DOES SCHOOLING REFORM AFFECT THE RETURNS TO EDUCATION IN MALAYSIA?

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Abstract

The objective of this paper is to examine the impact of education reforms on earnings. One of the significant changes in the Malaysian education system was the school reform of 1970 that changed the medium of instruction from English language to the Malaysian national language. Using data from the household income surveys, this paper updates previous estimates of the private rate of return to schooling. Applying a homogenous return model, an ordinary least square (OLS) regression indicates that the private rate of returns to schooling is about the world average. Meanwhile, using instrumental variable approach, the impact of the schooling reforms indicates that the private rate of return to education is higher than the average.

Keywords *Human capital, instrumental variables, rate of return to education, labour economics.*

INTRODUCTION

In general, a study of returns to education in Malaysia can be divided into two stages. The first stage refers to studies that used a variety of data collected by official bodies or a field survey by the researchers. The second stage utilizes the official data from the government such as the Malaysian Family Life Survey 1 and 2 (MFLS1 and MFLS2) and the Household Income Survey. Hoerr (1973) conducted the first study on a cost-benefit analysis of education in Malaysia in 1976, using "Malaysian Socio-Economic Sample Survey of Households, 1967-68". However, his study covered only a relatively small sample. Nevertheless, it was important as a benchmark in investigating the returns to education in Malaysia. The findings showed that the cumulative private rate of returns to education was higher for

upper secondary education at 17.6 percent compared to primary or higher education, which were 12.9 and 16.0 percent respectively. Mazumdar (1981) used the 1970 Post Enumeration Survey (PES) and World Bank Migration and Employment Survey (MES) in 1975 which covered a small sample of male wage-earners and self-employed workers using information from three urban areas. Lee (1980) used non-random samples of 1,179 from private sector and 792 samples from public sector employees in Klang Valley. These studies concluded that the earnings variation in human capital theory is largely explained by education. Chapman and Harding (1981) found that the average returns to education was 9.37 percent. Unfortunately, these figures did not represent the Malaysian population as a whole but might be true for the returns of their samples, which covered less than a thousand respondents.

A second stage of studies on returns to education was a study from MFLS 1 and 2. This survey was conducted for the purpose of gathering information data on economic and biological aspects of fertility rates and other related variables. It was conducted by the government during 1976-79 (MFLS1) in Peninsular Malaysia. The sample consisted of 1,262 households in which at least one married women was aged less than 50 years old at the time of survey. It also included the earnings and occupational histories of the women, and the data for the husbands. Blau (1986), Gallup (1997) and Chung (2003) estimated the rate of return to education. However, the results of their studies were inconsistent, probably because their objectives and methods were different. The average rate of returns to an additional year of schooling education reported by Gallup was 7.6 percent. On the other hand, Blau and Chung did not report the overall returns. Rahmah & Rogayah (2003) found that the means of schooling for skilled, semi-skilled and unskilled workers were 14.25, 11.18 and 10.45 years respectively. Chung (2003) has revealed the marginal returns to education were 12 percent for lower secondary, 17 percent for upper secondary, 26 percent and 17 percent for pre-university and higher education respectively. In 2004, Chung (2004) has estimated the rate of returns to schooling in Malaysia using a massive data set, the Malaysian Household Income Survey 1997. She found that the marginal gross return was higher at the upper secondary to pre-university level where an individual has an annual gross return of 22.9 percent. This result is consistent with the previous findings but contrasts with the study carried out by Hoerr. However, due to the many differences, a comparison between the earlier and later studies does not always hold true. For example, the study conducted by Chung was more comprehensive. In addition, the data sets also added more explanatory variables, including wage earners, self employed, marital status and gender.

