Digital-Based Self-Employed Tendencies In Maintaining Income Levels In The Red Zone Of COVID-19

Dhea Rizky Amelia, Efriyani Sumastuti[*], Ika Indriasari, & Rita Meiriyanti

Universitas PGRI Semarang, Jl. Sidodadi Timur No.24, Kota Semarang, Jawa Tengah, 50232, Indonesia

Abstract

This study has two objectives: wanting to know the tendency of Self-Employed in the COVID-19 red zone to maintain income levels and the predictive probability of using digitalization to maintain income levels in the COVID-19 Pandemic Era. Secondly, wanting to know the socio-demographic factors of Self-Employed in the red zone and have used a digital approach in their work to maintain income levels during the COVID-19 pandemic. Data sourced from Sakernas August 2020, with logistic regression analysis method. Self-Employed in the red zone of COVID-19 have a lower tendency than those who work in the green zone of COVID-19 to maintain their income level. On the other hand, Self-Employed who have been digitized have a greater probability of increasing their income. Furthermore, Self-Employed with a digital approach who do not work in crowds, do not experience a decrease in working hours, have high skills, and live in villages have a greater probability of maintaining income levels in the red zone of COVID-19.

Keywords: self-employed; covid-19 red zone; digitalization business; income level.

1. Introduction

Self-Employed is considered one of the sources of job creators, drivers of economic growth, and social welfare (Acs, 2014; Grossmann, 2009). Self-employed contribute to the majority of the workforce in developing countries, including Indonesia (Gindling & Newhouse, 2014). Based on the dual labor theory, formal workers with minimum wages are dominated by skilled workers, while self-employed workers are often dominated by unskilled workers who voluntarily become self-employed (Kwon, 2022).

Furthermore, economic development has created social change, which is characterized by digital transformation (Cennamo, Dagnino, Di Minin, & Lanzolla, 2020; Denicolai, Magnani, & Alegre Vidal, 2020; Zaoui & Souissi, 2020). Digitalization modifies the entire structure of the business model (Saebi, Lien, & Foss, 2017; Volberda, Mihalache, Fey, & Lewin, 2017) and revolutionizes the way companies do business as well as changes the way they relate to consumers (Bouwman, Nikou, Molina-Castillo, & de Reuver, 2018). In Indonesia, technology has changed the nature of work since 2000 (Prospera, 2019). This condition has implications for the disruption prevalence of technology, product, and business model innovation based on the digitalization process, which continues to increase, so that the development and utilization of technology and innovation provide many opportunities for business actors, including increasing the risk profile of business actors.

Accompanying digital transformation that continues to develop, the COVID-19 outbreak has produced a scenario that is disruptive to the external environment and can stimulate the progress of digital transformation (Laato, Islam, Farooq, & Dhir, 2020). The COVID-19 pandemic has forced many businesses, especially self-employed ones, to invest in digital transformation (Soto-Acosta, 2020), so that it can ensure business continuity when many regulations regarding physical distancing and crowd restrictions are implemented in Indonesia. The development of digitalization has become an alternative to saving as well as developing digital entrepreneurship in Indonesia during the COVID-19 pandemic. The COVID-19 pandemic has caused the majority of economic sectors to be stagnant. The majority of actors cannot develop and many end up in bankruptcy. This is what makes business actors change sales strategies through digitalization schemes. The digitization scheme is by utilizing the marketplace (intermediaries) and using social media as marketing

---

techniques. Thus, the digital-based entrepreneur development scheme can be an alternative solution to save business actors during the COVID-19 pandemic (Arianto, 2020).

During times of environmental crisis and uncertainty, the decision-making process to pursue opportunities and address growing market needs becomes critical for self-employed if they want to survive in a changing market (Ferasso, Beliaeva, Kraus, Clauss, & Ribeiro-Soriano, 2020). Based on the survey result of the International Labor Organization (ILO) in 2020 of 571 micro-entrepreneurs, 2/3 of the business actors surveyed stopped operating, 52% lost income, and up to 63% had reduced the number of workers. Therefore, a hands-on strategy is needed for business actors to maintain their business amid the COVID-19 pandemic and increasingly rapid technological disruption. In this scenario, businesses need to develop entrepreneurial decisions, actions, and methods to take advantage of the changing scenarios. In this case, the entrepreneurial orientation toward digital becomes relevant (Wales, Kraus, Filser, Stöckmann, & Covin, 2021).

This study would focus on entrepreneurship or self-employed since it is predicted to have a relatively high risk when facing the COVID-19 pandemic. In this case, self-employed is also defined as workers who work at their own expense or with one or more partners. Self-employed are often also referred to as own-account workers or *wiraswasta*, and do not employ employees continuously during the working period (period of reference).

