

What Keeps Elderly Indonesians Working?

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Received: February 2021 | Revised: June 2021 | Accepted: June 2021

Abstract

The era of the baby boom and the improvement in the quality of life brought the Indonesian population to an aging phase. The increasing elderly population in Indonesia is not in line with the labor force participation rate of the elderly which tends to stagnant and decline based on BPS data from 2003 to 2019. This study aims to examine the determinants of the participation of the elderly to work, not only from the supply side but also from the demand side of the labor market that has never been studied in the Indonesian elderly. We use the 2018 Susenas and the 2018 Podes by Badan Pusat Statistik (BPS). We used logistic regression to analyze the variables that drive the elderly to work. From the results of the study, it is known that with a confidence level of 1 percent, poverty status, the distance to urban centers (access to work) and village industrial structure (with the agricultural sector) plays a role in increasing the opportunities for the elderly to work. While the living arrangement, age, education, and ownership of pensions contribute otherwise.

Keywords: elderly labor; family support; labor demand

JEL classification: J14, J12

How to Cite: Putri, E., & Wulansari, D. (2021). What Keeps Elderly Indonesians Working?. Jurnal Ekonomi Pembangunan: Kajian Masalah Ekonomi dan Pembangunan, 22(1), 90-103. doi:<https://doi.org/10.23917/jep.v22i1.13807>

DOI: <https://doi.org/10.23917/jep.v22i1.13807>

1. Introduction

The baby boom era that took place in the 1960s and the improvement in the quality of human life from year to year brought the world's population to an era of the aging population where the number of people aged 60 years exceeded 7 percent of the total world population (Kemenkes RI, 2017). In 2018, for the first time in human history, people aged 65 or older outnumbered children under the age of five worldwide. Between 2019 and 2050, the number of people 65 and over globally is projected to more than double, while the number of children under five is projected to remain relatively unchanged. As a result, projections show that in 2050 the number of elderly people will be twice the number of children under five. Besides, it is estimated that by 2050

the number of people aged 65 years or over will be 1.5 billion people worldwide and this number will exceed the number of young people aged 15 to 24 years, which is around 1.3 billion people (UN, 2019).

At the macro level, population aging can affect many aspects of the life of the elderly. The aging of the population can affect the labor force, labor productivity, aggregate saving, and demand (Myers, Schulz, Borowski & Crown, 1991). In Indonesia, the growth in the number of elderly people occurs quite rapidly. This is as a result of the demographic transition where Indonesia is currently at a low mortality and birth rate stage. The projection results Badan Pusat Statistik (BPS) states that in 2045 the elderly in Indonesia is estimated to reach almost one-fifth

of Indonesia's population. In line with that, the labor force participation rate (LFP) of the elderly in Indonesia based on BPS data for 2003 to 2019 tends to be stagnant, namely in the range of 46 percent to 52 percent. Even though it tends to be stagnant, the participation rate of the elderly labor force shows a downward trend, from 51.4 percent in 2003 to 49.6 percent in 2019. Considering the number of elderly people who continue to increase from year to year and the elderly's LFP which tends to decrease, the discussion is related to the extent of the contribution the elderly towards economic participation will be important.

The experience of developed countries in anticipating population aging cannot be automatically applied in developing countries like Indonesia, one of which is the pension plan. Systems in developed countries have well-institutionalized old-age benefits, the majority of the workforce has access to some form of formal social security benefits which are the main source of their retirement income (Crawford & Lilien,

1981), while in developing countries it is the opposite (Reddy, 2016). Not many elderly have a pension plan or have prepared financially well for life in old age. Without a substitute for old-age income such as retirement or planned savings, the elderly in developing countries depend on their livelihoods on family support, as well as income from work.

Traditionally, it is used in developing countries to have a large family system and it is common for parents to live with their adult children as part of the extended family. Such living arrangements provide emotional and economic support for the elderly. Although modernization theory argues that economic development results in a weakening of the relationship between parents and their adult children (Goode, 1963), however elderly in Indonesia are still in a relatively good condition of getting good family support compared to developed countries whose family values have faded (Ju & Jones, 1989; Junaidi, 2007).