Most of the studies were inconsistent and reported different findings. The estimates of returns to education were inconsistent for two main reasons. Firstly, the data sets in the studies are different. Secondly, the method or model specification was not the same despite most of the studies having used OLS as a tool of analysis. The limited data and resources, and to some extent the choice of schooling and earnings variables, also give a different impact on returns to education. Moreover, some of the studies, such as Gallup (1996) and Mazumdar (19810, for example, emphasize income inequality rather than return to schooling. The explanatory variables in the earnings equations are also inconsistent. Blau (1986), for example, included the dummy for occupation in the regression which

would have an impact on schooling coefficients. Nevertheless, this is common when researchers intend to include whatever variables are available from a data set. Income data is known to be difficult and costly to collect. The dissimilarity of methodological aspects and data availability, economic and educational change will affect the outcomes. On top of that, the results may suffer from the bias of estimation either from measurement error, omitted variables or the absence of information about how ability affects schooling choice. Nevertheless, these studies that estimate the returns to education have made a great contribution to the literature relevant to Malaysia.

In this study, the objective is to update the private rate of return to education in Malaysia using the latest data set: in particular, to estimate the average return for an additional year of schooling. Furthermore, it will provide new evidence of returns by using latest data sets. Additionally, a main objective is to clarify the difference in the returns to different individuals due to the impact of the schooling reform. It will estimate the returns using the alternative method, i.e. the Instrumental Variable (IV), providing a new estimate of the returns for those who were affected by the educational reforms. The IV method is increasingly important in the literature because it also reduces the potential bias. This method has never previously been applied to the Malaysian data.

The Malaysian Education System

Currently, the Malaysian education system consists of pre-school, primary school, secondary school and higher learning institutions. The main purpose of pre-school is to prepare a basic education of young children before they go on to formal education. The objectives of pre-school education are to foster love for the country, instil moral values, and develop character, develop basic communication skills, respect the national language, acquire the basics of the English language, appreciate physical activities and, finally, to develop critical thinking skills through enquiry and the use of all the senses (Ministry of Education - MOE, 2001). The pre-school begins at the age of 5 or 6 at a government kindergarten, a non-government agency or a private sector kindergarten.

Primary education starts at seven and ends within six years. The structure of primary education in Malaysia can be divided into two phases. The first phase is from Year One to Year Three and the second phase is from Year Four to Year Six. During the first phase, students will go through the curriculum to master the 3Rs; i.e. Reading, Writing and Calculating (Arithmetic) to be used in daily life. The second phase, i.e. from Year Four to Year Six, mastery of the 3Rs is reinforced and emphasised by acquisition of general knowledge, pre-vocational education, and the development of personality, attitude and social values as well. Over the six years of primary education, students are assessed by continuous school-based assessment until, at the end of Year Six; they experience the first National Examination known as Primary School Achievement Test (PSAT) to evaluate their performance. All students are automatically promoted to secondary school after completion of six years in primary school.

The normal duration of secondary schooling is five years but it is divided into two levels. Level one refers to Form 1, 2 and 3 (Lower Secondary) and level two refers to Forms 4 and

5 (Upper Secondary). Under the New Integrated Secondary School Curriculum, secondary school offers a comprehensive education programme with a wide range of subjects from the arts and sciences to vocational and technological education with a practical basis. During this period, students in the government schools must sit two national examinations at the end of each level; namely Lower Secondary Examination (LCE) at the end of level one, and Malaysian Certificate of Education (MCE) after finishing level two. The Upper Secondary Education offers choices to students to fulfil their needs, skills and interests in career development. All Malaysian government schools use the same curriculum known as the Integrated Secondary School Curriculum. Besides these schools, another choice is to enter Technical and Vocational Schools which offer core and elective subjects in various technical and vocational combinations. The purpose is to prepare students to pursue their study to technical and engineering tertiary education, or to enable them to take up a career as technical and semi-skilled workers. They have two years to prepare themselves for the third national examination, which is the Malaysian Certificate of Education (MCE). Post-secondary education offers school leavers or students the opportunity to continue their studies after completing five years of secondary education. The options in post-secondary education are not only in the academic field but also in various studies including matriculation, technical and vocational, and short term courses. These courses are conducted by government and, non-government agencies, or in the private sector. Form 6 education is a continuation of the five years of academic schooling that helps students to prepare themselves to qualify to go to the university. It takes two years to complete the post-secondary education either in the science or the arts stream before the student can sit for the Higher School Certificate (HCE), conducted by the Malaysian Examination Council.