Research on crises and self-employed has received a great deal of attention (see, eg, Doern, Williams, & Vorley, 2019). On the one hand, most of this literature focuses on the question of how individuals decide to open a new business in response to a crisis. On the other hand, some researchers focus on business crisis management. In contrast to other crises, the COVID-19 pandemic has affected nearly the entire self-employed population, as documented in contemporary research, all of which show that the self-employed have suffered greatly from the COVID-19 pandemic.

Based on the description above, research on self-employed needs to be done since the number of self-employed in developing countries is higher than in developed countries and is a sector that dominates the economy (Halvarsson, Korpi, & Wennberg, 2018). The dominance of self-employed labor in developing countries is reflected in the existence of the agricultural sector as a major player in the traditional economy, as well the limited development of the formal economy and financial markets. On the other hand, self-employed in the modern era need to be encouraged to adjust to technological advances so that their income survives. One of the ways is through digital entrepreneurship. Digital entrepreneur is a subcategory of entrepreneurship in which traditional organizations that operate physically are digitized so that traditional entrepreneurs change into new forms of business in the digital era (Hair, Wetsch, Hull, Perotti, & Hung, 2012; Le Dinh, Vu, & Ayayi, 2018), both in terms of product, distribution, and business location (Hair et al., 2012). Digital entrepreneurship is also an effort to achieve new business opportunities through new media and internet technology (Davidson & Vaast, 2010). More specifically, Richter (2020) stated that digital business is an effort to gain market share, business opportunities that generate money, and strive to be innovative. The digital economy then opens opportunities for the self-employed to create different business areas through the e-commerce models (Guthrie, 2014).

In line with this, technological change can be both sustaining and disruptive. Continuous innovation reinforces conventional business practices and technology standards. Sustaining innovation does not necessarily lead to the development of technological innovations, but rather supports existing developments. In contrast, technology disruption primarily focuses on markets, industries, and companies (Karimi & Walter, 2016; Momeni & Rost, 2016; Presutti, Boari, Majocchi, & Molina-Morales, 2019). The main perspective from the technology disruption literature is the shift of old businesses to other businesses to support the entry of new businesses into the market. Technological disruption provides new business opportunities to enter and easy market dominance, while long-established businesses are forced to change other strategies to keep up with current market trends (Feder, 2018). A strong relationship between entrepreneurship, innovation, and surrounding demographic factors has been identified in several kinds of literature (Autio, Kenney, Mustar, Siegel, & Wright, 2014; Hang, Garnsey, & Ruan, 2015).

Considering that one of the problems experienced by self-employed is the acceleration of digital transformation, it is important to analyze socio-demographic factors, especially amid the COVID-19 pandemic. First, the need to develop business competencies may not be in line with inherent personal and social skills (Seyyed Amiri, Shirkavand, Chalak, & Rezaeei, 2017). Second, attitudes and behaviors that can support the special interests of many subgroups, such as self-employed (Ringov & Zollo, 2007).

Focusing research on opportunities for digital-based self-employment in maintaining income levels in the red zone of COVID-19, this research would look at two research objectives including (1) (a) Knowing the tendency of self-employed in the red zone of the COVID-19 in maintaining income levels (1) (b) Knowing the magnitude of the predictive probability of using digitalization in an effort to maintain income levels in the COVID-19 Pandemic Era (2)

Knowing the socio-demographic factors of self-employed who are in the red zone and have used a digital approach in their work to maintain income levels during the COVID-19 pandemic.

2. Methods

This study focuses on observations on self-employment or entrepreneurs, where they work at their own risk and in their work are not assisted by permanent paid workers or unpaid family workers. The data used in this study are the data from the national labor force survey (Sakernas) on August 2020. Sakernas is a specific survey that can describe the general condition of employment in Indonesia between enumeration periods. The Sakernas August 2020 would have been carried out in all regions of Indonesia with a sample size of around 300,000 households, spread across all provinces in both urban and rural areas, and is intended to generate estimation figures down to the district/municipality level. The analysis unit in this study is self-employment and its relation to efforts to maintain or increase income in the red zone of COVID-19. Referring to the research objectives, this study would look at two research objectives including (1) (a) Knowing the tendency of self-employed during the COVID-19 pandemic in maintaining Income Levels (1) (b) Knowing the magnitude of the predictive probability of using digitalization in an effort to maintain income levels in the Era of the COVID-19 Pandemic (2) Knowing the socio-demographic factors of self-employed who are in the red zone and have used a digital approach in their work to maintain income levels during the COVID-19 pandemic. To answer these questions, analysis using the logistic regression method would be used which is divided into two models. The determination of the probability in each research model would be calculated by Marginal Effect. In the Linear Probability Model (LPM), the direction coefficient directly measures the change and probability of an event happening as a result of a one-unit change in the independent variable, with the assumption that the other independent variables are constant. In a logit variable, the direction coefficient of a variable indicates the magnitude of the change of the value in the log of the odds' is due to a one-unit increase in that variable if other variables are constant. To estimate the logit in this study, the rate change in probability of an event happening is given by $Bj\ P(1 - Pi)$, where Bj is the partial regression coefficient of the independent variable or regressor to j. However, in calculating Pi, all the variables involved in the analysis must be included. Thus, all independent variables would be involved in the calculation of probability changes. Meanwhile, in LPM, only the jth regressor is involved. To overcome this, in this logit model analysis, the marginal effect (dy/dx) would be used, in order to measure the variable X to Y. Where the equation used is:

$$\text{Logit } (Y = \text{Increased Income} = 1) = \beta_0 + \beta_1 X_i + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + e \tag{1}$$

