Accountancy Business and the Public Interest
ISSN: 1745-7718

Volume: 34
Issue Number:02

ADDRESSING ENDOGENEITY PROBLEM IN ESTIMATING ECONOMIC RETURNS TOSCHOOLING IN MALAYSIA

NORLIN KHALID[1*], RAHMAH ISMAIL[1], WYE CHUNG KHAIN[1], SUHAILI ALMA'AMUN[1] and HAKIMAH NUR AHMAD HAMIDI[1]

[1]Faculty of Economics and Management, Universiti Kebangsaan Malaysia, Malaysia.

ABSTRACT

The Ordinary Least Square coefficient of years of schooling in standard Mincer's (1974) equation may not reflect the effect of education on wages if it is correlated with ability of individual that alsocorrelated with wages. Furthermore, productivity and skills between gender also may contribute differently on wages. Hence, this paper aims to estimate the economic returns to schooling on wages for Malaysia by using data gathered from the field survey of 1263 respondents in 2015. The contribution of this paper is twofold. First, we construct an ability index of individual during schooling and workplace to tackle the problem of omitted ability variable bias in OLS estimation. Then we compare this outcome with instrumental variable method by using family background as the instrument for education, taking into account the endogeneity problem. Second, we also investigate if the overall effect of education on wages reponds differently between genders by comparing both OLS and IV estimations. Our results indicate that family background is proven to be the best instrument for education, taking into account the endogeneity problem. Then, the IV rate of return for overall sample and split sample are higher than OLS. In regard of genders, the OLS suggests higher rate of return of men while IV estimates higher rate of return of women. Theseresults have particularly important policy implications, concerning the government wage policies to achieve fair income between genders and thus contribute to the further development of Malaysianlabor market efficiency.

Keywords: Education, Instrumental Variable Approach,Wages, Workers Ability

INTRODUCTION

Theory of investment in human capital proposed by Mincer (1974) and human capital theory by Becker (1964) are prerequisites to understand the phenomenon of income distribution. The standard Mincer equation measures the relationship between earnings, schooling and work experience. Past studies conclude schooling and experience play significant roles in determining the wage level. Workers with sufficient years of schooling and have higher work experience are expected to receive a higher wage (see Blau and Kahn, 1994; Sapiro, 1994; Gregorio and Lee, 2002; Gabriel, 2005; Cohen, 2006; Dubeck and Dunn, 2006; Blau et. al, 2006, Larson, 2006; Andini, 2007; Zeher, 2007; Billger, 2007; Miki and Yuval, 2011; Fisher and Houseworth, 2012; Klein et. al, 2013 and Rahmah et. al, 2015). This is in line with human capital theory in which it states that individuals who have invested more in their education levels and training are more likely to earn higher wages and be employed in higher-level occupations (Becker, 1964 and Mincer, 1974).

Despite the fact that education is prone to be a significant determinant for wages, a several well-documented empirical studies points out that the use of education as an income measurement may suffer from endogeneity suspicions due to the omitted ability (Griliches and Mason, 1972, Blackburn and Neumark; 1993, Dickson and Harmon; 2011; Chen and Hamori, 2008; Hause, 1972 and 1975; Pitt et. al, 2012). Ability-schooling relationship does exist according to these studies. The relationship to some extent causes the upward-biased estimates of the return to schooling. The return coefficient to schooling is biased upwards because chosen

schooling levels are positively correlated with omitted ability, while ability is positively correlated with the wage rate (Blackburn and Neumark, 1993; Chen and Hamori, 2008). This has raised a question about the problem of bias in the returns to education when ability is ignored. Therefore, this study perceives it is crucial to observe ability when explaining earnings differential.

Apart from that, some researchers address the endogeneity problems by incorporating an instrumental variable

(IV) approach in the regression. Angrist and Krueger (1991), Angrist et al. (1996) and Card (2001) claim that this approach is able to generate an appropriate estimator in the presence of endogeneity. However, it should be noted thata weak instruments problem may occur. Hence, the approach only works provided that the selected appropriate instrument is strongly correlated with the endogenous variable and having no direct effect on wage. Many previous studies use family backgrounds when instrumenting education on the ground that they meet the assumptions that is required for IV regressions (see Blackburn and Neumark, 1993; Bound et al., 1995; Parker and Van Praag, 2006; Hoogerheide et al., 2012). On the other hand, the use of family background variables has been critized in several studies. For example, Trostel et al. (2002) and Psacharopoulos and Patrinos (2004) argue the validity of the family backgroundvariables because these variables have direct effects on the respondents' income level. They are perceived to be correlated with the preference for finding a job in a certain firm or industry. Thus, this preference may have a direct influence on the respondents' income. Despite of all the arguments, family background remains used as an instrumentfor education in many studies in regard to study of the return to schooling and the criticisms do not appear to be justified (Hoogerheide et al., 2012). Hence, this has led to our first research question – which approach is the most appropriate method to address the endogenity problem in estimating return to schooling?

Over the last few decades, the rapid economic transition and equal access to the labor market have led to an increase in women's labor force participation. Although women's labor force participation tends to increase with economic development, issues of income gap between genders are continuously debated among the researchers, economist and policy makers. Previous studies prove that a woman consistently earn less than a man (see, for example,Chua, 1984; Chapman and Harding, 1986; Lee and Nagaraj, 1995; Low and Goy, 2006 and Fernandez, 2006).

Researchers are also interested to explore wage differentials issue in Malaysia. In the case of Malaysia, Mohd. Nahar and Gairuzazmi (2015) elaborate that factors such as educational level, age, marital status, gender, occupational types, ethnicity and geographical location are significantly important to explain wage differentials in Malaysia. In regard to effect of gender on earnings, this study finds that male workers on average receive 40.3 percent higher than female workers indicating a high and growing wage differential based on gender in Malaysia. However, they do not provide justification for their finding. In other study by Mohd. Nahar (2016), the same finding is obtained but he suggests that this could be due to issues of glass ceiling and glass wall. Both are always associated with gender discrimination at the workplace which limit the opportunities for women to advance their careers.

