The factors influencing labor supply (the case for worker with non-permanent mobility in Central Java Province, Indonesia)

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Abstract. The study about the labor supply based on worker with non-permanent mobility is very interesting, because we can find several reasons such as flexible time, family reasons, cost of living, and others. From this paper, we try to find out the factors that influence the labor supply based on worker with non-permanent mobility. This paper uses Sakernas data and the Heckman two step estimation procedure. We found that the factor from education, age, marital status, and rural-urban influence on the labor supply for worker with non-permanent mobility in Central Java Province. We suggest that the government needs to improve public transportation facilities that are feasible, accessible, safe, comfortable, and friendly to the population. In addition, when developing each mode of transportation, the government also needs to consider the physical and mental capacity aspects of transportation users, especially for commuters.

1 Introduction

In the world of employment, there are two things that cannot be separated, namely population and development. This happens because both are interrelated where the population is the center of development, in other words, the population can be the subject and object of development [1]. So it’s not surprising that the development should be centered on humans, where it can involve four important elements, namely education, health, freedom of movement, and freedom from fear. On the other hand, the population when viewed from the side of employment can represented as the offering for the labor market in a region. Although not all residents can do it, because only the working age population can be in the labor market [2,3].

By definition, the working age population is divided into two groups, namely the workforce and the others. The workforce consists of residents who actively work or who looking for a job (often called open unemployment); while non-workforce groups are those who are still in school, taking care of households, retirees, etc. In addition, if it’s associated with the phenomenon of worker mobility, it has become a common trend for some workers in Indonesia. Labor mobility can be divided into two types, namely spatial labor mobility and non-spatial labor mobility. Spatial labor mobility consists of the permanent mobility and the non-permanent mobility. For non-permanent mobility, it’s divided by commuting and circular. The commuting defined with the movement of residents from the area of origin to the destination area within a certain time limit to return to the area of origin on the same day. The
circular is the movement of residents from the area of origin to the destination, usually to earn a living, but they stay temporarily because they consider permanent residence in the area of origin [1].

In various regions, there is a shift from permanent mobility to non-permanent mobility. One important factor that can be a concern is the improvement of transportation facilities because it can change the behavior of worker mobility, such as ownership of motorized vehicles tend to increase, public transportation facilities are getting better, and modes of transportation are becoming increasingly diverse [4,5,6].

Based on the background above, the aim of this paper wants to find out what the factors influence labor supply for workers with non-permanent mobility. Where, the workers with non-permanent mobility tends to increase, besides that this type of mobility is very suitable with work participation in the informal sector because of a flexible time commitment that it allows individuals to return to their home country (hometown) more often. Then, the cost of living in the destination area tends to be higher than in the area of origin, making workers prefer to do non-permanent mobility.

2 Methods

This section attempts to explain the methods used namely data and estimation techniques, to address the research objectives. This study uses data from Sakernas, where the data is most representative, since data from Sakernas is explicitly intended to collect data that can explain the present condition of employment for a certain period of time. To address the problem of selection bias that typically occurs when researchers estimate the labor supply models, the Heckman two step estimation procedure is applied.

2.1 Data

The data in this study using a national labor force survey data (Sakernas). The 2015 Sakernas data is used in this paper. In this sakernas data, we can find information about worker characteristics both from the social demographic to the economic side. Information such as gender, age, education, time of work, distance to work place, industrial origin, wages, reasons for work, reasons for stopping, and information on work experience. This paper collect the information about wage, age, gender, marital status, characteristics of the region, and the highest education level attained.

2.2 The Estimation Technique and The Empirical Model

The paper employed the Heckman two step estimation procedure [7]. To explain this, the exact form of the two-step Heckman process is shown below, where the first equation (Eq.1) represents the selection equation and the second equation (Eq.2) represents the substantive equation of interest.

\[ Y_2 = aZ + \delta \]  
\[ Y_1 = y_0 + y_1 X + \sigma \rho_\delta \lambda (T - aZ) + \sigma' \epsilon' \]

The selection equation is estimated using the probit regression, \( Y_2 \) is the dependent variable which is dichotomous, \( Z \) is the independent variable, \( a \) is the Z coefficient, and \( \delta \) represents the normally distributed error term. In the regression equation, the \( Y_1 \) value is observed when \( Y_2 \geq T \) (threshold), and censored (i.e. missing) if \( Y_2 \leq T \). Estimation of equation (2) would be biased by simply regressing \( Y \) on \( X \) due to the sigma term, which represents the omitted variable. We can solve this problem in two steps. The first, at equation (1), we estimated it using probit and it preserves the expected values as estimates of \((T - aZ)\). In each case, the inverse Mills ratio can calculated by dividing the normal density function evaluated at \(-(T - aZ)\) by one minus the normal cumulative distribution function estimated at \(-(T - aZ)\), as follows.

