The Empirical Econometrics and Quantitative Economics Letters
ISSN 2286 – 7147
Volume 1, Number 2 (June 2012), pp. 97 – 110.

Relationship between Health, Education, and Economic Growth in Southeast Asian Region

Nutcha Sawatdirakpong* and Rossarin Osathanunkul

Faculty of Economics, Chiang Mai University
**E-mail: step_n_cha@hotmail.com*

ABSTRACT

The purpose of this research paper is to examine the impact of human capital in terms of health and education on economic growth of nine countries in Southeast Asia. The empirical results are based on the analysis of annual panel data from 1960 to 2009. The methods used in this research are various standard methods of unit roots test. Panel data estimation methods consist of pooled OLS, fixed effects model, and random effects model. The optimal estimation model was determined by Hausman test. The results show that the impact of health and education on economic growth are statistically significant. This study consists of economic theories and using of statistical economics which can be applied for policy making in Southeast Asian region.

Keywords: Economic growth, Health, Education, Southeast Asia, ASEAN

JEL Classification: I15, I25, O15

1. Introduction

The Association of Southeast Asian Nations: ASEAN is the regional organization aiming at social, scientific, technological, cultural, politic, and economic cooperation of 10 country members including Indonesia, Laos, Cambodia, Myanmar, Malaysia, the Philippines, Singapore, Vietnam, Brunei, and Thailand (The Association of Southeast Asian Nations, 2010). Although the economic growth of Southeast Asia is affected by the latest economic crisis "Subprime Crisis" in 2008, it recovered faster than the other regions. According to the data from trading and investment report in Asia Pacific of UNESCAP, ASEAN's economy recovered in two years after the crisis because various countries adapted and improved economic policy and opened more free trade areas. Anyway sustainable growth, equity, balance, and knowledge-based growth are important to prepare for the changing trade and investment patterns in Southeast Asian region. (Bureau of Multilateral Trade Negotiations of Department of Trade Negotiations, 2010)

Health and education are the most important role player for sustainable development because human capital is fundamental for. When people in labor force are in good health and education and working skills, they can perform their tasks more effectively, and well-equipped with productively and creatively. In a broader context, health and education quality of the general population will reflect the living standard of the nation. Then, the education and health play as the important role of the sustainable development. The pertinent empirical study can benefit policy makers and researchers in contributing to the sustainable development in the region.

This paper represents an empirical study on the relationship between health, education, and economic growth in Southeast Asia using suitable health and education variables for analysis. The longitudinal data collected covered 50 years period from 1990 to 2009.The rest of this paper is organized as follows: section 2 is literature review, section 3 discusses methodology and model used in this study, section 4 is data discussion, section 5 presents the estimated results of the regression analysis and the conclusions of each analytical tool, section 6 presents the discussion of the study, and the last section discusses about the recommendations.

2. Literature review

According to Lucas (1988), human capital has the most important role in generating economic growth. The role of human capital in the form of education and health has been well recognized by many theoretical and the empirical studies. For instant, Schultz (1961) compared the role of health with the empirical study on education which affected economic growth. There is few interest in academic studies about human capital and economic growth in Asia. In the recent empirical studies at regional level, one study was undertaken on the effects of health and education on income distribution and poverty in Islamic countries (Sadegh and Hossein, 2009). Another study emphasized the impact of health especially the decreasing rate of HIV patients which affected the decision making on investment in human capital and economic growth (Rui,Lilyan, and Wesley, 2010). There is also a study emphasizing the impact of health, education on economic growth in East Asia (Hongyi and Huang, 2010). There are just a few empirical investigations on the role of education and health on economic growth in Southeast Asia.