Logit (Y) is the dependent variable with Model Y1 is the income of self-employment in the red zone of COVID-19 compared to February 2020 (1 = income increases and there is no change; and 0 = income decreases), β_0 is Intercept, β_1-β_8 is regression model slope, X_1 is crowd category, X_2 is the change in working hours, X_3 self-employed skills, X_4 is gender, X_5 is age group, X_6 is residence category, X_7 is marital status. Meanwhile for Model Y2 is the tendency to maintain the income levels of digital-based self-employment in the red zone of COVID-19 compared to February 2020 (1=Increased income and no change; and 0=Decreased income), β_0 is Intercept, β_1......β_8 is regression model slope, is crowd category, X_2 is the change in working hours, X_3 self-employed skills, X_4 is gender, X_5 is age group, X_6 is residence category, X_7 is training participation, X_8 is marital status.

$$\text{Logit } (Y = \text{Increased Income} = 1) = \beta_0 + \beta_1 X_i + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + + \beta_7 X_7 + \beta_8 X_8 + e \tag{2}$$

In model 1, we would also see how big predictive probability of utilizing digitalization in an effort to maintain income levels during the COVID-19 pandemic compared to if business actors do not take a digitization approach in their business, through the following equation:

$$\Pr\big(\text{PU Digital} = 1\big) \frac{e^{xb}}{1 + e^{xb}}$$

Where xb is the linear predictor of the equation

$$\text{Logit } (Y_{1,}) = \beta_0 + \beta_1 X_i + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + e \tag{3}$$

$$\text{Logit } (Y_{2,3}) = \beta_0 + \beta_1 X_i + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + + \beta_7 X_7 + \beta_8 X_8 + e \tag{4}$$

In calculating predictive probability, it is necessary to involve two steps. First, calculate the predicted value for the linear predictor. Then the linear predictor is transformed into a probability metric using the predicted value which can be identified by b.

$$\hat{Pr} = \frac{e^{\hat{xb}}}{1 + e^{\hat{xb}}}$$

The difference between predicting and adjusting is that predicting first applies a transformation to the linear predictors and then calculates the average, whereas adjusting first calculates the average of the linear predictors and then applies the transformation. The result of the predictive probability equation can ultimately help in making a policy paper on optimizing a digital-based approach to self-employment.

3. Results and Discussions

This study would basically focus on considering what factors contribute to maintaining the income of business actors. The first difference between this study and previous studies is that the focus of the research study area is intended to find the differences between current business actors and before the COVID-19 pandemic or in February 2020. Another novelty offered is to see business actors by zone category in the severity of COVID-19 as well as see the resilience of those who are allowed to operate when social restrictions are imposed in several regions in Indonesia. Through the selection of variables, this study would adopt a lot of regulations and information regarding COVID-19 to be implemented in the research operational variable.

Table 1. Logistic Regression Test of Model 1

Dependent Variable: Income Condition

Independent Variables	(1) General Model
Red_Zone	-0.0375***
	(0.00425)
Crowd	-0.110***
	(0.00368)
Fixed/Increased_Working_Hours	0.350***
	(0.00275)
Medium_skill_level	0.0271***
	(0.00645)
High_skill_level	0.0480***
	(0.0104)
Men	-0.00847***
15-24years (Ref)	(0.00328)
25-34 years	-0.00117
	(0.00749)
35-44 years	-0.0122*
	(0.00710)
45-54 years	0.00187
	(0.00716)
≥55 years	0.0505***
	(0.00719)
Urban	-0.116***
	(0.00323)
Observation	98,986

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Sakernas, 2020 (Processed)

Focus on Self-Employed, those who work in the red zone of COVID-19 have a 3.75% lower tendency than those who work in the green zone of COVID-19 to be able to maintain income levels. In the conditions of COVID-19, those who can maintain or even increase their income levels are those who do not work in crowds. If their work tends to be in