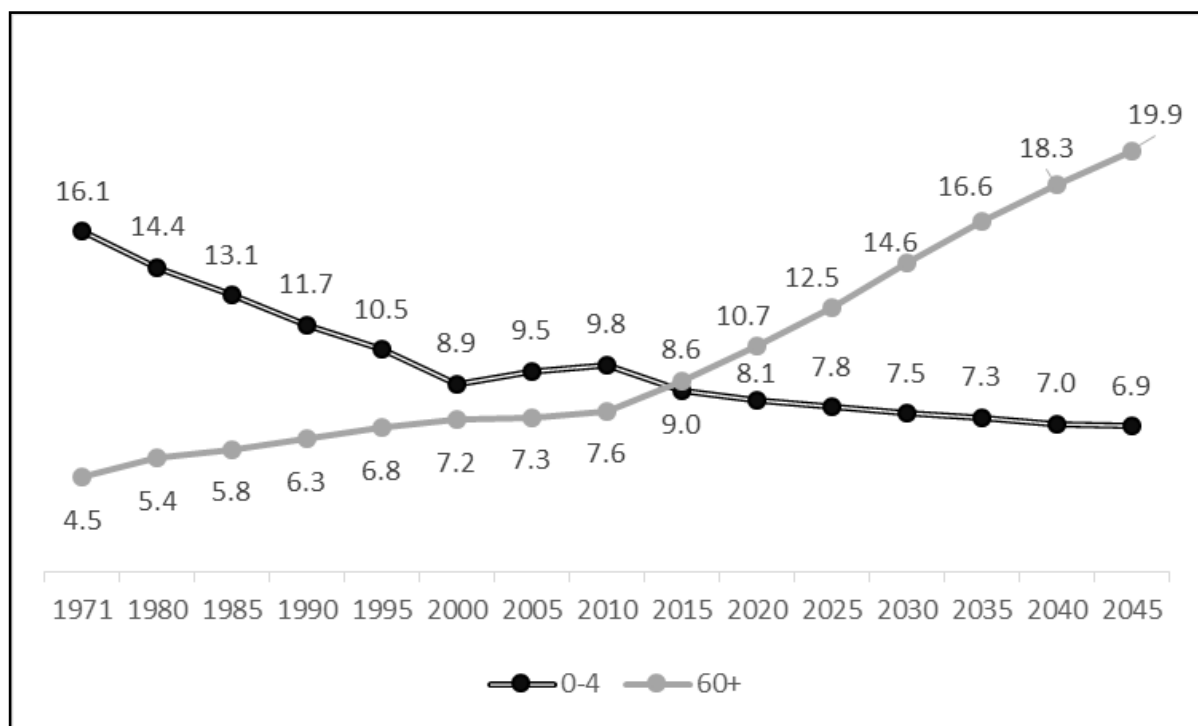


Figure 1. Percentage of Elderly and Toddler Population

Source: BPS, 2020

Initially, research related to the relationship between work decisions and family support was carried out by looking at how the income variable influenced the elderly's residency decision. From several studies, it was found that the income of the elderly significantly influences the decision of the elderly to work (Cameron, 2000; DaVanzo & Chan, 1994). With the development of the research, some researchers instead include family support as a factor that influences the work participation of the elderly along with several variables of the elderly's job offer. As research conducted by Cameron (2001) where the education of children living with the elderly significantly affects the work participation of the elderly in developing countries. This is in line with Reddy (2016) that the living arrangement of the elderly is proven to significantly affect the work participation of the elderly in India, namely that the elderly who live alone have a higher probability of working, compared to the elderly who live with their children.

Previous literature also found that poverty is the main driving factor for the elderly to work (Friedman et al., 2001; Reddy, 2016). Adhikari, Soonthordhada & Hassen (2011) states that the elderly who have low income and have debt will increase the likelihood that the elderly will continue to work. In line with previous research Giang Thanh & Le Thi, (2015) stated that the elderly who live in poverty tend to keep working.

Apart from family support, and poverty status, the determinants of the participation of older people working from the supply side were found in the previous literature such as ownership of pension insurance (Edmonds, Mammen & Miller, 2005; Kaushal, 2014; Ning et al., 2016; Widjaja, 2010), age (Dingemans, Henkens & Solinge, 2017; Engelhardt, 2012; Komp, Groenou & Tilburg, 2010), pendidikan (Agree & Clark, 1991; Giang Thanh & Le Thi, 2015; McKee, 2006; Yamada, 1990), and geographic location (Ito, Rose & Lee, 2013; Reddy, 2016).

