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Higher levels of education for higher private returns: New evidence from Malaysia

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ABSTRACT

This study provides new and more accurate information about private rates of return to education (RORE) in Malaysia. Most of the prior studies on RORE have not addressed selectivity bias, and those that have are based on an older data set. The findings suggest that for both males and females, the average private returns to education are highest at the secondary (16.5 percent and 27.2 percent, respectively) and university (15.5 percent and 16.1 percent, respectively) education levels. Thus, it is important to pursue education until the secondary level and further to the university level to capture higher returns to education.

1. Introduction

The *Human Capital Framework* has been a driving force behind huge investments in education in developing countries for the past 40 years. Human capital development always has been a priority of the Malaysian government as it is seen as an important tool for national development. The Malaysian government has been the primary financier of education in Malaysia and has allocated a substantial amount of its resources to the education sector. For example, a sum of RM47.7 billion was allocated in 2009 for education and training, accounting for 23 percent of the total annual budget allocation (MOF, 2009).

According to the human capital theory, education or training increases the productivity of workers by imparting useful knowledge and skills, thereby raising workers' future income by increasing their lifetime earnings (Becker, 1964). Human capital analysis starts with the assumption that a rational investor (either a student or his/her family) will weigh the costs and benefits of education and will invest in additional schooling when the private benefits are greater than the private costs. The private benefits of investing in another year of education are the resulting gains in earnings (after taxes) for the rest of a person's working life (Psacharopoulos, 1995; Levin and McEwan, 2001; Jimenez and Patrinos, 2008). The private costs include any fees or direct costs that the individual pays plus the opportunity costs in terms of forgone earnings. These values occur over time and therefore must be discounted to be comparable (Tsang, 1994; Psacharopoulos, 1995; Jimenez and Patrinos, 2008).

Because resources are scarce, most households have to prioritize the allocation of resources to those investments that yield the highest returns (Cohn and Geske, 1990). Previous studies conducted in Malaysia indicate that rates of return to education are high at the secondary, upper secondary and university levels (Chung, 2003). However, World Bank statistics indicate that the Malaysian gross enrollment rates for secondary and tertiary education are still at 68 and 32 percent, respectively, in 2007; these rates are far behind developed nations' rates. For instance, secondary and tertiary gross enrollment rates for South Korea were 97 and 96 percent, respectively, in 2007 (World Bank, 2009). According to the Tenth Malaysia Plan (2011–2015), the Malaysian workforce remains relatively unskilled, with 77 percent reporting 11 or fewer years of basic education (primary and secondary), and with only 28 percent of jobs requiring advanced skilled-based education (MOF, 2010). It is hoped that the updated rates of return for different levels of education will help households understand the importance of investing in their children's education.

Additionally, studies show that rates of return to education for women in Malaysia are generally higher than rates of return for men (Chung, 2003; Psacharopoulos and Patrinos, 2004). However, it is important to understand that most of the women in developing nations are not involved in waged-work. In fact, the percentage of women who participate in the labor force in Malaysia is only 47.3 percent (MWFC, 2007). The majority of women work at home, indicating higher implicit value placed on housework. Thus, an adjustment needs to be made to rates of return to education to take into consideration the non-randomness of the sample.

The analyses in this study will provide new and more accurate information about private rates of return to education in Malaysia. Most of the prior studies on rates of return to education have not addressed selectivity bias, and those that have are based on an older data set (Schafgans, 2000). Thus, the selectivity-bias adjustments in this study, which uses the latest available data set, will provide more precise estimates than those found in existing literature. Additionally, this study uses nationally

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representative data to provide more accurate information about returns to education, in light of which the Malaysian government, international agencies, and households might make more informed decisions about public and private educational expenditures.

The objective of this study is to estimate the private rates of return to different levels of education in Malaysia by gender and then to estimate the private returns by location (urban/rural). In addition to Ordinary Least Square Estimates, this paper reports estimates that correct for sample selectivity problem owing to potential non-random labor force participation by females.

The organization of this paper is as follows: the second section provides a review of the literature on private returns to education. Section 3 provides research-related details in terms of data collection and methodology. Section 4 presents the results and empirical issues. Finally, section 5 concludes the paper.

2. Literature review: rates of return to education

Since the late 1950s, rate of return to education (RORE) has been used by economists to understand educational investment decisions. The benchmark model for the empirical estimation of rates of return to education has been developed by Mincer (1974). The Mincer-type earnings function has been extensively used in the literature (Mincer, 1974).

$$\log W_i = \alpha + rS_i + \lambda_1 \ \mathrm{Exp}_i + \lambda_2 \mathrm{Exp}_i^2 + \gamma X_i + \varepsilon_1$$

In this equation, W_i is earnings, S_i is years of schooling, Exp_i is the potential experience of individual$_i$, X_i is set of other variables assumed to affect earnings and ε_1 is an error term. r can be considered as the private returns to schooling assuming years of schooling is a continuous variable.

The Mincer Method is the credible approach to estimate rate of return to education in industrialized countries. However, it does not account for direct costs of education (Levin and McEwan, 2001). This is an important concern for developing countries as there is considerable evidence that total direct costs of education are a heavy burden for many households and can, in turn, adversely affect the demand for education (Tsang, 1994). However, due to data limitations, the Mincer method has been commonly used by researchers.

Conventionally, the returns to schooling are estimated using ordinary least squares (OLS). However, there are three main biases associated with OLS estimates of the return to schooling: selectivity bias, omitted variable bias and measurement error.

Sample selection bias arises when individuals self-select into waged work on the basis of some unobserved attributes (such as ability, taste, and motivation) that also affect their wages (Willis and Rosen, 1979). This is an important issue in the context of developing countries where the majority of the population is engaged in various self-employment activities. Thus, the sample of individuals who are involved in wage work for which data are available is likely to be non-random. In addition, labor market participation for females is low compared to that of their male counterparts. For instance, in Malaysia, the labor force participation rate for females is 47.3 percent, compared 80.9 percent for males (MWFC, 2007).

Willis and Rosen (1979) argue that if more able students select themselves into the better educated comparison group, the rate of return to education could be overstated unless a selection-corrected measure of return to schooling is computed. In most applied work, Heckman's correction for sample selectivity is used. This entails estimating a work participation probit from which a sample selectivity correction term, lambda, is derived. Then, the earning function is estimated with lambda included in the list of regressors as an extra variable (Heckman, 1979). In one key study, Asadullah (2006) estimates private return to education in Bangladesh. To adjust for selection bias, the author uses land holdings, income from sales of different types of assets, and rent earned from other sources (such as remittances or leasing household assets) as exclusion restrictions in the probit model (p. 456). To account for self-selection bias in the female sample (in terms of the choice to work or not to work), Asadullah includes marital status and household size as additional exclusion restrictions.

Besides sample selection bias, OLS estimates of earning functions potentially suffer from omitted variable bias. For example, unobserved inherent ability is a determinant of both schooling attainment (independent variable) as well as earnings (dependent variable). It thereby causes the schooling variable to be endogenous in the earnings function, yielding inconsistent estimates of returns to schooling (Aslam, 2009). Card (2001) points out that bias arise not only from variation in ability but also from the different marginal rates of substitution between current and future earnings. When individuals in the labor market have similar ability but differ in terms of discount rates (indicating the preference for current consumption over future consumption), then OLS estimates are negatively biased. However, if there is no variance in discount rates, then the endogeneity will arise exclusively from the correlation between ability and education; since this is likely to be positive, the bias will be upwards.

Previous work has dealt with the endogeneity issue using one of four methods. One method to address the issue of ability bias is the inclusion of explicit measures (such as IQ or similar tests) as proxies for unobserved ability (Griliches and Manson, 1972; Griliches, 1977). The results of these studies suggest an upward bias in results for which ability measures are unavailable. However, this approach (adding proxies for ability measures) has been criticized because it is difficult to develop ability measures that are not determined by schooling (Ashenfelter et al., 2000).

A second approach uses within-twins differences in wages and education, assuming that unobserved effects (such as abilities, tastes, motivations, and preferences) are common within twins. However, studies based on siblings or twins have been criticized for two primary reasons. First, if ability consists of both an individual component as well as a family component,[1] which is endogenous to the schooling variable, the within-family approach may not result in estimates that are less biased than OLS estimates. Second, if there is measurement error in the schooling variable, this will account for a large portion of the differences between the twins than across the population as a whole (Ashenfelter et al., 2000).

When measurement error is of the classical type[2] in the schooling variable, it generates a correlation between the error terms in the earnings and schooling functions. This leads to attenuation bias[3] in schooling coefficient in the earnings function. In sibling or twin studies, data differencing exacerbates measurement errors since differencing within families reduces the true signal-to-noise ratio[4] in schooling (Angrist and Krueger, 1999). Recent literature has attempted to control for measurement error. For instance, the innovative paper by Ashenfelter and Krueger

[1] The contribution of individual ability as well as the influence of family background.

[2] In the earnings function, earnings are determined by both observable variables (e.g., schooling) and unobservable variables (e.g., innate ability). In the classical regression analysis, the unobservable variables will render as error terms. These errors have to be uncorrelated with the independent variables for the coefficient to be unbiased. But, ability is highly correlated with schooling. Therefore, the regression coefficient on schooling is biased.

[3] The attenuation bias is an underestimate of the schooling coefficient.

[4] In the Mincer type earnings function, signal will be the independent variables that we observe (such as age, gender, ethnicity and other household characteristics). The standard error of the estimate is the noise of the data. When we do data differencing between twins, the age variable will be dropped from the data as well as all the other household characteristics. This will reduce the signal but the noise remains constant, hence reduce the signal-to-noise ratio.