In other studies, genders discrimination is also believed to be the main cause of difference in

wages between thegenders. Chapman and Harding (1985); Latifah (2000); and Seshan (2013) are some of the past literature who acknowledge the existence of discrimination either between genders, abilities and even between the public or private sectors in Malaysia. Such discrimination develops a perception that men have abilities that match with almost jobs and this causes them earn higher income and get promoted quickly as compared to women. These past studies also prove men are more favored in private sectors than women. This is indeed will impart negative views on Malaysian government wage policies in reducing gender wage discrimination.

The increases in earning are greater as person reaches higher levels of education. This positive relationship between all levels of education and earnings in Malaysia case, is found in Mohd. Nahar (2016). However, Mohd. Nahar and Gairuzazmi (2015) provide more useful insights regarding wage differentials between male and female workers according to their educational levels. Their study shows that firstly, the return to education for female workers with secondary qualification is higher than their male counterparts; and secondly, the male workers with university qualifications (diploma or degree) received higher returns to education than their female counterparts. The second finding in Mohd. Nahar and Gairuzazmi (2015) is similar to Nagaraj et al. (2014) in which they find that female graduates in Malaysia are more likely than male graduates to be in lower paying jobs or unemployed. They rationalize their finding that this could be due to firstly, the possible mismatch between qualification and job availability; secondly, female graduates are more likely to be waiting for placement or thirdly, male graduates are more likely to be in permanent positions while female graduates are more likely to be in temporary positions. Human capital theory and occupational-crowding hyphothesis explain the relationship between gender and job selections which really helpful in comprehending the differences in skills between genders. Both theories posit that women are more likely to choose occupations that regarded as feminine jobs, those that require skills with small investment in human capital and fit their daily schedules or long term labor for participation intentions. These eventually result in gender income gap (Boraas and M. Rodgers III, 2003).

Past studies with regard to Malaysia case do not raise the issue of endogeneity problem due to the omitted abilityin their underlying theory and analysis. Research on economic returns to schooling has much significance in regard to gender wage differences in Malaysia. It can demonstrate the relationship between education, productivity, human capital and public investment on education. Therefore, this has raised our second question - does the return to schoolingdiffer for men and women in the case of Malaysia when ability is taken into account? Following the concerns arising from the past studies, we intend to address omitted ability and gender pay differences issues simultenously. We finally conduct a survey with the total number of respondents is 1263. An abilityindex is constructed and included into OLS regression to figure out whether the ability index has impact on wage. The first objective is answered by comparing results that use ability index and IV approach. These results also provide answer to our second question as to whether the return to schooling differ for men and women in the case of Malaysia when ability is taken into account.

The novelty in our paper lies with the explicit inclusion of the unobserved ability commonly omitted in previousstudies by constructing an ability index that accounts for the core skills and

process skills competency developed at school and workplace. Besides that, the ability index also includes four personality traits that are relevant to wage determination. The combined effect of these skills and personality traits on wage determination has less been attemptedin the past.

The Effects of Skills and Personality Traits on Wage Determination

In eliminating the potential bias inflicted by omitting the unobserved ability in the study of returns to schooling, Belzil and Hansen (2002) proposed a structural dynamic programming model of schooling decisions that accounted for the unobserved heterogeneity in school ability and market ability. Despite the fact that larger portion of the interindustry and interoccupation wage differentials are not attributable to differences in unobserved ability (Blackburn & Neumark, 1992), the explicit inclusion of the unobserved school ability and market ability is still relevant in cross-sectional studies that consider overall wage determination just like the present one. In this study, the authors consider both core skills and process skills to be the unobserved abilities developed at school and workplace. In addition, personality traits are regarded to be part of the workplace abilities that too have bearing on wage determinations together with the core and process skills.

Core skills are described as a set of non-technical skills, knowledge and understandings that are transferable across all fields of work (Gibbons-Wood and Lange, 2000; Department of Education and Training, 2018). Examples of core skills are numeracy, language skills, critical analysis, creativity, written communication, and oral presentations. These skills are emphasized in the training and vocational branch of education (Tribe, 1996), and are important in determining earnings in the job market. For example, McIntosh and Vignoles (2001) found a substantial wage return to basic literacy and numeracy skills. Bleakley and Chin (2004) found that wages among adults who immigrated to the United States (US) as children were positively affected by their English proficiency through education. Gabe, et al. (2007) noticed that workforce creativity enhances county-level labor earnings in the urban context of the US. Dustmann (1994) contented that writing proficiency among migrants in the West Germany has considerably improved their earnings position. In short, these studies have proven the wage enhancing role of core skills competency.

On the other hands, some skills are deemed to be important along the process of completing a job task. The examples of these process skills are computer literacy, planning, applying subject understanding, problem solving, decision making, and team work. Falck, et al. (2016) found that the information and communication technologies skills (ICT) were substantially rewarded in the Germany labor market, and that the use of computers complemented workers in carrying out ICT skills-required tasks. MacLeod, Coates and Hetherton (2008) noticed that goal-setting and planning skills could be learnt and could enhance psychological well-being, and that the psychological well-being has incremental value over and above that of positive job and work attitudes in predicting self-reported levels of performance (Robertson, et al., 2012). Papa et al. (2018) found that knowledge acquisition positively affects innovation performance via human resource management, indirectly underscoring the importance of having a pool of knowledged workers who can apply subject understanding to their job. Besides that, interpersonal problem solving skills have been found to be significantly correlated to social self-efficacy (Erozkan,

2013), and that leader supportive behaviors lead to employee problem-solving capacity and subsequently their job performance in the creative industry (Carmeli, Gelbard & Reiter-Palmon, 2013). In addition, Lyubovnikova et al. (2018) found that team perceived organizational support for teamwork training are indirectly related to team productivity and innovation via their shared objectives in the health care organizations across the United Kingdom. In short, these studies have proven the job productivity enhancing role of process skills competency, which in turn have a bearing wage determination. In fact, empirical studies in Malaysia also prove the positive impact of labor productivity on real wage, supporting the marginal productivity theory (Goh, 2009).