crowds, self-employment has a lower probability of 11% than those who work not in crowds. Those who succeed to maintain their working hours have a 35.0% higher probability than those who lost working hours during the COVID-19 pandemic. Those with medium and high skills tend to be 2.71% and 4.8% higher than those with low skills in maintaining income levels. On the other hand, those who are male have a 0.84% lower tendency than women and those who live in cities have a lower probability of 11.6% than those who live in villages to maintain their income levels.
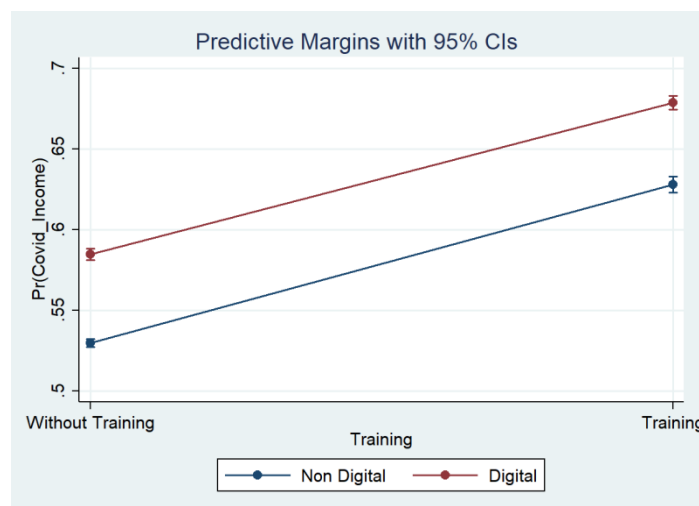
Figure 2. Predictive probability of training and business digitalization

Based on the result of predictive probability, it can be seen that without training, those who work without using the internet or are not digitized have a lower probability of maintaining or increasing their income than those who have attended training. The probability will be even higher if they attend training and their work base is digitized. Those who have used the internet for promotions, consumption, and transactions have a greater probability of increasing their income during the COVID-19 pandemic. Meanwhile, those have used digitization in their work and receive training will help increase the probability of maintaining or even increasing their income. This condition then supports the pre-employment card policy issued by the Indonesian government during the COVID-19 pandemic. Apart from aiming to provide incentive assistance to the productive age population, this program can also help up-skilling and re-skilling, which will ultimately help increase the probability for workers to maintain their income levels.

Table 2. Logistic regression test of model 2

Dependent Variable: Income Conditions

Independent Variables	(1) General Model
Crowd	-0.0283**
	(0.0122)
Change in Hours	0.279***
	(0.0103)
Medium_skill_level	0.0218
	(0.0227)
High_skill_level	0.143***
	(0.0320)
Gender	-0.0231**
15-24 years (Ref)	(0.0115)
25-34 years	-0.00319
	(0.0196)
35-44 years	0.00157
	(0.0201)

Independent Variables	(1) General Model
45-54 years	0.00394
	(0.0210)
≥55 years	0.0306
	(0.0247)
Urban	-0.0868***
	(0.0147)
Training	0.0119
	(0.0138)
Mar	-0.0205
	(0.0145)
Observations	4,860

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Sakernas, 2020 (Processed)

Based on the logistic regression results, self-employed who work in crowds in the red zone of COVID-19 have a 2.83% lower probability of experiencing increased income than those who work not in crowds even though they have used digitalization in their work. Those whose working hours can be maintained or increased have a 27.9% higher probability of maintaining their income incomes than those who have experienced reduced working hours in their main job. In order to maintain income levels, those with high skills have a 14.3% higher probability than those with low skills. Then, when viewed from their gender, men have a lower probability of 2.31% than women to maintain income levels. Meanwhile, age does not significantly affect the probability of self-employment to maintain or increase income. Meanwhile, those who live in cities actually have a lower probability of 8.68% compared to those who live in villages. As for the training and marital status variables, they do not significantly affect the probability of self-employed to maintain income levels.

The increase in COVID-19 cases in early March 2020 prompted the Indonesian government to issue Large-Scale Social Restrictions or PSBB regulations based on Government Regulation Number 21/2020 to accelerate the handling of COVID-19. Based on this regulation, regional governments can implement PSBB with the approval of the Minister of Health. Since then, several regencies/cities have implemented PSBB in their areas to suppress the spread of COVID-19. In some areas, especially during the PSBB period, restaurants are still allowed to operate but with limited operating hours, not eating on-site or ordering online. Especially in the red zone, sectors that are not included in the essential sector and have the potential to cause crowds are prohibited from trading. This condition causes a decrease in demand in various business sectors. In line with this, based on the result of logistic regression, it can be seen that self-employed in the red zone of COVID-19 have a 3.75% lower tendency compared to those who work in the green zone of COVID-19 to be able to maintain income levels. Based on Sakernas data on August 2020, 41.67% of workers and self-employment experienced a decrease in income in the red zone compared to March 2020. On the other hand, based on the TNP2K report 2020, decreased demand is the main problem related to the production aspect experienced by Self-Employed during the COVID-19 pandemic. Other problems include more expensive raw materials, difficulty obtaining raw materials, and limited operating hours. Based on the COVID-19 case study in 2020, as many as 245 regencies/cities in Indonesia have the status of a COVID-19 red zone. This means that in that period there are large-scale social restrictions, which could potentially affect a decrease in Self-Employed income. Those whose working hours can be maintained or increased have a 27.9% higher probability of maintaining their income levels in the red zone of COVID-19 than those who have experienced decreased working hours in their main job, even though both of them use digitalization in their work operations.