(1994) uses data that were collected at an annual twin festival in 1991 to estimate the returns to schooling by contrasting the wage rates of identical twins with different schooling levels. The authors have attempted to deal with the measurement error problem by instrumenting the education of twin A using the measure of twin A's education as prepared by twin B. In this study, it was possible to calculate the reliability ratio for variables such as wages, education levels and parental education levels since both twins were asked to report about the same variables. Angrist and Krueger (1999) argue that reliability ratios for parental education (0.86 for father's education and 0.84 for mother's schooling) might have been overestimated due to the positive correlation in reporting errors. This is caused by the fact that when a parent misrepresents his or her education level to one twin, there is tendency for the parent to misrepresent the same information to the other twin as well.

Recent studies conducted in developed countries have attempted to address the issue of endogeneity of the schooling variable in an earnings function through an application of the instrumental variable (IV) framework. IV methodology identifies variables (instruments) that are correlated with schooling but uncorrelated with unobserved ability and measurement errors. This method also simultaneously addresses measurement error issues (e.g., Ashenfelter and Krueger, 1994). Generally, there are two kinds of IV estimates that are reported in the literature. The first type of studies use various institutional reforms, such as changes in the minimum age necessary to stop receiving formal schooling, as instruments that cause exogenous variation in academic attainment. Card (1999) provides a selective review of the recent literature on estimating the return to schooling.

The second type of studies, on the other hand, use family background variables such as father's education and mother's education to construct instruments for education (e.g., Butcher and Case, 1994; Trostel et al., 2002). Trostel et al. (2002) find that using spouse's education as an instrumental variable leads to estimates which are a little over 20 percent higher than corresponding OLS estimates. Card (1999) argues that the use of parental education as an instrument results in IV estimates that are at least 15 percent above the corresponding OLS estimates. However, it is important to note that these variables constitute valid instruments only if they affect earnings indirectly through their effect on schooling, that is, if there is no intergenerational transmission of ability.[5] But, the validity of such an assumption is questionable (e.g., Behrman and Rosenzweig, 2002, 2005).

Recent studies have attempted to estimate rates of return to education using multiple methods. Aslam (2009) estimates returns to schooling by gender for Pakistan using four approaches: OLS; the Heckman two-step procedure, which corrects for sample selectivity; two-stage least squares estimates using family background measures (parental education and spouse's education) as instruments; and household fixed effects estimation to control for unobserved family-specific heterogeneity.[6] The results suggest that after correcting for selection bias, the marginal return to schooling is reduced from 7.2 percent to 6.4 percent for males and from 16.6 percent to 14.2 percent for females. Household demographic variables (number of children age 7 or less; number of adults age 60 or above), marital status and log of unearned income are used as exclusion restrictions. For the IV framework, parental education variables are used as instruments for the subset of individuals reporting father's and mother's education; alternatively, spouse's education is used as an instrument for married wage workers. The findings show that the IV estimates are higher for both males (10 percent to 11 percent) and females (17 percent to 18 percent) compared to the corresponding OLS estimates (7 percent for males and 17 percent for females).

In this study, the author also uses observations from different individuals within the same family to "difference out" the variables generating correlation in the residuals in a "household fixed effects" approach (Aslam, 2009). The results are based on sub-samples of at least one male and one female wage worker within a household who are related (such as father–daughter, mother–son, brother–sister or husband–wife) or siblings (only brother–sister pairs). Fixed estimates are computed for all relations (panel A) and for sibling pairs (panel B). Fixed effects estimates are found to be smaller than OLS estimates for majority of people in panel A but not for sibling pairs. The author argues that part of the decline in estimates could be caused by upward bias in the OLS estimator due to omitted variables. Some part of the attenuation could be attributable to measurement error (Aslam, 2009).

Card (1999) concludes that the effect of ability and related factors does not exceed 10 percent of the estimated schooling coefficient and that this is consistent with the summaries of the literature by Griliches (1977, 1979), which find that the ability bias in the OLS estimates of the return to education is relatively small. Another interesting point is that IV estimates based on supply-side interventions are at least 20 percent higher than the corresponding OLS estimates. However, measurement error can explain only 10 percent of the gap between OLS and IV estimates (Card, 2001). Similarly, IV estimates of returns to education based on family background are systematically higher than OLS estimates (Card, 1999). Angrist and Krueger (2001) contend that the most important problem in the instrumental framework is the possibility that an association between the instrumental variables and omitted variables can lead to a bias in the resulting estimates that is much greater than the bias in OLS estimates. Another concern is the potential bias that might arise when instruments are only weakly correlated with endogenous regressors (Angrist and Krueger, 2001). In another words, the OLS methodology provides a conservative estimate of true returns to education (Asadullah, 2006). Thus, in this study, the rate of return to education is estimated using the OLS method in order to draw a conservative conclusion.

3. Data and methodology

The 2007 Malaysian Household Income Survey (HIS) was conducted by the Malaysian Economic Planning Unit (EPU). The survey primarily collected demographic data, including respondents' age, gender, earnings, and education. The 2007 HIS collected data from 38,083 households composed of 68,221 individuals between ages 0 and 99. The EPU used a stratified multi-stage design to select the sample for the HIS. The HIS is a nationally representative data set and one of the most comprehensive surveys of individuals' earnings in Malaysia, making it an ideal data source for this research.

Since the purpose of this study is to estimate labor market (private) returns to education, only those who are between the ages of 18 and 58 years are included in the analyses.[7] "Employed" refers to individuals between the ages of 18 and 58 years who are earning income either from wage employment, self-employment (both agricultural and non-agricultural activities) or dual-employment (both wage employment and self-employment).

[5] Intergenerational transmission of ability means more able parents tend to have more able children (e.g., IQ scores).

[6] In micro-econometric applications, the term fixed effects means that one is allowing for arbitrary correlation between the unobserved effects and the observed explanatory variables. In the household fixed effects model, we add further control variables (for family background such as assets ownership, demographic composition) to control for all the common unobserved characteristics shared by the individual from the same household.

[7] The retirement age in Malaysia is 58 years of age.

Thus, 9521 responses were excluded from data set prior to its use in this research because those individuals likely were not in the working age population when data were collected (i.e., they were younger than 18 or older than 58 years of age). In addition, 11 cases with missing values for education were excluded from the analysis. Further, six cases with unreasonably high or low yearly income were dropped from the analysis since these data may have arisen from errors during data entry or processing. 2384 cases, consisting of part time students, homemakers, unemployed and pensioners are categorized as "not working". 480 homemakers have been categorized as "not working".[8] Finally, 960 cases were categorized as "not working" due to inconsistent reporting.[9] Thus, the final sample used for this research consists of 36, 369 males and 18, 552 females (54,921 individuals).

The empirical analyses in this study use a human capital earnings function to estimate the private rate of return to education in Malaysia.

$$\ln W_i = \alpha + \beta_1 S_i + \lambda_1 \ \mathrm{Exp}_i + \lambda_2 \mathrm{Exp}_i^2 + \gamma X_i + \varepsilon_1$$

In this equation, $\ln W_i$ is natural log of yearly earnings, S_i is years of schooling (a continuous variable), Exp_i is the potential experience of individual$_i$, X_i is set of other variables (such as ethnicity, regional characteristics) assumed to affect earnings and ε_1 is an error term. The dependent variable ($\ln W_i$) in the earning function is in a logarithmic form because the distribution of log earnings is very close to a normal distribution (Card, 1999). In addition, the successes of the standard (semi-logarithmic) human capital earnings function also provide extra support for the use of logarithmic transformation (Willis, 1986). Since data on experience are not available, Mincer offers (1974) alternative procedure to compute Exp_i in the equation, (age minus years of schooling minus seven) reflects the assumptions that a child begins schooling at the age of 7 and starts working immediately after completing schooling. Exp_i^2, the quadratic of experience, is used to capture the concavity of the observed earnings profile. In this semi-log specification, the coefficient for years of schooling (β_1) can be interpreted as the average private rate of return to an additional year of schooling. This model enforces constant rate of return to each additional year of schooling regardless of the level of education.

However, the assumption that the return to education is linear is not necessarily true for Malaysia. Thus, in the equation below, dummy variables are included for each educational level to calculate RORE by education level. The base category is below primary or nonformal education.

$$\ln W_i = \alpha + \beta_1 \,\mathrm{primary} + \beta_2 \,\mathrm{lowersec} + \beta_3 \,\mathrm{secondary} + \beta_4 \,\mathrm{uppersec} + \beta_5 \,\mathrm{university} + \lambda_1 \ \mathrm{Exp}_i + \lambda_2 \mathrm{Exp}_i^2 + \gamma X_i + \varepsilon_1$$

The average rate of return r_i to each educational level (compared to the level below it) is calculated using the estimated OLS coefficients in the following way: $r_i = (\beta_i - \beta_{i-1})/(S_i - S_{i-1})$, where i is the level of education (i.e., primary, lower secondary, secondary, upper secondary). S_i is the year of schooling at education level i (belowprim/nonformal = 3, primary = 6, lowersec = 9, secondary = 11, uppersec = 13, university = 17)[10] and β_i is the estimate of the coefficient on a corresponding education-level dummy in the wage regression. For instance, the average private return to lower secondary education is calculated as $r_{(\mathrm{lowersec})} = (\beta_{\mathrm{lowersec}} - \beta_{\mathrm{primary}})/(S_{\mathrm{lowersec}} - S_{\mathrm{primary}})$. Thus, $r_{(\mathrm{lowersec})} = (\beta_{\mathrm{lowersec}} - \beta_{\mathrm{primary}})/(9-6)$.

The earnings function will be estimated separately for males and females. As noted in the international literature, females typically demonstrate a higher return to education than their male counterparts. However, levels of investment in females' education consistently have been lower. Thus, it is important to provide precise estimates to help households and governments understand the importance of investing in girls' education. In most applied work, the two-stage Heckman procedure (Heckman, 1979) is used to correct for the bias that arises due to nonrandom samples. Due to a high labor market participation rate for males in Malaysia (about 80.9 percent in 2004), a sample selectivity adjustment is unnecessary. For females, though (at a 47.3 percent labor market participation rate in 2004), the most important choice is the decision of whether or not to work (MWFC, 2007).