Besides core skills and process skills, personality traits are part and parcel to enhancing employability which in turns influence the earnings from labor market (Nyhus and Pons, 2005). Groves (2005) found that traits such as locus of control, aggression, and withdrawal were all statistically significant factors in determining wage for white women in the US and UK. Semeijn, et al. (2005) explored the predictive power of four specific personal qualities in explaining Economics graduates' labor market entry in the Netherlands, such as locus of control, type A behavior, self-monitoring, and sensation-seeking. They found that these four personality traits have their own effect on labor market outcomes that were independent from the effects of traditional human capital variables. These studies therefore underscore the need for explicitly and independently considering the explanatory power of personality traits in the setting of labor market outcome determination.

'Locus of control' refers to the individual's generalized belief in internal versus external control of reinforcements. Frucot and Shearon (1991) found that the effect of locus of control on job performance was significantly stronger among high-level managers than lower-level managers in Mexico. Besides that, internal locus of control has led to higher objective career success among preschool teachers in Germany (Smidt et al., 2018). 'Type A behavior' is characterized by such behavioral patterns as being in a hurry and trying to achieve more in less time. Workers with Type A behavior has higher job performance and job satisfaction (Fisher, 2001). 'Self-monitoring' involves the ability of people to adapt their self-presentation to the requirements of the environment or situation. Such a self-adaptability would increase job performance for workers with less tenure due to their ability to control the cues available to those who appraise their job performance (Moser and Galais, 2007). 'Sensation seeking' relates to the motivation to experience sensation. Workers who are sensation seekers are adventurous, risk taking and curious. Mussel (2013) found that curiosity is an important predictor for job performance, and its importance will keep rising given the drastic change in the job market. However, sensation seeking behavior may adversely affect workplace learning, workplace socialization and job performance, if such behavior were not manifested in dynamic workplaces (Reio Jr and Sanders-Reio, 2006). In a nutshell, the performance enhancing role of personality traits may indicate greater likelihood of generating higher income, rendering the rationale to include personality variables in the analysis of wage determination.

RESEARCH METHODOLOGY

Source of Data

The data used for the analysis are gathered from the field survey using a set of structured questionnaire. There are several approaches to determining the size of the sample. This includes using census for small population size, using the same sample survey with previous studies or using published tables and using formulas for calculating sample size. According to Cohen (1977), choosing a sample that represents the population is better. Consequently, Cohen et al (2000) argues that determining the sample size should take into account the level of significance and sampling errors. They determine the size of the sample taking into account the significant level at $p > 0.05$ (level of reliability = 95%) and $p < 0.01$ (level of reliability = 99%). Table A1 in the Appendix shows the sample size by taking into account the level of significance and sampling errors. Based on data from the Labor Force Survey 2013, the total number of employment populations for all sectors was 3,568 million. Therefore, based on the above calculations, the relative size of the sample is at the significance level of 0.05 which is a total of 384 respondents minimally required in this study. However, in this study, we have collected the total of 1263 respondents which is higher than the minimum sample of study required. The larger the size of the samples taken, the better the results obtained (Jamal, 2002).

Population framework or the distribution of workers by sectors and states in Malaysia was gathered from the Labour Force Survey Report, Department of Statistics Malaysia, 2013. Eight states in Peninsular Malaysia have been chosen in this study to include four zones; North (Penang and Perak), East (Pahang and Terengganu), West (Selangor, Federal Territory of Kuala Lumpur and Melaka) and South (Johor). There are only five prominent service subsectors were chosen to include education, Information and Communicant Technology (ICT), tourism, finance and health. The sample covers 612 workers in the services sector, which comprise of 116 in education, 123 in health, 108 in finance, 79 in communication and 186 in tourism, while 651 workers were sourced from the manufacturing sector that make a total of 1263 respondents. Data collection was done from February till June 2015 with the help of enumerators. A pilot test on 20 respondents in Selangor and Federal Territory of Kuala Lumpur was performed to test the validity of instruments used in the study. Based on the results of reliability test, the Cronbach's Alpha for all instruments are around 0.90, indicating that the internal consistency of instruments is considered to be good (Kline, 2000; George and Mallery, 2003; DeVellis, 2012)[*]. This reflects that instruments used in the questionnaire have high value of reliability and fit to be used in the study.

Construction of Individual Ability Index

In order to construct the individual ability index of a worker, the study combines two sub-ability indicators, namely schooling ability and workplace ability. Schooling ability indicator is made up of three dimensional indices, namely experience during schooling, core skills development, and process skills development. For experience during schooling, workers were required to recall if they had been involved in a list of activities during their school time, such as forming a study group, attending tuition class, representing the school for competition and the like. Besides that, workers were also asked to indicate their perception on how well their previous schooling experience had developed their competency in core skills like numeracy,

language skills, critical analysis, etc., and process skills like planning, problem solving, decision making, etc.

On the other hand, workplace ability indicator is formed by two skill dimensional indices, namely, core skills competency and process skills competency, and four personality dimensional indices, namely locus of control, type Abehaviour, self-monitoring, and sensation seeking. Skills competency at workplace is measured the same way as the skills competency at schooling, using the same sets of skills. Locus of control is measured by asking the workers to indicate their level of agreement to a list of statements describing situations upon which they feel they have the abilityto influence. Type A behaviour measures the extent of aggressiveness among workers towards their job. Self- monitoring measures the extent of adaptability among workers to suit to different situations. Sensation seeking measuresthe extent of risk-taking and adventurous behaviour among workers in approaching their job tasks.

