wide gap between rural and urban areas when it comes to access to digitalization. The gig economy, with its solid base in internet use, increases the opportunities for urban workers to become gig workers as opposed to their rural counterparts. Recent migrant workers are also more likely to become gig workers. In general, a worker decides to migrate to obtain better job opportunities in the migration destination area. The ease of entering gig jobs might increase the probability of recent migrants becoming engaged as gig workers at their destination. Relevant to these findings, several studies have shown that migrant workers become gig workers to gain greater employment opportunities (Chen et al., 2022; Lata, Burdon, & Reddel, 2023; van Doorn, Ferrari, & Graham, 2023).

The next characteristic is education. Workers who graduate from universities are more likely to become gig workers. This finding supports the findings of Adermon and Hensvik (2022), which showed that numerous university graduates have become gig workers. Workers with a higher education level have better skills than those who have lower levels of education. These skills serve as capital for choosing jobs that offer flexibility. Furthermore, workers who have previous work experience, as well as workers who have taken part in training programs under the Kartu Prakerja scheme, are more likely to be gig workers. These findings are closely related to the skills acquired by experienced workers, as well as workers with additional skills that they obtained from the Kartu Prakerja, with several types of digital capability enhancement. Some of the training available under the Kartu Prakerja scheme is in line with types of gig work, such as computer application training and freelancing.

In addition, disability status has a significant negative effect on individual gig worker status. This applies to all models in general and applies to male and female workers. People with disabilities are less likely to become gig workers. These results

suggest that gig employment is still inaccessible for people with disabilities. Furthermore, no specific protection standards have been established for people with disabilities who work as gig workers (Harpur & Blanck, 2020), which raises the barrier to becoming a gig worker. This is intrinsically tied to the conditions in Indonesia, where gig employment is still dominated by occupations requiring physical strength.

The characteristics of the business sector have a significant effect on the status of gig workers. Working in the transportation sector in Indonesia increases a person's probability of becoming a gig worker up to six times compared to working in another sector. This finding supports several previous studies related to gig workers that have shown that transportation sector workers make the largest contribution to the overall population of gig workers (Rachmawati, Safitri, Zakia, Lupita, & De Ruyter, 2021; Stanton & Thomas, 2020).

Looking at regional characteristics, workers who live in provinces with a high digital literacy index are more likely to become gig workers. A higher digital literacy index suggests that people have better access to digital technology, both as gig workers and consumers of the services provided by gig workers. A previous study showed similar results, i.e., that gig workers create a condition of demand and supply of services that keeps the wheels in motion (Allon et al., 2022). However, the estimation results, which show a negative influence of the rate of economic growth on gig workers, indicate that the acceleration of economic growth in the region is not supported by gig jobs but rather by highly productive non-gig workers, such as formal entrepreneurs and formal workers with contracts.

Comparing gender, and, in particular, for the male worker model, the workers with the greatest tendency to become gig workers are those engaged in the transportation sectors. The types of work found in this sector are generally specific to male workers, such as package delivery workers and platform drivers. However, in the female worker model, the characteristic with the greatest tendency to become

a gig worker is being a member of Generation Z. The high tendency of female Generation Z workers to become gig workers is related to their ability to better adapt themselves to technological changes as opposed to female workers from the other generations. This adaptability makes it easier for them to become gig workers, which is directly related to the use of digitalization in work.

4.3 Estimates on Vulnerability of Gig Workers

The estimations in Table 4 indicate that gig economy workers tend to have a lower income than non-gig workers (shown by the negative coefficient of Gig Worker). The analysis clearly shows that gig economy employment has not significantly improved individuals' incomes. Gig workers often lack stable income guarantees or traditional employment rights such as health care benefits, leave, or pensions (Woodcock & Graham, 2019). In the context of a fluctuating economy, this vulnerability exposes individuals to shifts in market demand or unstable economic conditions. The low income of gig workers can be attributed to uncertain demand or the unpredictability of task availability, resulting in inconsistent and unsustainable earnings compared to non-gig workers. Additionally, intense competition in the gig job industry frequently drives down service prices in order to remain competitive, ultimately reducing gig workers' income. These results align with previous research indicating a decline in income for gig economy workers (Hafeez et al., 2022). The results are also consistent across different estimates, including the Heckman selection coefficient, OLS coefficient, and logit coefficient (Table 4).