Schooling Reforms

The post-independence era was the basic starting point for the foundation, continuous changing and development of the Malaysian education system today. The early years of independence were the period of reconstruction intended to build the nation in the Malaysian mould. At that point of time it was thought to be very important to integrate the multiracial society and to build up a strong nation. The basis of that unity was to be laid by the school and education system. It was an important objective of the education policy to bring together all races by gradually making the Malaysian language the medium of instruction, as addressed in the Razak Report of 1957. This report was reviewed by the Review Committee (known as Rahman Talib Report, 1960) which suggested that the public accepts the education policy proposed by a previous report. The recommendations from both reports were important sources for the most significant shift in Malaysian education that led to the implementation of the new Education Act in 1961. The act also provided comprehensive and universal free education whereby all students were granted automatic promotion up to Form 3 (Grade 9) in secondary schools (MOE, 1980).

The first impact of the changes was the upgrading of the various types of primary schools to national schools. Subsequently, gradual implementation of the Act has seen the

overall changes from the British education system to the Malaysian education system, with a Malaysian outlook and orientation. The second impact of the legislation was the introduction of the Malaysian language as the official medium of instruction in all government schools. It was started in Primary 1 in 1970, and continued thereafter. At the end of 1978, all schools were using this language as the medium of instruction and in the mid-1980s the universities followed suit. This was a significant change in the Malaysian education system. The adoption of the Malaysian language at all levels was considered necessary to ensure that the education system became a tool for the integration agenda as addressed in New Economic Policy, 1971-1990. It also aimed to promote nationhood and national identity starting from the grassroots level (Neville, 1998). On top of that, the school reforms will give better opportunities to people in rural settlements and to poor families in the enhancement of their level of schooling. Furthermore, it was seen as the main tool to be used in the eradication of poverty, narrowing and eventually closing the education gap between regions and races, as well as integrating the education systems of the Sabah and Sarawak states with the national system (Okposinet al., 2005).

Since 1970s, the education system also reflected the changes in the needs of labour market changes in which there was great emphasis on science and technology. Technical and vocational courses were also popular due to the higher demand for skilled and semi-skilled labour. The curriculum also changed tremendously by adapting the syllabus to the changing needs of the nation, especially the adapting of the curriculum to fulfil the development needs of the country. The last decade of the twentieth century witnessed an extraordinary and accelerating change in the Malaysian education system. Due to liberalisation, the globalisation process and advances in information technologies, the Malaysian education system has had to maintain a pace parallel to the international process. A balanced and integrated approach has been taken to make sure that the nation is not left behind in terms of technological development. The country should move at the same pace and should also grab the emerging opportunities of new technologies, economic and social progress, by re-structuring and re-focusing, as well as reforming, its education system towards the market needs, and to meet global competition. In order to do this, some changes had to be made and, accordingly, several adjustments were carried out such as the Education Act 1961 being replaced by the Education Act 1996. Furthermore, some educational legislation was enacted and amended to support the new aspiration to achieve a developed nation by 2020. The important legislation educational institutions are University and Universities Colleges 1996, Private Higher Education Institution Act 1996, National Accreditation Board 1996, National Council on Higher Education 1996 and National Higher Education Fund Board 1996.