The above mentioned indicators and dimensional indices are computed using the following equation:

$$\frac{(\sum_{s=1}^{j} X_{is})-(\sum_{s=1}^{j} Min_{is})}{(\sum_{s=1}^{j} Max_{is})-(\sum_{s=1}^{j} Min_{is})} \quad (1)$$

The actual, minimum, and maximum score given by i^{th} worker on s^{th} item compiled in a list of total j items are denotedby Xis, Minis, and Maxis, respectively. The list of j items measures each of the nine dimensional indices mentioned above. In computing the schooling ability indicator, this study assigns a weight using percentages that are based on the relative importance of experience during schooling, core skills development, and process skills development dimensional indices to each of the respondent. This is a commonly-used approach to weight assignment when expressing an average.

The choice of weight using percentages is inspired by the proposal put forth by Chowdhury and Squire (2006) when setting weights for aggregate indices, where the importance of each category forming the indices and a country's importance (scale) for that category are emphasized. In our study, individual's importance in experience during schooling, core skills development, and process skills development is expressed in percentages of total to be used as the weight, and each individual will have different weight to each of these three aspects so as to reflect the fact that therelative importance of each aspect is individual-specific. By so doing, we can avoid assigning similar weight for a particular aspect to all individuals to avoid biases in index computation. Similarly, the importance of core skills, processskills, and personality traits formed in the labour market in determining one's income level is weighted in the same way as proposed by Chowdhury and Squaire (2006). Subsequently, the workplace ability indicator is thus computed.

After computing nine dimensional indices above, we combine them into the corresponding ability indicators to which they belong. Being inspired by the United Nations Development Programme [UNDP] (2015) when constructing the Human Development Index (HDI), we first calculate the geometric mean of the combined dimensional indices based on the assigned weights. The formula is as follows:

$$Combined\ Dimensional\ Index = (D_{i1})^{w1i} \times (D_{i2})^{w2i} \times (D_{i3})^{w3i} \times \ldots \times (D_{in})^{wni} \quad (2)$$

Where Di denotes the first to n^{th} dimensional indices for i^{th} worker while w denotes the weight

assigned for each of the
n dimensional indices for each of the i[th] worker.
We then identify the maximum and minimum value of the combined dimensional indices and apply Eq. [1]again to construct the two ability indicator indices. The formula is as follows:

$$\underset{-(Min)}{Index\ of\ Ability\ Indicator} = \frac{[(D_{i1})^{w1i} \times (D_{i2})^{w2i} \times (D_{i3})^{w3i} \times \ldots \times (D_{in})^{wni}]}{(Max)-(Min)} \quad (3)$$

The minimum and maximum value of the combined dimensional indices is denoted by Min and Max, respectively, while the geometric-mean $[(D_{i1})^{w1i} \times (D_{i2})^{w2i} \times (D_{i3})^{w3i} \times \ldots \times (D_{in})^{wni}]$ is now representing the i[th] worker's actual value of the combined dimensional index. The two ability indicator indices are ultimately combined into a geometric-mean overall individual ability index using the weight assignment approach as inspired by Chowdhuryand Squaire (2006) for schooling ability and workplace ability, that is, based on their relative importance to each individual worker in terms of percentages.

Empirical Framework

We estimate the effect of education on wages by following a Mincer-type equation (Mincer,1974). The specification isexpressed as follows:

$$lnW_i = \beta_0 + \beta_1 YOS_i + \beta_2 EXP_i + \beta_3 EXP^2 + \beta_4 GEN_i + \mu_i \quad (4)$$

where lnW denotes the natural logarithm of the observed hourly wage, β_0 is a constant variable, YOS is total years of schooling, EXP is working experience, EXP^2 is working experience squares, GEN is dummy variable for gender, 1=males, 0=otherwise, μ is an error term and i is individual.
Since measurement of income by using education may suffer from endogeneity problem, we apply two methods to overcome this problem. Chen and Hamori (2009) states that endogeneity problem can arise because of omitted ability. This is because years of schooling are (positively) correlated with omitted ability, while ability is (positively) correlated with the wage rate. Therefore, to overcome this problem, we include the ability variables (OA), which is constructed using the methodology discussed in previous section as a proxy in equation [5];

$$lnW_i = \beta_0 + \beta_1 YOS_i + \beta_2 EXP_i + \beta_3 EXP^2 + \beta_4 OA_i + \beta_6 GEN_i + \mu_i \quad (5)$$

Then, the second method that is believed to yield an appropriate estimator in the presence of endogeneity is by using the instrumental variables (IV) regression. If we found no significant effects of ability on wages, adding an instrument in the equation may be the best option. We choose father's years of schooling as an instrument (Hoogerheideet al., 2012). Although there are many papers criticized the use of family background as an instrument, the statements does not appear to be justified. Thus, father's years of schooling is chosen as a possible instrument in our analysis as itis believed to be correlated with individuals schooling but not with the wage rates.
The following two-equation model describing the natural logarithm of wages (lnW_i) and years of schooling (YOS_i) is normally applied to cope with the endogeneity of schooling:

$$lnW_i = \beta_0 + \beta_1 YOS_i + \beta_2 EXP'_i + \beta_3 EXP'^2 + \beta_4 GEN'_i + \varepsilon_i \quad (6)$$

$$YOS_i = \delta Z'_i + v_i \quad (7)$$

where Z_i denotes the vector of observed instrumental variables which is father's years of schooling. We then compared the results from these two methods to fulfill our objectives research.

RESULTS

Table 1 presents the returns to schooling for overall sample of men and women respondents. The first column provides the OLS estimates of Eq. (5) which includes the ability variable (OA), with an estimated return to schooling equal to 13.27%. The OLS results also show that the wages of male workers is always higher than female workers by 14% as the gender variable (GEN) is significant in determining wages. We also include the ability variables (OA) to analyze whether it plays a significant role in explaining wage. However, based on the results, we failed to capture a significant relationship between wages and ability. Hence, the first method proposed in the present study in addressing the endogeneity problem in the wage model is proven not to be appropriate. To address this problem, an instrumental variable (IV) regression is applied in our analysis.

