

Impact of Higher Education on Income and Economic Growth: A Cross Country Evidence

*(Impak Pendidikan Tinggi terhadap Pertumbuhan Ekonomi dan Pendapatan Negara:
Bukti Merentas Negara)*

Lai Wei Sieng

Universiti Kebangsaan Malaysia

Ishak Yussof

Universiti Kebangsaan Malaysia

ABSTRACT

Education is commonly used as indicator for human capital and can be divided into three levels: primary, secondary and tertiary. Each level of education designed with different skills and knowledges for population from different ages and hence produce human capital stock with different quality. Higher education leads to higher individual income or earning and thus contribute to income and economic growth. Middle income nations are investing less in higher education compared to high income nations in higher education. This study provides evidence on the impact of higher education on income and economic as a reference to middle income nations. This study applies dynamic panel data using PMG method and data from 2000 to 2015 for 30 high income countries. Empirical results suggest that tertiary education have positive and significant impact on income and economic growth. Besides, investment on nonfinancial assets, household consumption and trade openness also contribute positively on income growth. The result of this study suggest that government should allocate more fund on expansion of higher education in order to produce more labor with higher education, particularly middle income nations which aiming at achieving high income nation's status.

Keywords: Human capital; higher education; income and economic growth

ABSTRAK

Pendidikan lazimnya digunakan sebagai penunjuk kepada modal insan dan boleh dibahagikan kepada tiga tahap, iaitu rendah, menengah dan tinggi. Setiap peringkat pendidikan direka untuk melengkapkan pelajar dengan kemahiran dan pengetahuan yang berbeza untuk penduduk dari pelbagai peringkat umur dan menghasilkan modal insan dengan kualiti yang berbeza. Pendidikan tinggi membawa kepada pendapatan individu yang lebih tinggi dan seterusnya menyumbang kepada pertumbuhan pendapatan dan ekonomi negara. Negara berpendapatan sederhana kurang melabur dalam pendidikan tinggi jika dibandingkan dengan negara berpendapatan tinggi. Kajian ini menyediakan bukti impak pendidikan tinggi terhadap pertumbuhan pendapatan dan ekonomi negara berpendapatan tinggi sebagai rujukan kepada negara berpendapatan sederhana. Kajian ini menggunakan data panel dinamik dan kaedah penganggaran PMG dari tahun 2000 hingga 2015 untuk 30 negara berpendapatan tinggi. Keputusan empirikal menunjukkan bahawa pendidikan tinggi memberi kesan positif dan signifikan terhadap pertumbuhan pendapatan dan ekonomi negara. Di samping itu, pelaburan terhadap aset bukan kewangan, perbelanjaan isi rumah dan keterbukaan perdagangan juga menyumbang secara positif kepada pertumbuhan pendapatan dan ekonomi negara. Hasil kajian ini mencadangkan supaya kerajaan harus memperuntukkan lebih banyak dana untuk pengembangan pendidikan tinggi bagi menghasilkan lebih banyak buruh berpendidikan tinggi, terutamanya negara berpendapatan pertengahan atas yang telah menetapkan matlamat untuk mencapai status negara berpendapatan tinggi.

Kata kunci: Modal manusia; pendidikan tinggi; pendapatan dan pertumbuhan negara

INTRODUCTION

In the beginning of formal and systematic analysis on economic, Adam Smith (1776) whose has been regarded as the father of economic, identified the division of labour as the major source of economic growth. The Neoclassical growth model introduced by

Solow (1956) then focuses on technological change as the major factor of economic growth. Human capital was not considered as a source of economic growth up to this point. In short, according to the exogenous growth model by Solow and Swan (1956), physical capital accumulation is the most robust determinant of economic growth in short run while the determinant in



long run is the exogenous technical change. However, technological change required investment and human capital embodied knowledge and skills. Human capital is a term created by a Nobel Prize winning economist, Schultz (1961). He believed that human capital can be invested, just like other capital, through education and training, resulting in improvement of quality and output level. Abilities, experiences and education possessed by labours have economic value to the employer and economic collectively. Schultz (1961) emphasized the importance of human capital accumulation in promoting economic growth. The emergence of endogenous growth theory (Lucas 1988) then introduced human capital accumulation as an endogenous source of long run economic growth. Therefore, education had become the main indicator of human capital for research purposes (Barro 1991 & 1997). Countries with outstanding economic growth has been linked with progressive human capital formation. Western countries for example had gone through a lengthy period of stagnation in economic conditions, skills, life expectancy and population size before managed to transform due to investment in human capital (Matteo & Uwe 2005). In the eastern region, a lot of studies also confirmed that human capital is a vital determinant contributing to the economic growth achieved by East Asian region. Walter (1998), Leeuwen and Foldvari (2008) found that human capital bring impact on economic growth in Japan, Indonesia and India. Lee and Hong (2012) states that economic development in 12 Asia countries explained by education and labor input. Other studies conducted by bunches of researches such as Kang (2006), Sajid (2008) and Hawley (2004) support the findings that human capital is one of the important determinant of economic growth among East Asian countries.