3. Methodology

The basic framework of this study is based on Lucas's proposition that economic growth is determined not only physical capital but also human capital. In theoretical model of this study we consider human capital in the form of health and education following the human capital theory of Schultz (1961). This paper identified the appropriate proxy variables to examine the impact of health and education on economic growth. The model used in this study is as follows:

$$GDP_{it} = \{EDU_{it}, PTRATIO_{it}, LE_{it}, HE_{it}\}$$

Where GDP_{it} is gross domestic product

EDU_{it} is primary school enrolment (% gross)

$PTRATIO_{it}$ is pupil to teacher ratio in primary education

LE_{it} is life expectancy at birth

HE_{it} is health expenditure (% of GDP)

i is country (i=1, 2, …, 9)

t is period of time (t=1, 2, …, 50)

The model in the format of logarithm is shown as follow

$$lnGDP_{it} = \beta_0 + \beta_{i1} ln\mathrm{EDU}_{it} + \beta_{i2} ln\mathrm{PTRATIO}_{it} + \beta_{i3} ln\mathrm{LE}_{it} + \beta_{i4} ln\mathrm{HE}_{it} + \varepsilon_{it}$$

All of the variables are panel data of country and time specific. In the regression model, GDP is gross domestic product, EDU is primary school enrolment (% gross), PTRATIO is pupil to teacher ratio in primary education, HE is health expenditure (percent of GDP), LE is life expectancy, and ε_{it} is the error term.

3.1 Econometric Method

Panel data analysis for this empirical study was performed by various econometric methods which are divided into three steps. Firstly is the application of five methods for testing panel unit roots to assure the stationarity of the data. Second is the model setting and regression analysis of panel data through pooled OLS, fixed effects model, and random effects model. And last is the specification test based on Hausman's criteria.

3.1.1 Unit Roots Test

Almost all time series data are trending and non-stationary with time-varying mean and variance. Since all statistical analysis require the condition of using only stationary data to assume statistical equilibrium which is not affected by time. Therefore, time series data should be tested for Unit Roots to check the stationarity of the data before using statistical analysis. If the time series are not stationary, differencing operations are required to remove the trend effect until the new data series are stationary.

This present study used five methods of unit roots test: Levin, Lin, and Chu Test (LLC), Breitung test, Hadri test, Im, Pesaran and Shin test (IPS), and Fisher-Type test . These panel unit roots tests are different under two processes namely test with common unit roots process and test with individual unit root process. The description about the assumptions and statistical tests in each alternative is presented in the following table.

TABLE 1. The hypothesis setting and test statistics used in panel unit roots test

Common Panel Unit Root Test			
Method	**H_0**	**H_1**	**Statistic value**
LLC (2002)	With unit root	No unit root	t*-Statistic
Breitung (2000)	With unit root	No unit root	Breitung t-Statistic
Hadri (2000)	No unit root	With unit root	Z-Statistic
Individual Unit Root Test			
Method	**H_0**	**H_1**	**Statistic value**
IPS (2003)	With unit root	Some variables have no unit root	W-Statistic
Fisher-Type (1932)	With unit root	Some variables have no unit root	Fisher Chi-Square

3.1.2 Model setting

The models for estimating the relationship between dependent and independent variables in this study follow three economic approaches.

(1.)Pooled Regression Model

Pooled Regression Model or Constant Coefficient Model is estimation which determines constant intercept and slope. This model estimates panel data by using two stages least the basic model for this estimation can be written as follows

$$Y = x\beta + \epsilon$$

Under the assumption that $\varepsilon_{it} \approx iid(0, \sigma^2)$ for all i and t which cannot lead to autocorrelation problem. Moreover, time period and error terms of each cross-section have constant deviation.

(2.) Fixed Effects Model

This model estimation is simply a linear regression model which allows the intercept terms to vary over the cross-section data i, i.e.

$$Y_{it}=\beta_1+\beta_2 X_{2it}+\beta_3 X_{3it}+\varepsilon_{it}$$

Where i=1,2…,N

t=1,2…,T

In addition, this model focuses on differences within cross-section data. On the other hand, the parametric assumption about β shows that the change in x has the same effect, even it is a change from one cross-section to others or from one time period to the other time periods. However, it is important to realize that the results from fixed effects regression may impose the parameters which are identified only through the within data's dimension.