There is very little research on elderly work decisions that touch on the demand side. Labor market conditions also have the potential to determine the elderly's decision to continue working or not (Ito, Rose & Lee, 2013). For example, Blau and Shvydko (2011), found that the economic

sector with rigidity in the use of technology can affect the age structure of the labor force, where the elderly prefer traditional jobs with flexible working hours. A recent study by Mestas, Mullen & Powell (2019) in their research concluded that elderly workers are responsive to local labor demands. From the demand side, the work participation of the elderly is driven by the local economic structure. Where the available business sector and ease of access can influence a person's decision to work (Cameron, Suarez & Rowel, 2019). With the supportive demand for local labor, and according to the qualifications of the elderly in the local area, the elderly will tend to work.

In Indonesia, Research related to the decision of the elderly to work has grown in the last ten years. However, the research conducted is still limited to the driving factor from the supply side as done by Andini, Nilakusmawati & Susilawati (2013); Febriani (2012), Moelyono & Parinding (2017), Triyanto & Lukis Panjawa (2019), and Wijaya, Muhyidin, Soebyakto, & Yuliana (2019). No one has yet included demand-side pull factors as an important factor in explaining the elderly's decision to keep working.

Therefore, this study intends to examine what keeps elderly Indonesians keep working on two sides. We distinguish the labor participation of the elderly on the supply and demand side of the labor market, such as living arrangement, education, ownership of pension security, poverty status, the type of area where the elderly resident, distance to the city center, and major local industries. By controlling for some variables on the supply and demand sides of the labor market, we can observe better the factors driving older people's work participation.

This study is organized into four parts, the first is an introduction which is presented together with a review of the research literature related to family support, poverty status, and the potential for local labor demand that affects the elderly to work as described above. The second is the research method followed by an explanation of the data used. Then the third part discusses the research findings and closes with the fourth part of the conclusions and policy implications of the results of this study.