METHODOLOGY

The empirical analysis of this study uses the human capital earnings function to estimate the private rate of return to education in Malaysia. Since the breakthrough by Mincer (1974) the earnings function has been widely used to estimate the returns to education. According to Card (2001), this path-breaking work was extensively used by economists

as an econometric approach to estimate the rate of return to investment in education. The empirical model used in this study will start from the Mincerian earnings function that is already known in the literature as a benchmark and will use this to estimate the average private rate of returns to education in Malaysia. The basic specification is;

$$\ln W_i = \alpha + \beta_i S_i + \lambda_1 Exp_i + \lambda_2 Exp_i^2 + \varepsilon_i \qquad (1)$$

where ln W_i is log earnings, S_i is years of schooling, Exp_i is the potential experience of individual i, and ε_i is well-behaved error term. The last term of equation, Exp_i^2 represents the experience squared to capture a concavity of the observed earnings profile. Due to the absence of the completed data on experience, Mincer proposed the "potential experience", i.e. the number of years individual A could have worked after completing schooling and then, assuming that he/she starts schooling at 7 years old and begins working immediately after S_i of schooling, hence Exp_i is equal to A–S–7 (Age – Years of Schooling – 7). Running the simple Ordinary Least Square (OLS) regression to the above equation, one can estimate the coefficient β_i as the average of private rate of return to schooling (Card, 1999). The estimation of the parameters λ_1 and λ_2 will become positive and negative respectively. Mincer (1974) claimed the weekly earnings were preferred as a dependent variable in the model. His argument was that individuals with more education tend to work more and will receive higher earnings compared to those with less education. However, in the literature on the human capital earnings function a variety of earning measurements have been used to estimate the rate of return. For example, the alternatives of annual or monthly earnings have been used as the dependant variable, depending on the data availability. Consistently, the earnings variable in equation (1) makes use of the logarithm form because the distribution of log earnings is very close to a normal distribution, especially log hourly wages (Card, 1999). In addition, it is preferable to use the log transformation based on the success of the standard (semi-logarithm) human capital earnings function (Willis, 1986). The method used here is preferable having regard to the data available and the log transformation is convenient for interpretation in this study. For the purpose of this study, independent variable will use monthly earnings depending on what is reported by the survey.

Despite the popularity of using OLS with the Mincerian earnings function, its use raises a number of issues regarding the robustness of estimation. OLS regression of log earnings on schooling will produce bias in estimation on β_i because of the correlation between S_i and ε_i. The sources of bias could emerge from three sources. Firstly, returns bias – this occurs because of the correlation between marginal returns with the schooling choice of S_i. It is not very clear, but depends on the average returns among the sub-population of those with S_{1i}. Schooling may be endogenous as a result of the individual's optimal schooling choice. Consequently, OLS estimates will be biased upward. Secondly, ability bias due to the unobservable factor that is correlated with both schooling and wages, also leads to estimation bias. Moreover, if ability is believed to be associated with both wages

and schooling (Ashenfelter et al., 1999), estimates of the return to schooling will tend to be biased upwards (Grilihes, 1977; Card, 1999). However, most of the cases of omitted ability are biased by not more than 5-15 percent (Schultz, 1988). Finally, a third source of potential bias is associated with the measurement error. This bias, associated with schooling measurement, age and experience, is misreported in the data (Angrist & Krueger, 1992). The simple way to deal with this problem is to include the omitted variable in the equation. This means that ability becomes an explanatory variable in the equation. Nevertheless, it must be taken into consideration that ability itself is also influenced by schooling; hence, using the proxy, this variable will be biased downwards (Ashenfelter et al., 1999). But recently most researchers have used IV estimation to avoid this bias, although there is still no consensus about the better approach.

