

## **The Relationship between Human Capital Investment and Economic Development in Sabah**

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### **Abstract**

*This research analyzes the effects of human capital investment on education, health and migration to economic development in Sabah. Extended augmented Solow growth model theory is utilized in this research. This study uses time series data from 1980 to 2010. Ordinary Least Square (OLS) regression analysis is employed using Eviews 6.0 version software. Regression shows higher gross domestic product (GDP) per capita influenced by better literacy rate, longevity of life expectancy at birth and required number of immigrants with a sustainable gross domestic savings and improvement in unemployment rate. Empirical tests of theoretical hypothesis produce results that are consistent with the conclusion in this study.*

**Keywords:** *human capital investment, education, health, migration, economic growth*

### **1 Introduction**

Over the years, human has indirectly connected to economic activities where the changes of economic development are influenced by human development. Human development is related to the human capital investment through the capability of knowledge and skill that influence to the standard of living. The practice of human capital investment in Malaysia was introduced in year 2006 a bit later than other countries that had been applying it years before for economic development. The formation of Malaysia as an independent nation was a complex process that took time to achieve independence from the British colonization. In the era of British colonization in year 1874, the Federal of Malaya applied an economic system called self-sufficient economics. There were no technological advancement during that period and family members contributed largely to the labour force (Okposin *et al.*, 2003).

The success of economic development planning was issued after the independence of Federal of Malaya on 31 August 1957. The purpose of this mission was to balance the economic growth for all citizens in the Federal of Malaya. The implementation of the economic development planning from the year 1957 to 1963 was to avoid poverty and to balance the economic after the colonization of British. The importance of the formation of Malaysia is to co-operate Federal of Malaya with Singapore, Brunei,

Sabah and Sarawak for economic, political, social and safety benefit. This formation was a shortcut for Sabah and Sarawak to gain independence. The formation of Malaysia consists of Sabah, Sarawak and Singapore without the presence of Brunei on 16th September 1963. Finally, Singapore separates from Malaysia in August 1965 (Hui, 1995). After 50 years of Malaysia's independence, now Sabah aspires to achieve in developing the state as an 'Upper Middle Income Nation' following Malaysia's Vision 2020 to be a 'High Income Nation' by year 2020. Then, human capital investment is one of the agenda to achieve Vision 2020.

Sabah is the second largest state in Malaysia and contributed highest income state but suffer with number of poverty. After Independents, Sabah State Development Plan for year 1965 to 1970 was introduced to generate economic growth as much as human resources. It aimed to reduce social inequalities with improvement in standard of living and welfare. Sabah in Tenth Malaysia Plan (10MP) aimed to increase productivity and economic quality through technology and innovation that supported by government and private sector on human capital investment. (State Economic Planning Unit, 2012).

Wealth of Sabah is contributed by oil and gas resources but only 5.9 per cent of it is spent for Sabah where it is titled as 'Poorest State in Malaysia' (Department Statistic of Malaysia, 2013). Human capital investment is important by following the nation's global competitiveness through the knowledge, skill and intellectual capital which is human capital with 'First Class Mentality' (Ninth Malaysia Plan, 2006). The education investment is important for human development where it increases literacy rate but it also affects to the increase of unemployment rate (Subramaniam, 2004). Variety of pollution in Sabah especially on surface water gives negative effect on nutrition since good condition of health is one of human capital investments (Environmental Conservation Workgroup, 2001). Government should keep an eye out for safety through politic, economic, social community and environmental since number of immigrants from the Philippines and Indonesia is increasing in Sabah (Ramli Dollah et al., 2003).

This study aims to investigate the relationship between human capital investment and economic development in Sabah for period year from 1980 to 2010. The study emphasized on education, health and immigration investment by following the augmented Solow growth model theory where human capitals included on economic development. This study is set to examine the relationship which maintains the important growth of capital and growth of labour in economic development on Solow growth theory.

## 2 Literature Review

Research about human capital investment to economic development is getting the credit by academicians and economists around the world. For the example, research by Becker (1962), human capital investment may affect the future income and consumption for individual through school attainment, medical care, training and others. Higher levels of education induce to receive higher wage rate of return with regards to age profile. Furthermore, the increase in wage rate leads to the improvement of health and physical health as one of the human capital investment. This is referring to better nutrition that may improve work productivity and receive higher wage and shows the decreasing in death rate at working age.

