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CONFERENCE PROCEEDINGS

The 14th IRSA International Conference

"Strengthening Regional and Local Economies"

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PROCEEDING

THE 14th IRSA INTERNATIONAL CONFERENCE 2018

Strengthening Regional and Local Economies

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The Determinants of Earnings: Analyzing the role of Abilities on Labour Market Outcome in Indonesia

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ABSTRACT

This study aims to examine the contribution of schooling to earnings by incorporating the potential endogeneity issue in the basic Mincer model. Considering the development in the methodology aspect of the earnings model, this study employs both approaches suggesting by Humprey (2012) and Lall and Sakallarious (2010). The two Stage Least Squares (2 SLS) is employed to manage the endogeneity issue by using the direct measure of cognitive ability as instrument of schooling. In addition, this study adds some control variables covering the individual ability to improve the quality of basic Mincer model as suggested by Humprey (2012). This study exploits the benefit provided by the Indonesia Family Life Survey dataset (IFLS) which provides direct measures of ability comprised both cognitive and non-cognitive skills. The modified Mincer equation was estimated to examine the role of schooling, working experience, tenure, demographic factors and personality traits and cognitive capacities on monthly wages. The results show that schooling, cognitive and non-cognitive of personality traits determine the labour market outcomes. The level of education has positive and statistically significant influence on monthly wages on both estimations.

Keywords: wages, labour market, cognitive & non-cognitive skill, big five personality traits, Mincer equation

INTRODUCTION

In the labour economics literature, the basic Mincer model is frequently employed to understand the determinants of earnings. The model stipulates that wages are determined by schooling measured by years of education and experience. Humphreys (2012) criticizes the basic model since it suffers some methodological issues. First, the model has the problem of endogeneity and the omitted variable bias. Second, there is non-linearity of the relationship between wages and education unlikely the basic mincer model that assumes the linearity of the relationship between wage and education (Maluccio, 1998). Finally, there may be a condition where there are different experience premiums for people with different levels of education.

In addition, Dickson (2009) argues that the return on education estimated using the basic Mincer model is valid if there is no relationship between individual characteristics such as ability and

residuals. In addition, the relationship is valid if the relationship between schooling and residuals is non-zero. Meanwhile, some studies reveal that education measured by schooling is endogenous variable since there is possibility that unobserved characteristics influence the schooling choice that may correlate with earnings.

Harmon et al., (2003) also concerns the potential endogeneity problem of the basic Mincer model due to “ability bias”. The bias can be explained by the contribution of hidden ability in earnings. The paper describes that students with greater abilities which is hidden and unobservable are likely to have higher education so that receives higher earnings. Thus, the causal relation between schooling and earnings could not be explained using the simple relation. Further, Harmon et al., (2003) and Maluccio (1998) suggest to include more variables capturing the natural ability such as IQ test score and school grade.

Alternatively, Lall and Sakallariou (2010) suggests to solve the endogeneity issue by using the instrumental variable (IV) approach. The model should select the instruments which are closely correlated with schooling but it is not correlated with the ability (as unobserved characteristics) and earnings. Their study employs the distance of schooling and the spouse’s education as instruments in the earnings model. This approach is without critique as Humprey (2012) argues that the IV model generates higher coefficient for education compared to Ordinary Least Squares (OLS) approach while the previous literature suggests that the coefficient should be lower.

Therefore, this study aims to examine the contribution of schooling to earnings by incorporating the potential endogeneity issue in the basic Mincer model. Considering the development in the methodology aspect of the earnings model, this study employs both approaches suggesting by Humprey (2012) and Lall and Sakallariou (2010). The two Stage Least Squares (2 SLS) is employed to manage the endogeneity issue by using the direct measure of cognitive ability as instrument of schooling. In addition, this study adds some control variables covering the ability to improve the quality of basic Mincer model as suggested by Humprey (2012). This study exploits the benefit provided by the Indonesia Family Life Survey dataset (IFLS) which provides direct measures of ability comprised both cognitive and non-cognitive skills.

LITERATURE REVIEW

Canonical model stipulates that human capital determines the level of earnings (Bowles, Gintis, & Osborne, 2001). Human capital can be defined as the skills consisted of capacities that contribute to production. Some literatures proxy human capital by the schooling variable of the years of education. In addition to schooling, literature acknowledges the role of other demographic characteristics such as individuals’ age, working experience and occupation on earnings. However,

Bowles et al. (2001) argued that the capability of demographic factors to explain earnings variation in the US was merely two-thirds until four-fifths and left one-third until one-fifth earnings variation unexplained. In addition to demographic characteristics, some studies found that parents' success passes on to their children in terms of advantage in the labour market. This advantage includes superior education, an inheritance of wealth, or genetic inheritance of cognitive ability (Bowles et al., 2001).