COVID-19 is marked by the impact of losing livelihoods and decreased business performance. The presence of the pandemic has also highlighted the wide digital discrepancy between low and high-income residents, between rural and urban areas, and between developed and developing countries (Beaunoyer, Dupéré, & Guitton, 2020). One of the consequences of COVID-19 is the trend of acceleration toward business model digitization, which tends to be dominant in online stores. This then raises the question of whether the online business model will always be profitable for self-employed. In other words, whether traditional companies are able to recover their income by incorporating greater digitization into their business model. Based on the result of predictive probability, those who have used the internet

for promotion, consumption, and transactions have a greater probability of increasing income during the COVID-19 pandemic, and those who have used digitization in their work and receive training, will help increase the probability of maintaining or even increasing income. The use of the internet in this context is divided into 3 uses: (1) the internet is used for promotions (2) the internet is used for communication, and (3) the internet is used for transactions. In general, self-employed do work using the internet with details, for promotion 54.11%, communication 97.25%, and transaction activities 45.50. Meanwhile, regarding the use of the internet at their work, overall only 30.62% of self-employed people use the internet for three activities at once, namely promotion, communication, and transactions. In this regard, it can be concluded that the use of the internet to run business units has not been optimally implemented.

The emergence of crowd prohibition causes a decrease in economic activity, which has an impact on decreasing the probability of Self-Employed in maintaining income levels. In the study conducted by Azlan (2020), recently, most people during the COVID-19 pandemic take action to prevent the spread of the virus by avoiding crowded places. This indicates a change in behavior in dealing with the COVID-19 pandemic. Previous studies have also shown that those with higher incomes are less willing to comply with health protocols when a health crisis occurs (Wong, 2016), and they feel less fear (Setbon & Raude, 2009). In this case study, a decrease in crowd numbers ultimately results in a decrease in economic activity. This condition is in line with the result of logistic regression which shows that self-employed who work in crowds have a 2.83% lower probability even though they have used digitalization in their work to experience increased income compared to those who work not in crowds in the red zone of COVID-19.

The first half of the COVID-19 pandemic causes unprecedented losses. The health crisis results in a decrease in working hours in economic activities. Based on ILO (2020), the estimated working hours which are lost for the first quarter is 4.5 percent (equivalent to around 130 million full-time jobs, with the assumption of 48 working hours/week) compared to pre-crisis levels (fourth quarter of 2019). This estimation has a substantial degree of uncertainty. The estimated decline in work activity in the first quarter of 2020 in various countries is uneven. Meanwhile, the number of working hours in the first quarter decreases by 6.5 percent in Asia and the Pacific (driven by 11.6 percent decrease in East Asia) compared to the last quarter of 2019, all other major regions experience decreased working hours less than 2 percent. This pattern of changes in labor activity is closely related to working hours and the existence of social distancing in various regions of the world. In Indonesia, 2.43% of Self-Employed experience increased working hours in August 2020 compared to February 2020. Those who experience reduced working hours are 27.71%, and those who experience regular working hours are 69.87%. Based on the analysis by the ILO (2020) globally, the loss of working hours in the first quarter of 2020 is largely driven by the major impact of COVID-19 in China during this period. According to the estimation, around 305 million full-time jobs will lose working hours. Two main factors have contributed to the reduction in working hours, including, first, the extension of the PSBB in many countries, where when the action is implemented it will have a cumulative impact on work activities. Second, several countries, including Indonesia, provide additional strict regulations for essential sectors, including closing workplaces, which in turn has an impact on reducing working hours. This rule is then in line with the result of the logistic regression which shows that for those who have been digitized and their working hours can be maintained or increased, there is a 27.9% higher probability of maintaining a level of income, compared to those who have experienced a decrease in working hours in their main job in the red zone of COVID-19.

Based on research (Wales et al., 2021) in Brazil and Ecuador, the workers with high skills would experience more minimal impact from the crisis on their wages. This condition has only a short impact on their employment but has long-lasting effects on the average wage of workers in the nine years after the start of the crisis. Those who enter the labor market during a crisis face poor conditions for their careers and are less possible to recover. The combination of the informal economy and workers with widely varying skill levels shows a hierarchy in adjustment costs, where informal workers, who have less job protection, face the highest probability of losing their job (and livelihood) regardless of their skills. Workers in lower-income quintiles are generally more possible to experience a negative labor transition than workers in higher-income quintiles—but overall, the result of the research conducted by the World Bank shows that high-skilled jobs are more responsive to growth shocks than low-skilled jobs. This finding is consistent with the larger cycles of jobs noted above in large firms and higher cycles of job loss among workers who are formally employed as such workers are more likely to be employed by highly skilled workers. In line with the finding, in order to maintain income levels, those with high skills in the red zone of COVID-19 have a 14.3% higher probability than those with low skills, even though both of them have used digitalization in their work.