Education is commonly used as indicator for human capital and can be divided into three levels: primary, secondary and tertiary. Each level of education designed with different skills and knowledges for population from different ages and hence produce human capital stock with different quality. Tertiary education or higher education have been largely related to economic growth of a nation. Enrolment in higher education is increasing worldwide. World Bank data reports that the gross enrollment ratio in higher education in the world has significantly increased, from 10.1 per cent in 1970 to 35 per cent in 2014. The East Asia and Pacific region achieved the highest increase of 11 per cent, while the North American region recorded the highest gross enrollment ratio of 84 per cent. Meanwhile, South Korea is a country where the population aged 15 and above is highly educated is 30 per cent in 2010. This is followed by the United States by 27 per cent. The developed countries typically number between 15 percent and 20 percent, while developing countries are below 10 percent. Higher education leads to higher

individual income or earning and thus contribute to nation income growth (Sandy & Kathleen 2004). However, higher education is a high-cost investment. It requires both education and research and development activities. Generally, there are a number of funding for higher education supported by several sources and the most important source is the public allocations (Tilea & Vasile 2014). Government will need to continuously support and finance higher education as higher education provide excellent research, training and experiences which becomes knowledge capital for the country (Maria et al. 2012). Apparently, high income countries allocated more fund on higher education compared to developing countries. Fig. 1 indicates that upper income nations are not allocating sufficient fund on higher education compared to high income nations. Thus, increasing the allocation of fund on higher education seems to be the right move in order to achieve high-income status. However, higher education is an investment which needs to be supported by research.

High-income nation is a goal which most of the countries government set to achieve within stipulated period. According to World Bank's classification, high income country is defined as a country with a gross national income (GNI) per capita above US\$12,475 in 2015. It is calculated using the Atlas method. There are a lot of challenges especially for middle-income countries to jump out of the middle-income trap to achieve the goal. In the past decades, East Asia region have achieved promising economic growth compared to other regions, according to World Bank (2017). Japan, South Korea and Singapore are among the few high-income countries in East Asia. Japan and Singapore both achieved the status of high-income nation since 1987 while South Korea became high-income country in 1995 to 1997 and since 2001. At the mean time, middle-income countries like Malaysia, Thailand and China have been working hard on achieving the high-income nation goal. According to World Bank, one of the causes of middle-income trap is the fall short of human capital accumulation. Therefore, studying the model of human capital accumulation among high-income countries will serve as reference for middle income countries in accelerating the process to reach the high-income nation status.

This study provides evidence from high income countries on the impact of higher education on income and economic growth. Therefore, the objective of this study is to study the impact of higher education on income and economic growth across high income nations. The paper is organized as follows. Section 2 will discuss briefly on previous related studies, Section 3 explains the methodology, variables and data in this study, Section 4 presents the results and discussion, and lastly Section 5 summarizes and concludes.

LITERATURE REVIEW

Empirical studies on the impact of education and economic growth have been done since centuries ago. The general consensus is education indeed have positive impact on economic growth and different levels of education have different impact on economic growth. Besides, results also varies with countries or region of interest. Empirical studies support that education directly and indirectly impacts the country's output (Theodore 2013). The educated workers will increase the country's income directly because schooling will increase their productivity suit. In addition, educated workers also increase productivity in physical capital and other employees. Research reports conducted in developed countries also support the importance and role of higher education in increasing the income of individuals and countries. Kent et al. (2005) summarizes higher education provide high returns to individuals. These returns vary depending on the quality of the institution. Graduates from quality institutes will earn higher returns than graduates from other institutions. In addition, higher education also benefits the local community. Highly educated people will increase productivity that will lead to an increase in the country's output. The spillovers of higher education also include non-financial benefits such as the socio-economic community in the United States. Barra and Zotti (2017) found that university competence had a significant positive impact on per capita Gross Domestic Product. Side effects will exist in the immediate vicinity of a highly efficient university. A study of universities across 78 countries, by Anna and John (2016) reports that the income of a region will increase when the number of universities in the region is doubled. Based on data from the UNESCO higher education database, focusing on the location of 15,000 universities for the period 1950 to 2010, Anna and John find out on average, the income of a region will increase by 4 percent when the number of universities increases one-fold.

Higher education leads to increase in income by providing opportunity to individuals to have access to well-paid jobs (Brannelly et al. 2011). Husaina (2013) studied the private rates of return to education in Malaysia and suggests that the average private returns to education are highest at the secondary and tertiary level. It is advised that people should pursue education until tertiary level to capture higher returns to education. In Great Britain, income at age sixty-five is significantly influenced by educational attainment and also a significant effect on survival (Richard et al. 2014). Turcinkova and Stavkova (2012) analyzed the relationship between attained level of education and the income situation of households in the Czech Republic. They concluded that higher education level of the head of a household is no guarantee of a lower risk of poverty. In West Virginia, Saima et al. (2012) conducted empirical analysis and found that income growth and education growth are positively

related. They suggested that investment in education, particularly targeting to the poor countries would be essential for income growth. This is consistent with report by Jennifer (2016) which documented differences in earning of United States adults with different education levels. The median earnings for people with degree is higher than those without degree. Ilga et al. (2015) also confirmed that increasing the level of education will increase the average income of household member in Latvia. Marta (2011) argues that national government should have a balance budget in all levels of schooling. This is consistent with recent study by Fulgence (2017) and Marta (2011). Despite the positive impact of higher education, Fulgence (2017) argue that an economy couldn't be optimal to have all workers with tertiary education and there should be proportions of workers with lower than tertiary levels of education.