In terms of skills, in general literature on labour market confirmed that both observed skills and unobserved skills contributes to labour productivity. The observed skills are measured by the schooling, works experience and positive influence from parents and peers. Further, unobserved skills are consisted of cognitive and non cognitive skills. Bowles et al. (2001) reported two studies examining the role of unobserved skills into labour market outcomes in the US and the UK. The first study was conducted for 3,000 employers assessing the importance of skills in the hiring for production workers. The survey found that the unobserved skills both cognitive and non cognitive are important in determining the hiring results. Using the five-scale where 1 is unimportant and 5 is very important, the survey reported that employers perceived attitude as highly important skills with means score of 4.6 and followed by communication skills of 4.2 means score. Further, cognitive skills measured by score of employer giving tests was scored 2.5. The second study explored the skill shortage in the UK and found that workers have an issue in terms of lacking of technical skills by 43 per cent and lacking of personality traits such as poor attitude, motivation and personality of 62 percent.

Plenty empirical studies have confirmed the positive effect of cognitive ability on wages (Becker, 1993) and economic growth (Hanushek 2013). Early studies discussing the importance of cognitive capacities in determining economic status was examined in the psychology and sociology literatures. A prominent literature by Herrnstein & Murray (1994) known as the "g" theory of human behaviour emphasized the importance of cognitive capacities measured by Intelligence Quotient (IQ). They argued that cognitive ability is the best predictor of workers' productivity. This proposition was supported by Jensen (1998) that cognitive capacities is the main elements of socioeconomic outcomes.

Moreover, current empirical studies argued that both cognitive and non-cognitive skills are capable to predict the outcome of the labour market Heckman & Urzua (2006). Their study found that both capacities are capable in explaining labour market outcomes and social behaviour. In addition, a study by Heckman & Kautz (2012) focused on the role of non-cognitive skills on wages in the labour market. A study by Bowles et al. (2001) convey that the standard set of factors determining earnings such as age, years of schooling, years of labour market experience, parents' level of schooling, and

occupation in the standard earnings equation contribute less in explaining the earnings of workers. The US data reveals that for about 65 percent to 80 percent of natural logarithm of earnings of hourly wages of annual earnings could not explained by the canonical model of earnings.

DATA AND METHODOLOGY

This study utilizes the advantage of cognitive skills and personality traits data collected by the Indonesia Family Life Survey (IFLS). In addition, a whole set of data of demographic background, education, working experience, tenure, cognitive capacities and personality traits is generated from IFLS dataset. Particularly, this study employed the IFLS wave five collected between 2014 and 2015. The personality traits information is only available for the wave 5 IFLS data. There are 8,810 sample representing 86 per cent of all population of Indonesia. The samples resided at the 13 provinces in Indonesia which are all provinces in Java island, Bali, Nusa Tenggara Barat, South Sulawesi, South Kalimantan, South Sumatera, Lampung, West Sumatera and North Sumatera.

This study employs some empirical models to understand the role of cognitive and non-cognitive capacities on wages. The cognitive factor is measured by the education level and non-cognitive capacity is proxied by using the personality traits response. The empirical models also include demographic variables such as gender, age and marital status.

The first empirical model is Mincerian equation estimating the contribution of schooling measured by years of education on labour market outcomes proxied by monthly wages. The empirical model was adopted from Purnastuti et al., (2013) is as follow:

$$\text{Log}(wage) = \beta_0 + \beta_1 education_i + \beta_2 expr_i + \beta_3 expr_i^2 + \beta_4 tenure_i + \beta_5 tenure_i^2 + \beta_6 male_i + \beta_7 married_i + \beta_8 urban_i + \mu_i \quad (1)$$

Finally, in order to captures schooling and the non-cognitive capacities of individuals on wages, this study includes the personality traits in the Mincerian equation. Below is the empirical model:

$$\text{Log}(wage) = \beta_0 + \beta_1 education_i + \beta_2 expr_i + \beta_3 expr_i^2 + \beta_4 tenure_i + \beta_5 tenure_i^2 + \beta_6 male_i + \beta_7 married_i + \beta_8 urban_i + \beta_9 openness_i + \beta_{10} conscientiousness_i + \beta_{11} extraversion_i + \beta_{12} agreeableness_i + \beta_{13} neuroticism + \mu_i \quad (2)$$

The ordinary least squares are employed to estimate all empirical models. By construction, the model ignores the underlying accumulation process for education; education is assumed to be exogenous. One of the alternatives to avoid OLS inconsistency, proposed initially in the context of cross section data, is the use of instrumental variables (IV) procedures, where education is treated as an endogenous regressor, in the econometric sense of being correlated with the residual (Ruiz, Gómez, & Narváez, 2010). Another common approach is to use an instrumental variable (IV) that

correlates closely with schooling but is not correlated with ability or wages. Possible confounding instrumental variables include ability, health, and family background characteristics. Any resultant correlation between education and the wage, then, can no longer be reliably interpreted as a causal effect (that is, an economic return).