The impact of schooling reform to the private rate of return to education can be estimated using the Instrumental Variable (IV) approach. The IV operates by constructing another variable, which is not correlated with the earnings function, which will generate an unbiased estimation of the rate of return. The general endogenous schooling model consists of the two equations below;

$$\ln W_i = X_i' \delta + \beta_i S_i + \mu_i \qquad (2)$$

where $$S_i = Z_i' \alpha + \upsilon_i \qquad (3)$$

In equation (2), $\ln W_i$ is determined by a vector of exogenous variables X_i and years of schooling S_i. Meanwhile, the β_i' s coefficient is interpreted as the private rate of return to education. Estimation of the equation (2) by OLS will yield unbiased estimate of β_i if the S_i is exogenous, so that is there is no correlation between the two error terms. If this condition is not satisfied alternative estimation methods (i.e. IV approach) must be employed since OLS will be biased. The model is a reduced form in which providing variable in vector Z_i that is not contained in X_i(Pon & Gonzalo, 2001; Chernozhukov & Hansen, 2008; Marmer & Sakata, 2011). That is a vector of exogenous variables which is determinant of schooling that can legitimately be omitted from the earnings equation. Then, replace the schooling in equation (2) with the predicted or fitted value for schooling. This basic idea of IV operates using two steps. First, estimate the effect of the IV variable on schooling and, then estimate the effect of the instrumental variable on earnings. This is based on the assumption that the instrument is correlated with earnings only because it influences schooling, so the ratio of the effect of the instrument on earnings to its effects on schooling will provide an estimate of the causal effect of schooling on earnings (Ashenfelter et al., 1999). Many researchers apply IV estimation with different types of policy reforms to estimate returns to schooling and compare the results with those derived using OLS. For example, Harmon and Walker (1995) used the change in the school leaving-age (SLA) in UK, which first occurred in 1946 from 14 to 15, and then from 15 to 16 in 1973.The exogenous impact on the Malaysian education system was the introduction of the Malaysian language as the official medium of instruction, and this is the instrument chosen in this study. Under these circumstances, those students born after 1963 automatically used the national language in the learning process. The dichotomous variable, we called D70, is a dummy variable which is equal

to 1 for individuals starting schooling in 1970 and thereafter, and otherwise is equal to 0. It also added the same controlling variables as in previous OLS estimations. Given the year of the reform, affected individuals ($D_i = 1$) are taken to be those who were born in 1963 and later. This exogenous variable affected the decision and opportunity to pursue education at higher levels. In this context, IV estimates of the return to schooling using a medium of instruction reform as the instrument, would be interpreted as the average return to schooling for those who affected by the policy reform. Borrowing the terminology from the literature on "treatment effects", D_i (exposure to different education system reform) is independent of individual ability and the reduced form schooling residual (Heckman & Vytlacil (2000), with the assumptions that there is heterogeneity in the returns to schooling and that the IV estimate is the "Local Average Treatment Effect (LATE)" (Blundell et al., 2000; Imbens & Angrist, 1994; Blundell te al., 2004 and Oreopoulus & Salvanes, 2009).

This study used data from the household income survey, which were covered about 37,763 households in Malaysia. 11.42 percent or 4,313 observations from this survey were dropped from the estimation as those not in the labour force. It also excludes people with no income at the time of survey. Those with extraordinary earnings, i.e. more than MYR50,000 per month are also excluded. For the year 2002, only 5 observations earned an amount equal to or more than this. Students, pensioners, housewives and unpaid workers were also not included. This group consists of 3,760 observations from the whole population. The final sample of year 2002 is 13,326 observations or approximately 35.29 percent of the total heads of households in the surveys. The household income survey of year 2004 is included information from 36,481 household heads. Initially, 22.19 percent of these observations were dropped from the population because they were not in the labour force. Next, the pensioners, students, house makers and unpaid workers were excluded. This left 13,492 from the 2004, approximately 36.98 percent from the total of household heads in 2004.

THE RESULTS

The return of education in the homogenous return model is constant across individuals. The empirical results were derived from the estimation using equation 1 as presented by Table 1. Column 2 and 4, reported the OLS estimates for year 2002 and 2004, respectively. It estimated the Mincerian earnings equations where the natural log of monthly earnings received by an individual is a function of years of schooling, potential experience and its square, while the control variables used dummies for gender, marital status, household heads' activities and location (settlement type and zone of residential). The average private rate of return for an additional year of schooling was 10.51 percent in year 2002 and 10.04 percent in 2004. One additional year of experience increased earnings by 4 percent in 2002 and 3 percent in 2004. With the exception of the dummy for employee (in 2004), all parameters are significant at 0.05 levels or better in all years. Most of coefficients are significant at 0.001. The results show the Malaysian data are consistent with the basic human capital model. Regression on earnings function by controlling gender, marital status, activity and area of residence give results that are in line with the basic theory. Schooling and experience are positively correlated with earnings but experience squared is negatively correlated.