A Heckman two-step model is used to adjust for the female sample selection bias that arises because earnings are observed only for women who are employed, resulting in a non-random sample. The first step of the two-step approach is to estimate the work participation probit for the female sample. The dependent variable is a binary outcome (1 = employed and 0 = not). The independent variables are given in Table A.1. The Heckman estimation of wage regression for the female sample is obtained using two identifying variables: marital status and total unearned income. Total unearned income is calculated by adding income from rental, royalties, and interest together with the transfers received (scholarships, pensions, cash transfers, money orders, and living allowances). Total unearned income is then transformed to a natural logarithm to comply with a normal distribution. Marital status (*married*) and total unearned income are used as excluded identifying variables since both being married and having high levels of unearned income affect females' probability of participation in the employment but do not directly affect their wages. These two identifying variables are included in the participation model (the first step) but they are not part of the independent variables in the OLS earnings model (second step). The Heckman procedure considers non-working women in the first step. These are the women who decide not to work because of unearned income and marital status. This procedure allows us to use the information from non-working women to improve the estimates of the parameters in the regression model. The selectivity correction term (lambda)[11] is computed from the participation probit and it is then included in the OLS earnings model to obtain the corrected earnings function for the female sample. Further, RORE is also estimated for male and female workers after controlling for kind of work (wage workers, self-employed or dual-employed). Additionally, estimates of RORE are separately reported for households in rural and urban areas.

4. Data analysis

4.1. Descriptive statistics

Table 1 presents a breakdown of the sample by individuals' work status. About 66 percent of the total sample is involved in

[8] OLS regression shows that most of them have very large negative residuals. In developing countries, it is common for women with university education just to work part time. As such, their incomes do not reflect their education level, and for this study they have been categorized as not working.

[9] These individuals are probably students who are working part time. They are categorized as not working because their part-time earnings will not reflect the real return to education since their jobs are not directly determined by their education.

[10] Primary school (7–12 years old); lower secondary (13–15 years old); secondary (16–17 years old); upper secondary (18–19 years old), university (20–24 years old). Since no exact figures are available for religious education/below primary, the figures are based on average years of education (6/2 = 3 years).

[11] Lambda is rho × sigma. Rho is the correlation of the residuals in the participation probit and the earnings function; sigma is the standard error of the residuals of the earnings function.

Table 1
Distribution of the sample by work status.

	Full sample		Male		Female	
	n	%	*n*	%	*n*	%
Wage workers	38,822	66.16	23,722	62.44	15,100	72.98
Self-employed	10,396	17.72	7550	19.87	2846	13.76
Dual-employed	5703	9.72	5097	13.42	606	2.93
Not working	3762	6.41	1624	4.27	2138	10.33
Total	58,683	100	37,993	100	20,690	100

Note: All individuals are between ages 18 and 58.

Table 2
Percentages of wage, self-employed, and dual-employed workers by education level and gender.

Education level	Wage workers				Self-employed workers				Dual-employed workers				Total			
	Male		Female		Male		Female		Male		Female		Male		Female	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Below primary/non-formal	970	4.09	679	4.50	1061	14.05	637	22.38	551	10.81	121	19.97	2582	7.10	1437	7.75
Primary	2129	8.97	1015	6.72	1667	22.08	580	20.38	985	19.33	102	16.83	4781	13.15	1697	9.15
Lower secondary	4561	19.23	1778	11.77	1795	23.77	593	20.84	1260	24.72	105	17.33	7616	20.94	2476	13.35
Secondary	11,265	47.49	7060	46.75	2371	31.40	819	28.78	1713	33.61	191	31.52	15,349	42.20	8070	43.50
Upper secondary	781	3.29	882	5.84	191	2.53	98	3.44	152	2.98	22	3.63	1124	3.09	1002	5.40
University	4016	16.93	3686	24.41	465	6.16	119	4.18	436	8.55	65	10.73	4917	13.52	3870	20.86
Total	23,722	100	15,100	100	7550	100	2846	100	5097	100	606	100	36,369	100	18,552	100

wage-work. Consistently, the majority of both males and females are involved in wage work (about 62 and 73 percent, respectively). However, only about 18 percent of the sample is self-employed, a category that describes individuals involved in both agricultural and non-agricultural activities (both family-related and profit-making). Similarly, only about 20 percent of males and 14 percent of females are self-employed. In addition, about 10 percent of the sample is dual-employed, a category that encompasses those who are involved in both wage work and self-employment. More males (about 13 percent) are dual-employed than females (about 3 percent) possibly because females often have additional "chores," such as taking care of children that prevent them from being dual-employed. It may also be the case that male workers, especially in urban areas, are involved in dual-employment to support the high cost of living in those areas. It may be that there are only part-time opportunities, in which case a single job leads to underemployment. Finally, about 4 percent of the sample reported being "not working", a category that includes those who are retired, part-time students, or homemakers. About 4 percent of males are "not working", whereas 10 percent of females are "not working", most of who are homemakers.

Table 2 shows the percentages of males and females of different education levels who are wage workers, self-employed workers, or dual-employed workers. The majority of male and female wage workers are those with secondary education (47.5 and 46.8 percent, respectively) possibly because the entry-level requirement for most jobs at the clerical, sales, construction, and technical levels is the SPM certificate, which is obtained after 11 years of primary and secondary education. In addition, about 17 percent of male wage workers and 24 percent of female wage workers have a university education possibly because there are many job opportunities for graduates in both the public and private sectors. Finally, only about 11 and 13 percent of male and female wage workers respectively have a primary education or below. They are mostly involved in plant and machinery work, craft related work, agricultural work and fishery-related activities.

In the self-employed category, most male and female workers (60 and 64 percent, respectively) have lower secondary education or below. They primarily are involved in agricultural work, family businesses, fishing and similar endeavors.[12] About 31 percent of male workers and 29 percent of female workers who are self-employed have a secondary education. Fewer than 9 percent of males and females who are self-employed have an upper secondary education or higher. One can assume that many of these individuals are involved in business or working at the professional or managerial levels.

The majority of both male and female dual-employed workers have a secondary education or below (88 percent and 86 percent, respectively). As noted earlier, it likely is the case that individuals who are dual employed receive insufficient income from a single job to support their families. Relatively small percentages (9–11 percent) of both males and females who are dual employed have a university education. These individuals may include school teachers who are wage workers but who also offer part-time tutoring services. They may also include physicians who moonlight.

Table 3 presents the average yearly earnings for wage workers by education level and gender. At all education levels, male earnings are significantly higher than female earnings. The absolute values of Cohen's *d* range from 0.3 to 0.6, indicating small to moderate effect sizes except at the "primary" and "below primary" levels, for which the effect sizes are medium.[13] On average, female wage workers earn about 60 to 80 percent of the earnings of male wage workers with similar education levels. The magnitude of the gap in earnings is greatest at the university level, but female wage workers earn the least compared to male wage workers, proportionally, at the primary and below primary education levels. This finding is consistent with Chapman and Harding's study (1985) from Malaysia which found that women earned only 71 percent of the earnings of men. The authors argue that one important reason for such differences is the difference in

[12] Detailed analysis of the data shows that 83 percent of the self-employed males and females with lower secondary education and below are involved in agricultural, family businesses, craft related work, plant and machinery and elementary (such as domestic, hotel and office cleaners) work.

[13] Cohen (1988) defined *d* as the standardized difference between two group means. The effect sizes are categorized as "small" if the $d = 0.2$, "medium" if the $d = 0.5$ and "large" if the $d = 0.8$.

Table 3
Average yearly earnings of wage, self-employed and dual employed workers by education level and gender.

Education level	Male (a)	Std. Dev. (b)	Female (c)	Std. Dev. (d)	Gap (MF) (a–c)	*t*-Test[a]	F/M (c/a)	Cohen's *d*[b]
	Wage work							
Below primary/non-formal	12,817.35	10,295.20	7684.17	5230.07	5133.18	13.27	0.600	0.599
Primary	15,055.93	10,206.89	9026.53	6363.56	6029.40	20.23	0.600	0.660
Lower secondary	16,932.07	12,763.81	11,186.71	7937.04	5745.36	21.54	0.661	0.495
Secondary	20,190.50	15,378.78	16,029.19	11,111.37	4161.31	21.21	0.794	0.300
Upper secondary	28,202.67	24,160.88	19,429.11	12,850.17	8773.56	9.08	0.689	0.462
University	48,644.46	40,186.30	36,205.45	30,224.34	12,439.01	15.43	0.744	0.348
	Self-employed							
Below primary/non-formal	12,690.80	19,588.64	6994.12	9803.00	5696.68	7.96	0.551	0.343
Primary	16,977.09	21,640.86	8949.29	17,962.46	8027.80	8.77	0.527	0.387
Lower secondary	20,903.56	24,659.07	9958.44	16,900.47	10,945.12	12.08	0.476	0.476
Secondary	26,423.71	39,653.27	12,737.73	17,925.58	13,685.98	13.32	0.482	0.387
Upper secondary	30,973.12	52,468.20	12,667.29	12,594.00	18,305.83	4.57	0.409	0.424
University	57,050.73	78,196.84	38,263.92	40,628.35	18,786.81	3.61	0.671	0.261
	Dual-employed							
Below primary/non-formal	11,318.42	7399.90	6411.04	3720.15	4907.38	10.61	0.566	0.714
Primary	12,889.53	8506.61	8442.27	5226.70	4447.27	7.61	0.655	0.539
Lower secondary	15,876.68	12,093.12	11,361.94	7842.10	4514.73	5.39	0.716	0.382
Secondary	21,787.55	20,763.34	15,908.58	11,804.32	5878.97	5.94	0.730	0.293
Upper secondary	28,364.14	17,150.38	18,173.86	12,795.42	10,190.27	3.33	0.641	0.614
University	47,175.88	34,527.23	37,444.83	16,180.24	9731.05	3.74	0.794	0.298

Note: Earnings numbers (a, c, and a–c) are expressed in terms of the Malaysian Ringgit.