Dickson (2009) explains that instruments must be correlated with the endogenous variables but not with the random error (rank condition), legitimately excluded from the wage equation (exclusion restriction) and be more numerous than the endogenous regressors (order condition). Suppose that Z_1 and Z_2 are two possible instruments for a variable X . The empirical model was adopted from Dickson (2009) is as follow:

$$\begin{aligned} \text{Cov}(Z_1, \mu) &= 0 = \text{Cov}(Z_2, \mu) \\ \text{Cov}(Z_1, X) &\neq 0 \text{ and } \text{Cov}(Z_2, X) \neq 0 \end{aligned}$$

The instruments variable used in this study are cognitive abilities based on Witoelar (2016). Cognitive abilities consist of episodic memory: Immediate and delayed word recall, Raven's Progressive Matrix (EK Test), and Woodcock-Johnson Battery Cognitive Test (WJ Test).

Over many years, economists have attempted solve the problem of the endogeneity of education in a number of ways. Firstly, a number of studies attempt to control for the effect of ability bias directly by including measures of ability such as IQ and other test scores in the model (Dickson, 2009). An alternative strategy which has been the focus of much of the literature, is to identify a variable (or ideally a set of variables) which affect education but do not independently enter into the earnings equation and are uncorrelated with the error term in the wage equation. If such variable(s) can be found, then they can be used to construct instrumental variables estimates of the return to education by 2SLS model. Recalling the model from the start of this section, the moment conditions that we want to impose:

$$\text{Education} = \alpha_0 + \alpha_1 \text{episodic memory test} + \alpha_2 \text{EK Test} + \alpha_3 \text{WJ Test} + v \quad (3)$$

In equation (3), added some exogenous variable as instrument variable for education. We assume $\text{Cov}(\text{episodic memory test}, v) = 0$; $\text{Cov}(\text{Raven's Progressive Matrix Test}, v) = 0$; and $\text{Cov}(\text{Woodcock-Johnson Battery Cognitive Test}, v) = 0$, which implies that all instrument variable it is not correlated with the error term.

Episodic memory test is memory test proposes to assess conjointly semantic and episodic knowledge across multiple tasks: semantic matching, naming, free recall, and recognition (Tulving, 1993). The Woodcock-Johnson sets a new standard for evaluation of individual strengths and weaknesses among contemporary, theory-based measures of academic achievement, oral language,

and cognitive abilities (Schrank, 2014). The Raven's Progressive Matrices (RPM) test is a standardized intelligence test that consists of visually presented, geometric-analogy-like problems in which a matrix of geometric figures is presented with one entry missing, and the correct missing entry must be selected from a set of answer choices (Kunda, Mcgreggor, & Goel, 2009).

TABLE 1. Operational Definition of Variables

Log Wage	Natural logarithm of monthly earnings/wages
Education	Number of years of schooling
Experience	Number of working experience
Experience ²	Quadratic of working experience
Tenure	Number of years of tenure
Tenure ²	Quadratic of number of years of tenure
Dummy Male	Dummy for male workers; 1= male, 0 = female
Dummy Married	Dummy for marital status; 1= married, 0 = single/ divorce/ widow/ others
Dummy Urban	Dummy for location; 1= urban, 0 = rural
Openness	Dummy for openness personality; 1 = openness, 0 = others
Conscientiousness	Dummy for conscientiousness; 1 = conscientiousness, 0 = others
Extraversion	Dummy for extraversion; 1= extraversion, 0 = others
Agreeableness	Dummy for agreeableness; 1= agreeableness, 0 = others
Neuroticism	Dummy for neuroticism; 1= neuroticism, 0 = others
Instrumental variable	
Woodcock-Johnson Test	Taken from the Woodcock-Johnson Battery Cognitive test scores using W-score and standard errors are computed and attached to each individuals
Raven's Progressive Matrices (RPM) Test	Standardized intelligence test that consists of visually presented, geometric-analogy-like problems in which a matrix of geometric figures is presented with one entry missing, and the correct missing entry must be selected from a set of answer choices
Episodic memory: Immediate word recall	Immediate word recall memory
Episodic memory: Delayed word recall	Delayed word recall memory

DISCUSSION

The total number of observation is 1,941 individuals between 15 to 32 years old. The sample is consisted of workers worked in the past one month and worked as full-time employee in public and private sectors. Among the sample, an average age was 22 years old and most workers studied for 11 years. Regarding to monthly earnings, average wages was 1,683,000 IDR (Indonesian Rupiah). Further, on average the workers had 11 years of experience and 2 years of tenure. Table 2 provides information on descriptive statistics of numeric.