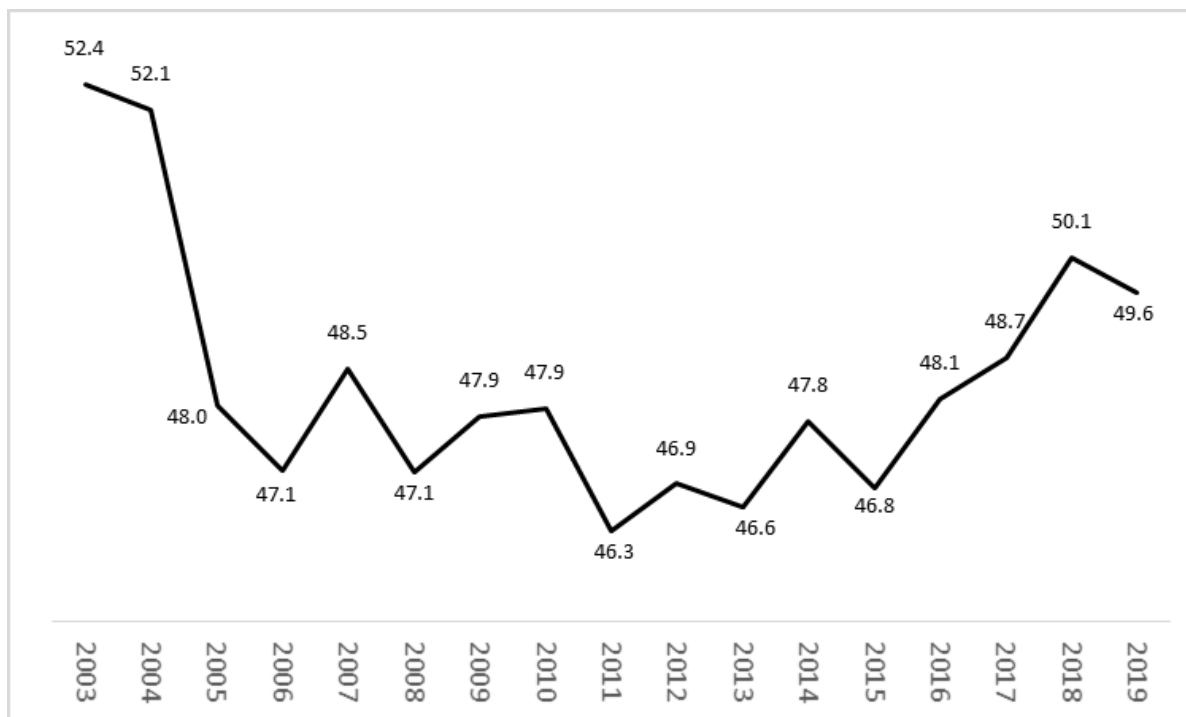


Figure 2. The Participation Rate of the Indonesian Elderly Workforce, 2003-2019

Source: BPS, 2019

2. Research Method

In this study, the response variable was used in the form of dummy variables, so the analysis tool used was binary logistic regression. Logistic regression analysis is a regression analysis used to see the effect of one or more explanatory variables on response variables that are binary or dichotomous (Hosmer & Lemeshow, 1989). In logistic regression, the response variable Y is a variable with two categories (dichotomy), namely the value of $y = 1$ indicates a “success” event and the value of $y = 0$ indicates a “failure” event so that the response variable y follows the Bernoulli distribution for each observation. In logistic regression

$$E(y|x) = \pi(x); 0 \leq E(y|x) \leq 1 \quad (1)$$

$E(y|x)$ is the mean value of the dependent variable y if x is specified, $y = 0$ or 1 . The general form of the logistic regression probability model with p factor is formulated as follows:

$$\pi(x) = \frac{\exp(\beta_0 + \beta_1 x_1 + \dots + \beta_p x_p)}{1 + \exp(\beta_0 + \beta_1 x_1 + \dots + \beta_p x_p)} \quad (2)$$

where

$\pi(x)$: probability of “success” event ($y = 1$)

β_j : parameter value, $j = 0, 1, \dots, p$

The logistic regression probability model is a nonlinear model that is difficult to estimate, so logit transformation is needed to make it easier to see the relationship between the response variable and the explanatory variable. Logit transformation is done by:

$$g(x) = \ln \left| \frac{\pi(x)}{1 - \pi(x)} \right| = \beta_0 + \beta_1 x_1 + \dots + \beta_p x_p \quad (3)$$

where $-\infty \leq g(x) \leq \infty$

Equation (2.3) above is a linear function of its parameters or $g(x)$ is linear in its parameters. If some of the control variables are discrete and have a nominal scale, then the variable is only for identification and does not have a numerical value so that a dummy variable is needed and for one independent variable with a nominal scale

with q categories, as many dummy variables as $p-1$. Suppose variable x_j has a level q_j , then the dummy variable q_j-1 is called D_{ju} with the coefficient β_{ju} , $u = 1, 2, \dots, q_j-1$. So that the logit transformation model becomes:

$$g(x) = \beta_0 + \beta_1 x_1 + \dots + \sum_{u=1}^{q_j-1} \beta_{ju} x_{ju} + \beta_p x_p \quad (4)$$

In the logistic regression model, the dependent variable is expressed as follows:

$$y_i = \pi(x) + \varepsilon_i \quad (5)$$

ε_i has one of two possible values, namely:

$\varepsilon_i = 1 - \pi(x)$, if $y = 1$ with probability $\pi(x)$, and

$\varepsilon_i = -\pi(x)$, if $y = 0$ with probability $[1 - \pi(x)]$

in this case, the error follows the Binomial distribution with means of zero and variance $\pi(x)[1 - \pi(x)]$.

This regression identified the relationships between control variables and labor force participation. Whether a working elderly person will reflect on his/her decision to work and whether

there is a demand for his/her labor, so we control for variables on the supply and demand side of the labor market. On the supply side, we use control variables such as age, education, poverty status, living arrangement, and pension ownership. On the demand side, we control the variable we included were distance to the nearest government office and the main source of income in the village. We also control for geographic variables using island classification where the elderly live.

Also, the marginal effect value will be used as a measure to determine the magnitude of the change in the response variable when there is a change in the control variable, assuming the other variables are constant. In binary variables, the marginal effect measures discrete changes. In the logistic regression model, the marginal effect of x_p is written as follows:

$$\text{Marginal effect} = x_p \text{ Prob}(y=1 | x, x_p = 1) - \text{Prob}(y=1 | x, x_p = 0) \quad (6)$$

Table 1. Summary of Research Variables

Variable	Information
(1)	(2)
Response Variable	
labor Force Participation	0 not working 1 working
Explanatory Variables	
Living Arrangement	0 living alone 1 living with spouse only 2 living with families 3 living with three generations
Age	in years
Education	0 some primary 1 finished primary 2 beyond primary
Pension Ownership	0 No pension 1 Pension
Poverty Status	0 not poor 1 poor
Region Type	0 urban 1 rural
Java / Non-Java classification	0 non-Java