Because of the different assumptions of fixed value and coefficient, the fixed effects model can be divided into 4 variants as follows:

- All Coefficients Constant across Time and Individuals
- Slope Coefficients Constant but the Intercept Varies across Individuals: The Fixed Effects or Least-Squares Dummy Variable Regression Model (LSDV)
- Slope Coefficients Constant but the Intercept Varies over Individuals As Well As Time
- All Coefficients Vary across Individuals

(3.) Random Effects Model

Even the fixed effect model is easy to apply but it is not appropriate for estimation with high degrees of freedom or a large number of cross-section data. The random effects of both cross-section and time series data are included with error term. This model is called error component model (ECM)

The assumption is that there are other factors which might affect dependent variable in the regression analysis but are omitted from the investigation causing what is called random error term. The other assumption is α_i is random factors which are independent and vary in each cross section. Then, the random effects model can be written as:

$$y_{it} = \mu + X'\beta_{it} + \alpha_i + \varepsilon_{it}$$

where; $\varepsilon_{it} \sim iid(0, \sigma_\varepsilon^2)$ and $\alpha_i \sim iid(0, \sigma_\alpha^2)$

3.1.3 Hausman's Specification Test

Hausman test is the basic testing for choosing the efficient model estimation between fixed effects and random effects specification. Statistically, fixed effects estimations are always effective for panel data but for some groups of data, random effects one will give better P-values as being a more efficient estimator. So, it is necessary to use Hausman test to assure the efficient and consistent results. The assumptions of this test are as follows:

H_0 : The coefficients estimated by random effects estimator are consistent.

H_1 : The coefficients estimated by fixed effects estimator are consistent.

4. Data

This study uses panel data sets collected by the World Bank (World Bank Data, 2011) covering 1960 – 2009 periods annually and involving nine country members of ASEAN: Indonesia, Laos, Cambodia, Malaysia, the Philippines, Singapore, Vietnam, Brunei, and Thailand. Actually, Myanmar is also a member of ASEAN but its policy to be a closed country has restricted the availability of some of this country's data. This empirical investigation uses proxy variables for health and education for the following reasons.

For health human capital, this study first uses the life expectancy at birth (LE) because this measure of health reflects the quality of life and health standard of the population in each region. For example, Singapore has the highest level of LE meaning that the citizens of this country are healthy which might result from many reasons such as individual health controlling, standard of living, and standard of health care services. As a result, it is appropriate and necessary to consider LE as the indicator of health human capital. In addition, this study also uses health expenditure (% of GDP) (HE) as one of the proxy variables for health human capital. This variable reflects the government spending of health care services which is another necessary variable for health indicator. As this study has an interest on whether or not private or public health investments affect to economic growth. Life expectancy at birth (LE) deems an appropriate indicator for private health and health expenditure (% of GDP) (HE) is considered an appropriate indicator for public spending on health care services.

This study takes not only health but also education as the representative of human capital accumulation that how they affect the economic growth of Southeast Asian Regions. Thus, we consider the primary school enrolment (% gross) (EDU) as the indicator of individual investment on education capital. In addition, this study also uses the pupil to teacher ratio in primary education (PTRATIO) as another proxy variable for education human capital. This variable reflects the government spending on education and quality of education of each region. Both proxy variables of education are based on primary school because the primary level of schooling is the most appropriate for measuring the fundamental education attainment in each region and the rate of return to investment in primary education is higher than those of any other levels of education. In some developing countries, where governments provide the tuition fees support for secondary school students but some those income families still cannot afford the extra expenditure for their children's secondary schooling. Therefore, the factor of the primary schooling is considered appropriate and adequate as the measurement of education human capital.

As this empirical study analyzes the relationship between health, education, and economic growth, the most appropriate proxy variable for economic growth becomes gross domestic product (GDP).

5. Results

5.1 The results of the panel unit roots test

The panel unit roots tests namely: LLC test, IPS test, and Fisher-Type test (Fisher-ADF test and Fisher-PP test) were applied to examine the five logarithm term economic variables, which are i) Gross Domestic Product (GDP), ii) primary school enrolment (% gross) (EDU), iii) pupil to teacher ratio in primary school (PTRATIO), iv) life expectancy at birth (LE), and v) health expenditure (% of GDP) (HE). Table 2 presents the results of the panel unit roots tests at levels data. It indicates that the statistical values of all economic variables accept the null hypothesis of unit roots (non-stationary) at 0.01 level of statistical significance. According to the results, the five economic variables in logarithm form are non-stationary or not I(0). Then, all variables should be taken the first differencing to test the result of higher order of integration at I(1) and the results are presented in Table 3. All logarithms of economic variables reject the null hypothesis of unit roots at 0.01 level of statistical significance meaning that all variables are stationary at first difference level, I(1). Then, all variables are I(1) thus suitable for estimating the variables relationships with pooled OLS method, fixed effects model, and random effects model.

