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Lesson Learned in Education and Skill Mismatches from Maptaphut Industrial Estate, Thailand [1]

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Abstract. This paper studies educational and skill mismatch by using primary data in Maptaphut Industrial Estate, Rayong Province conducted from 226 surveyed workers. The ordinary least squares (OLS) and unconditional quantile (UQR) regressions are used to examine the mismatches on earnings. The findings are as follow: 1) Returns to education of high income workers are larger than average income workers; 2) Education mismatch affects earnings such that over-education is statistically significant whereas under-education is not significant for both OLS and UQR estimates. The UQR provides more informative on size of the over-education to the returns on schooling, and 3) Specific training for some job positions also indicate educational mismatch and skill mismatch, thus, it is would be a necessity for firms to invest in training for workers to reduce the weakness of education mismatch.

Keywords: Lesson Learned, Over-education, Under-education, kill Mismatch, Specific Training, Earnings, Maptaphut Industrial Estate, Thailand.

1. Introduction

Maptaphut Municipality, an industrial area in Rayong Province has a range of educational levels of schools from 10 lower secondary schools, two secondary schools, and two vocational colleges. Some of the secondary and vocational graduated students would find jobs in Rayong and provinces nearby. This followed in an economic development theory that a benefit or result of an industrial development is an employment by hiring workers in the local area or nearby. Questions are whether the graduates from Rayong have skills that match up with the local works and employer's demand for labor in the industrial sector. In addition, developed countries such as Germany has various ideas of developing industrial workers' potential, for example, an on-the-job training, school in factory, etc., that already expanded to some industrial areas of Thailand in a form of foreign direct investment (FDI) particularly manufacturing by vocational college workers.

The research aims to study a mismatch between educational skills and skills employers expecting the graduated employees were supposed to have. The study will provide Maptaphut Municipality and schools in the area an useful information for course management and development to achieve an objective of strategy of Maptaphut Municipality's Development Plan determining the match between education development and local needs.

The study set a testing hypothesis to answer two research questions: 1) The mismatch between education and necessary skills for work affects earnings, and 2) Training for workers indicates the mismatch between worker's education and necessary skills for work.

This article has six contents which are Introduction, Literature Review, Description and Source of Data, Model, Results, and Recommendation.

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2. Literature Review

According to the Assignment Theory (Duncan and Hoffman, 1981), it is forecasted that an over-education will have a negative impact on earnings because the job position may require lower education which is an under-level work and the variable coefficient is expected to be negative, while under-education should have a positive impact on the earnings.

Defining over-education or under-education, researchers in the past studied three approaches (Hartog, 2000) as follow. First, based on profession, job analysts have assessed an optimal level of education and skill for job position, called Job Analysis (JA). Second, workers were asked to assess themselves whether their jobs match their education, known as Worker Self-Assessment (WA). Third, workers were asked an appropriate year of education for their jobs, and calculate an average year of education to become a benchmark. Then, use it to compare with individual education of worker. A worker is over-education if his/her years of education are higher than benchmark, then years of over-education are positive. A worker is under-education if his/her years of education are less than benchmark, and years of under-education are negative. This paper used the second method for defining mismatch since it is simple to acquire current data. Besides, Thailand does not have any information on the first method. Although the third method uses the same data as the second method, there is a weakness of mean computation when data is outlier.

Allen and Velden (2001) used secondary data of Netherland in 1998 to test relationship between educational mismatch and the outcome of employment, which measured in 3 variables (Y_i, i = 1, 2, 3) as follows: Earnings (Y_1), job satisfaction (Y_2), and turn over (Y_3). There were 2 independent variables (X_i, i = 1, 2). Thus,

$Y_1 = f(X_1, X_2)$
$Y_2 = f(X_1, X_2)$
$Y_3 = f(X_1, X_2)$

where

X_1 = Education mismatch; Over-education (X_{11}), and Under-education (X_{12})
X_2 = Skill mismatch; Over-skill (X_{21}), and Under-skill (X_{22})

Allen and Velden found two significant findings, which are: First, over-education (X_{11}) had a negative impact on wage (Y_1). It implied that the higher level of education of workers would not increase earnings as their expectation. Whereas under-education (X_{12}) positively affected earnings (Y_1). Second, skill mismatch (X_2) was likely to explain job satisfaction (Y_2) to the education mismatch (X_1).