Betcherman (2015) showed that employment protection laws have been found to have an equalizing effect among full-time workers covered at working age, but the laws tend to disproportionately respect some groups such as youth, women, and the less skilled outside the scope and benefits (Betcherman, 2015; Heckman & Pagés, 2004). Furthermore, if it is based on gender, although it differs from other research findings which show that women tend to be employed

on temporary contracts, which deprives them of access to many benefits and protections against dismissal (Gatti, 2014; Kuddo, Robalino, & Weber, 2016) so that when the COVID-19 pandemic occurs, women tend to have the risk of leaving their jobs. Based on the result of logit analysis, it shows that men actually have a lower probability of 2.31% to maintain income levels or increase income levels in the red zone of COVID-19 pandemic than women, even though both of them have used digitalization in their work. This condition supports the opposite finding that so far women are more likely to choose different industries and jobs than men. Together with the degree to which this is affected differently by the pandemic and the effect on earnings and working hours would be different. Where the potential for working remotely differs greatly across sectors and occupations (Alipour, Falck, & Schüller, 2021; von Gaudecker, Holler, Janys, Siflinger, & Zimpelmann, 2021)) Men are considered to choose high-risk business fields. This condition affects income, especially when the government divides restriction sectors based on essential and non-essential sectors. In this regard, the data from Graeber's study (2021) present an important systematic pattern which shows that women are disproportionately affected by this economic crisis. For most of the countries surveyed, women are less possible to initiate remote work, more likely to be socially isolated due to the pandemic, and more likely to report suffering the psychological consequences of the pandemic. This finding supports the finding of Doepke & Olmstead-rumsey (2021) which shows that women are concentrated in sectors that have been disproportionately affected by the crisis. The data from Belot et al., (2021) do not include some of the questions that are key to understanding the sources of such gender disparities (e.g. the allocation of tasks within the household), but cross-country perspectives can prove helpful in guiding ongoing investigations into the root causes of gender disparities.

The COVID-19 pandemic is marked by the impact of losing livelihoods and decreased business performance. The presence of the pandemic has also highlighted the wide digital discrepancy between low and high-income residents, between rural and urban areas, and between developed and developing countries (Beaunoyer et al., 2020). Based on the logit estimation results, self-employed people in urban areas have a lower probability of 8.68% to maintaining income levels or increasing income levels in the red zone of the COVID-19 pandemic compared to residents in rural areas. This condition can be explained that the spread of COVID-19 in cities in wave one attacks more urban residents who tend to be densely populated. Coupled with the determination of PSBB, which mostly occurs in urban areas compared to rural areas, thus limiting the space for economic activity compared to those who live in rural areas. The spread of COVID-19 in wave one hit more urban residents who tend to be densely populated than residents in villages.

4. Conclusions

Preliminary conclusions show that those who work in the red zone of COVID-19 have a lower tendency than those who work in the COVID-19 green zone to be able to maintain income levels. In the conditions of COVID-19, those who can maintain or even increase their income level are those who do not work in crowds. If their work tends to be in crowds, self-employment has a lower probability than those who work not in crowds, and those who manage to maintain their working hours have a higher probability than those who lost working hours during the COVID-19 pandemic. Those with medium and high skills have a higher tendency than those with low skills in maintaining income levels. On the other hand, self-employed men actually have a lower tendency than women. Those who live in cities have a lower probability than those who live in villages to maintain their income level.

The development of digitalization has become an alternative to saving as well as developing digital entrepreneurship in Indonesia during the COVID-19 pandemic. The COVID-19 pandemic has caused the majority of economic sectors to be stagnant. The majority of actors cannot develop and many end up in bankruptcy. This is what makes business actors change their sales strategy through digitalization schemes, that those who work without using the internet or are not digitized have a lower probability of maintaining or increasing income than those who have been digitized. The probability will be even higher if they attend training and their work base is digitized. Those who have used the internet for promotions, consumption, and transactions have a greater probability of increasing their income during the COVID pandemic. Those who have used digitization in their work and receive training will help increase the probability of maintaining or even increasing their income.

More specifically, for self-employed who are in the red zone of COVID-19 and have used digitalization in their work, those who work in crowds have a lower probability of experiencing an increase in income than those who work not in crowds even though they have used digitalization in their work. Those whose working hours can be maintained or increased have a higher probability of maintaining their income levels than those whose working hours have decreased in their main job. In order to maintain income levels, those with high skills have a higher probability than those with low skills. Then, when viewed from their gender, men have a lower probability than women to maintain income levels. Meanwhile, age does not significantly affect the probability of self-employment to maintain or increase income. Lastly,

those who live in cities actually have a lower probability than those who live in villages to maintain their income level amid the COVID-19 pandemic

Acknowledgments

References

Acs, Z. J. (2014). Entrepreneurship , Economic Development and Institutions Entrepreneurship , economic development and institutions, (February 2008). https://doi.org/10.1007/s11187-008-9135-9

Alipour, J.-V., Falck, O., & Schüller, S. (2021). Germany's Capacities to Work from Home. *SSRN Electronic Journal*, (November). https://doi.org/10.2139/ssrn.3579244

Arianto, B. (2020). Pengembangan UMKM Digital di Masa. *Jurnal Administrasi Bisnis*.