The average return to education based on a homogenous return model (OLS) for Malaysia is consistent with the average return for middle-income countries, which is 10.7 percent (Psacharopoulos & Patrinos, 2002) and slightly higher than the Asian average. The private rate of returns for Asia as a whole in 2004 was 9.9 percent (Psacharopoulos & Patrinos, 2004). Nevertheless, it is low compared to the Asian Tigers. For example, in Singapore with an average return of 13.4 percent in year 1974 (Psacharopoulos & Patrinos, 2004) and 13.1 percent in year 1998 (Sakellariou, 2003); the Republic of Korea from 12 to 13.5 percent between 1974 and 1986 (Ryoo et al., 1993). But, in Thailand which is similar in terms of economic development the private return almost equals to the return for Malaysia. For example, an average return in Thailand (Hawley, 2004) was estimated at between 10.3 and 10.7 percent from 1985 to 1998. Both Malaysia and Thailand enjoyed considerably higher returns compared to the rest of Southeast Asia. In Vietnam, for example, average returns from education for an additional year of schooling were 4.8 percent for the overall sample, and 3.4 and 6.8 percent for males and females, respectively (Moock et al., 2003), whereas, in Indonesia young people benefited slightly more than those in Vietnam from an additional year at 7.0 percent in 1995 (Duflo, 2001).

Previous estimates for Malaysia in 1979 (Psacharopoulos, 1994) indicated a homogenous return of 9.4 percent. Meanwhile, average returns for secondary education and higher education were 32.6 and 34.5 per cent, respectively. However, the large swing over such a small period of time shown in this result is suspect. The mean years of schooling (at 15.8) is very high and this may explain the seemingly unusual result. Furthermore, other related studies in Malaysia reported the returns for each level of schooling rather than the average returns for an additional year of schooling. For example, Hoerr (1973), Lee (1980), Mazumdar (1981), Gallup (1997), and Chung (2003 & 2004) reported with regard to the level of education. They did not present overall rates of return, thus, it is very difficult to look at the trend of previous returns. Rupert (1998) using a household data set, found the rate of returns to education was 2 percent. However, her studies do not use individual earnings but total labour income as a dependent variable. As well as basic human capital, she put types of occupation in the models. Most of the coefficients were statistically significant, but the rate of return was very low for a developing country, probably due to the multicolinearity. Occupation is slightly related to education.

Now we consider the heterogeneous returns model, i.e. IV approach. The first step of estimation is to examine the relevance and validity of the instrument. The strong correlation between dummy D70 with endogenous variable (schooling) and orthogonality to the error process needs to be confirmed. Otherwise, the results will be biased and inconsistent. The degree of correlation to the endogenous variable is tested by examining the fit of the first stage equation which included the dummy D70 (Bound te al. (1995); Patrinos & Sakellriou, 2004). The results of tests using a dummy year of changing the medium of instruction in schooling are statistically significant. The F-test is equal to 9644.73 and p-value is 0.000 for 2002 and 75534.30 ($p = 0.000$) for 2004. With regard to the quality of the D70's dummy, the F-test on excluded variables and partial R^2, is reported in the first row under Test Result at the bottom of the Table 1 (Column 3 and 5). Furthermore, the "robust" regression approach is used in case heteroskedasticity errors are present.