3. Data

Data used for the analysis were collected by interviewing workers of 58 companies located in Maptaphut Industrial Estate, Rayong province, which most of them are in petrochemical industry. The total sample size is 226 observations randomly surveyed. The survey team collected data while workers were shopping for consumption goods and food at local markets, at the parks, temples as they waiting for holding rites, and their residents on Friday and weekend.

Table 1 contains descriptive statistics of variables in equations. Most of the respondents are male (83.20%), average age of 36 years old, about 15 years of education, and approximately 19 months of work experiences. The respondents assess on the relatedness between education and work position. Of all workers, 7.2% are over-education, 47.10% are under-education. Hence, the rest (45.70%) indicates the appropriate matching. It is noticeable that most of respondents have to obtain the specific training while working in companies.

Table 1 Descriptive Statistics of Variables

Variable	Number of Observations	Mean	Standard Deviation	Min	Max
Male_dummy	226	0.832	0.375	0	1
Age (yr)	207	36.63	8.080	21	62
Schooling (yr)	223	14.92	3.569	9	21
Exp (mo)	204	18.99	9.330	1	49
Over_edu	221	0.072	0.260	0	1
Under_edu	221	0.471	0.500	0	1
Specific_training	207	0.860	0.349	0	1
Earnings (baht/mo)	218	27,415.40	41,325.80	5,500	500,000

4. The Model

Based on a famous Mincer framework, the paper focuses on concept of the equation $Y_1 = f(X_1, X_2)$. To answer the research question on whether the educational mismatch affects earnings and what size of effect is, as well. For clearly variable defining, Y_1 consists of 2 parts; 1) worker earnings (Y_{11}) and 2) in kind benefits (Y_{12}). For model estimation, the researcher adapts form of the Mincerian semi-logarithmic earnings equation Y_1 into 3 models; equation (1), (2), and (3) as follow.

Model 1: Mincer Model (1974)

$$\ln(\text{Earnings}) = a_0 + a_1\,\text{Male\_dummy} + a_2\,\text{Schooling} + a_3\,\text{Exp} + a_4\,\text{Exp}^2 + e \quad (1)$$

where earnings represents worker salary (baht per month) which is dependent variable[2]; Male_dummy is dummy indicating 1 if respondent is male, 0 otherwise; Schooling is years of education; Exp is work experience (month); Exp^2 represents work experience squares; whereas e is the disturbance term.

Model 2: Mincer Model and extending Mismatching education variables

In Model 2, researcher uses Model 1 and adds two dummy mismatch variables: over-education (Over_edu) and under-education (Under_edu), shown in equation (2)

$$\ln(\text{Earnings}) = a_0 + a_1\,\text{Male\_dummy} + a_2\,\text{Schooling} + a_3\,\text{Exp} + a_4\,\text{Exp}^2 + a_5\,\text{Over\_edu} + a_6\,\text{Under\_edu} + e \quad (2)$$

Model 3: Mincer Model and adding Mismatching education and Mismatching specific training

Model 3 uses Model 2 and adds a dummy mismatch specific training (Specific_training). The specific training indicates workers who do not have adequate skill or suitable skill for positions, thus they need to have specific training for the job. According to the assignment theory, under skill for position would expect a negative impact on earnings.

$$\ln(\text{Earnings}) = a_0 + a_1\,\text{Male\_dummy} + a_2\,\text{Schooling} + a_3\,\text{Exp} + a_4\,\text{Exp}^2 + a_5\,\text{Over\_edu} + a_6\,\text{Under\_edu} + a_7\,\text{Specific\_training} + e \quad (3)$$

[2] Estimating model by using $Y_1 = Y_{11} + Y_{12}$, the result is poor because of imperfect data on Y_{12}.
Thus, this paper uses Y_{11} as a proxy of Y_1