\[ \lambda (T - aZ) = \frac{\phi(T - aZ)}{1 - \phi(T - aZ)} \]
Then, we estimated with the ordinary least square regression with X and the inverse Mills ratio used as regressors. The empirical model becomes

\[ \ln(wage_i) = \delta_0 + \delta_1 \text{juniorhigh}_i + \delta_2 \text{seniorhigh}_i + \delta_3 \text{university}_i + \delta_4 \text{age}_i + \delta_5 \text{age2}_i + \delta_6 \text{male}_i + \delta_7 \text{urban}_i + \delta_8 \text{married}_i + \gamma \lambda_i + \epsilon_i \] (4)

The description of the variables from the empirical model in equation (4) as follows.

| Variable  | Description                                                                 |
|-----------|-----------------------------------------------------------------------------|
| Lwage     | wages in the form of money and goods (which can be valued in rupiah).        |
|           | This variables in the logarithms form.                                      |
| juniorhigh| 1 = finished junior high school; 0 = other                                  |
| seniorhigh| 1 = finished senior high school; 0 = other                                  |
| university| 1 = finished university; 0 = other                                          |
| Age       | Age                                                                         |
| age2      | age squared                                                                  |
| Male      | 1 = male; 0 = others                                                        |
| Urban     | 1 = who lived in urban; 0 = others                                          |
| married   | 1 = if married; 0 = others                                                  |
| lambda    | invers mills ratio                                                          |

### 3 Result and Discussion

Based on Table (2), most circular mobility workers are male, as well as for commuter mobility workers. However, for the category of female having commuter mobility workers tend to be higher than circular mobility workers. It could be an indication of the possibility of a better and more affordable transportation system, besides that there are also various alternative modes of transportation; this allows workers to return faster to their place of origin or residence so that they can immediately diversify their work in their place of origin [1]. In addition, the proportion of female workers is higher for commuters than circular, which is an indication of the still large role and duties of female in the household [8]. This can be seen from the proportion of commuter workers with married status greater than others. In addition, married workers tend to be higher for circular mobility, while non-married workers choose to do commuter mobility compared to circular mobility [3].

| Character | Percentage | Character | Percentage |
|-----------|------------|-----------|------------|
| Sex       |            |           |            |
| Male      | 94.35      | 63.98     | 21.35      |
| Female    | 5.65       | 36.02     | 78.65      |
| Urban-Rural |          |           |            |
| Urban     | 43.69      | 72.78     | 16.94      |
| Rural     | 56.31      | 27.22     | 83.06      |
| Status    |            |           |            |
| Married   | 91.78      | 71.55     | 6.15       |
| Other     | 8.22       | 28.45     | 93.85      |

If we see from the status of residence, workers living in urban areas tend to do commuter mobility, this indicates that commuter workers tend to be more educated where they prefer to live in urban areas and can enjoy increased utility by working in other cities that provide higher wage rates [10]. In terms of education, workers with graduate education from high school tend to be commuter, this indicates the
existence of utility differs according to education level. Higher education tends to make individuals maximize utility by doing mobility in other areas [6,8].

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From table 3, lambda values are not significant so this gives the conclusion that there is not enough evidence that there is a sample selection bias problem [7]. The value of R-squared obtained from the regression output were 0.193 and 0.269, we can interpret that 19.3 and 26.9 percent of the dependent variable variation can be explained by independent variables while 80.7 and 73.1 percent are explained by other variables outside the model. This R-squared value can be categorized as low, but this value can still indicate the existence of a real relationship between significant independent variables and the dependent variable. According to some researchers, such as Neter and Wiserman states that R-squared can be a measure of explanatory power, but does not determine whether the model is fit or not. In addition, in social science discipline, often not all predictor variables are relevant to explaining the response variable, so that the variable does not have to be included in the regression model. In social science disciplines or other disciplines involving behavior, it is quite difficult to obtain high R-squared values [9].

| Dependent: wage | Circuler | Comuting |
|-----------------|---------|----------|
| Independent: Coef. Std.Err Sign | Coef. Std.Err Sign |
| juniorhigh | 0.154 | 0.047 *** | 0.239 | 0.051 *** |
| seniorhigh | 0.366 | 0.052 *** | 0.455 | 0.044 *** |
| university | 1.116 | 0.080 *** | 0.930 | 0.050 *** |
| age | 0.026 | 0.014 * | 0.019 | 0.009 ** |
| age2 | -2.2E-04 | 1.62E-04 | -9.97E-05 | 1.11E-04 |
| male | 0.159 | 0.108 | 0.099 | 0.032 *** |
| urban | -0.083 | 0.041 ** | 0.019 | 0.035 |
| married | 0.190 | 0.086 ** | 0.103 | 0.043 ** |
| lambda | 0.087 | 0.224 | 0.034 | 0.205 |
| cons | 13.308 | 0.283 *** | 13.053 | 0.163 *** |