TABLE 2. The result of panel unit roots test at levels data

Test statistic / Variable	LLC	IPS	ADF-Test	PP-Test
lnGDP	-1.39267* (0.0819)	2.68322 (0.9964)	6.04401 (0.9960)	4.33996 (0.9996)
lnPTRATIO	1.22395 (0.8895)	3.46691 (0.9997)	8.80509 (0.9641)	9.44314 (0.9486)
lnEDU	-1.65248** (0.0492)	0.24651 (0.5974)	16.4880 (0.5585)	18.3406 (0.4334)
lnLE	3.14308 (0.9992)	4.29599 (1.0000)	54.0744*** (0.0000)	109.306*** (0.0000)
lnHE	1.06706 (0.8570)	3.20002 (0.9993)	4.56653 (0.9994)	6.43645 (0.9941)

Source: calculation

Note: The number in parenthesis is p-value

*** means statistical value is significant (stationary data) at 0.01 level of significance.

** means statistical value is significant (stationary data) at 0.05 level of significance.

* means statistical value is significant (stationary data) at 0.1 level of significance.

TABLE 3. The results of panel unit roots test at 1^{st} differencing

Test statistic / Variable	LLC	IPS	ADF-Test	PP-Test
lnGDP	-10.6698*** (0.0000)	-10.4313*** (0.0000)	138.210*** (0.0000)	185.437*** (0.0000)
lnPTRATIO	-7.97961*** (0.0000)	-10.0322*** (0.0000)	136.159*** (0.0000)	212.110*** (0.0000)
lnEDU	-10.0818*** (0.0000)	-10.4481*** (0.0000)	140.057*** (0.0000)	235.737*** (0.0000)
lnLE	-4.21536*** (0.0000)	-6.69596*** (0.0000)	98.1216*** (0.0000)	50.0046** (0.0103)
lnHE	-10.4390*** (0.0000)	-12.1733*** (0.0000)	166.407*** (0.0000)	229.413*** (0.0000)

Source: calculation
Note: The number in parenthesis is p-value
*** means statistical value is significant at 0.01 level of significance.
** means statistical value is significant at 0.05 level of significance.
* means statistical value is significant at 0.1 level of significance

5.2 The results of pooled OLS estimation

The estimation results in Table 4 reveal the coefficients of pupil to teacher ratio in primary education and life expectancy are significant at 0.01 level of significance while primary school enrolment (% gross) and health expenditure (% of GDP) are significant at 0.1 level. The estimation results indicate that both education and health capital stocks have significant implications for economic growth.

TABLE 4. The result of pooled OLS estimation

Test statistic / Variable	Pooled OLS
β_0	-8.812371*** (0.0000)
lnPTRATIO	-1.991430*** (0.0000)
lnEDU	-0.705136* (0.0503)
lnLE	6.068409*** (0.0000)
lnHE	0.189708* (0.0590)
Adjusted R-square	0.768439
F-statistic	373.5045*** (0.000000)
Durbin-Watson statistic	0.049869

Source: calculation
Note: The number in parenthesis is p-value
*** means statistical value is significant at 0.01 level of significance.
** means statistical value is significant at 0.05 level of significance.
* means statistical value is significant at 0.1 level of significance

The estimation results from Table 4 can be put in the form of equation as follows:

$$lnGDP = -8.812371 - 1.991430lnPTRATIO - 0.705136lnEDU + 6.068409lnLE + 0.189708lnHE$$

The regression outcomes provide explanation that if pupil to teacher ratio in primary education increases by 1%, gross domestic product of ASEAN would decrease by 1.991430%. If primary school enrolment (% gross) increases by 1%, gross domestic product of ASEAN would decrease by 0.705136%. If life expectancy increases by 1%, gross domestic product of ASEAN would increase by 6.068409%. If health expenditure (% of GDP) increases by 1%, gross domestic product of ASEAN would increase by 0.189708%.