Table 2 Results of OLS & UQR Estimates

Variable	OLS			UQR		
	Model 1	Model 2	Model 3	Model 4 Q25	Model 5 Q50	Model 6 Q75
Dependent Variable: ln (earnings)						
Independent Variables: Male_dummy	0.392* (0.114)	0.351* (0.114)	0.353* (0.121)	0.401* (0.156)	0.215 (0.139)	0.396 (0.203)
Schooling	0.099* (0.014)	0.119* (0.015)	0.117* (0.016)	0.089* (0.017)	0.126* (0.018)	0.167* (0.033)
Exp	0.064* (0.016)	0.062* (0.017)	0.064* (0.018)	0.032 (0.023)	0.073* (0.018)	0.114* (0.028)
Exp^2	-0.001* (0.0004)	-0.0009* (0.0004)	-0.00093* (0.0004)	-0.0005 (0.0005)	-0.00139* (0.0004)	-0.0019* (0.0006)
Over_edu		-0.378* (0.167)	-0.388* (0.174)	-0.301 (0.210)	-0.516* (0.221)	-0.941* (0.322)
Under_edu		(0.100)	0.151 (0.107)	0.155 (0.114)	0.183 (0.121)	0.105 (0.222)
Specific_training			0.021 (0.114)	-0.035 (0.149)	0.092 (0.135)	0.126 (0.184)
Constant	7.336* (0.293)	7.021* (0.311)	7.016* (0.327)	7.404* (0.383)	6.791* (0.337)	6.162* (0.652)
Adjust R^2	0.2809	0.3081	0.2990	0.1588	0.2533	0.1734
n	198	196	181	181	181	181

Note: * Coefficients are significant at the 0.05 level.
Value in parenthesis is standard deviation of its coefficient.

The results of Ordinary Least Squares (OLS) and Unconditional Quantile Regression (UQR) estimates are summarized in Table 2. The OLS estimates of the impact of explanatory variables on the mean of a dependent variable, while the UQR estimates the effect of explanatory variables on the unconditional, marginal, quantiles of the outcome variable. The UQR's allow researcher to measure the effect of small change in education on the unconditional income distribution. Due to the number of observations, researcher investigate how over-education, over-education, and specific training affect earnings at different quantiles; namely the 25^{th} (low), 50^{th} (median), and 75^{th} (high) quantiles.

5. The Results

Table 2 presents a summary of parameter estimation of the wage equations. It is noticeable that the result of OLS estimation from the 2012 survey data (cross section) shows the adjusted R^2 between 28.09% and 30.81%. By OLS estimation using cross sectional data, William Greene (2008) asserted a criteria that adjusted R^2 about 25% would be sufficient and acceptable.

Model 1, the explanatory variables (gender, level of education, work experience, and work experience squares) would affect a change in dependent variable, ln (Earnings), with adjusted R^2 of 28.09% which is acceptable. Considering on human capital investment, the returns to schooling are significantly at rate of 9.9%. The more year of educational investment, the higher average earnings. Therefore, the return of education investment is worth more than bank deposit interest rate per year.

Moreover, work experience has also a positive effect on earnings. The more work experiences, the higher earnings of workers. The research finding is that workers would significantly receive higher average earnings of 6.4%. Although the result of higher work experience is an increase in earnings, the earnings would rise in diminishing rate (negative sign of Exp^2), which is consistent with Mincer wage theory.

Earnings difference consideration by gender, male workers earn 39.2% higher earnings than female workers. Most of the respondents work in petrochemical industry which its proportion is usually more by men. Male workers are 83.2% as shown in Table 1.

Model 2 in Table 2 reports the results of over-education and under-education variables. A rise of adjusted R^2 to 30.81% indicates that the dependent variable would be affected by explanatory variables more than Model 1. Consideration on mismatch, the result reports that over-education reduces earnings by 37.8 percent, which suggests a negative correlation between over-education and earnings, as anticipated in the theory section.

Turning to the result for under-education, the estimate indicates that it would not affect earnings. Working in petrochemical industry which is sensitively concerned about safety in workplace and environment of Maptaphut Industrial Estate area would require optimal education and experiences. Although the coefficient of the under-education is not significant, the sign of estimator is still positive that accords to the Assignment Theory.