Table 1 The Private Rate of Returns to Education, 2002-2004

Variables	**2002**		**2004**	
	OLS	**IV**	**OLS**	**IV**
Schooling	.1051**	.1174**	.1004**	.1109**
	(.0018)	(.0049)	(.0018)	(.0043)
Exp	.0381**	.0394**	.0292**	.0298**
	(.0016)	(.0017)	(.0016)	(.0016)
Exp2	-.0005**	-.0004**	-.0003**	-.0002**
	(.0000)	(.0000)	(.0000)	(.0000)
Female	-.1037**	-.1061**	-.0859**	-.0873**
	(.0178)	(.0178)	(.0178)	(.0180)
Single	.1140*	.1069**	.1513**	.1453**
	(.0165)	(.0165)	(.1646)	(.0173)
Widow	-.0794*	-.0757*	-.0074	-.0033**
	(.0311)	(.0312)	(.0311)	(.0292)
Divorced	-.0825**	-.0776*	-.0400	-.0389
	(.0357)	(.0359)	(.0357)	(.0368)
Employee	.0753**	.0697**	.0179	.0129**
	(.0126)	(.0129)	(.0126)	(.0127)
Rural	-.2392**	-.2270**	-.2994**	-.2885**
	(.0099)	(.0109)	(.0099)	(.0108)
Central	.1306**	.1212**	.0939**	.0871**
	(.0149)	(.0153)	(.0149)	(.0159)
East	-.3027**	-.3047**	-.2563**	-.2575**
	(.0148)	(.0149)	(.0148)	(.0153)
North	-.2018**	-.2055**	-.1886**	-.1915**
	(.0139)	(.0324)	(.0134)	(.0144)
Sabah & Sarawak	-.0895**	-.0801**	-.1551**	-.1465**
	(.0154)	(.0359)	(.0154)	(.0157)
Constant	5.8371**	5.6885**	6.0672**	5.9405**
	(.0319)	(.0648)	(.0319)	(.0579)
R-squared	0.3937	0.3913	0.3893	0.3875
F	618.39	409.47	570.26	407.77
Test Result				
Partial R^2 for excluded variable instrument at first stage		0.9311 (0.000)		0.9173 (0.000)
F-test [p-value]		9644.73 [0.000]		75534.30 [0.000]
Endogeneity test-Wu Hausman				
F-test [p-value]		7.5676 [0.0059]		7.3390 [0.0068]
Chi-sq		7.5714 (0.0059)		7.344 (0.0067)
Observations	13,324	13,324	13,492	13,492

Robust standard errors in parentheses.
** Significant at 1 % level.
* Significant at 5 % level.

Results from both 2002 and 2004 from reduce-equation of schooling have a highly significant effect on length of schooling and no direct impact on earnings. In other words, all equations are exactly identified. It is proved that D70 dummy can be used as the instrument for schooling. In addition, any potential endogeneity in schooling was also checked. Using the well-known Durbin-Wu and Hausman's test, the hypothesis that the OLS estimates differ is accepted at the significant level of 1 percent. All diagnostic tests of relevancy and validity having been satisfied, D70 was therefore acceptable as the instrument for IV. All the diagnostic test results are presented in the bottom rows (Test Result) in Table 1. By obtaining the original controlling variables, dummies for gender, marital status, activity and region (zone), the results suggested that IV estimates were somewhat higher than those derived using OLS. Column 3 and 5 provide the rate of returns estimated using IV, at 11.74 and 11.09 percent for 2002 and 2004, respectively.