Economic development is a process of increasing gross domestic product and gross domestic product per capita depending on the growth in total population of a nation in long term that shows improvement in standard of living. Gherghina and Duca (2013) analyzed that economic development is contributed by education as human development with central focus on education spending and employment levels to reduce number of poverty in a country. Tamura (2006) explained about the relationship between demographic transitions in population influences the economic development according to the human capital investment in health, life expectancy, fertility rate and mortality. Population has led to a boost in labour productivity especially for countries that employ labour-intensive in operating production. Furthermore, Ranis et al., (2000) support that significant relationship between economic development and human development contribute to labour productivity.

Education investment generates human capital through knowledge and skills that socially contributes to economic growth due to the reduction in inequality especially for the developing world. Economic progress is shown by the increase in labour productivity based on learning quality, technologies advancement and awareness of human capital investment in education (Cremin and Nakabugo, 2012). Abdul Jalil and Muhammad Idrees (2013) discuss about the endogenous growth theories regarding the human capital accumulation on education that has a positive effect to the economic growth in Pakistan. The secondary education level in Pakistan is more important than other education level as it has an influence on the economic growth in the long run for the year 1960 to year 2010. The observation by Seetanah (2009) has found that human capital is the determinant of economic development in education as it focused on 40 countries in Africa. The education enrolment has a massive growth at all levels of education in the 20th century.

Schooling attainment has relationship with human capital level which may improve the quality of life in the United States (US). The enrolment in higher education

institutions influences a high number of university graduates. The result of research shows that an increase in the education level explains that individual with a high human capital level may generate income level for the future to cover the increasing cost of living (Winters, 2011). Education attainment improves the economy of emerging Asian countries at secondary level education. High education especially secondary and tertiary should invest more on human development to generate quality in education of the institutions and increase quantity enrolment (Lee and Francisco, 2012).

Research by Kaas and Zink (2011) focuses on the competitive labour search with human capital investment. The unemployed face risk of high education loans. Then, skill workers face debts even though they are provided with higher income. Regarding wealth endowment, workers adapt the same expected cost of education. Then, the expected skill premium for the poor is lower because they invest less on it than the richer. Scoones (2000) supports the study by Kass and Zink (2011) where specific skill and general skill generate different productivity among trainees. Meaning that specific skills generate productivity only for a firm but general skills are applicable for many firms. Returns on specific investment generate benefits to firms thus employers cannot bid up on worker's wage.

The increasing of interest rate because of the rising in government education spending as investment has influenced people to reduce their willingness to invest in education even though they know about the positive result in future earnings that implies their productivity towards the economic development. The increasing of human capital formation by an increase in government spending in education has led to a boost in human capital level (Lin, 1998).

Kalemli-Ozcan et al. (2000) found that human capital investment on health depends on higher income since people has better body nutrition and longevity in life expectancy. The relationship between a declining mortality and school attainment is significant. Technological advancement on health equipment leads to a reduction in the number of mortality and additional schooling year will increase human capital accumulation. Strulik (2008) mentions that health factor is the reason why these positive effects shown in terms of nutrition and health expenditure. At low geographic latitudes, population growth has increased in terms of demographic transition because of the decrease in child mortality at birth and increase in fertility rate.

Liu et al. (1998) study the comparison between China and Russia on health and economic transition. After the economic reformation in China, mortality had declined and life expectancy also decreased for both gender, male and female. Contrast with Russia where life expectancy in year 1994 to 1999 decreased and the mortality rate increased by 50 per cent for men aged 35 to 54 years old. The reasons

for the increasing mortality were because of suicide and poisoning in China and accidents as an added factor in Russia.

Gong et al. (2012) explore the health investment effect on physical capital that leads to a positive effect on the economic growth. Health investment has the same aim with education investment that generates the improvement on economic growth in term of labour productivity. Better health condition encourages an increase in economic growth where people purchase medicine not only for health investment but also to maintain good health. Araujo (2004) mentions that economic growth is closely related to technological advancement as a form of human capital investment in education that may affect output in goods sectors.

Mayer (2001) discusses the factors that influence economic growths depend on health investment in the long-term in Latin America. The impact of good health contributes to an increase in income, a reduction in human capital depreciation, attracting people to invest more in education and to have life longevity. Good health shows that people have enough money to spend on nutrition and supplement depending on their income earning. Automatically, workers have afforded to work hard and enhance productivity, increase education investment and the rate of female participation in the labour market also boost up. In addition, a reduction in the number of patients with diseases generates a faster economic growth. Health improvement in certain age group is important to the economic development. Healthier grandparents encourage younger family members to take care about their children and contribute to the longevity in terms of demographic transition.