In a nutshell pooled OLS estimation shows that pupil to teacher ratio in primary education and primary school enrolment (% gross) of ASEAN have negative effect on gross domestic products or economic growth of ASEAN. While both life expectancy and health expenditure (% of GDP) have positive effects on economic growth of ASEAN.

5.3 The results of fixed effects model estimation

Table 5 shows the estimated coefficients of pupil to teacher ratio in primary education, life expectancy, primary school enrolment (% gross) and health expenditure (% of GDP) are significant at 0.01 level. Both education and health capital stocks therefore have significant effects for economic growth.

TABLE 5. The results of fixed effects model estimation

Variable \ Test statistic	Fixed effects
β_0	-2.780072 (0.1295)
PTRATIO	-1.973973*** (0.0000)
EDU	1.449642*** (0.0000)
LE	2.244646*** (0.0000)
HE	0.413758*** (0.0002)
Adjusted R-square	0.892305
F-statistic	311.0162*** (0.000000)
Durbin-Watson statatistic	0.090975

Source: calculation

Note: The number in parenthesis is p-value

*** means statistical value is significant at 0.01 level of significance.

** means statistical value is significant at 0.05 level of significance.

* means statistical value is significant at 0.1 level of significance

The estimation result from Table 5 can be presented in form of equation as follows:

$$lnGDP = -2.780072 - 1.973973 lnPTRATIO + 1.449642 lnEDU + 2.244646 lnLE + 0.413758 lnHE$$

From the above equation one can see that if pupil to teacher ratio in primary education increases by 1%, gross domestic product of ASEAN would decrease by 1.973973%. If primary school enrolment (% gross) increases by 1%, gross domestic product of ASEAN would increase 1.449642%. If life expectancy increases by 1%, gross domestic product of ASEAN would increase by 2.24464%. If health expenditure (% of GDP) increases 1%, gross domestic product of ASEAN would increase by 0.413758%.

The estimation by fixed effects model discloses that only pupil to teacher ratio in primary education of ASEAN has negative effect on gross domestic products or economic growth of ASEAN. In contrast, primary school enrolment (% gross), life expectancy, and health expenditure (% of GDP) have positive effect on economic growth of ASEAN.

5.4 The results of random effects model estimation

Table 6 shows that the estimated coefficients of pupil to teacher ratio in primary education, life expectancy, primary school enrolment (% gross) and health expenditure (% of GDP) are statistically significant at 0.01 level meaning that both education and health capital stocks have significant effects for economic growth.

TABLE 6. The result of random effects model estimation

Variable \ Test statistic	Random effects
β_0	-3.185599* (0.0786)
PTRATIO	-1.984669*** (0.0000)
EDU	1.399265*** (0.0000)
LE	2.410500*** (0.0000)
HE	0.387573*** (0.0003)
Adjusted R-square	0.720056
F-statistic	289.7230*** (0.000000)
Durbin-Watson statistic	0.089130

Source: calculation

Note: The number in parenthesis is p-value

*** means statistical value is significant at 0.01 level of significance.

** means statistical value is significant at 0.05 level of significance.

* means statistical value is significant at 0.1 level of significance

The finding in Table 6 can be put in the form of equation as follows:

$$lnGDP = -3.185599 - 1.984669lnPTRATIO + 1.399265lnEDU + 2.410500lnLE + 0.387573lnHE$$

This estimated equation suggests that if pupil to teacher ratio in primary education increases by 1%, gross domestic product of ASEAN would decrease by 1.984669%. If primary school enrolment (% gross) increases 1%, gross domestic product of ASEAN would increase by 1.399265%. If life expectancy increases by 1%, gross domestic product of ASEAN would increase by 2.1405%. If health expenditure (% of GDP) increases 1%, gross domestic product of ASEAN would increase by 0.387573%.

In brief, the fixed effects model estimation indicates that only pupil to teacher ratio in primary education of ASEAN's region have negative effect on gross domestic products or economic growth of ASEAN. While, primary school enrolment (% gross), life expectancy, and health expenditure (% of GDP) have positive effects on economic growth of ASEAN.

5.5 The result of Hausman specification test

The result presented in Table 7 leads to the acceptance of the null hypothesis that the coefficients estimated by random effects estimator are consistent because the statistical value is not significant.