Autio, E., Kenney, M., Mustar, P., Siegel, D., & Wright, M. (2014). Entrepreneurial innovation: The importance of context. *Research Policy*, *43*(7), 1097–1108. https://doi.org/10.1016/j.respol.2014.01.015

Azlan, A. A., Hamzah, M. R., Sern, T. J., Ayub, S. H., & Mohamad, E. (2020). Public knowledge, attitudes and practices towards COVID-19: A cross-sectional study in Malaysia. *PLoS ONE*, *15*(5), 1–15. https://doi.org/10.1371/journal.pone.0233668

Beaunoyer, E., Dupéré, S., & Guitton, M. J. (2020). COVID-19 and digital inequalities: Reciprocal impacts and mitigation strategies. *Computers in Human Behavior*, *111*(May). https://doi.org/10.1016/j.chb.2020.106424

Belot, M., Choi, S., Tripodi, E., Broek-Altenburg, E. van den, Jamison, J. C., & Papageorge, N. W. (2021). Unequal consequences of COVID 19: representative evidence from six countries. *Review of Economics of the Household*, *19*(3), 769–783. https://doi.org/10.1007/s11150-021-09560-z

Betcherman, G. (2015). Labor market regulations: What do we know about their impacts in developing countries? *World Bank Research Observer*, *30*(1), 124–153. https://doi.org/10.1093/wbro/lku005

Bouwman, H., Nikou, S., Molina-Castillo, F. J., & de Reuver, M. (2018). The impact of digitalization on business models. *Digital Policy, Regulation and Governance* , *20*(2), 105–124. https://doi.org/10.1108/DPRG-07-2017-0039

Cennamo, C., Dagnino, G. B., Di Minin, A., & Lanzolla, G. (2020). Managing Digital Transformation: Scope of Transformation and Modalities of Value Co-Generation and Delivery. *California Management Review*, *62*(4), 5–16. https://doi.org/10.1177/0008125620942136

Davidson, E., & Vaast, E. (2010). Digital entrepreneurship and its sociomaterial enactment. *Proceedings of the Annual Hawaii International Conference on System Sciences*, (June). https://doi.org/10.1109/HICSS.2010.150

Denicolai, S., Magnani, G., & Alegre Vidal, J. (2020). Competitive renaissance through digital transformation. *European Management Journal*, *38*(6), 827–828. https://doi.org/10.1016/j.emj.2020.09.013

Doepke, M., & Olmstead-rumsey, J. (2021). The Impact of COVID-19 on Gender Equality in Europe. *Intereconomics*, *56*(5), 248–248. https://doi.org/10.1007/s10272-021-0992-7

Doern, R., Williams, N., & Vorley, T. (2019). Special issue on entrepreneurship and crises: business as usual? An introduction and review of the literature. *Entrepreneurship and Regional Development*, *31*(5–6), 400–412. https://doi.org/10.1080/08985626.2018.1541590

Feder, C. (2018). A measure of total factor productivity with biased technological change. *Economics of Innovation and New Technology*, *27*(3), 243–253. https://doi.org/10.1080/10438599.2017.1329697

Ferasso, M., Beliaeva, T., Kraus, S., Clauss, T., & Ribeiro-Soriano, D. (2020). Circular economy business models: The state of research and avenues ahead. *Business Strategy and the Environment*, *29*(8), 3006–3024. https://doi.org/10.1002/bse.2554

Gatti. (2014). Balancing Flexibility and Worker Protection, (October).

Gindling, T. H., & Newhouse, D. (2014). Self-Employment in the Developing World. *World Development*, *56*, 313–331. https://doi.org/10.1016/j.worlddev.2013.03.003

Graeber, D., Schmidt-Petri, C., & Schröder, C. (2021). Attitudes on voluntary and mandatory vaccination against COVID-19: Evidence from Germany. *PLoS ONE*, *16*(5 May 2021), 1–18. https://doi.org/10.1371/journal.pone.0248372

Grossmann, V. (2009). Entrepreneurial innovation and economic growth. *Journal of Macroeconomics*, *31*(4), 602–613. https://doi.org/10.1016/j.jmacro.2008.12.008

Guthrie. (n.d.). guthrie.pdf.