Greenwood et al. (1997) state that unskilled immigrants have the country-specific skills but they are weak in knowledge, customs and language of the receiving country compared to local domestic workers. The reduction of unskilled immigrant workers may increase the capital demand as long as the unskilled immigrant workers are replaced by unskilled native workers. However, the effect of wage rate influences the unskilled native workers to be unwilling to work at the workplace. The changes of unskilled immigrant workers enhance the changes of demand for all levels of local workers at a given wage rate.

International migration has linkage with economic growth where it contributes to the reduction of unemployment since the Philippines government introduced labour export policy in early 1970s. Besides that, political and socioeconomic factors also increase the emigration that may induce the economic growth and development in the Philippines (Agbola and Acupan, 2010). Based on Fu and Gabriel (2012), labour productivity is increasing since they move from less productive to more productive places. In China, unskilled workers prefer to migrate if wage rate that is offered to

them is higher than that in their origin. Then, unskilled workers become skilled workers when they move to cities that contribute to an increase in the number of highly skilled workers in that high human capital area. The agglomeration of human capital in a region influences labour to migrate for skills that show the existence of the spillover of human capital in China where with more skilled workers in the country encourages the economic to develop well.

Pholphirul (2013) focuses on the demand pattern of unskilled immigrants to the economic development in Thailand by labour market adjustment. In Thailand, majority of unskilled immigrants come from Myanmar where they have been recruited to work on 3D (Dirty, Difficult and Danger) jobs. The challenge of the Thai government is problem with the undocumented unskilled immigrants. Unskilled immigrant workers help to fulfill the job vacancies in manufacturing sectors since Thailand has problem of shortage of unskilled and skilled local workers. This shortage is because of the awareness of skill qualification and job requirement on skill, wage and requirement activities. The unskilled immigrant workers on manufacturing sectors generate the economic development by saving the wage expenditure and maintaining cost competitiveness especially for labour-intensive manufacturing production.

### **3 Research Methodology**

This study follows the augmented Solow growth model where human capital investment is involved in the economic development. Research model is formed based on Solow growth model and augmented Solow growth model theories.

The traditional economic theory has been divided into two theories namely the human capital theory and neoclassical theory. Both of these theories have brought only capital and homogenous labour as factor of productions. Solow (1956) focuses on externalities and education that are included in the neoclassical growth theory based on the competitive market assumption by predicting that all factor of productions are depending on their own social marginal production. Meaning that, the traditional economic theory excluded education as a human capital creation. The Solow growth model started with the production function on supply side of the economy with the aggregate output and two input factors in equation (1) below as stated by Romer (2006),

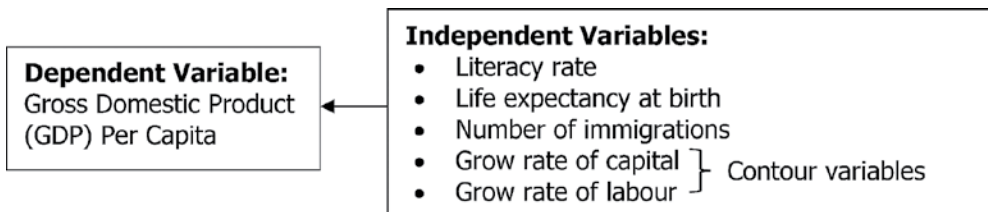
$$Y = F(K, AL) \tag{1}$$

Where,  $Y$  is the aggregate real output,  $K$  is physical capital,  $L$  is labour and  $A$  is knowledge or technology. In Solow growth model, time may affect output through  $K$ ,  $L$ ,  $A$  and  $A$ . Technology is labour-augmenting and  $AL$  is effective labour. Human

capital has introduced a new growth theory adapting the theory of the Solow model in the neoclassical model as the Augmented Solow Model. The aggregate production function by including the human capital is shown in equation (2).  $H$  is human capital stock,  $L$  is labour where skilled worker has one unit of labour and some of the human capital stock.

$$Y = F(K, AL) \tag{2}$$

In order to examine the impact of education and health on the economic development, the number of immigrants is included as a variable as a contribution for this research and is summarized in Figure 1.