[a] If the assumption of equal variance is violated, the reported *t*-value has been approximated using individual sample variance instead of pooled variance and the Satterthwaite's degree of freedom applied. (obtained using STATA).

[b] To account for unequal sample size and unequal variance between the two groups, the formula that is used to calculate Cohen' s *d* is as follows: $d = (\bar{X}_1 - \bar{X}_2)/\sqrt{(n_1 x \hat{\sigma}_1^2 + n_2 x \hat{\sigma}_2^2)/N}$. The numerator is the sample means difference between two groups, whereas the denominator is defined as the square root of weighted pooled variance.

the occupational distribution of males and females, whereby the females tend to be concentrated in lower paid jobs (Chapman and Harding, 1985; Fernandez, 2009).

Similarly, at all education levels, male earnings are consistently higher than female earnings for self-employed workers. The absolute values of Cohen's *d* range from 0.2 to 0.4, indicating small to medium effect sizes. The magnitude of the gap in earnings is greatest at the upper secondary and university education levels. Similarly, female self-employed workers earn the least compared to male self-employed workers, proportionally, at the upper secondary education level. On average, female self-employed workers earn about 40 to 70 percent of the earnings of male self-employed workers with similar education levels. According to the UNDP Asia Pacific Human Development Report on Gender (2010), the gender-wage gap between men and women by occupation is an important concern in Malaysia, with wage differentials being as high as MR1, 774 per month (about US$ 600) for senior officials and managers doing the same job. According to Global Gender Gap report 2009, the overall wage equality for similar work (ratio of female over male) is 0.73 for the year 2009.

Finally, among workers who are dual-employed, male earnings are consistently higher than female earnings at all education levels. The absolute values of Cohen's *d* range from 0.2 to 0.7, indicating small to medium effect sizes. The magnitude of the gap in earnings is greatest at the upper secondary education level, while female dual-employed workers earn the least compared to male self-employed workers, proportionally, among those who have below primary education On average, female dual-employed workers earn about 50 to 70 percent of the earnings of the male dual-employed workers with a similar education level.

4.2. Regression results

4.2.1. Linearity in return to education

The summary statistics are presented in Table A.1. Table 4 presents the results for the full sample separately for males and females.[14] For the male sample, only the OLS estimates are reported. However, for the female sample, both the OLS and selectivity-corrected Heckman estimates are reported (together with the first-stage participation probit underlying the Heckman estimates). In the years of schooling column, the schooling variable is defined as a continuous variable (years of schooling) with the assumption that returns to education are linear (each additional year of schooling yields the same return).

The probit model (Table 4) presents an estimation of female employment participation. Being married has a significantly positive association with female employment participation, suggesting that married women are more likely to work. On the other hand, the coefficient for unearned income is negative and significant. This suggests that alternative sources of income reduce the need to work among the female sample. The effect of experience is positive and the effect of experience squared is negative, suggesting that experience increases the chances of being employed at a decreasing rate. Females who indicate their ethnicity as "Indian or other" are more likely than those of the Bumiputera ethnic group to work. Finally, females residing in the South, East and East Malaysia regions are more likely to work than those in the North region.

In the OLS model (for the male workers) and the Heckman model (for the female workers), the effects of experience and experience squared are significant, exhibiting the non-linear pattern of the experience-earnings profile. An additional year of

[14] The Breusch–Pagan test was conducted using STATA to detect heteroskedasticity. The test unambiguously rejects the homoskedasticity hypotheses for all the models. Robust standard errors have been reported for all the models that violate the assumption of homoscedasticity. Robust standard errors are better because they relax the assumption that errors are identically distributed (Wooldridge, 2002). The normal probability plots were examined to check the normality of the residuals. In the *k*-density plots, the residuals are approximately normal, and the large sample size allows the regression model to be robust despite modest departures from normality.

Table 4
OLS and Heckman estimates of earnings functions (male and female labor force) in Malaysia, with years of education and levels of education.

Variables	Years of schooling				Levels of Education			
	Full Male OLS	Full Female			Full Male OLS	Full Female Sample		
		OLS	Heckman	Probit		OLS	Heckman	Probit
adjexp	0.058***	0.039***	0.053***	0.070***	0.065***	0.050***	0.059***	0.052***
	(0.001)	(0.002)	(0.002)	(0.004)	(0.001)	(0.002)	(0.002)	(0.004)
adjexpsq	−0.001***	−0.001***	−0.001***	−0.001***	−0.001***	−0.001***	−0.001***	−0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
adjyr_schl	0.121***	0.145***	0.154***	0.071***				
	(0.001)	(0.002)	(0.002)	(0.004)				
primary					0.153***	0.097***	0.070*	−0.187***
					(0.016)	(0.029)	(0.029)	(0.055)
lowersecondary					0.333***	0.278***	0.239***	−0.242***
					(0.016)	(0.029)	(0.029)	(0.064)
secondary					0.663***	0.787***	0.782***	0.086
					(0.016)	(0.028)	(0.028)	(0.065)
uppersecondary					0.908***	1.027***	1.006***	−0.054
					(0.024)	(0.035)	(0.035)	(0.085)
university					1.527***	1.742***	1.650***	−0.487***
					(0.018)	(0.029)	(0.030)	(0.069)
Chinese	0.325***	0.267***	0.271***	0.062	0.326***	0.275***	0.281***	0.092**
	(0.008)	(0.012)	(0.012)	(0.033)	(0.008)	(0.012)	(0.012)	(0.033)
IndianOth	0.054***	0.042*	0.080***	0.196***	0.048***	0.038*	0.056**	0.133*
	(0.012)	(0.018)	(0.018)	(0.052)	(0.012)	(0.017)	(0.017)	(0.052)
married				0.065*				0.167***
				(0.027)				(0.028)
lntotunearn				−0.168***				−0.155***
				(0.007)				(0.006)
urban	0.226***	0.199***	0.187***	(0.017)	0.232***	0.207***	0.211***	0.073*
	(0.007)	(0.012)	(0.012)	(0.029)	(0.007)	(0.012)	(0.012)	(0.030)
Central	0.320***	0.358***	0.399***	0.003	0.302***	0.332***	0.375***	0.127**
	(0.010)	(0.015)	(0.015)	(0.040)	(0.010)	(0.014)	(0.015)	(0.040)
South	0.199***	0.224***	0.239***	0.192***	0.194***	0.218***	0.229***	0.175***
	(0.010)	(0.015)	(0.015)	(0.040)	(0.010)	(0.015)	(0.015)	(0.040)
East	−0.032**	−0.065***	−0.021	0.237***	−0.044***	−0.082***	−0.049**	0.247***
	(0.011)	(0.018)	(0.018)	(0.043)	(0.010)	(0.018)	(0.018)	(0.043)
EMsia	0.028**	0.026	0.070***	0.437***	−0.001	−0.007	0.017	0.354***
	(0.011)	(0.017)	(0.017)	(0.038)	(0.010)	(0.017)	(0.017)	(0.038)
lambda			0.790***				0.581***	
			(0.049)				(0.048)	
_cons	7.470***	7.115***	6.776***	0.703***	8.075***	7.864***	7.742***	1.731***
	(0.018)	(0.026)	(0.034)	(0.075)	(0.019)	(0.031)	(0.033)	(0.073)
Adj R^2/pseudo R^2	0.421	0.429	0.439	0.174	0.431	0.445	0.450	0.177
N	36,369	18,552	18,552	20,690	36,369	18,552	18,552	20,690

Note: Standard errors in parentheses.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

experience increases earnings by 6 and 5 percent,[15] respectively, for employed male and female. Compared to the Bumiputera ethnic group, earnings are significantly higher for Chinese males and females (38 and 31 percent, respectively). Similarly, Indians report significantly higher earnings (6 and 8 percent, respectively, for males and females) than members of the Bumiputera ethnic group. Both urban males and females earn significantly more (25 and 21 percent, respectively) than their rural counterparts. Finally, yearly earnings are significantly higher for both male and female workers in the Central of West Malaysia (38 and 49 percent, respectively), South of West Malaysia (22 and 27 percent, respectively) and East (3 and 7 percent, respectively) Malaysia regions than for their counterparts in the North region of West Malaysia. However, males in the East region of West Malaysia earn significantly less (3 percent) than males in the North region of West Malaysia.

The effect of the "years of schooling" coefficient (adjyr_schl) is positive and significant on earnings for both males and females. The average private return to education for the total male sample is 12.1 percent[16] (Table 4), whereas the average return to education for the total female sample is 15.4 percent. In the Heckman regression model, the lambda term is significant, suggesting there is significant sample selection bias in the female sample. The Heckman estimate for female returns to education that is corrected for sample selection bias (15.4 percent) is somewhat higher than the corresponding OLS estimate (14.5 percent).

In this study, the estimated returns are slightly higher than earlier estimates of return to education in Malaysia. For example, using the Household Income Survey data for the years 2002 and 2004, Ismail (2007) found that the average private return for an

[15] The reported value is obtained after taking the exponential value of the coefficients in the OLS model for male and minus 1 and then multiplying by 100. For instance, for experience, the value is obtained as follows: $(\exp(0.058) - 1) \times 100 = (1.061 - 1) \times 100 = 6.1$ % (Table 4). Similar approach has been applied for all the other estimates in the OLS model for men and Heckman model for women.

[16] The reported average private return to education is obtained by multiplying the beta coefficient for years of schooling (adjyr_schl) in the OLS model for men by 100. Similar approach has been applied to the year of schooling coefficient in the Heckman model for females.

additional year of schooling was 10.51 and 10.04 percent, respectively for each year. However, the author did not report the estimates separately by gender and also did not account for sample selection bias in the female sample.

4.2.2. Non-linearity in returns to education

4.2.2.1. Regression and Heckman two-step results for the full sample. The assumption that the average private rate of return to additional years of schooling is the same regardless of education level is not necessarily valid for Malaysia. In this study, the schooling variable is redefined as "education level" (5 dummies are introduced: primary, lower secondary, secondary, upper secondary and university), with a reference category of below primary/non-formal education.