TABLE 7. The result of Hausman test

Test	Chi-sq. Statistic
Hausman test Chi-sq. d.f=4	6.098012 (0.1919)

Source: calculation

Note: The number in parenthesis is p-value

6. Discussions

The empirical findings indicate that both education and health factors affect ASEAN's economic growth by at I(1) level data. The cointegrating relationship is consistent in all estimation methods: pooled OLS estimation, fixed effects model, and random effects model. However, by Hausman test the most suitable model is the random effects model. The education factor in term of pupil to teacher ratio in primary education appeared to have negative effect on gross domestic product. The random effects model estimation provides the implication that if pupil to teacher ratio in primary education increases by 1%, gross domestic product of ASEAN would decrease by 1.984669%. Meanwhile, primary school enrolment (% gross) was found to has This positive effect on gross domestic product with implication that in case primary school enrolment (% gross) increases by 1%, gross domestic product of ASEAN would increase by 1.399265%. For health human capital, the factor of life expectancy did have positive effect on economic growth of ASEAN with tendency that if life expectancy increases by 1%, gross domestic product of ASEAN would increase by 2.1405%; so did the health expenditure factor (% of GDP) as it was found if health expenditure (% of GDP) increases by 1%, gross domestic product of ASEAN would increase by 0.387573%.

7. Concluding remarks

In this paper, we discussed the theoretical framework of the relationship between health and education human capital and economic growth. From literature search we found meager empirical works in previous study which analyze the role of health and education on economic growth of ASEAN. This study might fulfill the gap of knowledge. Our endeavor was to focus on nine countries members of ASEAN using 1960-2009 panel data,

According to this empirical study, life expectancy has larger effect on gross domestic product than health expenditure. Moreover, the reason why public investment on health is weakly stimulating economic growth might due to corruption. In the other word, life expectancy reflects not only individual health care but also public health care services. So, we propose that policymakers, especially for developing countries of ASEAN, should support individual health care and provide more efficient health care services for example promote concept of individual health care, provide cheap health care services to the poor, and create project to encourage citizen to be healthy. Even education factors affect economic growth to a lesser extent than health factors but they also have some contribution to economic growth of ASEAN. So, policymakers should invest on both health and education especially for setting up the learning program schools to teach children for the benefits of being healthy and how to be healthy. Then, children will have both healthy body and enough knowledge to be the great skill labor in the future which will lead to the sustainable growth of each country.

For more effective studies, the dataset should be extended in terms of both time periods and proxy variables of education and health indicators. Then, the empirical results will be more beneficial for researchers to compare the effects of each variable on economic growth and policymakers will have more choices to create the policy to stimulate economic growth.

ACKNOWLEDGMENT

The authors would like to thank Dr. Chaiwat Nimanussornkul who advised them on analytical instruments. The first author would like to thank her parents, Mr. Chaluemkiet and Mrs. Supranee Sawatdirakpong who are always beside her and give her power to move on until the study was completed.

REFERENCES

Azmat, G. and Michael, D. C. 2010. **Services and economic growth in Pacific Island countries.** Retrieved 7 December 2012, from http://www.emeraldinsight.com/1446-8956.htm

Association of Southeast Asian Nations. 2010. **About ASEAN.** Retrieved 10 December 2011, from http://www.aseansec.org/about_ASEAN.html

Association of Southeast Asian Nations. 2008. **Asean Statistical Yearbook 2008**. Retrieved 12 December 2011, from http://www.asean.org/publications/aseanstats08.pdf

Association of Southeast Asian Nations. 2007. **ASEAN Community progress monitoring system PAN-ASEAN INDICATORS.** Retrieved 5 December 2011, from http://www.aseansec.org/publications/ACPMS-1.pdf

Baltagi, Badi Ho. 2001. **Econometric analysis of panel data**. 2nd ed. West Sussex: John Wiley & Son.

Becker, G. S. 1993. **Human capital: A theoretical and empirical analysis, with special reference to education.** 3rd ed. Chicago: The University of Chicago Press.