Regarding to the personality traits, this study analyzes the responds of respondents on the big-five personality questions. The data shows that Indonesian workers were mainly characterized as individuals with conscientiousness, agreeableness and extraversion personality. Meanwhile, the proportion of individuals with characteristics of openness and neuroticism are much lower. Table 3 provides information on descriptive statistics of personality.

TABLE 2. Descriptive Statistics

Variable	Obs.	Means	Std.dev	Min.	Max.
Independent Variable					
Age	1,941	22.61	3.361	15	32
Wage (IDR)*	1,941	1,683,000	1,806,000	2,500	4,500,000
Education	1,941	11.57	2.992	0	16
Experience	1,941	11.04	3.799	2	29
Tenure	1,941	2.056	2.126	0	15
Instrumental variables					
Woodcock-Johnson Test	1,941	538.3	53.69	299	635
Raven's Progressive Matrices (RPM) Test	1,941	12.52	3.177	0	17
Episodic memory: Immediate word recall	1,941	5.939	1.461	1	10
Episodic memory: Delayed word recall	1,941	5.048	1.638	1	10

Source: research data

TABLE 3. The Type of Personality of Indonesian Workers
2014-2015*

Type of Personality	Freq.		Proportion (%)	
	Personality match	Not Match Personality	Personality match	Not Match Personality
Openness	26	1,918	1.34	98.66
Conscientiousness	805	1,139	41.41	58.59
Extraversion	526	1,418	27.06	72.94
Agreeableness	860	1,084	44.24	55.76
Neuroticism	49	1,895	2.52	97.48

Source : research data

Note: *the total proportion of all types of personality is larger than 100 per cent because one individual may classify into two types of personality depending on the individuals' characteristic.

The results of the estimation of Mincerian equation in table 4 shows that most of all variables are strong predictors of labour market outcome. The ordinary least squares is employed to estimate empirical models. As previously discussed, the model ignores the underlying accumulation process for education; education is assumed to be exogenous. The result OLS in table 4 captures the effect of human capital investment in the form of education. The second estimation result is a 2SLS model used to address the endogeneity issue in order to estimate to be unbiased.

We can compare the results of both estimate. The level of education has positive and statistically significant influence on monthly wages on both estimation. The level of education increase at 2SLS model. In addition, the years of experience have positive and significant contribution on monthly wages on both estimation. Tenure only positive and statistically significant at model OLS. These findings support the human capital theory that investment on education contributes to increase labour market outcome.

TABLE 4. Result

	OLS	2 SLS
Independent variable		
Education	0.0749*** (8.11)	0.237*** (6.04)
Experience	0.137*** (4.90)	0.140*** (4.83)
Experience ²	-0.00309** (-2.95)	-0.000140 (-0.10)
Tenure	0.120*** (4.89)	0.0420 (1.26)
Tenure ²	-0.0140*** (-5.05)	-0.00893** (-2.88)
Dummy Male	0.243*** (5.71)	0.298*** (6.11)
Dummy Married	-0.117* (-2.37)	-0.307*** (-4.17)
Dummy Urban	0.346*** (7.21)	0.295*** (5.45)
Openness	-0.148 (-0.70)	-0.126 (-0.56)
Conscientiousness	0.0434 (1.07)	0.00479 (0.11)
Extraversion	0.113* (2.53)	0.120* (2.47)
Agreeableness	-0.00397 (-0.10)	-0.0467 (-1.05)
Neuroticism	-0.0159 (-0.13)	0.0535 (0.38)
Instrumental variables		
Woodcock-Johnson Test	0.00157*** (3.95)	
Raven's Progressive Matrices (RPM) Test	0.00934 (1.42)	
Episodic memory: Immediate word recall	0.000890 (0.05)	
Episodic memory: Delayed word recall	0.0184 (1.03)	
Constant	10.43*** (35.95)	9.389*** (17.07)
Observations	1,941	1,941
R ²	0.157	0.005
Instruments Test		
F-Test of the first stage regression	31.53	
Prob. > F (4,1924)	0.000	

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

CONCLUSION

This study aims to examine the determinants of earnings of workers in Indonesia by incorporating the direct measures of abilities of cognitive and non-cognitive capacities. The current literature in economics has acknowledged the role of non-cognitive capacities in determining workers' performance. The modified Mincer equation was estimated to examine the role of schooling, working experience, tenure, demographic factors and personality traits and cognitive capacities on monthly wages. The results show that schooling, cognitive and non-cognitive of personality traits determine the labour market outcomes. The level of education has positive and statistically significant influence on monthly wages on both estimations.



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