In the female work participation probit (Table 4), both identifying variables are statistically significant. As expected, unearned income is found negatively to affect female employment participation. Unexpectedly, the coefficient "married" is positive, suggesting that a female who is married is significantly more likely to work than one who is not. The lambda term is statistically significant, suggesting selection bias in the sample of employed females. Thus, the OLS estimate for the female sample is robust to the correction for sample selectivity.

As expected, the effect of experience is positive and the effect of experience squared is negative on earnings for both males and females. These results demonstrate that earnings increase with experience, but do not do so in a strictly linear fashion. An additional year of experience increases earnings by 6.7 and 6.1 percent, respectively, for employed male and female.

The experience profiles of average predicted yearly earnings in Figs. 1 and 2 illustrate the benefits of educational attainment for male and female workers in Malaysia. In Fig. 1, for male workers at all education levels, earnings grow more quickly at earlier compared to later years of experience. The experience earnings profile curve for all male workers, regardless of education level, is runs relatively parallel to the years of experience. This indicates that the differentials in wage rates do not change perceptibly with years of experience. Further, the experience profile curve tends to be relatively flat for all male workers (except those with university education). This suggests that male workers with university education earn substantially more than others with lower education levels. For female workers (Fig. 2), a similar pattern also is observed in the experience profiles. However, the earnings of female workers with informal or below primary education tend to fluctuate with experience possibly because these workers are at

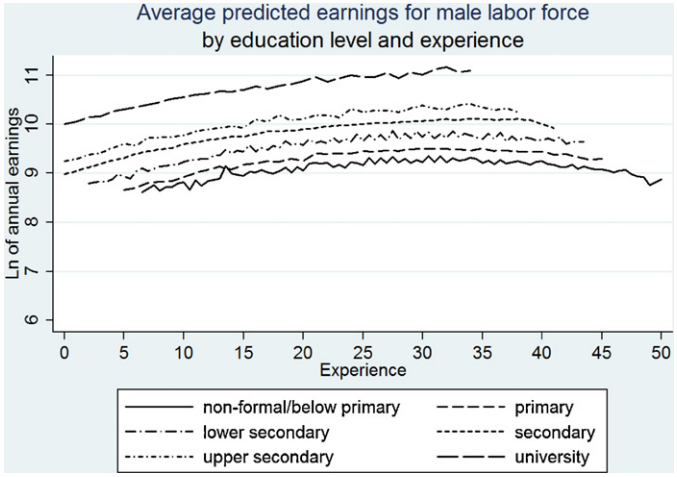

Fig. 1. Experience earnings profile for the male labor force.

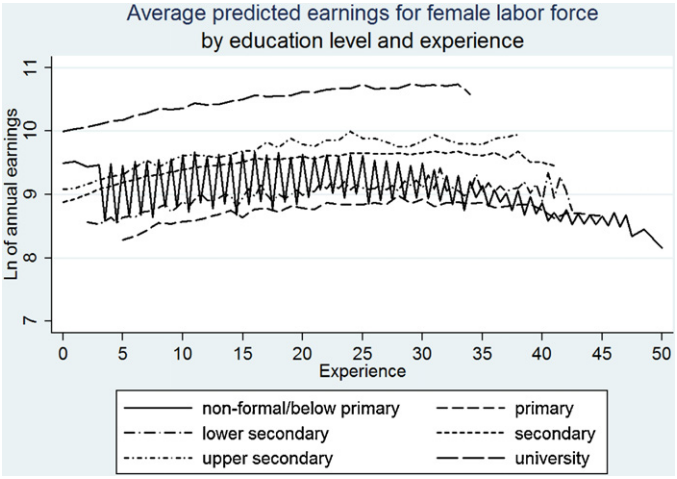

Fig. 2. Experience earnings profile for the female labor force.

risk of uncertain incomes since they often are working as laborers or at lower paid jobs such as cleaners.

In terms of ethnicity, the dummy variable for Chinese is positive and significant (Table 4), suggesting that yearly earnings are significantly higher for Chinese workers (38.5 percent for males and 32.4 percent for females) than for Bumiputera workers, holding all else constant. Similarly, the coefficient for IndianOth is positive and significant, indicating that the earnings for Indian/Other workers are higher (4.9 and 5.8 percent for males and females, respectively) than for Bumiputera workers, holding all else constant. These findings are consistent with Gallup (1997), who finds that Malay and Indian workers earn 17 and 24 percent less, respectively, than Chinese workers, holding experience, tenure and education constant.

The dummy variable for urban residence is positive and significant. This implies that urban workers earn significantly more (26.1 and 23.5 percent for males and females, respectively) than their rural counterparts, holding all else constant. Regionally, workers in the Central region of West Malaysia earn significantly more (35.3 and 45.5 percent for males and females, respectively) than workers in the North region of West Malaysia because the Central region consists of highly developed states such as Selangor and Kuala Lumpur, where there are many job opportunities and there is a higher standard of living (in terms of the availability of health services, transportation, telecommunications, financial centers and public amenities) (EPU, 2004). The Central region contributed 41.1 percent of the national GDP in 2005, with manufacturing and services as major contributors (Krimi et al., 2010). In addition, workers in the South region of West Malaysia earn significantly more (21.4 percent and 25.7 percent for males and females, respectively) than those in the North region of West Malaysia, holding all else constant. On the other hand the workers in the East region of West Malaysia earn significantly less (4.3 percent and 4.8 percent for males and females, respectively) than their counterparts in the North region. The East region consists of Malaysia's least developed states, such as Kelantan, Terengganu and Pahang. Most of the people living there are involved in agricultural and fishery activities (Hassan, 2011). For the year 2009, Kelantan, Terengganu and Pahang contributed 1.8, 2.7 and 4.6 percent of the national GDP, respectively (DSM, 2010). There are no significant differences in yearly earnings between workers living in the East Malaysia with those in the North region of West Malaysia, regardless of gender.

For both the male (OLS) and female samples (Heckman model) (Table 4), the coefficients for education levels are positive and progressively increase with education level. Table 5 presents the

Table 5
Average private return to education by gender with and without control for kind of work.

Education level	Excluding dummies for kind of work			Including dummies for kind of work	
	Male	Female		Male	Female (selectivity – corrected)
		Without selection correction	With selection correction		
Primary	5.10	3.23	2.33	5.00	1.77
Lower secondary	6.00	6.03	5.63	5.90	5.33
Secondary	16.50	25.45	27.15	16.45	25.25
Upper secondary	12.25	12.00	11.20	12.25	10.95
University	15.48	17.88	16.10	15.40	15.83

average private return to education in Malaysia.[17] For the male sample, the return to education increases slightly from 5.1 percent at the primary level to 6 percent at the lower secondary level. The average return is highest at the secondary level (16.50 percent), decreases slightly at the upper secondary level (to 12.25 percent), and then increases again at the university education level (to 15.48 percent). On the other hand, for the female sample, the average return to education is lower than the corresponding average male return at the primary, lower secondary, and upper secondary levels, at 2.3, 5.6 and 11.2 percent, respectively. However, the average return to secondary education for females is much higher than for males at the secondary and university levels (at 27.15 percent and 16.1 percent, respectively).

For females, the private return to education that is corrected for sample selection bias is slightly lower than the corresponding OLS estimate (without the selection correction) at the primary (2.33 percent versus 3.23 percent), lower secondary (5.63 percent versus 6.03 percent), upper secondary (11.2 percent versus 12 percent) and university (16.10 percent versus 17.88 percent) education levels (Table 5). However, at the secondary education level, the return to education (with the selection correction) is somewhat higher than the estimate without the selectivity adjustment (27.15 percent versus 25.45 percent).

In this study, estimates of private returns to education are slightly different from those in Chung (2003)'s study of data collected in 1997, which reported that the highest marginal gross return to education is found among workers with upper-secondary to pre-university education (21.8 and 23.2 percent for males and females, respectively). However, due to data limitations, Chung did not correct for sample selection bias. It is therefore important to note that in this study, the OLS estimates are robust to the correction for sample selectivity. The average private return to education for males is highest at the secondary and university levels (16.5 and 15.5 percent, respectively), and is highest for females at the secondary level (27.2 percent).

4.2.2.2. Controlling for kind of work. Table 6 presents OLS estimates and selectivity-corrected Heckman estimates for males and females when the dummies for "kind of work" are included in the earnings function. Two dummies are included to investigate whether the effect of education on earnings is partly a function of "kind of work": "Bsfx" (for self-employed) and "Bdualx" (for dual-employed). The base category is wage-workers.

In the female work participation probit, both selection variables are significant. Higher unearned incomes are generally found to decrease female work participation. Married women are more likely to work. Consistent with the previous analyses in this study, in the Heckman model, the lambda term is significant, indicating an evidence of sample selection.

In the OLS model for males and the Heckman model for females, experience is positive and experience squared is negative, further confirming the non-linear increase in experience (with the additional increase in income). Even after including the controls for kind of work, yearly earnings are higher for Chinese workers (39.8 percent for males and 30.9 percent for females) than for Bumiputera workers. In the male sample, the coefficient for IndianOth is positive and significant, indicating that yearly earnings are higher for male Indian workers (4.8 percent) than for male Bumiputera workers, holding all else constant. However, no such difference exists between female Indian and Bumiputera workers.

The coefficients "Bsfx" and "Bdualx" are negative and statistically significant for both male and female workers. Holding all else constant, self-employed males earn 8.2 percent less than male wage workers. However, self-employed females earn far less (about 60 percent) than female wage workers, holding all else constant possibly because self-employed women are involved in small-scale family business or craft-related jobs and thus their income is minimal. For dual-employed workers, both males and females earn less (4.2 percent and 6.1 percent) than wage workers, holding all else constant. Even though these workers have dual-income, they do not receive a significant income since they are mostly involved in lower paid jobs.