It is noted that adding the education mismatch variables in Model 2 cause a larger effect on returns to education than Model 1. The size of returns on schooling in Model 2 is 11.9%, comparing with value of 9.9% in Model 1, therefore the returns on years of education is higher about 2%. This would be a reason for individual to invest too much on education. The evidence shows that education mismatch not only initiates earnings, but also affects the returns on education investment. While the size of work experience effect on earnings in Model 2 (6.2%) is similar to Model 1 (6.4%).

To answer the question why under-education in Model 2 is not significant, though its sign is positive that corresponds to the Assignment theory. Adapting Model 2 with specific training shows the results in Model 3 that the under-education and specific training are still not significant. Moreover, it worsens the adjusted R^2 of Model 3 to 29.90%. This asserts the findings that specific training does not affect earnings of workers is not wrong since workers would receive direct benefits from having more skill and knowledge. The workers could adapt knowledge for their work, and results in more efficient work. While the expenses on specific training would be burden for firms, they do not want to raise wages and salaries of workers. Therefore, Model 3 would support Model 2.

To examine how earnings vary with education, education and skill mismatches at the 25^{th} (low), 50^{th} (median), and 75^{th} (high) percentiles of the distribution of earnings, the results of UQR estimates are Model 4, 5, and 6 in Table 2. The returns of education are significantly different among the three groups; high earnings workers receive 16.7%, medium earnings workers receive 12.6%, and low earnings workers get 8.9%. The results indicate the more income workers would invest more on education, which would be more informative than the OLS average returns of 11.7%.

Considered how work experience affects the distribution of earning, it is found significantly positive effects for medium and high earnings workers. An increase in work experience, workers of high earnings group would significantly acquire more earnings of 11.4%, for medium earnings group 7.3%, but not significantly for low earnings workers.

The effect of education mismatch on the distribution of earnings is found that the rate of return to over-education is significantly negative for all three different income workers, which is like the

OLS estimates. But the sizes of returns to over-education on each income workers are different. The over-education of high income workers would get more harm to their earnings (-0.941) than medium income workers (-0.516). But over-education does not affect earnings of the low income group. Investigating under-education and specific training using UQR, both coefficients do not affect the distribution of earnings for all three earnings groups, the same findings as the OLS estimates.

6. Conclusion and Recommendation

The "Lesson Learned in Education and Skill Mismatches from Maptaphut Industrial Estate, Thailand" paper could be one of very first papers in Thailand to answer the questions: 1) Returns to education of high income workers (UQR) are larger than average income workers (OLS estimate). 2) Educational and skill mismatches have negative affect on earnings. The findings indicate that over-education is significant, whereas under-education is not significant for both OLS and UQR estimates. The UQR provides more informative on a negative effect of over-education to the rate of returns on schooling. That is, a rise in highly–educated workers would raise earnings inequality. 3) Specific training arranged by companies would indicate such education and skill mismatches for work positions. Therefore, it is necessary for the companies to invest on training for employees, especially training on work safety, to reduce the weakness of education mismatch.

However, the procedure of data collection in this research would have downward biased since most of the target respondents had lower under-graduate level of education. Thus, the appropriate number of observations could be an issue. There are a couple of issues to propose for future research. First, the sample size should be increased up to the level where it could reduce the biased from respondent replies. Second, the worker assesses himself/herself whether he/she is over-education or under-education correctly replies. What statistical test should be used or some additional questions for cross-check would be applied.

References

Allen, J., & Velden, R., 1976. Educational Mismatches versus Skill Mismatches: Effects on Wages, Job Satisfaction, and On-the-job search. Oxford Economic Papers 3: pp 434-452.

Duncan, G., & Hoffman, S., 1981. The Incidence and Wage Effects of Overeducation. Economics of Education Review, I (1): pp 75-86.

Firpo, S., Fortin, N.M., & Lemieux, T., 2006. Unconditional Quantile Regressions. Econometrica, Vol.77, No.3 (May, 2009): pp 953-973.

Greene, W., 2008. Econometric Analysis, 6th ed., Prentice Hall, Upper Saddle River, NJ.

Hartog, J., 2000. Over-education and Earnings: Where are we, Where should we go? Economics of Education Review 19: pp 131-147.

Mincer, J., 1974. Schooling, Experience, and Earnings. New York: National Bureau of Economic Research.