**Figure 1** Theoretical framework dependent variable and independent variables

A planned theoretical framework employs multiple regression analysis to determine factors that influence economic development in Sabah. Each variable explains the relationship with economic development by using the gross domestic product (GDP) per capita in Sabah. Independent variables for human capital investment are the literacy rate, life expectancy and immigration as proxy for education, health and migration investment respectively. Then, the growth rate of capital and growth rate of labour are maintained to follow the augmented Solow growth model theory. Equation (3) can be modified as,

$$GDP = \beta_1 + \beta_2 LR + \beta_3 LE + \beta_4 MIG + \beta_5 GRC + \beta_6 GRL + \varepsilon \tag{3}$$

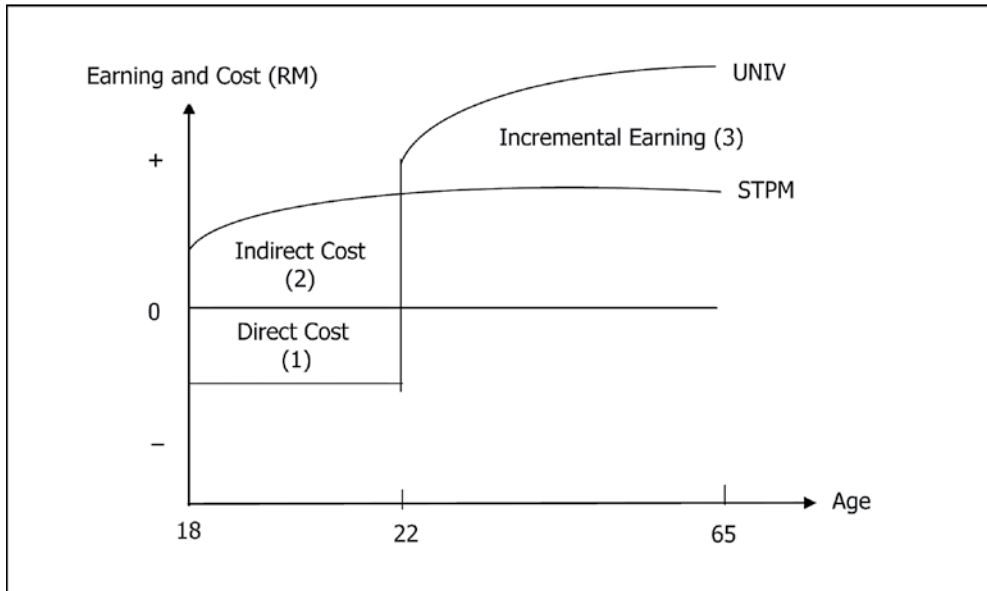
Whereas,  $GDP$  is gross domestic product per capita in Sabah,  $LR$  is literacy rate in Sabah as proxy human capital investment on education,  $LE$  is life expectancy at birth as the proxy for human capital investment on health and  $MIG$  is the number of immigration as the proxy for human capital on immigration,  $GRC$  is the growth rate of capital,  $GRL$  is the growth rate of labour,  $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$  and  $\beta_6$  are parameters and  $\varepsilon$  is error term.

In addition, the three categories of human capital investment are discussed following the approaches for human capital investment on education, for human capital investment on health and migration. Adam Smith in Copley (1995) mentions

that human is an invaluable machine in competence based on appearance and skill. The relationship between human and machine is bonded on the day the machine is purchased. The examples for machine are equipment and building as physical capital. Machines generate benefits in the future of an organization especially before the accumulated depreciation of a machine that also related to the interest rate and profit. The benefit will generate profit since the machine produces good quality of product in a large quantity. Employer will expect their employee to generate more products and in return employee expects more wages from their employer (Manis, 2005, p.13).

The education expenditure generates profit for economic development and wealth. Returns on education are related to higher income earning, position in organization, satisfaction during work, respect from the outside labour market and interest. These are related to the educated people that are encouraged to increase productivity and hence lead to boost the economic development. Benefit and cost on education investment are shown in Figure 2 since individuals decide to further study depend on age and education level for future income earning by Becker (1962, p.15). Cost in human capital investment has been divided into three categories. First category is direct cost in area (1) when individuals take out money from their own pocket for education expenditure as it also known as direct expenditure such as tuition cost, books and others. Second category of cost on education investment is the income earning that should be forgone when they are at school that is also known as indirect cost in area (2). Last category is cost during the difficult and boring study period. Finally, the benefit from education investment depends on age and income is shown in financial benefit from the university level. Financial benefit is the income earning at the highest point after the reduction of income tax if university graduates enter the labor market. Incremental earnings show that there are differences between age and earning at university and Sijil Tinggi Pelajaran Malaysia (STPM) line after 21 years old at area (3). Income gap between university graduates and STPM leavers is bigger according to their age when individuals achieve the average age in the labour market where the income of STPM leavers is decreasing but on the other hand the income of and university graduates continue to increase.