Both male and female workers in urban areas earn significantly more (25.5 percent and 19 percent, respectively) than their rural counterparts, holding all else constant. Similarly, yearly earnings are significantly higher for both male and female workers in the Central (35.8 percent and 46.2 percent respectively) and South (12.2 percent and 12.4 percent) regions of West Malaysia than for their counterparts in North region of West Malaysia, holding all else constant. Male workers in the East region of West Malaysia earn significantly less (4.4 percent) than their counterparts in the North region of West Malaysia, holding all else constant. Female workers in the East Malaysia region earn significantly more (4.8 percent) than those in North region, holding all else constant.

In the OLS model for males and the Heckman model for females, the coefficient values for primary, lower secondary, secondary, upper secondary, and university are lower when the dummies for kind of work are included. The reduction is greater among female workers than among their male counterparts. However, the coefficients for all the education level are still large and significant (except primary education for females), suggesting that there are still meaningful economic benefits derived from education that are not explained by the kind of work undertaken by an employed member.

For males, the coefficients for primary, lower secondary, secondary, upper secondary and university are all significant and

[17] The average rate of return r_i to each educational level (compared to the level below) is calculated using the estimated OLS coefficients in the following way: $r_i = (\beta_i - \beta_{i-1})/(S_i - S_{i-1})$, where i is the level of education (i.e., primary, lower secondary, secondary, upper secondary, university). S_i is the year of schooling at education level i (belowprim/nonformal = 3, primary = 6, lowersec = 9, secondary = 11, uppersec = 13, university = 17).

Table 6
OLS and Heckman estimates of earnings functions (male and female labor force) in Malaysia, with and without control for kind of work.

Variables	Without control of kind of work				With control of kind of work			
	Full male OLS	Full female sample			Full male OLS	Full female sample		
		OLS	Heckman	Probit		OLS	Heckman	Probit
adjexp	0.065***	0.050***	0.059***	0.052***	0.064***	0.052***	0.061***	0.052***
	(0.001)	(0.002)	(0.002)	(0.004)	(0.001)	(0.002)	(0.002)	(0.004)
adjexpsq	−0.001***	−0.001***	−0.001***	−0.001***	−0.001***	−0.001***	−0.001***	−0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
primary	0.153***	0.097***	0.070*	−0.187***	0.150***	0.082**	0.053	−0.187***
	(0.016)	(0.029)	(0.029)	(0.055)	(0.016)	(0.029)	(0.029)	(0.055)
lowersecondary	0.333***	0.278***	0.239***	−0.242***	0.327***	0.252***	0.213***	−0.242***
	(0.016)	(0.029)	(0.029)	(0.064)	(0.016)	(0.029)	(0.029)	(0.064)
secondary	0.663***	0.787***	0.782***	0.086	0.656***	0.724***	0.718***	0.086
	(0.016)	(0.028)	(0.028)	(0.065)	(0.016)	(0.028)	(0.028)	(0.065)
uppersecondary	0.908***	1.027***	1.006***	−0.054	0.901***	0.959***	0.937***	−0.054
	(0.024)	(0.035)	(0.035)	(0.085)	(0.024)	(0.035)	(0.034)	(0.085)
university	1.527***	1.742***	1.650***	−0.487***	1.517***	1.663***	1.570***	−0.487***
	(0.018)	(0.029)	(0.030)	(0.069)	(0.018)	(0.029)	(0.029)	(0.069)
Chinese	0.326***	0.275***	0.281***	0.092**	0.335***	0.264***	0.269***	0.092**
	(0.008)	(0.012)	(0.012)	(0.033)	(0.008)	(0.012)	(0.012)	(0.033)
IndianOth	0.048***	0.038*	0.056**	0.133*	0.047***	−0.005	0.012	0.133*
	(0.012)	(0.017)	(0.017)	(0.052)	(0.012)	(0.017)	(0.017)	(0.052)
lambda			0.581***				0.579***	
			(0.048)				(0.048)	
married				0.167***				0.167***
				(0.028)				(0.028)
Bsfx					−0.079***	−0.468***	−0.470***	
					(0.011)	(0.021)	(0.021)	
lntotunearn				−0.155***				−0.155***
				(0.006)				(0.006)
Bdualx					0.041***	−0.003	−0.059*	
					(0.009)	(0.027)	(0.028)	
urban	0.232***	0.207***	0.211***	0.073*	0.227***	0.171***	0.174***	0.073*
	(0.007)	(0.012)	(0.012)	(0.030)	(0.007)	(0.011)	(0.011)	(0.030)
Central	0.302***	0.332***	0.375***	0.127**	0.306***	0.338***	0.380***	0.127**
	(0.010)	(0.014)	(0.015)	(0.040)	(0.010)	(0.014)	(0.014)	(0.040)
South	0.194***	0.218***	0.229***	0.175***	0.195***	0.208***	0.218***	0.175***
	(0.010)	(0.015)	(0.015)	(0.040)	(0.010)	(0.015)	(0.015)	(0.040)
East	−0.044***	−0.082***	−0.049**	0.247***	−0.043***	−0.03	0.003	0.247***
	(0.010)	(0.018)	(0.018)	(0.043)	(0.010)	(0.018)	(0.018)	(0.043)
EMsia	−0.001	−0.007	0.017	0.354***	0.000	0.022	0.047**	0.354***
	(0.010)	(0.017)	(0.017)	(0.038)	(0.010)	(0.017)	(0.017)	(0.038)
_cons	8.075***	7.864***	7.742***	1.731***	8.087***	7.949***	7.830***	1.731***
	(0.019)	(0.031)	(0.033)	(0.073)	(0.019)	(0.030)	(0.032)	(0.073)
Adj R^2/pseudo R^2	0.431	0.445	0.450	0.177				
N	36,369	18,552	18,552	20,690	36,369	18,552	18,552	20,690

Note: Standard errors in parentheses.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

positive. Similarly, for females, the coefficients are positive and significant at all education levels except primary education, at which it is not significant. At lower education levels, the value of the coefficients (primary and lower secondary) is higher for male workers than for female workers. On the other hand, at higher education levels, the value of the coefficients (secondary, upper secondary, and university) is higher for female workers than for male workers.

Table 5 shows the average returns to education when dummies for "kind of work" are included in the earnings equation model. For males, when the dummies are included, the average return to primary education decreases slightly from 5.10 percent to 5 percent. However, the estimate for females given the inclusion of the dummies is much lower: 1.77 percent rather than 2.33 percent. A similar pattern also is observed for returns to education at the lower secondary education level, where the adjusted estimates are 6.0 percent (compared to 5.90 percent) for males and 5.63 percent (compared to 5.33 percent) for females. However, changes in returns to education at the secondary and university levels resulting from the inclusion of dummies for "kind of work" are minimal. For males, the returns to secondary education decrease from 16.5 percent to 16.45 percent, while the returns to university education decrease from 15.48 percent to 15.4 percent.

For females, with the inclusion of controls for kind of work, the average private returns to secondary education decreases from 27.15 to 25.25 percent. However, there was only a slight decrease (about 0.25 to 0.3 percent) in the return to upper secondary and university education when controls for kind of work are included. The new estimates for upper secondary and university are 11.20 and 16.10 percent respectively compared to previous estimates of 10.95 and 15.83 percent.

When the models are adjusted to control for "kind of work," the overall decrease in the return to education is less than 2 percent for both males and females. This suggests that there are high returns to education for males and females in Malaysia even after controlling for kind of work. High returns to education might partially be associated with education's role as a screening device

Table 7
Average private return to education by gender, education level and location.

Education level	Urban		Rural	
	Male	Female	Male	Female
Primary	5.33	0.73	4.70	3.10
Lower secondary	5.10	7.13	6.57	3.97
Secondary	15.50	26.40	17.45	26.85
Upper secondary	13.70	8.90	9.95	14.95
University	14.25	15.30	18.33	19.05

as well as a productivity measure for selection into the well-paid public sector jobs (Blau, 1985).

4.2.2.3. Private return to education by location (urban/rural areas). Wage functions are estimated separately for urban and rural areas to determine whether those estimates vary by location in part because there are still wide disparities between urban and rural areas in terms of students' performance (Hassan and Rasiah, 2011). Table 8 presents the OLS model for males and the two-step Heckman model for females. For male workers both in urban and rural areas, at all education levels, the coefficients are positive and significant. Table 7 presents the average private returns to education separately for the urban and rural samples. At the primary and upper secondary education levels, the average private returns to education are higher for urban males than for rural males. However, at the lower secondary, secondary and university education levels, private returns are higher for rural males than for their counterparts in urban areas. The higher return to education for rural male workers might be related to the scarcity of educated personnel in rural areas.

In the employment participation probit for the female sample (Table 8), the selection terms are significant. Similar to the full sample, the coefficient "married" is positive and is found to increase the chance of female participation in employment. Consistently, the coefficient for unearned income is negative and is found to decrease urban females' participation in the employment. Further, the lambda term is significant, suggesting that there are sample selection issues in the urban female sample. For the rural female sample, in the participation probit, the coefficient "married" is negative (as expected) but non-significant. However, the coefficient for unearned income is significant and has the expected sign (negative). The lambda term is significant, suggesting that there is sample selection bias in the rural female sample.

In Table 8, the Heckman estimates for urban female workers show that at all education levels, the coefficients are positive

Table 8
OLS and Heckman estimates of earnings functions (male and female labor force) in Malaysia, with years of education and levels of education.