Variable	Information
(1)	(2)
	1 Java
Main Source of Income in a Village	
Agriculture	0 no 1 yes
Trading	0 no 1 yes
Services	0 no 1 yes
Distance to Regency Office	distance from a household to regency offices (in km)

Table 2. Summary Statistics of Variables

Social, Economic, and Demographic Characteristics	Sample Distribution	Work Participation	
		Not	Work
(1)	(2)	(3)	(4)
Living Arrangement			
Living alone	8.6	52.0	48.0
Living with spouse only	22.1	41.3	58.7
Living with families	30.9	46.3	53.7
Living with three generations	38.4	57.7	42.7
Gender			
Man	51.5	35.3	64.7
Women	48.5	65.5	34.5
Age group			
Young Elderly (60-69)	64.7	41.2	58.8
Middle Elderly (70-79)	28.4	62.1	37.9
Oldest Elderly (80+)	6.9	81.0	19.0
Education			
Some primary	85.7	48.0	52.0
Finished primary	9.8	59.2	40.8
Beyond primary	4.5	66.8	33.2
Pension Ownership			
No pension	86.0	45.9	54.1
Pension	14.0	74.8	25.2
Poverty Status			
Not Poor	7.9	51.7	48.3
Poor	92.1	49.8	50.2
Region Type			
Urban	44.5	59.6	40.4
Rural	55.5	42.2	57.8
Java / Non-Java classification			
Non Java	62.8	49.9	50.1
Java	37.2	50.0	50.0
Total		49.9	50.1

Source: BPS 2018

Table 3. Percentage of Elderly Work According to the Main Income Sector of the Village Population Where The Elderly Lives

Characteristics	Agriculture	Mining	Industry	Trading	Services	Others
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Participation						
Not Working	44.2	60.9	58.0	62.7	50.3	63.7
Working	55.8	39.1	42.0	37.3	49.7	36.3
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: BPS, 2018

The data used in this study came from two sources, namely Survei Sosial Ekonomi Nasional (Susenas) 2018 and Potensi Desa (Podes) 2018 published by BPS. Susenas 2018 is used to collect information on individual and household characteristics of the elderly. Meanwhile, Podes is used to see demand-side characteristics of the labor market such as the distance from the residence to the nearest district/city government office (which is an approach to access to work), and the sector which is the main source of income for the population in the village.

Podes 2018 is data available for the level of presentation of village areas, while Susenas 2018 is data at the level of presentation of household/individual units. Therefore, before carrying out research data processing, it is necessary to combine the two data sets. This aims to add area-based variables from the Podes data to the Susenas household/individual data.

The unit of analysis in this study is an elderly individual who is over 60 years old, this is following Law Number 13 of 1998 that states an elderly person is someone who has reached the age of 60 years and over. In this study, observations were limited to the elderly with the status of the elderly living alone, with spouse only, with family, and three generations. The elderly who live together with other than family is not included in the observations of this study, this is to support the research objectives, namely how the role of family support in working. BPS in its publication regarding elderly data divides the elderly into three groups, namely young elderly (60-69 years), middle elderly (70-79 years), and oldest elderly

(80 years and over). Specifically in this research, the oldest elderly group does not include seniors aged 90 years and over, this is done to maintain consistency of the interval for each group of elderly people. So that the overall sample in this study included 75,983 observations, of which 49,139 observations were included in the young elderly group (60-69 years), 21,577 observations were included in the middle elderly group (70-79 years), and 5,267 observations were included in the old elderly group (80- 89 years).

Table 2. shows the characteristics of elderly respondents in this study which are sourced from the Susenas 2018 data, it can be seen that 50.1 percent of elderly people in Indonesia in 2018 are working. In other words, 1 in 2 elderly is still working in their old age. However, the participation of the elderly in work can show different patterns based on a living arrangement, age group, education, pension ownership, poor status of elderly households, region type, and classification area where the elderly live.