Table 1 Returns to Schooling for Overall Sample

Technique	**OLS**		**OLS**	**IV**
No. of Column	**1**	**2**	**3**	**4**
		VIF		
YOS	0.1327*** (19.2515)	1.2481		0.2142*** (10.34)
EXP	0.0494*** (10.0004)	6.5636	-0.0701** (-2.33)	0.0569*** (8.33)
EXP2	-0.0007*** (-4.2813)	6.2068	0.0005 (0.49)	-0.0007*** (-3.08)
OA	0.0748 (0.8494)	1.2105		
GEN	0.1416*** (4.5099)	1.2118	-0.0599 (-0.39)	0.1396*** (4.13)
Instrument			0.2169*** (10.51)	
C	5.2753*** (53.3303)		12.0675** (43.03)	4.1481*** (13.78)
Adjusted-R^2	0.3629		0.1225	0.2522
BPG-Test	0.3734 [0.8671]			
First stage F-statistics			45.06	
p-value			0.0000	
Exogeneity F-test				51.70
p-value				0.0000
N	1263		1263	1263

Notes: *, **, *** indicates significant at 10%, 5% and 1% significance level respectively. t-statistics in ( ) & standard error in [ ]. VIF is a Variance Infaltion Factors which measures a

degree of multicollinearity in regression. If the value of VIF is less than 10, it indicates low correlation. BPG- Test is a Breusch-Pagan-Godfrey test for heteroscedasticity.

Then, in column 3, the first-stage F-statistics is calculated to test the validity and strength of the instruments. The value is significant at 1% significance level in which proves that our instrument variable which is father's years of schooling is not weak and suitable to be used in the analysis. Our findings is consistent with the past studies and therefore, using family background as an instruments which is father's years of schooling in an income regression is a viable option for solving the endogeneity problem with regard to education (Hoogerheide et al., 2012). Further, we conduct an endogeneity test to check whether the OLS estimation is consistent or not. The value of exogeneity F- statistics in column 4 is significant which rejects the null hypothesis that the OLS estimates are consistent. In the other

words, the results prove that our two stages least square regression (2SLS) is consistent. Therefore, by using father's years of schooling as an instrument, the IV rate of return of schooling is 8.15% higher than the OLS return.

Table 2 Returns to Schooling for Men

Technique	**OLS**	**OLS**	**IV**
No. of column	1	2	3
YOS	0.1347*** (18.21)		0.2134*** (6.87)
EXP	0.0561*** (7.31)	-0.0368 (-0.87)	0.0612*** (7.09)
EXP2	-0.00070*** (-2.90)	-0.00005 (-0.04)	-0.00067** (-2.55)
Instrument		0.1980*** (6.42)	
C	5.3827*** (47.20)	11.9754*** (28.05)	4.2629*** (9.58)
Adjusted-R^2	0.4287	0.1011	0.3178
BPG-Test	0.1866 [0.9055]		
First stage F-statistics		22.25	
p-value		0.0000	
Exogeneity F-test			42.57
p-value			0.0000
N	568	568	568

Notes: *, **, *** indicates significant at 10%, 5% and 1% significance level respectively. t-statistics in ( ) & standard error in [ ]. BPG- Test is a Breusch-Pagan-Godfrey test for heteroscedasticity.

Table 3 Returns to Schooling for Women

Technique	**OLS**	**OLS**	**IV**
No. of column	1	2	3
YOS	0.1322*** (17.01)		0.2185*** (7.96)
EXP	0.0457*** (4.90)	-0.0911** (-2.10)	0.0559*** (5.28)

EXP2	-0.00073** (-2.26)	0.00053 (0.35)	-0.00078** (-2.20)
Instrument		0.2357*** (8.48)	
C	5.3639*** (43.95)	12.0304*** (32.79)	4.1074*** (10.19)
Adjusted-R^2	0.3046	0.1414	0.1805
BPG-Test	0.3734 (0.8671)		
First stage F-statistics		39.11	
p-value		0.0000	
Exogeneity F-test			26.05
p-value			0.0000
N	695	695	695

Notes: *, **, *** indicates significant at 10%, 5% and 1% significance level respectively. t-statistics in ( ) & standard error in [ ]. BPG-Test is a Breusch-Pagan-Godfrey test for heteroscedasticity.

In the next step, we separate the sample between men and women to analyze its return to schooling. The results for both men and women are presented in Table 2 and 3 respectively. The OLS estimates shows that men's and women's return to schooling are 13.47% and 13.22% respectively. The rate values are also quite similar to the overall sample in Table 1. For both men and women, the significant value of the first-stage F-statistics indicates that the instrument used in the analysis is not weak and thus the validity of the instruments is confirmed. Furthermore, the result of the endogeneity test in both cases rejects the null hypothesis that the OLS estimates are consistent. As we can see from the results in column 3 in both Table 2 and 3, the IV rate of return is 21.34% for men and 21.85% for women. If we compared the results between two methods, it seems that the IV rate of return for both men and women are higher than the OLS estimation results. This indicates that the OLS estimation may underestimate true rates of return for both men and women.

CONCLUSION AND DISCUSSION

In this study, we applied both ordinary least square (OLS) and instrumental variable (IV) methodologies to estimate returns to schooling by incorporating ability of individuals. The first method is done by constructing ability index and estimate it using a standard OLS. The second method uses Instrumental Variable approach by using family background as the instrument for education, taking into account the endogeneity problem.