Sharmistha and Richard (2004) adopted gross enrolment rates and average years of education concluded that there is strong positive relation between all education levels and growth in India. Furthermore, they found that female education at all levels has potential for generating economic growth whereas male have a causal impact on growth only at the primary and secondary level. Abbas (2001) adopted school enrolment rates found negative impact for primary school enrolment rates on economic growth for Sri Lanka and Pakistan while secondary and tertiary school enrolment rates both has positive impact on economic growth. A similar result is obtained from a study by Nowak and Dahal (2016) which investigates the long run relationship between education and economic growth in Nepal using gross enrolment ratio at three education levels. Result demonstrates that secondary and higher education have positive and significant contribution on the real GDP per capita in Nepal. Bogdan et al. (2017) found important positive impact of number of students in higher education on economic growth in Czech Republic and Romania using data series from 1980 to 2013. Furthermore, they also showed that causality relationship exists between higher education and economic growth for both countries. The same result also found for North Cyprus (Katircioglu 2009). Study on Greece by Pegkas (2014) reveals that in the long run, secondary and higher education had a positive contribution to economic growth. In addition, there is existence of long-run and short-run causality from higher education to economic growth.

Another study by Vandenbussche et al. (2006) indicates that high education labours proxied by the number of years of skilled education have significant positive impact on economic growth among countries with advanced technology. However, higher education have negative impact on countries with less advanced technology. Postiglione (2011) then suggests that both regular and vocational-technical in higher education make a significantly positive impact on economic growth

in eastern Asian region. Similar result is found by a research on different region in a country in China using average years of schooling as proxy. Tertiary education give positive impact on more advanced province in China, while primary and secondary education play more important role in less developed province (Zhang & Zhuang 2011). The positive impact of higher education in China is supported by Huang et al. (2009). In Malaysia, Secondary and tertiary education equip the people with knowledge to compete globally and lead to economic growth (Ramesh & Rohana 2009). Shaihani et al. (2011) adopting enrolment rates in each education level concluded only higher education have positive and significant impact on GDP per capita in Malaysia. Japan as an advanced country also experienced the same situation. Primary education was important before war while secondary and tertiary education give positive impact on economic growth after war (Sharmistha & Richard 2003). Siew et al. (2015) concludes that private higher education institutions and public universities have a direct and indirect impact on income, with private institution being found to have a greater multiplier effect than public universities. A study by Risti (2009) demonstrates that the complementarity between education and other factors in enhancing productivity and efficiency are the driving force of economic growth in East Asia. Fulgence (2017) confirmed the positive and significant contribution of higher education on OECD countries but argued that increasing tertiary education increases output and reached a point where further increase in tertiary education reduces output. Mahdi (2008) confirmed that higher education variable has positive effect on the economic growth of Iran in both the short and long run. Craig (2013) suggests higher growth is not guaranteed by mass higher education. It depends on the skills produced by an expanding tertiary sector and their utilization in the jobs available to increasing numbers of graduates. Agiomirgianakis et al. (2002) examines the role of human capital on economic growth by using a large panel data of 93 countries. The empirical result indicates that education has a significant and positive long-run impact on economic growth. They suggested that governments taking actions towards an expansion of their higher education may well expect larger gains in terms of higher economic growth in their countries. Lee and Fransisco (2012) studies the human capital accumulation in emerging Asia for year 1970 to 2030 suggest that Asian economies must make investment to improve educational quality and raising enrollment rates at both the secondary and tertiary levels. Krueger and Lindahl (2001) suggests that examining growth across regions of countries will be more promising by applying reliable data.

Review on previous studies clearly shows that the positive and significant impact of education, particularly higher education, on economic growth measured by GDP. Besides, it is also obvious that two major proxy

of education are the average years of schooling and the gross enrolment rates in each education level. The lack of studies on nation income growth is a gap to be filled as countries are categorized based on level of income and World Bank classifies countries by GNI per capita and that upper middle income nations are aiming at achieving high income status within a targeted period of time. In addition, this study contributes in term of proposing another proxy for education for more reliable interpretation of the contribution of higher education on growth.

DATA AND EMPIRICAL METHODOLOGY

DATA AND VARIABLES

Past research on the link between education and nation income growth is limited. Most researches were focusing on the contribution of education on economic growth. In fact, there is a thin differences in terms of definition between economic growth and income growth. Oxford dictionary defines economic growth as the increase in the amount of goods and services produced per head of the population over a period of time. It is measured by gross domestic product (GDP). Nation income growth is measured by growth in Gross National Income (GNI). GNI is a measure of a country's income. Whereas GDP only counts income received from domestic sources. GNI includes net income received from abroad (World Bank, 2017). Therefore, GNI will be adopted as dependent variable to capture the impact of higher education on nation income and economic growth. This study uses dataset comprising of 30 high income countries (Austria, Belgium, Bulgaria, Canada, Cyprus, Czech Republic, Denmark, Dominican Republic, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Korea Republic, Latvia, Luxembourg, Malta, Netherlands, Norway, Portugal, Romania, Spain, Sweden, Switzerland, United Kingdom and United States) for a period of time from 2000 to 2015. The selection of countries and study period are based on the data availability of all variables. All data are generated from World Bank Online Databank (2017). The descriptive statistics for panel data is reported in Table 1.