Based on the living arrangement of the elderly, it can be seen that the majority of Indonesian elderly people live with their three generations, meaning that the elderly live with their children and grandchildren. Meanwhile, the elderly who live alone have the smallest proportion, at 8.6 percent. When viewed based on the proportion of working elderly people, it can be seen that the more complex the family, the smaller the proportion of the elderly who work. The participation of the elderly in work can differ based on gender. Based on the results of the 2018 Susenas, it is also known that the percentage of

elderly people in Indonesia is dominated by young elderly with the percentage reaching 64.7 percent, the rest are middle elderly at 28.4 percent, and the oldest elderly at 6.9 percent. The percentage of working elderly was greater in the young elderly group, which was 58.8 percent. The proportion of elderly men who work is greater than that of elderly women, at 64.7 percent of elderly men and 34.5 percent of elderly women. If you look at the distribution of working elderly people according to education level, it is known that 85.7 percent of Indonesian elderly have not graduated from high school. And in terms of the proportion of working elderly people, it can be seen that 52 percent of the elderly who do not finish high school are working, and the percentage of the elderly working decreases when their education gets higher.

Ownership of pension security in the household also makes a difference in the proportion of elderly participation in work. In Table 2., it can be seen that the proportion of elderly people who work is greater in the group of households that have no pension security. Meanwhile, elderly households that have pension insurance show a low tendency to continue working at old age, which is only 26.8 percent. If it is based on the proportion of elderly people working based on poverty status, it can be seen that households with poor status will have a larger proportion of working elderly people than elderly people who are not poor.

When viewed by area type, the percentage of elderly in rural areas who work is higher than the elderly in urban areas. Besides, the participation of the elderly in work is also different based on the area where the elderly live in which in this study it is only divided into two, namely Java Island and outside Java Island. The participation of the elderly in work in Java is greater than outside Java.

Furthermore, Table 3. shows the proportion of elderly people who work when viewed from the demand side, namely the main source of income in the village where the elderly live, the data

is from Podes 2018. The proportion of working elderly people who live in villages where the main source of income of the population comes from the agricultural sector has a large percentage, reaching 58.9 percent. The second-largest sector is the service sector, followed by the industrial sector.

3. Result and Discussion

3.1 Result

This study uses binary logistic regression analysis techniques to see the effect of family support and the potential demand for local labor in increasing the opportunities for the elderly to work. The estimation results are equipped with the overall test, robustness check, partial test, model feasibility test (Hosmer and Lemeshow test), and marginal effect values. Table 4. presents the estimation results on several model schemes that use different observation groups based on age groups which aim to see the consistency of the estimation results (robustness check) of the main variables, namely the living arrangement, poverty status, and the main sector of income of the elderly in the village where the elderly residents. Model I uses elderly observation in the young elderly group (49,139 obs). Model II uses elderly observation in the middle elderly group (21,577 obs). Model III uses the oldest elderly observations in the elderly group (5,2671 obs). Model IV used overall observations of the elderly (75,983 obs). Based on Table 4. It can be seen that the living arrangement of the elderly has a negative effect, while poverty status and the main income sector in the village that comes from the agricultural sector has a positive effect on the participation of the elderly in work, both in the observation group of young elderly, middle elderly, oldest elderly, and overall observations. The analysis in this research will be focused on the fourth model, which is a model that uses all observations.

The main regression results are presented in Table 4. Column (8) shows the results of the parameter coefficient test partially on the explanatory variable. The variables of living

arrangement, age, education, pension ownership have a negative and statistically significant effect on the 1 percent confidence level. As expected, the existence of family support, increasing age, higher education, and pension security will reduce the opportunities for the elderly to work. Meanwhile, the variables of poverty status, area type, and island classification for elderly people have a positive and statistically significant effect at the 1 percent confidence level. When viewed from the side of potential demand for local labor, It is seen that the main source of income in a village from the agricultural sector and the further away the village where the elderly live from the district/city government center will increase the probability of the elderly to work at a 1 percent confidence level. On the other hand, the main source of income in a village comes from the service sector will reduce their probability of working at the 1 percent confidence level. Meanwhile, the main source of income in a village coming from the industrial sector did not significantly influence the elderly's participation in work.

Simultaneous testing shows that the model used in the study is feasible to use. This is indicated by a p-value that is smaller than the significance level of $\alpha = 0.05$. The Pseudo R² value in this study was 0.11, meaning that all explanatory variables in the research model were able to explain 11 percent of the response variable, while the rest was influenced by variables outside the research model. The results of the model fit test can be seen in the Hosmer and Lemeshow test obtained a p-value of 0.08 so that a significance level of $\alpha = 0.05$ indicates that the binary logistic regression model used in this study is suitable and feasible to use.