Furthermore, this study investigates gig workers' vulnerability to excessive working hours. The results in Table 4 show that workers in the gig economy sector are more likely to work excessively, exceeding the standard full-time workweek (>48 hours), compared to their counterparts who work outside the gig economy sector. The OLS estimate also supports the result. This overexploitation of working hours often stems from the high levels of flexibility offered in this sector (Anwar &

Graham, 2021). Gig workers typically enjoy a high level of schedule flexibility, but they enjoy this flexibility at the expense of fixed contracts or well-defined work schedules. Consequently, gig workers are often seen to have arduously long working hours (Taylor et al., 2023). Hence, they tend to extend their working hours to achieve the desired income. Additionally, in various gig job sectors, the competition for jobs or clients is exceptionally fierce. In such scenarios, workers tend to extend their work hours to secure as many jobs and as much income as possible (Horton & Zeckhauser, 2016).

Based on generational analysis, it is evident that members of Generation X, who tend to be older than members of other generations, show an inclination toward increased income. This outcome can be attributed to Generation X being the first generation to become accustomed to modern technology and information technology advancements. Our findings also indicate a similar likelihood of higher incomes for members of Generation Y; this outcome is rooted in members of Generation Y having greater access to higher education, as higher educational attainment tends to unlock better employment opportunities and higher wages. In contrast, in the case of Generation Z, although the findings suggest a potential increase in income, the coefficient value is comparatively smaller when compared to that of previous generations.

Table 4. Results of estimated income and working hours for gig workers

Variables	Income			Working Hours		
	Heckman Coefficient	OLS Coefficient	Logit Coefficient	Logit Coefficient	Odds Ratio	OLS Coefficient
Gig Worker	-0.034***	-0.034***	-0.350***	0.366***	1.443	2.330***
Generation						
Gen-X	0.309***	0.322***	0.651***	0.451***	1.570	4.393***
Gen-Y / Millennials	0.275***	0.285***	0.724***	0.623***	1.865	5.360***
Gen-Z	0.181***	0.134***	0.825***	0.523***	1.687	2.249***
Man	0.508***	0.522***	0.474***	0.526***	1.692	4.766***
Married	-	-	-	0.025***	1.025	1.051***

Urban	0.336***	0.333***	0.442***	0.766***	2.152	5.941***
University	0.582***	0.585***	0.577***	-0.675***	0.509	-1.534***
Experience	-0.026***	-0.022***	-0.110***	0.110***	1.117	0.824***
Kartu Prakerja	-0.137***	-0.135***	-0.311***	0.092***	1.096	0.599***
Recent Migrant	-	-	-	0.198***	1.219	2.147***
Disability	-0.226***	-0.232***	-0.417***	-0.315***	0.730	-2.753***
Sector						
Transportation and Warehouse	0.033***	0.029***	0.134***	0.390***	1.477	4.331***
Accommodation and Food & Beverage Service	0.140***	0.141***	0.122***	0.693***	2.000	6.660***
Digitalization Index	0.337***	0.336***	0.638***	0.498***	1.645	4.397***
Economic Growth	0.007***	0.007***	0.010***	0.000	1.000	0.087***
Constant	12.590***	12.289	-2.496***	-3.864***	0.021	11.739***
No. of Observations	415700	415700	415700	498451	498451	498451
R^2	-	0.184	0.042	0.061	-	0.094

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Moreover, our findings indicate that male workers tend to experience higher incomes and are prone to excessive working hours compared to female workers. These tendencies might be attributed to some men choosing careers in industries or fields that typically offer higher salaries. Male workers might also lean toward working longer hours to meet job demands.

Distinguishing between urban and rural regions, estimations revealed that individuals living in urban areas have a better prospect of earning larger incomes compared to their rural counterparts. However, a notable aspect emerged: Despite their higher income, urban residents tend to face issues of overworking, especially engaging in excessively long working hours (see also Lyon, Sepulveda, & Syrett, 2007).