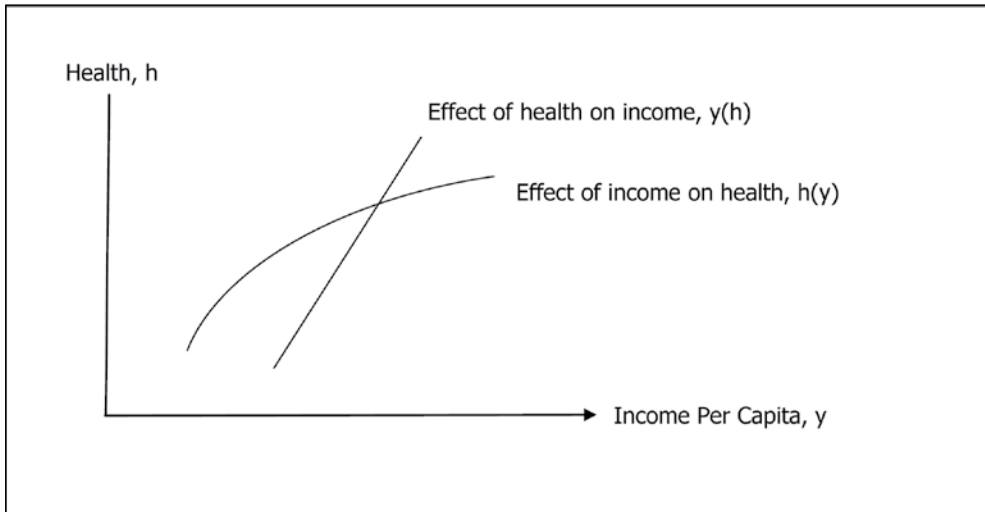




Source: Age-Earning With and Without College (Becker, 1962, p.15)

**Figure 2** Age-earning by education

Human capital investment on health may improve labor productivity by taking good body nutrition indicator that may facilitate in increasing life expectancy at birth for a population. Health care may prevent and cure diseases to increase quality of life. In contrast, malnutrition may affect in less healthy, no energy and low worker ability. The increment in income for a nation is influenced by good health condition of a population. Figure 3 shows the interaction between health and income by Robert William Fogel model where income causes health and health causes income (Weil, 2006, p.30). Population in a country with better nutrition may generate higher gross domestic product. Conversely, country with higher income may generate better nutrition. People with good health condition are motivated to generate more production output effectively and have the ability to work longer hours. There is positive relationship between health and income where people with better health may be hired with higher income. This relationship is shown in upward sloping curve  $y(h)$  which is the effect of health on income. The  $h(y)$  curve is the effect of income on health in upward sloping curve shows that people with higher income afford to pay more on health care products as prevent disease is better than last minute cure for better quality of life.



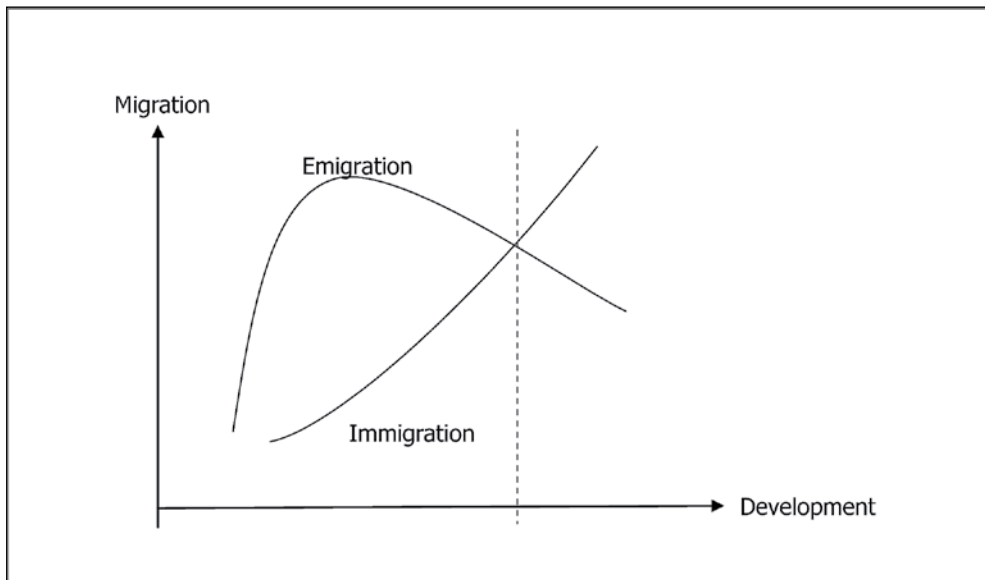
Source: Health and Income on Robert William Fogel Model (Weil, 2004: p.30)