TABLE 1. Panel Unit root test

Variables	Mean	Standard Dev.	Minimum	Maximum
ln <i>GNI</i>	10.275	0.751	8.197	11.538
ln <i>HL</i>	15.032	1.541	11.728	18.630
ln <i>INV</i>	0.361	0.949	-9.721	2.342
ln <i>HC</i>	25.910	1.739	22.193	30.066
ln <i>GE</i>	24.839	1.798	21.052	28.556
ln <i>OPEN</i>	-0.121	0.513	-1.450	1.341

ESTIMATION MODEL

The objective of this study is to determine the impact of higher education on income and economic growth. Based on previous works, the estimation model, equation (1) is build:

$$\ln GNI_{it} = \theta_i + \delta_{1i} \ln HL_{it} + \delta_{2i} \ln INV_{it} + \delta_{3i} \ln HC_{it} + \delta_{4i} \ln GE_{it} + \delta_{5i} \ln OPEN_{it} + \mu_{it} \quad (1)$$

All variables are expressed in logarithmic form. Where, *GNI* is gross nation income per capita (constant 2010 U.S. Dollars). It is the sum of value added by all resident producers plus any product taxes not included in the valuation of output plus net receipts of primary income from abroad. GDP per capita has been widely used as the dependent variable for studies on economic growth. However, in this study, GNI per capita is the appropriate dependent variable as it reflects nation's income and serves as the indicator in positioning the income levels of a nation by World Bank. *L* is the number of labor force with advanced education. Total labor force is multiplied with percentage of working population who are in the labor force with advanced level education. Advanced level education refers to tertiary education which comprises bachelor's degree or equivalent education level, master's degree or equivalent education level, or doctoral degree or equivalent education level according to the International Standard Classification of Education 2011. Two most common proxy for education are enrolment ratio and average years of schooling provided by Barro et al. (2013). Enrolment ratio does not reflect the appropriate output of higher education as students just enrolled in higher education are not considered as labor force. Hence it is not a suitable variable. Average years of schooling shows the average year of schooling among population. A fraction of population included in the calculation is not in the labor force. Therefore this study adopts the number of labor force with advanced education as proxy for higher education. The same was done by a recent study by Fulgence (2017). *I* is the net investment in government nonfinancial assets such as inventories and fixed assets. These assets stores value and provide gains either through their use in production of goods and services or in the form of property income. *C* is household final consumption expenditure. It is calculated by sum up the market value of all goods and services purchased by households, including durable products such as cars and electric appliances. *GE* is government final consumption expenditure. It includes all government current expenditures (constant 2010 U.S. dollars) for purchases of goods and services, including compensation of employees. It also includes most expenditures on national defense and security, but excludes government military expenditures that are part of government capital formation. *OPEN* is the degree of trade openness. It is calculated by summing exports and imports then divided by GDP. Equation (23) will be estimated by applying PMG.

PANEL UNIT ROOT TEST

Panel data analysis required panel unit root test to be applied on the data. This test must be conducted before cointegration method can be applied. All variables should be stationary on I(0) or I(1). If the variables exceed I(1), there is possibility of inconsistent estimation (Asteriou & Monastirious, 2002). The tests applied in this study are those developed by Im, Pesaran and Shin. (IPS, hereafter) (2003), Levin et al. (2002). IPS is test with individual unit root processes while Levin et al. is test with common unit root processes. IPS provides a solution to Levin et al.'s serial correlation problem by assuming heterogeneity between units in a dynamic panel framework. Panel unit root done by using software Eviews 7. Table 1 reports the panel unit root test results for all variables in this study.

PANEL COINTEGRATION TEST

Once variables' stationarity is confirmed, next step is the panel cointegration test. This test is conducted to identify the existence of significant long-run relationship between the variables in the estimation model. The test applied here is the one introduced by Pedroni (1999, 2004). Pedroni's cointegration tests is similar to IPS panel unit root which take into account the heterogeneity by applying specific parameters that are allowed to vary across individual members of the sample. Pedroni introduced seven different statistics for this purpose. Null hypothesis of no co-integration is rejected when negative statistic values are large, except for panel-v test which null hypothesis of no-cointegration is rejected when the positive value is big. The finite simple distribution for the seven statistics has been tabulated by Pedroni using Monte Carlo simulations. Null hypothesis of no cointegration can be rejected if the calculated statistical value is smaller than the tabulated critical value. Eviews 7 applied for panel cointegration test. Table 2 summarizes panel cointegration test results for high-income countries involved in this study.

PMG

Estimation can be conducted if the variables are co-integrated. The main advantage of using panel data for growth analysis is country's special effect can be controlled, for example, by applying Dinamic Fixed Effect (DFE) or Generalised Methods of Moment (GMM). However, these methods generally apply homogenous to all slopes and only allow intersection to be differed among countries. This could leads to inconsistent and misleading long-term coefficients. Pesaran and Smith (1995) suggested that under heterogenous slopes, the estimation will face serious heterogeneity bias problem, especially in the case of number of sample countries is

TABLE 2. Panel Unit root test

Variables	Im et al.	Levin et al.
ln <i>GNI</i>	-1.002	-6.580***
ln <i>GNI</i>	-8.187***	-10.687***
ln <i>HL</i>	0.318	-3.094***
ln <i>HL</i>	-13.374***	-14.802***
ln <i>INV</i>	-6.526***	-11.815***
ln <i>INV</i>	-21.342***	-32.279***
ln <i>HC</i>	-0.514	-5.266***
ln <i>HC</i>	-6.881***	-10.103***
ln <i>GE</i>	-0.961	-6.564***
ln <i>GE</i>	-7.539***	-9.709***
ln <i>OPEN</i>	2.328	-2.230**
ln <i>OPEN</i>	-12.589***	-16.454***

*** indicates significant level 1%

small. Pesaran, Shin and Smith (1999) then proposed intermediate estimator that allows the short-term parameters to differ between groups while imposing equality of the long-term coefficients between countries. The proposed methods are the pooled mean group (PMG) estimators and mean group (MG).