Education also emerged as a crucial factor under examination. Our findings indicate that individuals with higher education levels, such as tertiary education or university degrees, have the potential to attain higher incomes compared to those

with lower educational backgrounds. Additionally, the analysis of working hours variables indicates that higher education levels are associated with fewer working hours. In the context of the government's role through the Kartu Prakerja training program, our findings suggest that participation in such a program can actually lead to a lower income for its participants. This outcome seems to emphasize that the impact of the Kartu Prakerja program on income enhancement remains insignificant. As mentioned by Al Ayyubi, Pratomo, and Prasetyia (2023), the impact of the program may require lag effects since its launch in March 2020. Employment status as a migrant worker demonstrates a significant and positive impact on excessive working hours. In other words, migrant workers tend to work excessively long hours. This phenomenon may be attributed to the high level of economic pressures faced by migrant workers, which forces them to seek additional income by working longer hours. Furthermore, the desire to prove oneself in a new work environment can also drive these individuals to demonstrate commitment through hard work and excessive working hours.

We also conducted an analysis of several crucial sectors within our study: the transportation and warehousing sector, as well as the food and beverage service sector. Our findings reveal positive and significant outcomes regarding income in both sectors. This indicates that the transportation and food and beverage service sectors play a vital role in supporting the economy, as evidenced by their substantial income contributions (Burtch, Carnahan, & Greenwood, 2018; Hasegawa, Ido, Kawai, & Kuroda, 2022). The research findings also indicate a positive correlation between the level of digitalization and individual income growth. This discovery reflects the positive impact that digital technology advancements can have on individual income levels. These results align with prior research indicating that digitization can not only enhance profits but also income and contribute to the sustainability of employment (Fedorova, Koropets, & Gatti, 2019).

In the long run, it is crucial to examine the economic growth conditions within the context of this study. Our estimations show that economic growth has the potential to enhance individual incomes. However, the resulting impact on working hours does not exhibit significant changes. This highlights the need to further evaluate how economic growth can be linked to sustainable work standards to ensure that economic success reflects individual well-being and work-life balance in the face of exploitation due to excessive working hours.

5. Conclusion

This study aims to analyze the dynamics of gig workers in the Indonesian labor market, specifically focusing on the characteristics, well-being, and vulnerability of gig workers during the economic recovery period in the aftermath of the global crisis following the COVID-19 pandemic. Our estimations reveal that millennials and members of both Y and Z Generations have a higher likelihood of engaging in gig economy jobs compared to members of the previous generations. Residing in urban areas, having a higher education, having work experience, and participating in the Kartu Prakerja scheme also increase the chances of an individual entering the gig economy. Additionally, being a migrant increases the probability of one joining the gig economy. Meanwhile, individuals with disabilities have a lower probability of becoming gig workers. The sectors that are the most likely to absorb gig economy jobs are transportation and warehousing, as well as accommodation and food services. Digitalization also plays a crucial role in the growth of gig workers.

Furthermore, this research evaluates the vulnerability of gig workers in terms of income and excessive working hours. Our findings indicate that gig workers tend to experience a lower income and face excessively long working hours. Therefore, although the gig economy offers high levels of flexibility and low entry barriers, gig

workers are exposed to significant risks, including income instability and the overexploitation of working hours. Hence, a robust governmental role is essential in crafting policies that safeguard the rights of gig workers, providing them with stable income assurance, and regulating their working hour limits to ensure the sustainability and well-being of these individuals.

Based on the findings of this research, it is imperative that the Indonesian government takes steps to encourage and ensure that gig workers have access to adequate social security. Given that gig workers often experience reduced income and excessive working hours, social security that includes health insurance, old age security, and unemployment insurance is essential to provide stability for them. Several countries, such as Singapore and France, encourage social security for gig workers to ensure a safer working environment, even though gig workers still have the status of informal workers. Therefore, the Government needs to promote easily accessible social protection schemes and expand regulations that recognize the rights of gig workers. Apart from social security, several initiatives are also being undertaken to protect gig workers from income shortages. For example, the Peruvian government implemented a savings program for gig workers in the transportation sector based on a certain percentage of their weekly income. And in Spain and Vietnam, gig workers can be classified as formal workers so that they get many benefits that formal workers should receive, such as health insurance, work accident security, and others.

Effective supervision and law enforcement also need to be carried out to prevent the violations of workers' rights by digital platform companies that can lead to the exploitation of gig workers, especially in relation to excessive working hours and in the transportation sector. In addition, governments need to map the most vulnerable groups of gig workers, such as those living in rural areas, those with low levels of education, women, people with disabilities, and inexperienced workers, to provide targeted protection and support for these groups. Increasing the resilience of

vulnerable groups is carried out by providing skills that adapt to market changes. Governments also need to create equal access to upskilling and training programs to help gig workers improve their skills and increase their future earning potential.

Acknowledgments

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