**Figure 3** The interaction of health and income on Robert William Fogel Modeling

Migration is referring to the movement of people from a place to other places to deliberately become permanent residence that pass the political barriers in the destination country, state, administrative or region. Hass (2010) points out that the decision for migration depends on the individual utility maximization where it automatically tends to bring together their social group. Baayah Baba et al. (2008) state that migration is one of the human capital investments where individual is willing to find new wage at other places to create new job position which will reduce the rate of unemployment. The size of international immigration depends on the pull factor at the receiving country. The pull factor is related to the development factor on social and economic condition of the receiving country such as industries development, education, trade, residential, transportation and other factors. However, for those who make decision to emigrate or also known as out-migration, means that they are depending on the push factor of their native country because of limitations in politic, economic and social activities such as weakness in the education system, less job opportunities, crimes and other factors of their sending country which sometimes may increase the number of refugees in receiving country (Lee, 1966).

Haas (2009) represents the migration transition theory graphically in Figure 4 which shows the effect of human development through immigration and emigration. Migration is divided into three categories namely the internal migration, international migration and unskilled migration. Short distance migration shows the obstacles faced by immigrants since they chip in a small sum in the increment of human

development. Human development increase rapidly and will decrease when human capital development is high known as the increasing migration with diminishing rate of capability. However, the immigration from poor countries may lead to a positive and linear increase of the human development.



Source: Haas's migration transition theory graph (Haas, 2009, p.19)

#### Figure 4 Migration transition theory

Planned sample observes the importance of human capital investment for the development of Sabah economy because Sabah is titled as the 'Poorest State in Malaysia' even though the distribution of wealth in Sabah is ranked the fifth among the other states of Malaysia. Sample formation investigates the relationship between human capital investments with Sabah's economic developments for annual time series data throughout 1980 to 2010. The specified data are obtained from the Department of Statistics Malaysia (2011) and Department of Immigration Malaysia (2013). Then, the collected data is analyzed by E-views Software.

The hypothesis assumes that all independent variables have influence on the dependent variable which is gross domestic product per capita in Sabah. Literacy rate is the proxy for human capital investment on education and life expectancy at birth is the proxy for human capital investment on health. Literacy rate and life expectancy at birth are the factors in Human Development Index (HDI). The contribution given in this study is the number of immigration in Sabah that examines its relationship with the economic development since most of immigrants work at plantation and construction sectors.

Multiple regressions by ordinary least square estimation have been used for estimated coefficient to ensure that research model is fit and good. There are three hypothesis tests to examine the relationship between human capital and economic development in Sabah. Firstly, the two-tail test of significance that measures the relationship between each variable to the economic development. Secondly, the unit root test using the Augmented Dicky Fuller test to measure of stationarity of each variable. Lastly, the cointegration test residual series in ordinary type by Augmented Dickey Fuller on unit root test to measure stationary level for the relationship between variables with the economic development in the long term.

#### 4 Result Analysis

The result and outcome of the investigation where a thorough analysis is examined following the research objective. The theory of augmented Solow growth model is contributed to form new model for the relationship between human capital investment and economic development in Sabah. In this research, the E-views Software is used to estimate the relationship between human capital investment and economic development in Sabah by Ordinary Least Square (OLS) estimation. Subsequently, the empirical results on the two-tail test of significance of whether to the reject or accept null hypothesis, augmented dickey-fuller test through unit root test and the cointegration test are explained.