We found that the rate of return for schooling estimated by IV approach for the overall sample and split sample are higher than that estimated by OLS approach. This finding suggests that education in terms of years of schooling still remains to be important policy approach and

aspect for government spending allocation in determining wage in Malaysia, regardless of genders – and its impact is larger after solving for endogeneity problem, underscoring the relevance of applying IV estimation approach for determining the wage effect of schooling in the Mincerian wage model. Malaysian government is expected to increase her annual budget allocation for improving the educational infrastructure not only at the tertiary level, but elementary and secondary level as well. Educational quality enhancement at the elementary and secondary level will lay an important foundation for achieving excellence in tertiary level. Everylevel of education in Malaysia is crucial for human capital accumulation, given the linear significant association between years of schooling and wage determination found in our study. However, ability is not a significant wage determinant in our study. Its importance on wage determination hasbeen taken over by educational qualifications since years of schooling exert greater and significant wage effect both for the OLS and IV approaches. Despite its insignificance in wage determination, our finding does not suggest that abilityis irrelevant in the Malaysian labour market. Given the substantial wage impact of years of schooling from which ability can be obtained, the effect of ability could come complementarily with educational qualification in Malaysia. This is because the core skills, process skills and personality traits considered in constructing the overall ability index in our study could be directly obtained from attending schools and colleges in Malaysia following the incorporation of problem-based learning approach and soft-skill proficiency emphasized in Malaysian educational system. Those skills and personality traits can be nurtured through group discussion, assignment presentation and problem solving on a team-work basis, and through internship placement towards the end of one's study. These approaches to learning are toensure higher employability and relevance of programme of studies to job requirement among Malaysian students upongraduation. A certificate signaling the educational level obtained and a blend of soft skills proficiency and personality traits may work hand-in-hand in determining labour market outcomes of a graduate. However, someone may not get the desired job and salary without an educational certificate that works as a maket signaling for labour productivity, despite the possession of the skills required for a particular job. Perhaps, our finding partly supports the Recognition ofPrior Experiential Learning (RPEL) Scheme implemented by the Human Resources Development Fund (HRDF) of the Ministry of Human Resources in Malaysia. This scheme enables Malaysian workers to get recognition on their skills and experiences by applying for Malaysia Skills Certification (MSC), Malaysia Diploma Skills (MDS) or Malaysia Advanced Diploma Skills (MSDS) according to their competency levels.

Our wage model directly controls for the overall ability index to address for the omitted variable bias. It is notour initial intention to examine the interplay between educational level and ability in determining wage. Interested future researchers may therefore extend our study by examining the interaction between these two important human capital variables for wage determination. Besides that, it is our initial intention to examine the wage effect of ability asa whole through the combination of core skills, process skills and personality traits obtained through schooling and workplace. Such a combination may undermine the wage effect of each of the ability components individually. Ittherefore serves as the avenue for future research to better capture the wage effect from each subcomponent of ability.

In regard of genders, the OLS suggests higher rate of return to schooling for men while IV

estimates slightly higher rate of return for women. Although women are found to be rewarded slightly higher than the men after addressing for the endogeneity problem, the difference is deemed to be small. In fact, men's schooling were initially more highly rewarded than women's before accounting for the endogeneity problem, casting fear if this scenario has been due to gender wage discrimination that is unexplained by the educational attainment. While future studies could explicitly account for the discriminatory factor in the wage model, policy makers may also explicitly implement the pre-market and post-market anti-discrimination policy to ensure equal-pay-for-equal-work among genders. Greater opportunities for schooling and job promotion can be granted to the women to empower them in their pursue of careerdevelopment. In a nutshell, our results have particularly important policy implications, concerning the government wage policies to achieve fair income between genders and thus contribute to the further development of Malaysian labor market efficiency.

REFERENCES

- Andini, C. (2007). Returns to Education and Wage Equations: A Dynamic Approach", Applied Economics Letters, 14, pp.577-579
- Angrist, J.D. and Krueger, A.B. (1991). Does Compulsory School Attendance Affect Schooling and Earnings? QuarterlyJournal of Economics, 106 (4), pp. 979-1014
- Angrist, J.D., Imbens, G.W. and Rubin, D.B. (1996). Identification of Causal Effects Using Instrumental Variables. Journal of the American Statistical Association, 91, pp. 444-455
- Becker, G.S. (1964). Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education. 3rd ed. Chicago: The University of Chicago Press.
- Belzil, C. and Hansen, J. (2002). Unobserved Ability and the Return to Schooling. Econometrica, 70 (5), pp. 2075–2091. Billger, S.M. (2007). Does Attending Predominantly-Female Schools Make a Difference? Labor Market Outcomes for Women. Journal of Economic and Finance. 31 (2), pp. 166- 185
- Blackburn, M.L. and Neumark, D. (1993). Omitted-Ability Bias and The Increase in the Return to Schooling. Journal ofLabor Economics, 11 (3), pp. 521-544
- Blau, F.D. and Khan, L.M. (1994). Rising Wage Inequality and the U.S Gender Gap. The American Economic Review. 84(2), pp. 23-28
- Blau, F., Ferber, A. M. and Winkler, E.A. (2006). The Economics of Women, Men, and Work. 5th edition. New Jersey: PearsonPrentice Hall
- Bleakley, H. and Chin, A. (2004). Language Skills and Earnings: Evidence from Childhood Immigrants. Review of Economics and statistics, 86 (2), pp. 481-496
- Boraas, S. and Rodgers, W. M III. (2003). How Does Gender Play a Role in the Earnings Gap? An Update. Monthly Labor Review, 126 (3), pp. 9-15
- Bound, J., Jaeger, D.A. and Baker, R.M. (1995). Problems with Instrumental Variables Estimation When the Correlation Between the Instruments and the Endogenous Explanatory Variable is Weak. Journal of the American Statistical Association, 90 (430), pp. 443-450
- Card, D. (2001). Estimating the Return to Schooling: Progress on Some Persistent Econometric Problems. Econometrica, 69(5), pp. 1127-1160
- Carmeli, A., Gelbard, R. and Reiter-Palmon, R. (2013). Leadership, Creative Problem-Solving Capacity, and Creative Performance: The Importance of Knowledge Sharing. Human Resource Management, 52 (1), pp. 95-121
- Chapman, B.J. and Harding, J.R. (1986). Sex Differences in Earnings: An Analysis of Malaysian Wage Data. Journal ofDevelopment Studies, 21 (3), pp. 362-376
- Chen, G., and Hamori, S. (2008). An Empirical Analysis of Gender Wage Differentials in Urban China. Kobe UniversityEconomic Review, 54, pp. 25–34
- Chen, G. and Hamori, S. (2009). Economic Returns to Schooling in Urban China: OLS and the