PMG is a combination of pooling and averaging the coefficients while MG estimator is based on estimating *N* time-series regressions and averaging the coefficients while (Pesaran & Smith, 1995). PMG estimation derives long run parameter from average long run parameter from ARDL model for individual country (Pesaran & Smith 1995). For example, if ARDL as follow:

$$a_i(K)y_{it} = b_i(K)x_{it} + c_i y_{it} + e_{it} \tag{2}$$

For country *i*, for *i* = 1, ..., *N*, long run parameter is:

$$\varepsilon_i = \frac{b_i(1)}{c_i(1)} \tag{3}$$

And MG estimator for the overall panel is:

$$\varepsilon = \frac{1}{N} \sum_{i=1}^N \varepsilon_i$$

This shows that MG estimation with high sequence of lag will have consistent estimator for long run average parameter.

MG estimation allowed both slope and intercept to be different among countries whereas for fixed effect method, slope is fixed and intercept is allowed to be different among countries. In PMG estimation, only long run coefficient is fixed to be the same for all countries while short run coefficient are allowed to be different. In other words, PMG estimator yields efficient and consistent estimates only when homogeneity restriction is indeed true. In addition, when *N* is rather small, PMG estimator is less sensitive to outliers problem and can simultaneously correct the serial autocorrelation problem and the problem of endogenous regressors by

choosing appropriate lag structure for both dependent and independent variables. In this study, PMG will be applied. PMG estimation require appropriate lag selection. The lag is selected by Akaike Information Criterion (AIC). The lag length can be determined by taking maximum lags and then choose the model where the value of AIC in the minimum. Eviews 7 and Stata 12 software are used for conducting the empirical analysis in this study.

The basic ARDL (*p*, *q*₁, *q*₂, *q*₃, *q*₄, *q*₅) equation system for period of time *t* = 1, 2, ..., 15 and country *i* = 1, 2, ..., 30 for dependent variable *y* is:

$$\begin{aligned} \ln GNI_{it} = & \alpha_{0i} + \sum_{j=1}^p \delta_{ij} \ln GNI_{i,t-j} + \sum_{j=0}^{q_1} \vartheta'_{ij} \ln HL_{i,t-j} \\ & + \sum_{j=0}^{q_2} \vartheta'_{ij} \ln INV_{i,t-j} + \sum_{j=0}^{q_3} \vartheta'_{ij} \ln HC_{i,t-j} \\ & + \sum_{j=0}^{q_4} \vartheta'_{ij} \ln GE_{i,t-j} + \sum_{j=0}^{q_5} \vartheta'_{ij} \ln OPEN_{i,t-j} \\ & + \varepsilon_{it} \end{aligned} \tag{4}$$

This model can be revealed in VECM (*Vector Error Correction Model*) form:

$$\begin{aligned} \Delta \ln GNI_{it} = & \alpha_{0i} + \theta_i (\ln GNI_{i,t-1} - \alpha'_i \ln HL_{i,t-1} - \alpha'_i \ln INV_{i,t-1} \\ & - \alpha'_i \ln HC_{i,t-1} - \alpha'_i \ln GE_{i,t-1} - \alpha'_i \ln OPEN_{i,t-1}) \\ & + \sum_{j=1}^{p-1} \delta_{ij} \ln GNI_{i,t-j} + \sum_{j=0}^{q_1-1} \vartheta'_{ij} \ln HL_{i,t-j} \\ & + \sum_{j=0}^{q_2-1} \vartheta'_{ij} \ln INV_{i,t-j} + \sum_{j=0}^{q_3-1} \vartheta'_{ij} \ln HC_{i,t-j} \\ & + \sum_{j=0}^{q_4-1} \vartheta'_{ij} \ln GE_{i,t-j} + \sum_{j=0}^{q_5-1} \vartheta'_{ij} \ln OPEN_{i,t-j} \\ & + \varepsilon_{it} \end{aligned} \tag{5}$$

Where α_i is long run parameter and θ_i is error-correcting speed of adjustment term, $\theta_i < 0$ indicates the existence of long run relationship. Thus, a negative and significant value of θ_i prove the existence of cointegration between $\ln GNI_{it}$ and the independent variables. PMG allows for the long-run coefficient to be equal over the cross-section, that is $\alpha'_i = \alpha'$ for all *i*, thus the specific model for PMG is given as below:

$$\begin{aligned} \Delta \ln GNI_{it} = & \alpha_{0i} + \theta_i (\ln GNI_{i,t-1} - \alpha' \ln HL_{i,t-1} - \alpha' \ln INV_{i,t-1} \\ & - \alpha' \ln HC_{i,t-1} - \alpha' \ln GE_{i,t-1} - \alpha' \ln OPEN_{i,t-1}) \\ & + \sum_{j=1}^{p-1} \delta_{ij} \ln GNI_{i,t-j} + \sum_{j=0}^{q_1-1} \vartheta'_{ij} \ln HL_{i,t-j} \\ & + \sum_{j=0}^{q_2-1} \vartheta'_{ij} \ln INV_{i,t-j} + \sum_{j=0}^{q_3-1} \vartheta'_{ij} \ln HC_{i,t-j} \\ & + \sum_{j=0}^{q_4-1} \vartheta'_{ij} \ln GE_{i,t-j} + \sum_{j=0}^{q_5-1} \vartheta'_{ij} \ln OPEN_{i,t-j} \\ & + \varepsilon_{it} \end{aligned} \tag{6}$$

RESULTS AND DISCUSSION

PANEL UNIT ROOT TEST

Table 2 reports the outcomes of panel unit root test. According to results, all variables are integrated of both I(0) and I(1) based on Levin et al. unit root test. Besides, all variables are integrated of I(1) according to Im et al. unit root test. The null hypothesis of unit root exists can be rejected at 1% level of significance. In other words, it is confirmed that all variables are free of non-stationary issue. Upon confirming the variables are not exceed I(1), panel cointegration tests can be conducted.