The variable of literacy rate, life expectancy at birth and number of immigration in Sabah represented as grow rate of human capital investment,  $G_H$ . Production function at augmented Solow growth model,  $Y = F(AL, K, H)$  had included human capital factor as contributor to the economic development. The econometrics model in this research used double-log functional form in equation specification that can be written as an algebraic expression shows in equation (4). The result and output about the relationship between human capital investment and economic development in Sabah are estimated based on the annual time series data obtained from the year 1980 to 2010. The model through a concise form:

$$\ln GDP = \beta_1 + \beta_2 \ln LR + \beta_3 \ln LE + \beta_4 \ln MIG + \beta_5 \ln GRC + \beta_6 \ln GRL + \varepsilon \quad (4)$$

$$\ln \widehat{GDP} = -8.154 + 0.227 \ln LR + 2.166 \ln LE + 0.021 \ln MIG + 0.246 \ln GRC - 0.073 \ln GRL \quad (5)$$

(se)	(3.720)	(0.091)	(1.023)	(0.009)	(0.025)	(0.012)
(t)	(-2.192)	(2.492)	(2.117)	(2.286)	(9.897)	(-5.839)
$R^2 =$	0.9976	$Adjust R^2 =$	0.9972	$F - static =$	2112.891	

## Parameter Estimation

By using the data and EViews software, it is possible to estimate the parameters of  $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$  and  $\beta_6$  to obtain average relationship between gross domestic product with the independent variables.

### *Multiple Regression Analysis: Ordinary Least Square*

The least square result for the relationship between human capital investment and economic development. One per cent increase in independent influence to increase in gross domestic product per capita by coefficient  $\beta_k$ . The changes of gross domestic product per capita because of the changes of independent variables. This is called elasticity theory. The elasticity theory is positive and negative relationship and shows the factor that most important in this model.

From equation (5), if Sabah did not have independent variables, the gross domestic product per capita in Sabah estimated goes down with 8.154 by constant factor at parameter  $\beta_1$ . If the literacy rate increasing by 1 per cent, the gross domestic product per capita increased by 0.227 per cent. The expected sign for  $\beta_2$  as parameter of literacy rate is positive where increasing literacy rates lead to increase the gross domestic product per capita in Sabah. The increasing on human capital investment on education shows the positive effect to the economic development in Sabah where increase the capability, skill and knowledge to contribute in industry and individually they receive their higher income and develop economic in output of nation through the efficient of labour productivity.

Result shows that if the life expectancy at birth increased by 1 per cent, the gross domestic product per capita increased by 2.166 in Sabah. The increase on age influences people to invest more on health that leads to increase the number of ageing population. The longevity of life expectancy at birth shows the relationship between the advanced on the medical and health facilities. The decrease on the death rate leads to the life expectancy for population in Sabah to increase.

If number of immigration increases with 1 per cent, gross domestic product per capita in Sabah increased by 0.021 per cent. Number of immigration is good for Sabah especially unskilled immigrant workers to work on 3D (Dirty, Difficult and Danger) jobs. The higher of number of immigration is due to no local workers are willing to work at plantation and construction sector because of danger, dirt and difficult factors as long as they are hired with higher wage.

Parameter of grow rate of capital,  $\beta_5$  is used proxy of gross domestic savings in this research. If gross domestic savings increases by 1 per cent in Sabah, gross domestic product per capita lead to increase by 0.246 per cent. Gross domestic savings known as national savings referring to public and private savings that assume to be invested where the national income without the consumption and government purchases. The increasing gross domestic savings shows the increasing investment for nation of Sabah as savings for future.

However, proxy for grow rate of labour is unemployment rate in parameter  $\beta_6$ . The increasing 1 per cent of reduction in unemployment rate leads to increase the gross domestic product per capita by 0.073 per cent. A reduction in the unemployment rate is one of the accomplished missions by the government of Malaysia and all parties need to prevent and be aware about this issue. Thus, overview of all variables, the life expectancy at birth is more important in economic development in Sabah because the value of parameter for life expectancy at birth,  $\beta_3$  is bigger than other variables.

### **Test of the Hypothesis**

This research tested hypothesis relating to the regression coefficients using two-tail test of significance to determine the  $t$ -statistic significant. Then, test for each variables data examined by unit root test by augmented Dickey-Fuller for stationary. Furthermore, cointegration test for relationship between two variables used for stationary using residual series in ordinary type in augmented Dickey-Fuller.