Instrumental VariablesApproach. China Economic Review, 20 (2), pp. 143-152

- Chowdhury, S. and Squire, L. (2006). Setting Weights for Aggregate Indices: An Application to the Commitment toDevelopment Index and Human Development Index. The Journal of Development Studies, 42 (5), pp. 761 – 771.
- Chua, Y. P. (2006). Research Method. Malaysia: McGraw-Hill Companies
- Chua, Y. T. (1984). Wage Differential in Peninsular Malaysia. Unpublished PhD Dissertation, University of California, Santa Barbara, USA.
- Cohen, J. (1977). Statistical power analysis for the behavioral sciences (Rev. ed.). Hillsdale, NJ, US: Lawrence ErlbaumAssociates, Inc.
- Cohen, L., Manion, L. & Morrison, K. (2000). Reserch methods in education (5th ed.). London: Routledge/Falmer
- Cohen, Y. (2006). National, gender and ethnic wage gaps. In: Ram, O., Berkovitz, N. (Eds.), Inequality. Ben GurionUniversity Press, Beer-Sheva, pp. 339–347.
- Department of Education and Training. (2018). Core Skills for Work Developmental Framework. Australian Government.
- Retrieved November 15, 2018 from https://www.education.gov.au/core-skills-work-developmental-frameworkDeVellis, R. F. (2012). Scale development: Theory and applications. Los Angeles: Sage.
- Dickson, M. and Harmon, C. (2011). Economic Returns to Education: What We Know, What We Don't Know, and Where We Are Going- Some Brief Pointers. Economics of Education Review. 30 (6), pp. 1118-1122
- Dubeck, P.J. and Dunn, D. (2006). Workplace/Women's Place an Anthology. 3rd edition. Roxbury Publishing Company, CA. Dustmann, C. (1994). Speaking Fluency, Writing Fluency and Earnings of Migrants. Journal of Population Economics, 7 (2),pp. 133-156
- Erozkan, A. (2013). The Effect of Communication Skills and Interpersonal Problem Solving Skills on Social Self-Efficacy.
- Educational Sciences: Theory and Practice, 13 (2), pp. 739-745
- Falck, O., Heimisch, A. and Wiederhold, S. (2016). Returns to ICT Skills. IEB Working Paper N. 2016/05. Available at SSRN: https://ssrn.com/abstract=2744714 or http://dx.doi.org/10.2139/ssrn.2744714
- Fernandez, J. L. (2006). Gender Earnings Differentials in Malaysia. A PhD. Thesis Submitted to the Faculty of Economicsand Administration, University of Malaya, Kuala Lumpur.
- Fisher, R. T. (2001). Role Stress, the Type A Behavior Pattern, and External Auditor Job Satisfaction and Performance.
- Behavioral Research in Accounting, 13 (1), pp. 143-170
- Fisher, J.D. and Houseworth, C.A. (2012). The Reverse Wage Gap Among Educated White and Black Women. The Journalof Economic Inequality, 10 (4), pp. 449-470
- Frucot, V. and Shearon, W. T. (1991). Budgetary Participation, Locus of Control, and Mexican Managerial Performance andJob Satisfaction. Accounting review, 66 (1), pp. 80-99
- Gabe, T. M., Colby, K. and Bell, K. P. (2007). The Effects of Workforce Creativity on Earnings in US Countries. Agricultural and Resource Economics Review, 36 (1), pp. 71-83
- Gabriel, P. E. (2005). The Effects of Differences in Year-Round, Full-Time Labor Market Experience on Gender Wage Levels in The United States. International Review of Applied Economics, 19 (3), pp. 369-377
- George, D. and Mallery, P. (2003). SPSS for Windows step by step: A simple guide and reference. 11.0 update (4th ed.). Boston: Allyn & Bacon.
- Gibbons-Wood, D. and Lange, T. (2000). Developing Core Skills–Lessons from Germany and Sweden. Education+ Training, 42 (1), pp. 24-32
- Goh, S. K. (2009). Is Productivity Linked to Wages? An Empirical Investigation in Malaysia. CenPRIS Working Paper Series102/09.
- Groves, M. O. (2005). How Important is Your Personality? Labor Market Returns to Personality for Women in The US andUK. Journal of Economic Psychology, 26 (6), pp. 827-841
- Gregorio, J. and Lee, J.W. (2002). Education and Income Inequality: New Evidence from Cross-Country Data. Review ofIncome and Wealth, 48 (3), pp. 395-416
- Griliches, Z. and Mason, W.M. (1972). Education, Income and Ability. The Journal of Political Economy,80

(3), pp. 74-103Hause, J.C.(1972). Earning profile: Ability and Schooling. Journal of Political Economy SO, 3 (2), May/June, SlOS-S138. Hoogerheide, L., Block, J.H. and Thurik, R. (2012). Family Background Variables as Instuments for Education in Income