Hair, N., Wetsch, L. R., Hull, C. E., Perotti, V., & Hung, Y. T. C. (2012). Market orientation in digital entrepreneurship: Advantages and challenges in a web 2.0 networked world. *International Journal of Innovation and Technology Management*, *9*(6). https://doi.org/10.1142/S0219877012500459

Halvarsson, D., Korpi, M., & Wennberg, K. (2018). Entrepreneurship and income inequality. *Journal of Economic Behavior and Organization*, *145*, 275–293. https://doi.org/10.1016/j.jebo.2017.11.003

Hang, C. C., Garnsey, E., & Ruan, Y. (2015). Opportunities for disruption. *Technovation*, *39–40*(1), 83–93. https://doi.org/10.1016/j.technovation.2014.11.005

Heckman, J. J., & Pagés, C. (2004). *Introduction to "Law and Employment: Lessons from Latin American and the Caribbean." University of Chicago Press*.

Karimi, J., & Walter, Z. (2016). Corporate Entrepreneurship, Disruptive Business Model Innovation Adoption, and Its Performance: The Case of the Newspaper Industry. *Long Range Planning*, *49*(3), 342–360. https://doi.org/10.1016/j.lrp.2015.09.004

Kuddo, A., Robalino, D., & Weber, M. (n.d.). Regulations To Promote.

Kwon. (2022). Job dissatisfaction of the *Self-Employed* in Indonesia Author (s): Illoong Kwon and Kitae Sohn Stable URL : https://www.jstor.org/stable/44697220 Job dissatisfaction of the self-em, *49*(1), 233–249.

Laato, S., Islam, A. K. M. N., Farooq, A., & Dhir, A. (2020). Unusual purchasing behavior during the early stages of the COVID-19 pandemic: The stimulus-organism-response approach. *Journal of Retailing and Consumer Services*, *57*(July), 102224. https://doi.org/10.1016/j.jretconser.2020.102224

Le Dinh, T., Vu, M. C., & Ayayi, A. (2018). Towards a living lab for promoting the digital entrepreneurship process. *International Journal of Entrepreneurship*, *22*(1), 1–18.

Momeni, A., & Rost, K. (2016). Identification and monitoring of possible disruptive technologies by patent-development paths and topic modeling. *Technological Forecasting and Social Change*, *104*, 16–29. https://doi.org/10.1016/j.techfore.2015.12.003

Presutti, M., Boari, C., Majocchi, A., & Molina-Morales, X. (2019). Distance to Customers, Absorptive Capacity, and Innovation in High-Tech Firms: The Dark Face of Geographical Proximity. *Journal of Small Business Management*, *57*(2), 343–361. https://doi.org/10.1111/jsbm.12323

Richter, A. (2020). Locked-down digital work. *International Journal of Information Management*, *55*(May), 102157. https://doi.org/10.1016/j.ijinfomgt.2020.102157

Ringov, D., & Zollo, M. (2007). Corporate responsibility from a socio-institutional perspective: The impact of national culture on corporate social performance. *Corporate Governance*, *7*(4), 476–485. https://doi.org/10.1108/14720700710820551

Saebi, T., Lien, L., & Foss, N. J. (2017). What Drives Business Model Adaptation? The Impact of Opportunities, Threats and Strategic Orientation. *Long Range Planning*, *50*(5), 567–581. https://doi.org/10.1016/j.lrp.2016.06.006

Setbon, M., & Raude, J. (2009). Population response to the risk of vector-borne diseases: lessons learned from socio-behavioural research during large-scale outbreaks. *Emerging Health Threats Journal*, *2*. https://doi.org/10.3134/ehtj.09.006

Seyyed Amiri, N., Shirkavand, S., Chalak, M., & Rezaeei, N. (2017). Competitive intelligence and developing sustainable competitive advantage. *AD-Minister*, (june), 173–194. https://doi.org/10.17230/ad-minister.30.9

Soto-Acosta, P. (2020). COVID-19 Pandemic: Shifting Digital Transformation to a High-Speed Gear. *Information Systems Management*, *37*(4), 260–266. https://doi.org/10.1080/10580530.2020.1814461

Volberda, H., Mihalache, O., Fey, C., & Lewin, A. Y. (2017). Management and Organization Review Special Issue 'Business Model Innovation in Transforming Economies' . *Management and Organization Review*, *13*(2), 459–462. https://doi.org/10.1017/mor.2017.26

von Gaudecker, H.-M., Holler, R., Janys, L., Siflinger, B., & Zimpelmann, C. (2021). Labour Supply in the Early Stages of the COVID-19 Pandemic: Empirical Evidence on Hours, Home Office, and Expectations. *SSRN Electronic Journal*, (131). https://doi.org/10.2139/ssrn.3579251

Wales, W. J., Kraus, S., Filser, M., Stöckmann, C., & Covin, J. G. (2021). The status quo of research on entrepreneurial orientation: Conversational landmarks and theoretical scaffolding. *Journal of Business Research*, *128*, 564–577. https://doi.org/10.1016/j.jbusres.2020.10.046

Zaoui, F., & Souissi, N. (2020). Roadmap for digital transformation: A literature review. *Procedia Computer Science*, *175*, 621–628. https://doi.org/10.1016/j.procs.2020.07.090