4.3 Discussion

Based on the results of this study, it appears that the existence of consistent family support is negatively associated with elderly participation in work. This means that the more complex the family where the elderly live, the lower their probability of working. Family support reduces the probability of working for the elderly in all three age groups. When entering old age, the elderly tend to depend on their families for support and assistance both economically and socially. The

marginal effect value in column (10) means that the more complex the status of the elderly is, the probability for the elderly to work will decrease by 4.79 percent. This result is in line with several previous studies that the presence of a partner or family will greatly help the elderly to be able to meet their daily needs (Reddy, 2016; Cameron & Cobb-Clark, 2001; and Cameron, 2000).

In addition to the variable family support, the social, economic, and demographic characteristics of the elderly can also increase the opportunities for the elderly to work. Poverty conditions are one of the main drivers of the elderly, this can be seen from the estimation results that show the positive effect of poverty conditions on the participation of the elderly in work. This means that the elderly who live in poor households will have a higher probability of working compared to the elderly who live in non-poor households. The marginal effect value shows that the elderly who live in poor households will increase their probability of working by 3.92 percent (L. A. Cameron & Cobb-Clark, 2002; Friedman et al., 2001; Giang Thanh & Le Thi, 2015; Reddy, 2016).

Pension ownership has a negative and significant result in affecting the opportunities for the elderly to work. Receiving income in old age such as pensions can replace the income that should be obtained from work so that pension security can reduce the probabilities of the elderly continuing working. Based on the value of the marginal effect, it is found that the elderly who have pension security will reduce the opportunities for the elderly to work by 24.19 percent. This is in line with several studies which suggest that pension benefits make older workers leave the labor market faster (Yamada, 1990; Wan Ahmad, Ismail, Rahman & Asyraf, 2011; Giang Thanh & Le Thi, 2015; and Dingemans, Henkens & Solinge, 2017).

The elderly age variable is negatively associated with work participation. This means that as the elderly get older, their probabilities of working will decrease. This is because the older the elderly, the weaker their physical condition prevents them from continuing to work. In line with several previous studies that the probability of younger elderly people is greater than older

seniors (Dingemans, Henkens & Solinge, 2017; Engelhardt, 2012; and Cameron & Cobb-Clark, 2001). The higher education level of the elderly has a negative effect on the participation of the elderly in work. This means that the higher the education of the elderly, the less probability for the elderly to work. This can be because the elderly with high levels of education have sufficient wealth for their old age compared to elderly people with low levels of education (BPS, 2018).

Looking at the demand side of the labor market, the variable distance between the village where the elderly live to the regency office is an approach for the variable access to work. This study hypothesized that the coefficient of distance to the regency office will be negative because this variable aims to capture the distance to the nearest labor market where the farther the elderly travel to find work, the less likely they are to participate in work. However, in this study, the coefficient positively affects the opportunities for the elderly to work. The marginal effect value shows that the farther the village where the elderly live from the center of government, the probability for the elderly to work will increase by 0.59 percent. This variable can relate to agricultural work in rural areas, with a positive coefficient that reflects a greater involvement of the elderly in the agricultural sector. The coefficient of the main source of income in the village shows that the highest probability for elderly work participation occurs when the elderly live in a village with the main income from the agricultural sector. This is due to several things such as low education and limited employment opportunities so that the probability of elderly people involved in the agricultural sector continuing working are greater than other sectors. In developing countries, the agricultural sector does not require a retirement age as long as they are physically able (Wan Ahmad, Ismail, Rahman & Asyraf, 2011). Furthermore, for villages where the main income of the population is from the service sector, it is negatively associated with working. This is different from developed countries where the service sector plays an important role in influencing the elderly's decision to keep working

(Maestas, Mullen & Powel, 2019). In developing countries, the availability of service sector business opportunities tends to reduce the opportunities for the elderly to work. This is because most of the elderly only have low educational qualifications so that only a small proportion of the elderly have the probability to work in the service sector. Meanwhile, the main source of income in a village comes from the industrial sector has not had a significant effect on the work participation of the elderly in Indonesia.

The effect of the type of area where the elderly live shows that the elderly who live in rural areas have a significantly greater probability of working than the urban population. Compared to rural areas, in urban areas the proportion of people working in the formal sector is relatively higher and these urban workers have a greater probability of getting pension security. On the other hand, most rural workers work in informal agriculture and non-agricultural jobs which usually not only offer low income but also do not offer pension benefits. Therefore, the elderly in rural Indonesia must support themselves by continuing to work (Reddy, 2016). The participation of the elderly in work can also be based on the island where they live. The elderly who live on Java Island has a higher probability of working compared to the elderly who live on other islands. This happens because the largest number of poor people are in Java. The elderly who live in poor households will tend to work to make ends meet.