PANEL COINTEGRATION TEST

Outcomes of Pedroni’s (1999) cointegration tests presented in Table 3. Four within-group tests (labelled panel in the table) and three between-group (labelled group in the table) tests are used to examine whether the panel data in this study are cointegrated. The values in the columns labelled ‘group’ are the values of the computed statistics based on estimators that average individually estimated coefficients for each country. The values in the columns labelled ‘panel’ are the computed values of the statistics based on estimators that pool the autoregressive coefficient across different countries for the unit root tests on the estimated residuals. Four out of seven tests involved rejected the null hypothesis of no cointegration. Therefore, this confirmed the existence of long-run relationship between the variables and equation (23) can be estimated using PMG estimator, which will provide reliable inference about the long-run and short-run impact of labor force with high education, investment, household consumption, government expenditure and trade openness on nation’s income growth of countries involved in this study.

RESULTS OF PMG

The results of the PMG estimation using ARDL (1, 1, 1, 1, 1, 1) reported in Table 4. The value of the coefficient of the error-correction terms (EC) is -0.77 which is significant at 1% level and within the stable unit circle. This indicates that long-run relationship exists among the variables in the estimation model. In other words, this proves that the variables in the estimation model are indeed co-integrated and providing reliable

TABLE 4. PMG estimation result

Variable	PMG	
	Coefficient	Standard Deviation
ln <i>HL</i>	0.462***	0.108
ln <i>HL</i>	-0.030	0.110
ln <i>INV</i>	0.160***	0.011
ln <i>INV</i>	-0.023***	0.008
ln <i>HC</i>	0.644***	0.048
ln <i>HC</i>	0.440***	0.095
ln <i>GE</i>	-1.067***	0.099
ln <i>GE</i>	0.213***	0.075
ln <i>OPEN</i>	0.446***	0.029
ln <i>OPEN</i>	0.156**	0.053
ECM	-0.177***	0.042

*** and ** indicate significant level 1% and 5%

interpretation to the long run estimates. In addition, the error-correction term indicates the speed of adjustment of disequilibrium. In this case, -0.177 implies that equilibrium is reached in 5.6 years. Based on PMG estimations, in long-run, the coefficient ln*HL*, ln*INV*, ln*HC* and ln*Open* is positive and significant at 1% level. Meanwhile, the coefficient of ln*GE* is negative and significant at 1%. This implies that the number of labor force with higher education have positive impact on nation income growth. 1% increase in the number of highly educated labor will increase the nation income by 0.46%. Investment in nonfinancial assets also have positive and significant impact income and economic growth. 1% increase in investment on nonfinancial assets will lead to 0.16% increases in income. Besides, household consumption also contribute positively to nation income growth. A 1% increase in household consumption will increase income by 0.64%. Trade openness also has positive and significant impact on income and economic growth. A 1% increase in trade openness, income and economic growth increases by 0.45%. On the other hand, government expenditure give negative and significant impact on nation income. A 1% increase in government expenditure decreases GNI per capita by 1.067%. In short run, household consumption, government expenditure and trade openness have positive and significant effect on nation income growth, whereas investment in nonfinancial assets have negative impact on income and economic growth.

TABLE 3. Panel cointegration result

Panel				Group		
<i>v</i> -Stat	ρ -Stat	PP-Stat	ADF-Stat	ρ -Stat	PP-Stat	ADF-Stat
-2.168	6.422	-4.150***	-2.822***	7.732	-20.955***	-7.840***

*** indicates significant level 1%

DISCUSSION AND CONCLUDING REMARKS

This paper aims to examine the impact of higher education on income and economic growth. Proxy for higher education adopted in this study is the number of labor with higher education. In general, the results of this study confirmed the existence of significant long-run relationship between labor with higher education and economic growth. Consistent with previous studies discussed in literature review, higher education give positive and significant impact on income and economic growth. Based on the evidence from this study, the major policy implication of this study is that middle income nations which are seeking to be promoted to high income nation are highly recommended to allocate more fund on higher education to produce more labor with higher education. In addition, funds should be use more on efforts to improve the quality of higher education. This is important especially to meet the job market's needs. The job market continue to seek for highly skilled labor, particularly in the fourth industrial revolution. Thus, promoting higher education and encouraging workers to earn higher levels of education is the always the priority in engaging policies to move towards high income nation. In addition to promoting higher education, the results of this study implies that investment in government nonfinancial assets, household consumption and trade openness is encouraged to promote income and economic growth.