Breitung, J. 2000. **The local power of some unit root tests for panel data**. Retrieved 2 January 2012, from http://www.mathematics.Uni-bonn.de/publications/breitung.pdf

Bureau of Multilateral Trade Negotiations of Department of Trade Negotiations. 2010. **Summary of Economic Cooperation in Asia – Pacific (APEC).** Retrieved 5 December2012, from http://www.dtn.go.th/dtn/tradeinfo/สรุปย่อAPEC.pdf. (in thai).

Byrns, R. T. & Stone, G. W. 1995. **Economics.** 6th ed. New York: Harper Collin College.

Choi, I. 2001. "Unit root test for panel data." **Journal of international money and finance 20**: 249-272

Dougls, G. 1982. **Encyclopedia of economics.** New York: McGraw-Hill.

Fisher, R, A. 1932. **Statistical Methods for Research Workers**. 4th ed. Edinburgh: Oliver & Boyd.

Gujarati, Damodar N. 2003. **Basic econometrics.** 4th ed. Singapore: McGraw – Hill

Hadri, Kaddour. 2000. "Testing for stationarity in heterogeneous panel data." **Econometrics Journal 3**: 148-161

Hongyi, L. and Huang, L. 2010. "Health, Education, and Economic growth in East Asia." Retrieved 7 December 2012, from http://www.emeraldinsight.com/1754-4408.htm

Im, K. S; Perasan, M. H and Shin, Y. 2003. "Testing for unit roots in heterogeneous panels." **Journal of Econometrics** 115: 53-74

Jing-Lin, D. and Yilmaz, G. 2009. "A Panel Data Analysis of Locational Determinants of Chinese and Indian Outward Foreign Direct Investment." Retrieved 7 December 2012, from http://www.emeraldinsight.com/ 1558-7894.htm

Levin, A; Lin, C. F. and Chu, C. 2002. "Unit root tests in panel data: Asymptotic and finite sample properties." **Journal of Econometrics** 105: 1-24

Lucas, Robert E., Jr. 1988 "On the Mechanics of Economic Development," **Journal of Monetary Economics** 22(1): 3-42

Maddala, G.S and Wu, S. 1999. "A comparative study of the unit root tests with panel data and a new simple test." **Oxford Bulletin of Economics and Statistics** 61: 31-52

Raymond, O. and Eleonara, P. 2003. **The Hausman Test for Correlated Effects in Panel Data Models under Misspecification**. Retrieved 10 December 2012, from http://econwkshop.pbworks.com/f/obrienpatac1206.pdf

Rui, H; Lilyan, E. F. and E. Wesley, F.P. 2010. "Health and Growth: causality through education." Retrieved 7 December 2012, from http://www.emeraldinsight.com/ 1756-137X.htm

Rutherford, D. 1992. **Routledge dictionary of economics.** London: Routledge.

Sadegh, B. and Hossein, M. 2009. “An empirical investigation of the effects of health and education on income distribution and poverty in Islamic countries.” Retrieved 7 December 2012, from http://www.emeraldinsight.com/ 0306-8293.htm

Schultz, T.W. 1961, “Investment in human capital”, **American Economic Review,** Vol. 51, p. 1-17

Schultz, T. W. 1971. **Investment in human capital: The role of education and of research.** New York: The Free Press.

Suranovic, S. M. 2010. **International Trade Theory and Policy: internationalecon.** “The Role of Education in Building an ASEAN Community 2015”**.** Retrieved 5 December 2011, from http://www.lib.hcu.ac.th/asean/1TheRoleofED-building-ASEANcommunity2015.pdf

Verbeek, Marno. 2004. **A guide to modern econometrics.** 2nd ed. West Sussex: John Wiley & Son.

World Bank data. 2011. Retrieved 5 December 2011, from http://data.worldbank.org/indicator/SH.XPD.TOTL.ZS

Yaffee. 2003. “A Primer for Panel Data Analysis.” **Connect information technology at NYU**. Retrieved 3 January 2012, from http://www.colorado.edu/Economics/course/Jose/basura/PrimerPanel.pdf

Yijun, Y; Yanying, C. and Lili, W. 2010. “Size of government and FDI: an empirical analysis based on the panel data of 81 countries.” Retrieved 7 December 2012, from http://www.emeraldinsight.com/ 1746-8779.htm