Variables	URBAN				RURAL			
	Male OLS	Female sample			Male OLS	Female sample		
		OLS	Heckman	Probit		OLS	Heckman	Probit
adjexp	0.066***	0.055***	0.063***	0.059***	0.063***	0.044***	0.053***	0.051***
	(0.001)	(0.002)	(0.002)	(0.005)	(0.002)	(0.003)	(0.003)	(0.006)
adjexpsq	−0.001***	−0.001***	−0.001***	−0.002***	−0.001***	−0.001***	−0.001***	−0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
prim	0.160***	0.044	0.022	−0.173	0.141***	0.123**	0.093*	−0.168*
	(0.026)	(0.043)	(0.043)	(0.089)	(0.021)	(0.038)	(0.038)	(0.070)
lowersec	0.313***	0.271***	0.236***	−0.356***	0.338***	0.249***	0.212***	−0.073
	(0.025)	(0.042)	(0.042)	(0.096)	(0.021)	(0.041)	(0.041)	(0.087)
sec	0.623***	0.761***	0.764***	0.027	0.687***	0.756***	0.749***	0.137
	(0.025)	(0.040)	(0.040)	(0.097)	(0.022)	(0.041)	(0.041)	(0.089)
upsec	0.897***	0.954***	0.942***	−0.104	0.886***	1.069***	1.048***	−0.016
	(0.032)	(0.048)	(0.048)	(0.123)	(0.039)	(0.055)	(0.055)	(0.118)
univ	1.467***	1.644***	1.554***	−0.642***	1.619***	1.893***	1.810***	−0.302**
	(0.026)	(0.041)	(0.042)	(0.100)	(0.027)	(0.043)	(0.044)	(0.098)
Chinese	0.310***	0.238***	0.249***	0.144***	0.375***	0.380***	0.385***	−0.045
	(0.010)	(0.013)	(0.013)	(0.039)	(0.017)	(0.030)	(0.030)	(0.067)
IndianOth	0.024	−0.02	0.001	0.183**	0.106***	0.140***	0.159***	0.057
	(0.015)	(0.021)	(0.021)	(0.065)	(0.021)	(0.030)	(0.030)	(0.091)
lambda			0.629***				0.518***	
			(0.062)				(0.077)	
married				0.301***				−0.013
				(0.037)				(0.044)
lntotunearn				−0.143***				−0.175***
				(0.008)				(0.011)
Central	0.320***	0.317***	0.361***	0.173***	0.308***	0.361***	0.409***	0.083
	(0.012)	(0.017)	(0.018)	(0.049)	(0.017)	(0.028)	(0.029)	(0.077)
South	0.212***	0.163***	0.168***	0.204***	0.176***	0.289***	0.306***	0.133*
	(0.014)	(0.020)	(0.019)	(0.055)	(0.015)	(0.023)	(0.023)	(0.060)
East	0.009	−0.138***	−0.104***	0.190**	−0.086***	−0.031	0.001	0.257***
	(0.016)	(0.025)	(0.025)	(0.063)	(0.014)	(0.025)	(0.025)	(0.059)
EMsia	0.058***	0.011	0.031	0.439***	−0.071***	−0.054	−0.023	0.242***
	(0.014)	(0.021)	(0.021)	(0.053)	(0.016)	(0.030)	(0.030)	(0.055)
_cons	8.314***	8.117***	7.982***	1.782***	8.077***	7.872***	7.762***	1.787***
	(0.028)	(0.042)	(0.044)	(0.106)	(0.027)	(0.047)	(0.051)	(0.111)
N	20,250	11,234	11,234	12,432	16,119	7318	7318	8258

Note: Standard errors in parentheses.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

and significant, except at the primary education level. On the other hand, for rural female workers, the coefficients are positive and significant at all education levels. The average private returns to primary, secondary, upper secondary and university education (Table 7) are higher for rural female workers than for their urban counterparts. At the secondary education level, there are only slight differences (0.45 percent) in the private returns to education between urban and rural female workers. However, the private returns to lower secondary education are higher for urban female workers than for their rural counterparts.

It is important to note that in this study, the estimates of private returns to education do not account for the direct costs of education due to data limitations. However, such costs often are substantial in developing countries and can adversely affect households' decision to enroll their children in school (Tsang, 1988). Neglecting the direct costs of education, therefore, upwardly biases estimates of returns to education.

In addition, it is not possible to incorporate additional schooling data, such as school quality and type of school attended, in the earnings function due to unavailability of the data. However, in one seminal study conducted in Bangladesh, the author found that the estimate of returns to education is not affected by controlling for school quality (Asadullah, 2006). On the other hand, Card and Krueger (1992) find higher rates of return to education for students who attended higher quality schooling (such as institutions with lower student-teacher ratios).

Due to limitations of the data, we are not able to control for unobserved attributes, such as ability, which might lead to endogeneity bias. Some researchers have attempted to control for endogeneity using the instrumental variable framework. However, in the absence of valid instruments, I am not able to pursue such an approach

The theoretical framework underlying this analysis is based on human capital theory, which implies that education enhances productivity. However, it is important to note that education might also function as a device for signaling inherent ability to the employers. One of the most popular methods to test the screening hypothesis is to compare the rates of return to education between the competitive (private) and non-competitive (public) sector of the economy, with the presumption that those individuals in the non-competitive sector do not need to signal inherent ability (Psacharopoulos, 1979). Thus, those individuals will have less schooling than those in the competitive sector. However, we are not able to pursue such an attempt due lack of information on whether participants are public or private sector employees.

In this analysis, the employed has been treated as a homogeneous group. However, it may be the case that whether an individual is self-employed partially is determined by other (unmeasured) attributes, such as a willingness to undertake risks, managerial abilities, entrepreneurial skills, and similar traits. However, such information rarely is available in a household income survey.

In this study, due to limitations of the data, estimation of private rates of return is done only on pecuniary benefits. However, it is important to note that returns to education include both pecuniary and non-pecuniary benefits. Returns to education further include non-monetary private benefits, such as health effects, human capital produced at home, more efficient household management, lifelong adaptation and continued learning at home, motivational attributes, non-monetary job satisfaction, and other, similar benefits (McMahon, 2009).

In addition, in this study, private returns to education only consider only returns to formal schooling. There are also secondary channels through which education can be obtained, such as through on-the-job training, which also enhances the skills and productivity of workers (Chung, 2004).

5. Summary and conclusions

This study presents estimates of private returns to education in Malaysia separately by gender using the conventional OLS method. The OLS estimate for the female sample is robust to the correction for sample selectivity. In 2007, the average private returns to years of schooling for male and female workers were 12.1 and 15.4 percent, respectively. In addition, the findings suggest that private returns to additional years of schooling were a non-linear function according to different levels of education. For male workers, the returns to primary, lower secondary, secondary, upper-secondary and university-level education were 5.1 percent, 6 percent, 16.5 percent, 12.25 percent and 15.48 percent, respectively. The corresponding estimates for female workers were 2.3 percent, 5.6 percent, 27.15 percent, 11.2 percent, and 16.1 percent, respectively. The average return to education for female workers is much higher than for male workers at the secondary level and somewhat higher at the university level. This indicates that with an additional year of schooling, labor market earnings increase more for females than for males. This might be reflective of the additional job opportunities for female workers in the labor market as well as the development of policies to accommodate married female workers, including maternity leave and child-care services. It might also reflect that the pool of talent among males is already fully exploited in the formal economy but that this is not the case for females because some of them are not yet full participants in the formal economy.

When the models are adjusted to control for "kind of work," the overall return to education decreases less than 2 percent for both males and females combined. This suggests that there are high returns to education for males and females in Malaysia even after controlling for kind of work. This finding is consistent with previous studies that show that education plays an important role in explaining the earnings differential in Malaysia (Psacharopoulos and Patrinos, 2004; Mazumdar, 1981; Lee, 1980; Chung, 2000).

Private returns to education were estimated separately for those residing in urban and rural areas. The findings suggest that private returns to education for rural male workers are greater than those for urban male workers at higher levels of education; this might be due to the scarcity of educated personnel in rural areas. Similarly, the average private returns to primary, secondary, upper secondary and university education are higher for rural female workers than for their urban counterparts.

Overall, these findings suggest that average private returns to education are lower at the primary and lower secondary education levels. In other words, completion of primary and lower secondary schooling does not result in substantially higher returns to education in the market. This may be because the current job market demands a more educated workforce, and thus, it is important to pursue education until the secondary level – and further to the university level – in order to capture higher returns to education. Thus, it is important for individuals to invest in higher levels of education in order to reap higher returns from their investment in education.

The estimated private rates of return to education for both male and female workers are highest at the secondary education level (at 16.5 percent and 27.15 percent, respectively) followed by the university education level (at 15.48 and 16.10 percent, respectively). Even after controlling for kind of work, this finding remains consistent. However, according to the Global Gender Gap report 2010, enrollment rates for males and females at the secondary and tertiary education levels in Malaysia are still

relatively low (for secondary, 66 percent and 70 percent, respectively; for tertiary, 28 and 36 percent, respectively) (Hausmann et al., 2010). In the Global Education Digest 2010 report, Malaysia has been identified as one of the countries at risk of achieving gender parity at the secondary education level due to low enrollment of male students. Thus, the Malaysian government should consider appropriate actions to increase enrollments at the more advanced education levels. Nevertheless, any public policy intervention needs to be based on further research that identifies the causes of lower participation rates among certain groups. It might be that poor households do not realize the importance of pursuing higher levels of education or due to lack of information about the availability of financial aid for students or other possible reasons. However, further research – both qualitative and quantitative – is needed to elucidate these issues before any policy interventions can be warranted.

Since education is a primary avenue of upward mobility for children from disadvantaged families, appropriate support and opportunities targeting these children would enable each community to participate equitably in the human resource development of the country. Further research on social returns to education is needed before any suggestions for public policy interventions, such as providing incentives to invest in education for low-income households and middle-income households with multiple school-age children. In general, any change in public policy should take into account the change's effect on both public and private returns.

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Appendix A

Table A.1
Summary statistics for labor force, 2007, Malaysia.