REFERENCES

- Abbas, Q. 2001. Endogenous growth and human capital: A comparative study of Pakistan and Sri Lanka. *The Pakistan Development Review* 40: 987-1007.
- Agiomirgianakis, G., Asteriou, D. & Monastiriotis, V. 2002. Human capital and economic growth revisited: A dynamic panel data study. *International Advances in Economic Research* 8: 177-187.
- Anna, V. & John, V. R. 2016. *Growth Multiplier: How University Expansion Increases National Income*. LSE Business Review.
- Barra, C., & Zotti, R. 2017. Investigating the human capital development-growth nexus: Does the efficiency of universities matter? *International Regional Science Review* 40: 638-678.
- Barro, R. J. 1991. Economic growth in a cross section of countries. *Quarterly Journal of Economics* 106(2): 407-443.
- Barro, R. J. 1997. *Determinants of Economic Growth: A Cross-Country Empirical Study*. MIT Press, Cambridge, M.A.
- Barro, Robert & Jong-Wha Lee. 2013. A new data set of educational attainment in the world, 1950-2010. *Journal of Development Economics* 104: 184-198.
- Bogdan, O., Richard, P. & Raluca, M. D. 2017. Higher education and economic growth: A comparison between the Czech Republic And Romania. *Prague Economic Papers* 26: 467- 486.
- Brannelly, L., Lewis, L. & Ndaruhutsc, S. 2011. Higher Education and the Formation of Developmental Elites. A Literature Review and Preliminary Data Analysis. DLP Research Paper No.10.
- Craig, H. 2013. Has the expansion of higher education led to greater economic growth? National Institute Economic Review No. 224.
- Fulgence, D. W. 2017. Education and economic growth: Is tertiary education for all workers optimal? *Academic Journal of Economic Studies* 3: 29-34.
- Hawley, J. D. 2004. Changing returns to education in times of prosperity and crisis, Thailand 1985-1998. *Economics of Education Review* 23: 273-286.
- Huang, F., Jin, L. & Sun, L. 2009. Relationship between scale of higher education and economic growth in China. *Asian Social Science* 5: 55-60.
- Husaina, B. K. 2013. Higher levels of education for higher private returns: New evidence from Malaysia. *International Journal of Educational Development* 33: 380-393.
- Ilga, L., Olga, L., & Janis, T. T. 2015. Influence of education on unemployment rate and incomes of residents. *Procedia-Social and Behavioral Sciences* 174: 3824-3831.
- Im, K. S., Pesaran, M. H & Shin, Y. 2003. Testing for unit roots in heterogenous panels. *Journal of Econometrics* 115: 53-74.
- Jennifer, M., Matea, P. & Meredith, W. Education Pays 2016: The benefits of higher education for individuals and society. The College Board.
- Kent, H., Dennis, H., & Tom, R. R. 2005. The value of higher education: individual and societal benefits. Arizona State University.
- Kang J. M. 2006. An estimation of growth model for South Korea using human capital. *Journal of Asian Economics*: 852-866.
- Katircioglu, S. T. 2009. *Investigating Higher-Education-Led Growth Hypothesis in a Small Island: Time Series Evidence from Northern Cyprus*. Paper presented at Anadolu International Conference in Economics, Turkey.
- Krueger, A. B. & Lindahl, M. 2001. Education for growth: Why and for whom? *Journal of Economic Literature* 39: 1101-1136.
- Lee, J. W. & Hong, K. 2012. Economic growth in Asia: Determinants and prospects. *Japan and the World Economy* 24: 101-113.
- Lee, J. W. & Francisco, R. 2012. Human capital accumulation in emerging Asia, 1970-2030. *Japan and the World Economy* 24: 76-86.
- Leeuwen, V. B. & Foldvari, P. 2008. Human capital and economic growth in Asia 1890-2000: A time-series analysis. *Asian Economic Journal* 22: 225-240.
- Levin, A., Lin, C. F. & Chu, C.S.J. 2002. Unit root tests in panel data: Asymptotic and finite-sample properties. *Journal of Econometrics* 108: 1-24.
- Lucas, R. E. 1988. On the mechanic of economic development. *Journal of Monetary Economics* 22: 4-42.
- Mahdi, F. K. 2008. Higher education development and economic growth in Iran. *Education, Business and Society: Contemporary Middle Eastern Issues* 1: 162-174.
- Maria, L., Ioan, M. & Nistur, L. A. 2012. Financing higher education in Europe: Issues and challenges. *Procedia-Social and Behavioral Sciences* 51: 938-942.
- Marta, C. N. S. 2011. Education composition and growth: A pooled mean group analysis of OECD countires. *Panaeconomicus* 4: 455-471.