Table 3: Estimation Results

Next, the level of education is one of the important factors in determining the amount of wages. Each level of education shows different coefficients and increases with increasing levels of education. In general, in the circular mobility equation, if all independent variables are assumed to be constant, individuals with junior high school education will receive an average income greater than 15.4% compared to individuals with elementary education, while individuals with high school education and universities tend to be higher with each respectively at 36.6% and 111.6%. This findings is no different from the commuter equation, where the higher education of the individual tend to get the higher of wage. This finding can also explain that education is essential, as better educated workers may increase the probability of being stuck in relatively disadvantaged jobs if it is connected to job flexibility. They may have the least chance of being able to escape from unprofitable occupations, since those who are
university graduates are typically faced with jobs that require autonomy, responsibility and ownership of high-level skills [10]. For age, which in this case can be used as a proxy for work experience, linearly and quadratically also has an influence on the amount of income. Every additional one-year age, income will grow by an average of 2.6% in circular mobility equations and 1.9% in the equation of commuter mobility. On the other hand, age also contributes to income generation, where the effect tends to decrease after reaching the peak age, where increasing age will actually reduce the individual income rate [6,8].

Gender has a positive influence on wage. This means, in the condition that all other independent variables are assumed to be unchanged or constant (ceteris paribus), male have an average income of 15.9% (for circular mobility equations) and 9.9% (for equations of commuter mobility) higher than female. This indicates that there are still differences in income based on sex so that there is a gap between male and female. The factor of marital status provides a uniform finding where married individuals have higher average income than others [11]. The findings confirms that the existence of gender is used to identify the existence of gender gaps. In several studies, it has became important for policy issues. Then, the gender differences in commuting are interesting, given that they can lead to differences in welfare and health between male and female workers, and it may explain the gender wage gap [12]. However, non-permanent workers often triggers gender stereotypes, usually it's related to women's lack of commitment to work towards family responsibilities. Although this creates a cognitive bias that can undermine the evaluation of women's performance, they are represented as vulnerable individuals, when it comes to carrying out the role of mothers with young children, this arises from the concept of 'ideal worker' which is built with the assumption of individuals who prioritize work commitment. In addition, the existence of gender assumptions has made women have a disproportionate responsibility because they are faced with conditions for caring their children and running the household [13].

Same with the level of education, residence status (urban-rural) also has an influence on wages, although the sign is different between circular mobility and commuter mobility. In this empirical study, it was found that individuals living in urban (circular mobility workers) had an average income of 8.3% lower compared to individuals living in rural. Whereas in the commuter equation, individuals living in urban have higher average incomes than individuals who live in rural. This finding is in line with the previous study that commuter workers tended to be more educated, living in urban areas would get better utilities, for example, higher wages were received [14]. But, for people who live in urban areas, they often faced with traffic jams, it has become an environmental, economic and social issue. The costs resulting from traffic congestion have been calculated by many studies. In Europe, it is estimated to cost around 1 percent of Gross Domestic Product (GDP) annually. So it's no surprise, the commuters face recurring traffic jams every day during peak hours [15]. While commuting has become an important part of many urban people's daily life, many studies also have found a negative impact of long trip on academic and job performance [16]. Usually, they are faced with physical and emotional fatigue. It is very important to consider these things, not only to choose the right mode of transport, but also to develop each mode of transport [17].

4 Conclusion
Based on the analysis and findings above, this paper concludes that, First, the factors that influence the labor supply based on worker with non-permanent mobility are education, age, marital status, and rural-urban. Second, the factor of education plays an important role in wages where the higher education tends to be the higher wages. Individuals who complete university level education have the opportunity to get higher wages than those who are educated below.

In the future, more workers will carry out work mobility, it will require an increase in public transportation facilities and infrastructure. The government needs to improve transportation facilities that are appropriate, accessible, safe, comfortable, and friendly to the population, especially for the female and the elderly. In addition, its effect on the physical and mental capabilities of commuters needs to be addressed in the development of each mode of transport. Because it’s related to academic and work achievement. Commuter workers employed in labor-intensive industries, for instance, they can suggest using less strenuous modes of transport.
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