Variable	Definition	Male		Female	
		Mean	Std. Dev.	Mean	Std. Dev.
lnerns	log of yearly earnings	9.708	0.814	9.427	0.928
adjexp	experience (age-7-years of schooling)	20.417	12.18	17.403	12.205
adjexpsq	experience squared	565.182	546.233	451.8	515.517
bprimRelig	below primary or religious education (base category)	0.071	0.257	0.077	0.267
prim	dummy (=1 if primary)	0.131	0.338	0.091	0.288
lowersec	dummy (=1 if lower secondary)	0.209	0.407	0.133	0.34
sec	dummy (=1 if secondary)	0.422	0.494	0.435	0.496
upsec	dummy (=1 if upper secondary)	0.031	0.173	0.054	0.226
univ	dummy (=1 if university)	0.135	0.342	0.209	0.406
Bumiputera	Bumiputera (base category)	0.699	0.459	0.703	0.457
Chinese	dummy (=1 if Chinese)	0.225	0.417	0.215	0.411
IndianOth	dummy (=1 if Indian or others)	0.076	0.265	0.082	0.274
married	married (=1 if married)	0.702	0.457	0.601	0.49
lntotunearn	log of total unearned income	4.768	3.111	3.927	3.273
urban	dummy (=1 if urban, 0 if rural)	0.557	0.497	0.606	0.489
North	base category (=1 if North of West Malaysia[a])	0.228	0.419	0.239	0.426
Central	dummy (=1 if Central of West Malaysia[b])	0.206	0.405	0.238	0.426
South	dummy (=1 if South of West Malaysia[c])	0.162	0.369	0.161	0.367
East	dummy (=1 if East of West Malaysia[d])	0.185	0.389	0.168	0.374
EMsia	dummy (=1 if East Malaysia[e])	0.219	0.413	0.194	0.396
Observation		36,369		18,552	

[a] Comprise of Perlis, Kedah, Penang, Perak (states).
[b] Comprise of Selangor, Wilayah Persekutuan, Putrajaya.
[c] Comprise of Melaka, Negeri Sembilan and Johor.
[d] Comprise of Kelantan, Terengganu and Pahang.
[e] Comprise of Sabah, Sarawak, Labuan.

References

Angrist, J., Krueger, A., 1999. Empirical strategies in labor economics. Handbook of Labor Economics 3, 1277–1366.

Angrist, J., Krueger, A., 2001. Instrumental variables and the search for identification: from supply and demand to natural experiments. Journal of Economic Perspectives 15 (4), 69–85.

Asadullah, M., 2006. Returns to education in Bangladesh. Education Economics 14 (4), 453–468.

Ashenfelter, O., Krueger, A., 1994. Estimates of the economic return to schooling from a new sample of twins. The American Economic Review 1157–1173.

Ashenfelter, O., Harmon, C., Oosterbeek, H., 2000. A review of estimates of the schooling/earnings relationship, with tests for publication bias. Labour Economics 6 (4), 453–470.

Aslam, M., 2009. Education gender gaps in Pakistan: is the labor market to blame? Economic Development and Cultural Change 57, 747–784.

Becker, G., 1964. Human Capital. Columbia University Press (for NBER), New York.

Behrman, J., Rosenzweig, M., 2002. Does increasing women's schooling raise the schooling of the next generation? American Economic Review 92 (1), 323–334.

Behrman, J., Rosenzweig, M., 2005. Does increasing women's schooling raise the schooling of the next generation? Reply. American Economic Review 95 (5), 1745–1751.

Blau, D.M., 1985. Self-employment and self-selection in developing country labor markets. Southern Economic Journal 351–363.

Butcher, K.F., Case, A., 1994. The effect of sibling sex composition on women's education and earnings. The Quarterly Journal of Economics 109 (3), 531–563.

Card, D., 1999. The causal effect of education on earnings. Handbook of Labor Economics 3, 1801–1863.

Card, D., 2001. Estimating the return to schooling: progress on some persistent econometric problems. Econometrica 69 (5), 1127–1160.

Card, D., Krueger, A., 1992. Does school quality matter? Returns to education and the characteristics of public schools in the United States. Journal of Political Economy 100 (1).

Chapman, B.J., Harding, J.R., 1985. Sex differences in earnings: an analysis of Malaysian wage data. Journal of Development Studies 21 (3), 362–376.

Chung, T.P., 2000. The Returns to Education and Training: Evidence from the Malaysian Family Life Surveys. Studies in Economics/Department of Economics, University of Kent.

Chung, T., 2003. Returns to education: updates for Malaysia. Applied Economics Letters 10 (13), 837–841.

Chung, T.P., 2004. The returns to education and training evidence from the Malaysian family life surveys. Pacific Economic Review 9, 103–116.

Cohen, J., 1988. Statistical Power Analysis for the Behavioral Sciences, 2nd ed. Erlbaum, Hillsdale, NJ.

Cohn, E., Geske, T.G., 1990. The Economics of Education. Pengamon Press, Oxford, England/New York.

Department of Statistics, Malaysia (DSM), 2010. Gross Domestic Product (GDP) by State, 2009. Retrieved online from: http://statistics.gov.my/portal/index.php?option=com_content&view=article&id=340%3Agross-domestic-product-gdp-by-state-2009-updated-25112010&catid=98%3Agross-domestic-product-by-state&lang=en.

Economic Planning Unit (EPU), 2004. Malaysian Quality of Life Report. Retrieved online from: http://www.epu.gov.my/c/document_library/get_file?p_l_id=20603&folderId=122841&name=DLFE-4720.pdf.

Economic Planning Units (EPU), 2011. The Malaysian Economy in Figures 2011. Retrieved online from: http://www.epu.gov.my/meif2011.

Fernandez, J.L., 2009. Intra-occupational gender earnings gaps in Malaysia. Jurnal Kemanusiaan 14.

Gallup, J.L., 1997. Ethnicity and Earnings in Malaysia. Development Discussion Paper No. 593, Harvard Institute of International Development.

Griliches, Z., 1977. Estimating the returns to schooling: some econometric problems. Econometrica 45 (January (1)), 1–22.

Griliches, Z., 1979. Sibling models and data in economics: beginnings of a survey. Journal of Political Economy 87 (5), S37–S64.

Griliches, Z., Manson, W., 1972. Education, income and ability. Journal of Political Economy 80, S74–S103.

Hassan, C.H., 2011. Poverty in a Malay State in Malaysia: a socio-demographic study. In: Society of Interdisciplinary Business Research (SIBR) 2011 Conference on Interdisciplinary Business Research. Retrieved online from: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1867885.

Hassan, O.R., Rasiah, R., 2011. Poverty and student performance in Malaysia. International Journal of Institutions and Economies 3 (1), 61–76.

Hausmann, R., Tyson, L.D., Zahidi, S., 2010. Global Gender Gap Report 2010. World Economic Forum Retrieved online from: http://www3.weforum.org/docs/WEF_GenderGap_Report_2010.pdf.

Heckman, J., 1979. Sample selection bias as a specification error. Econometrica: Journal of the econometric society 47 (1), 153–161.

Ismail, R., 2007. The Impact of Schooling Reform on Returns to Education in Malaysia. .

Jimenez, E., Patrinos, H., 2008. Can cost–benefit analysis guide education policy in developing countries? Policy Research Working Paper 4568.

Krimi, M.S., Yusop, Z., Hook, L.S., 2010. Regional development disparities in Malaysia. Journal of American Science 6 (3), 70–78.

Lee, K., 1980. Screening, ability, and the productivity of education in Malaysia. Economics Letters 5 (2), 189–193.

Levin, H., McEwan, P., 2001. Cost–Effectiveness Analysis: Methods and Applications. Sage Publications, Inc..

Mazumdar, D., 1981. The Urban Labor Market and Income Distribution: A Study of Malaysia. Oxford University Press (Published for the World Bank), New York.

McMahon, W., 2009. Higher Learning, Greater Good: The Private and Social Benefits of Higher Education. Johns Hopkins Univ Press.

Mincer, J., 1974. Schooling, Experience, and Earnings. Human Behavior & Social Institutions No. 2. .

Ministry of Finance Malaysia (MOF), 2009. Mid-Term Review of the Ninth Malaysia Plan 2006–2010. Available online from: http://www.epu.gov.my/midtermreviewninty.

Ministry of Finance Malaysia (MOF), 2010. Tenth Malaysia Plan 2011–2015. Available online from: http://www.epu.gov.my/html/themes/epu/html/RMKE10/rmke10_english.html.

Ministry of Women, Family and Community (MWFC), 2007. Measuring and Monitoring Gender Equality: Malaysian's Gender Gap Index. .

Psacharopoulos, G., 1979. On the weak versus the strong version of the screening hypothesis. Economics Letters 4 (2), 181–185.

Psacharopoulos, G., 1995. The Profitability of Investment in Education: Concepts and Methods. Human Capital Development and Operations Policy Working Paper, 63.

Psacharopoulos, G., Patrinos, H., 2004. Returns to investment in education: a further update. Education Economics 12 (2), 111–134.

Schafgans, M., 2000. Gender wage differences in Malaysia: parametric and semiparametric estimation. Journal of Development Economics 63 (2), 351–378.

Trostel, P., Walker, I., Woolley, P., 2002. Estimates of the economic return to schooling for 28 countries. Labour Economics 9 (1), 1–16, http://dx.doi.org/10.1016/S0927-5371(01)00052-5.

Tsang, M., 1988. Cost analysis for educational policymaking: a review of cost studies in education in developing countries. Review of Educational Research 58 (2), 181.

Tsang, M., 1994. Costs of education in China: issues of resource mobilization, equality, equity and efficiency. Education Economics 2 (3), 287–312.

UNDP, 2010. The UNDP Asia Pacific Human Development Report on Gender Calls for Better Policies, Laws and Increased Budgetary Allocations for the Achievement of Gender Equality. Retrieved online from: http://www.undp.org.my/uploads/undp%20press%20release%20-%20gender%20report%20-%2015%20april%202010.pdf.

Willis, R.J., 1986. Wages determinants. In: Eshenfelter, O., Layard, R. (Eds.), Handbooks of Labor Economics, vol. 1. Elsevier Science Publishers B.V./North Holland.

Willis, R., Rosen, S., 1979. Education and self-selection. The Journal of Political Economy 87 (5), 7–36.

Wooldridge, J., 2002. Econometric Analysis of Cross Section and Panel Data. The MIT Press.

World Bank, 2009. Education Indicators. Retrieved online from: http://data.worldbank.org/indicator/SE.TER.ENRR.