- Matteo C. & Uwe S. 2005. Human capital formation, life expectancy, and the process of development. *The American Economic Review* 95:1653-1672.
- Nowak, A. Z. & Dahal, G. 2016. The contribution of education to economic growth: Evidence from Nepal. *International Journal of Economic Sciences* 5: 22-41.
- Pegkas, P. 2014. The link between educational levels and economic growth: A neoclassical approach for the case of Greece. *International Journal of Applied Economics* 11: 38-54.
- Pedroni, P. 1997. Panel cointegration; asymptotic and finite sample properties of pooled time series tests, with an application to the PPP hypothesis: New results. Working Paper, Indiana University.
- Pedroni, P. 2004. Panel cointegration; Asymptotic and finite sample properties of pooled time series tests, with an application to the PPP Hypothesis. *Econometric Theory* 20: 597-625.
- Pesaran, M. H., Shin, Y. & Smith, R. P. 1999. Pooled mean group estimation of dynamic heterogeneous panels. *Journal of the American Statistical Association* 94(446): 621-634.
- Postiglione, G. A. 2011. Global recession and higher education in Eastern Asia: China, Mongolia and Vietnam. *Higher Education* 62: 789-814.
- Ramesh, R. & Rohana, J. 2009. Spurring economic growth through education: The Malaysian approach. *Educational Research and Review* 4: 135-140.
- Richard, D., Silvia, L. & Martin, W. 2014. Education and its effects on income and mortality of men aged sixty-five and over in Great Britain. *Labour Economics* 27: 71-82.
- Risti, P. 2009. The role of education in economic growth in East Asia: A survey. *Asian-Pacific Economic Literature* 23: 1-20.
- Saima, B., Janaranjana, H. & Tesfa, G. 2012. An Empirical Analysis of Higher Education and Economic Growth in West Virginia. Agricultural and Applied Economics Association Annual Meeting.
- Sajid, A. 2008. Foreign investment, human capital and manufacturing sector growth in Singapore. *Journal of Policy Making* 30: 447-453.
- Sandy, B. & Kathleen, P. 2005. *The Benefits of Higher Education for Individuals and Society*. College Board.
- Schultz, T. W. 1961. Investment in human capital. *American Economic Review* 51: 1-17.
- Shaihani, M., Haris, A., Normaz, W. I. & Rusmawati, S. 2011. Long run and short run effects on education levels: Case in Malaysia. *International Journal of Economic Research* 2(6): 77-87.
- Shamistha, S & Richard, G. 2003. Education and long-run development in Japan. *Journal of Asian Economics* 14: 565-580.
- Sharmistha S. & Richard G. 2004. Does education at all levels cause growth? India, a case study. *Economics of Education Review* 23: 47-55.
- Smith, A. 1776. *An Inquiry into the Nature and Causes of the Wealth of Nations*. London.
- Solow, R. M. 1956. A contribution to the theory of economic growth. *The Quarterly Journal of Economics* 70: 65-94.
- Swan, T. W. 1956. Economic growth and capital accumulation. *Economic Record* 32 (63): 334-361.
- Theodore R. Breton. 2013. The role of education in economic growth: Theory, history and current returns. *Educational Research* 55(2).
- Tilea, D. M. & Vasile, B. 2014. Modern trends in higher education funding. *Procedia-Social and Behavioral Sciences* 116: 2226-2230.
- Turcinkova, J. & Stavkova, J. 2012. Does the attained level of education affect the income situation of households? *Procedia-Social and Behavioral Sciences* 55: 1036-1042.
- Vandenbussche, J., Aghion, P. & Meghir, C. 2006. Growth, distance to frontier and composition of human capital. *Journal of Economic Growth* 11: 97-127.
- Walter, W. M. 1998. Education and growth in East Asia. *Economics of Education Review* 17: 159-172.
- World Bank. 2017. *Global Economic Prospects*. 2017.
- Zhang, C & Zhuang, L. 2011. The composition of human capital and economic growth: Evidence from China using dynamic panel data analysis. *China Economic Review* 22(1):165-171.
- Lai Wei Sieng *
Fakulti Ekonomi dan Pengurusan
Universiti Kebangsaan Malaysia
43600 UKM Bangi Selangor
MALAYSIA
E-mail: laiws@ukm.edu.my
- Ishak Yussof
Fakulti Ekonomi dan Pengurusan
Universiti Kebangsaan Malaysia
43600 UKM Bangi Selangor
MALAYSIA
E-mail: iby@ukm.edu.my

*Corresponding author

APPENDIX

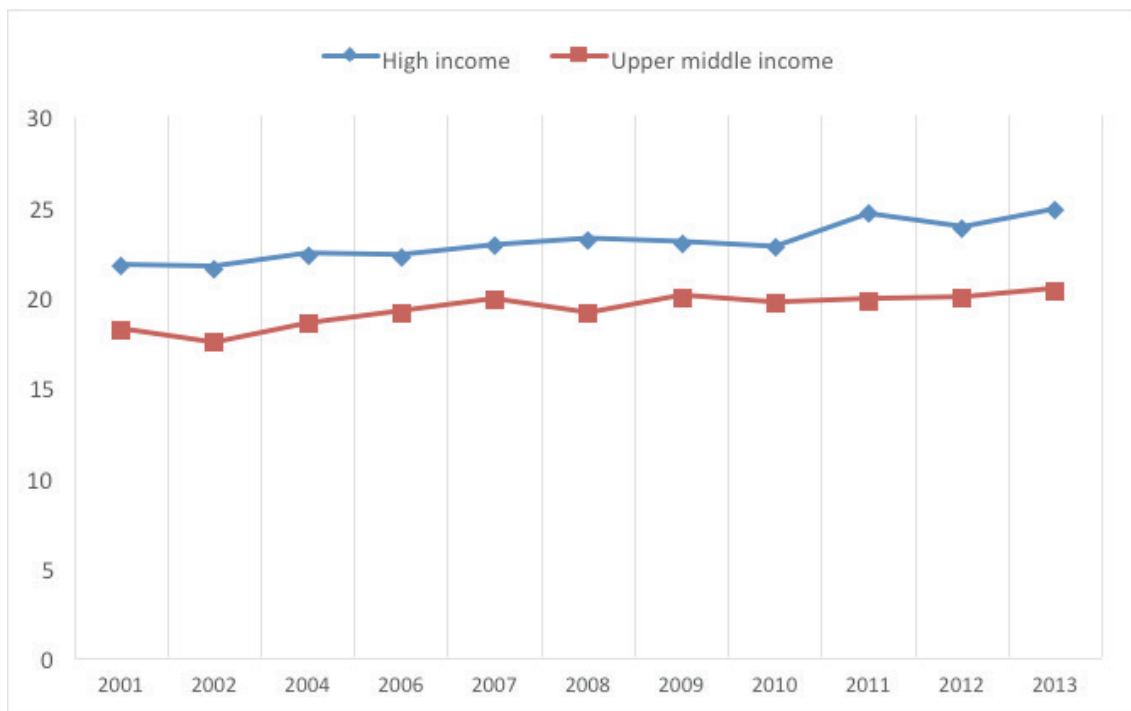


FIGURE 1. Expenditure on tertiary education is expressed as a percentage of total general government expenditure on education.

Source: World Bank, 2017