The private rates of returns to education by IV estimation are approximately 11.70 and 10.46 percent higher than those resulting from the use of OLS. It is frequently asserted in the literature that the standard error from IV estimation is higher than that from OLS (for example, see Card, 2001; Card, 1999; Angrist & Krueger, 1992). These results are in line with Brunello & Miniaci (1999) for Italy. They used data of male house hold heads drawn from The Bank of Italy Survey (from 1993 to 1995). The important exogenous event in Italian education, which is Law 910 of December 1969, was used as the instrument. Their results suggested that private rate of return increased from 4.8 percent (OLS) to 5.6 percent (IV). It was higher by 10 percent, as with our findings. Meghir and Palmer (1999) examined the impact of the Swedish school reforms, i.e. the extension of compulsory schooling by one year, and this also corresponded with our findings. Their result, obtained using the exogenous variation induced by reform assignment, led to a point estimate that was higher than that derived using OLS, even when they allowed for the heterogeneous returns to years of schooling. This is also consistent with the idea that reform changed the composition of those taking higher education towards lower average ability and poor family background. Ashenfelter et al. (1999) analysed a several studies in the US and seven non-US countries between 1974 and 1995. They found that IV and twin studies estimates exceeded OLS estimates by 3.1 and 1.6 percentage points. But after they controlled for studies that produced no interesting results and the insignificant difference between the IV and the least-squares estimates, the differences were only 1.8 and 0.9 percentage point respectively (Fuente, A & Ciccone, 2002).

Duflo (2001) examined the effect of the school constructions program in Indonesia on education and earnings. She found returns to education ranging from 6.8 to 10.6 percent. Patrinos and Sakellariou (2004) estimates for Venezuela found the private rate of returns was 12 percent higher when using compulsory education. Uusitalo (1999) using changes in education sector "L/70" but result was not as good as those for the UK or other countries. A few studies in urban China also indicate that IV is higher than OLS by between 4 and 5 percentage points such as Giles et al. (2004), Heckman & Li (2004) and Fleisher et al. (2005) and Oreopoulus (2006 & 2007). However, they used family background, quality of elementary education and other instruments related to socio-economic indicators as the instrument. In contrast, some studies provide the opposite findings. For example, Vieira (1999) considered legal changes in compulsory education in Portugal using data drawn

from Quadros de Pessoal for the years 1986 and 1992. The results showed high standard errors and OLS estimates that were higher than those derived using IV. Unfortunately, the comparison between OLS and IV estimations using Malaysian data with different IV instruments could not be made because there have been no previous studies of this kind relating to Malaysia. The main reason for this is probably the difficulty in getting the data.

CONCLUSION

The average private rate of return for an additional year of schooling in Malaysia was 10.51 and 10.04 percent for 2002 and 2004, respectively. An additional year of experience has increased earnings by 3 to 5 percent for all year of surveys. The human capital model, i.e. the earnings function, fitted well with the Malaysian data. The model's coefficients and signs were in line with the theory. The schooling parameters shows the private rate of return to education were similar to the world average and slightly higher than the average of Asia. The estimation of the private rate of returns to education using the IV approach is higher than results from using OLS by approximately 10 to 11 percent. The studies on the returns to education in Malaysia do not attract many local economists compared to other developing countries, such as China, and some countries across Europe. The lack of good quality and rich information relating to individuals' earnings and schooling has been a barrier to those interested in studying the economics of education in Malaysia. However, some previous studies have given a basic idea and information on returns for each level of schooling. For example, the private rate of returns was shown to be higher at pre-university, followed by university level education (Chung, 2002 & 2004), whilst, lower and upper secondary levels were not showing high rates of returns to education.

In summary, the findings of this study are as follows. Firstly, we found the average private rate of returns for Malaysia to be almost consistent with the world average. The homogenous return was about 10 percent, equal to the world average and slightly higher than the Asian average. Secondly, the most important finding is that the returns to schooling in Malaysia are heterogeneous. The returns vary across individuals. By using the IV method, we estimated the LATE from schooling reforms and found the returns to be higher than the estimate using OLS. Using two sets of data, 2002 and 2004, the private rate of return to education increased between 10 and 15 percent compared to conventional OLS-based estimation. The difference in estimates of rates of return to education using the OLS and the IV methods are not solely due to the well-known tendency for IV to result in higher estimates than OLS. It is also due to the fact that the schooling reform that is the chosen instrument in the IV method has itself generated higher positive returns. The findings of this study are also consistent with the findings using data from other countries.

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