5. Conclusion

Based on the results of the study it can be concluded that the participation of the elderly in work is influenced by supply and demand factors. The main drivers were found through the positive influence of poverty status, access to work, and village industrial structure (with agriculture being an elderly-friendly industry). The agricultural sector which has a positive correlation indicates that the involvement of the elderly is greater in the agricultural sector than in other sectors. This is in line with the variable distance between the elderly village and the regency office which has a positive coefficient. This means that

employment opportunities in the vicinity of the local regional government center cannot increase the opportunities for the elderly to work, on the contrary, the elderly in Indonesia are still focused on participating in the agricultural sector, which is mostly done in rural areas. The opportunity for the elderly to work will also increase based on the type of area and geographical location, where the elderly living in rural areas and the elderly on Java island will increase the opportunities for the elderly to work.

Our results can be the implication for policy. The slow movement of the Indonesian economy away from the agricultural sector and the elderly who tend to work in the agricultural sector will pose a threat to the availability of employment for the elderly in the future, especially in rural areas. Therefore, the government must design policies that can provide wider access to the elderly, especially in sectors that are growing rapidly in Indonesia such as the industrial sector.

One of the limitations of this study lies in the involvement of the explanatory variable used, participation in the workforce for some elderly people is not only limited to meeting life needs but can be caused by personal satisfaction preferences for which data are not available. The second limitation lies in the data used. The 2018 Susenas data cannot provide more detailed family support data. In this study, family support is reflected in the limitation of living arrangements for the elderly whether the elderly live alone, with a spouse only, with family, or with three generations. Another limitation of this study is the use of cross-section data so that it cannot see the trend of work participation in the elderly and the variables that influence it.

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7. Appendix

Table 4. Logistic Regression Estimation Results

Variabel	I		II		III		IV			
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE	Marginal Effect	SE
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Living Arrangement	-0.154 ***	0.010	-0.240 ***	0.014	-0.301 ***	0.033	-0.192 ***	0.008	-0.048 ***	0.002
Age	-0.078 ***	0.004	-0.095 ***	0.006	-0.060 *	0.014	-0.099 ***	0.001	-0.025 ***	0.000
Education	-0.077 ***	0.021	-0.040	0.042	0.217 *	0.122	-0.069 ***	0.018	-0.017 ***	0.005
Pension	-1.046 ***	0.032	-0.976 ***	0.053	-0.976 ***	0.136	-1.025 ***	0.027	-0.242 ***	0.006
Poverty Status	0.145 ***	0.037	0.185 ***	0.050	0.165	0.122	0.157 ***	0.029	0.039 ***	0.007
Region Type	0.358 ***	0.028	0.299 ***	0.043	0.319 ***	0.104	0.339 ***	0.023	0.084 ***	0.006
Java/Non Java Classification	0.095 ***	0.021	0.161 ***	0.032	0.193 **	0.077	0.120 ***	0.017	0.030 ***	0.004
Main Sector										
Agriculture	0.420 ***	0.033	0.470 ***	0.054	0.435 ***	0.144	0.437 ***	0.028	0.109 ***	0.007
Industry	0.049	0.046	-0.008	0.081	-0.125	0.246	0.027	0.039	0.007	0.010
Services	-0.110 ***	0.037	-0.185 ***	0.069	-0.007	0.187	-0.123 ***	0.032	-0.031 ***	0.008
Distance to Regency Office	0.025 *	0.009	0.023	0.015	0.022	0.037	0.024 ***	0.008	0.006 ***	0.002
Pseudo R2	0.066		0.070		0.056			0.110		
P-value	0.000		0.000		0.000			0.000		
Goodness of Fit	0.147		0.332		0.478			0.087		

Note: The response variable used in each model is the participation of the elderly in work.

Model I uses elderly observation in the young elderly group (49,139 obs). Model II uses elderly observation in the middle elderly group (21,577 obs). Model III uses oldest elderly observations in the elderly group (5,2671 obs). Model IV used overall observations of the elderly (75,983 obs). All regression results yielded an intercept, but they didn't interpreted. The overall test results are significant at the alpha level of 1% in each model.

Significant level: * p <0.1, ** p <0.5, *** p <0.01