- Regression: A Bayesian Analysis. Economics of Education Review, 31(5), pp. 515-523
- Klein, M.W., Moser, C. and Urban, D.M. (2013). Exporting, Skills and Wage Inequality. Labor Economics, 25, pp. 76-85.Kline, P. (2000). The handbook of psychological testing (2nd ed.). London: Routledge.
- Larson, C. (2006). Workplace/Women's Place an Anthology. 3rd edition. Roxbury Publishing Company, CA, pp. 77–83. Latifah, M.N. (2000). Occupational Sex Segregation and Discrimination in Peninsular Malaysia", Jurnal Pengurusan. 19, pp.
- 89-107
- Lee, K.H. and Nagaraj, S. (1995). Male-Female Earning Differentials in Malaysia. The Journal of Development Studies, 31(3),pp. 467-480
- Lim, U., Choi, Y.S. and Lee, H. (2015). Occupational Skills and the Gender Wage Gap in Seoul, Korea: A MultilevelApproach. The Annals of Regional Science. 55 (2), pp. 335-356
- Low, K. L. and Goy, S. C. (2006). Male-Female Earnings Differentials in Sarawak, Malaysia", International Journal of the Humanities, 3(8), pp. 171-180
- Lyubovnikova, J., West, T. H., Dawson, J. F. and West, M. A. (2018). Examining the Indirect Effects of Perceived Organizational Support for Teamwork Training on Acute Health Care Team Productivity and Innovation: The Role of Shared Objectives. Group & Organization Management, 43(3), pp. 382-413
- MacLeod, A. K., Coates, E. and Hetherton, J. (2008). Increasing Well-Being Through Teaching Goal-Setting and Planning Skills: Results of a Brief Intervention. Journal of Happiness Studies, 9(2), pp. 185-196
- Malaysia (2013). Laporan Penyiasatan Tenaga Buruh. Jabatan Perangkaan Malaysia.
- McIntosh, S. and Vignoles, A. (2001). Measuring and Assessing the Impact of Basic Skills on Labour Market Outcomes. Oxford Economic Papers, 53(3), pp. 453-481
- Miki, M. and Yuval, F. (2011). Using Education to Reduce the Wage Gap Between Men and Women. The Journal of Socio-Economics, 40(4), pp. 412-416
- Mincer, J. (1974). Schooling, Experience, and Earnings. National Bureau of Economic Research, New York: ColumbiaUniversity Press.
- Mohd. Nahar, M. A. (2016). Returns to Education By Ethnicity. A Case of Malaysia. International Journal of Economics and Management, 10(1), pp. 141-154
- Mohd Nahar, M. A. and Gairuzazmi, M. G. (2015). Returns to Education and Wage Differentials in Malaysia. The Journal ofDeveloping Areas, 49(5), pp. 213-223
- Moser, K. and Galais, N. (2007). Self-Monitoring and Job Performance: The Moderating Role of Tenure. InternationalJournal of Selection and Assessment, 15(1), pp. 83-93
- Mussel, P. (2013). Introducing the Construct Curiosity for Predicting Job Performance. Journal of Organizational Behavior,34(4), pp. 453-472
- Nagaraj, S., Goh, K., Cheong, K., Tey, N. and Rohani, J. (2014). Gender Imbalance in Educational Attainment and Labour Market Dynamics: Evidence From Malaysia. Malaysian Journal of Economic Studies, 51, pp. 127-145.
- Nyhus, E. K. and Pons, E. (2005). The Effects of Personality on Earnings", Journal of Economic Psychology, 26(3), pp. 363- 384.
- Papa, A., Dezi, L., Gregori, G. L., Mueller, J. and Miglietta, N. (2018). Improving Innovation Performance Through Knowledge Acquisition: The Moderating Role of Employee Retention and Human Resource Management Practices.Journal of Knowledge Management. https://doi.org/10.1108/JKM-09-2017-0391
- Parker, S.C. and Van Praag, C.M. (2006). Schooling, Capital Constraints, and Entrepreneurial Performance: The EndogenousTriangle. Journal of Business & Economic Statistics, 24(4), pp. 416-431
- Pitt, M.M., Rosenzweig, M.R., and Hassan, M.N. (2012). Human Capital Investment and the Gender Division of Liabor in aBrawn-Based Development. American Economic Review, 102 (7), pp. 3531 - 3560
- Psacharopoulos, G. and Patrinos, H.A. (2004). Returns to Investment in Education: A Further Update. Education Economics,
- 12(2), pp, 111-134

- Rahmah, I., Mohd, N.S., Wye, C.K. and Nur, S.P. (2015). Does Overeducation and Undereducation Matter for Returns toEducation in Malaysia? Prosiding PERKEM 10. Pp 66-73
- Reio Jr, T. G. and Sanders-Reio, J. (2006). Sensation Seeking as an Inhibitor ff Job Performance. Personality and IndividualDifferences, 40(4), pp 631-642
- Robertson, I. T., Birch, A. J. and Cooper, C. L. (2012). Job and Work Attitudes, Engagement and Employee Performance: Where Does Psychological Well-Being Fit In? Leadership & Organization Development Journal, 33(3), pp. 224-232
- Sapiro, V. (1994). Women in American Society. Mayfield Publishing, CA.
- Semeijn, J., Boone, C., van der Velden, R. and van Witteloostuijn, A. (2005). Graduates' Personality Characteristics and Labor Market Entry: An Empirical Study Among Dutch Economics Graduates. Economics of Education Review, 24(1), pp. 67 – 83.
- Seshan, G.K. (2013). Public-Private Sector Employment Decisions and Wage Differentials in Peninsular Malaysia. EmergingMarkets Finance & Trade, 49(5), pp. 163-179
- Smidt, W., Kammermeyer, G., Roux, S., Theisen, C. and Weber, C. (2018). Career Success of Preschool Teachers in Germany–The Significance of the Big Five Personality Traits, Locus of Control, and Occupational Self-Efficacy. Early Child Development and Care, 188(10), pp. 1340-1353
- Tribe, J. (1996). Core Skills: A Critical Examination", Educational Review, 48(1), pp. 13-27
- Trostel, P., Walker, I. and Wooley, P. (2002). Estimates of the Economic Return to Schooling for 28 Countries. Labour Economics, 9(1), pp. 1-16
- United Nations Development Programme. (2015). Human development report 2015: Work for human development.
- New York: Author.
- Zeher, D.B. (2007). The Gender Income Gap and The Role of Education. Sociology of Education, 80(1), pp. 1-22

APPENDIX

Table A1 The Sample Size at The Level of Significance p>0.05 dan p<0.01

Population Size	**Sampling error of 5 percent and 95 percent reliability level (level of significance =0.05)**	**Sampling error of 1 percent and 99 percent reliability level (level of significance =0.01)**
	Sample Size	Sample Size
50	44	50
100	79	99
200	132	196
500	217	476
850	265	823
1000	278	907
2000	322	1661
5000	357	3311
10000	370	4950
20000	377	6578
50000	381	8195
100000	383	8926
1,000,000 and above	384	9706

Source : Chua, 2006