### ***Crosstab Analysis: Two-Tail Test of Significance***

By following the standard error,  $SE$  and  $t$ -test, the two-tail test of significance determines whatever investment in human capital influences the economic development in Sabah or not. Hypothesis two-tail test of significance obtained as:

$H_0 : \beta_K = 0$ , independent variable not influenced by gross domestic product per capita

$H_1 : \beta_K \neq 0$ , independent variable influences gross domestic product per capita

Test hypothesis by using  $t$ -test through the information in variable, coefficient  $\beta_K$ , standard error,  $SE\beta$  and the calculated  $t$ -value given border  $t$ -value implied by the null hypothesis  $\beta_{H0}$  is equal to zero where  $t$ -value in this case is coefficient divided by standard error,  $\beta_K / SE\beta_K$  using the two-tailed critical  $t$ -value,  $t_c$  for the 5 per cent significance level. The test result by two-tail test of significance show on Table 1.

**Table 1** Result Analysis for two-tail test of significance for independent variables

Independent Variables	t-test	t-critical		Test Result
		Left Tail	Right Tail	
Literacy Rate	2.492	-	2.045	Influence
Life Expectancy at Birth	2.117	-	2.045	Influence
Number of Immigration	2.286	-	2.045	Influence
Gross Domestic Savings	9.897	-	2.045	Influence
Unemployment Rate	-5.839	-2.045	-	Influence
Reject hyphothesis null when $t \geq t_c$ and $t \leq t_c$				

From the test result, all independent variables are influenced to the gross domestic product per capita where reject the  $H_0 : \beta_k = 0$  which is independent variables did not influence to the gross domestic product per capita and not reject the  $H_1 : \beta_c \neq 0$  that independent variables influence to the gross domestic product per capita. The results suggest that all of the variables are influenced to economic development in Sabah using the right-tail test of significant. However, only unemployment rate as proxy of grow rate of labour is influenced to economic development using the left-tail test of significant.

**Unit Root Test**

The hypothesis by unit root test in Augmented Dickey-Fuller (ADF) test is known as *tau* test. The hypothesis test by unit root test in ADF is obtained as:

- $H_0$  = Data has unit root problem
- $H_1$  = Data has no unit root problem

The rule of unit root test in ADF when computed absolute value of ADF greater than critical value of ADF such as at 1 per cent, 5 per cent and 10 per cent levels of significance, null hypothesis,  $H_0$  will be reject and not reject the alternative hypothesis,  $H_1$  that shows the time series is stationary. Then, if computed absolute value of ADF less than critical value of ADF, null hypothesis,  $H_0$  will be not rejected and reject the alternative hypothesis,  $H_1$  shows the time series is not stationary. The tests for unit root in level, first different and second different by including trend and intercept in test equation with lags maximization of 4 on Schwarz Info criterion.

**Table 2** Result analysis of Augmented Dickey-Fuller on unit root test (constant, linear trend) for each variable

Variables	Level	First Different	Second Different	Result
Gross Domestic Product Per capita	-	5.053	7.019	stationary
Literacy Rate	-	5.561	8.656	stationary
Life Expectancy at Birth	7.234	-	9.531	stationary
Number of Immigration	-	5.888	9.364	stationary
Gross Domestic Savings	-	8.034	5.517	stationary
Unemployment Rate	-	8.744	13.279	stationary
Reject hypothesis null when $t \geq t_c$ and $t \leq t_c$				

Table 2 shows the result for unit root test by Augmented Dickey-Fuller where reject the null hypothesis,  $H_0$  and not reject the  $H_1$ . The results suggest that all of the variables in Sabah have unit root problem and non-stationary in level except life expectancy but other variables become stationary after first differencing.

**Cointegration**

A linear combination for two or more time series will be not stationary if one or more of them is not stationary (Dougherty, 2002). The hypothesis test by unit root test on cointegration using residual series in ordinary type in Augmented Dickey Fuller is obtain as,

$H_0$  = No cointegration

$H_1$  = Existence of cointegration

This research examined the relationship between gross domestic product per capita in Sabah with independent variable for stationary and cointegration between both variables. Two variables have long term or equilibrium relationship between them if they are cointegrated. The test for cointegration show on Table 3 where the relationship between independent variable and gross domestic product per capita are cointegrate and stationary. Thus, the relationship between dependent variable and independent variables are cointegrate and stationary after second different. All variables have long term or equilibrium relationship with economic development.



**Table 3** Result analysis of Augmented Dickey-Fuller on cointegration (intercept) between gross domestic product and independent variables

Independent Variables	Level	First Different	Second Different	Test Result
Literacy rate	-	4.179	5.729	Cointegrate and stationary
Life expectancy at birth	-	-	6.526	Cointegrate and stationary
Number of immigration	-	-	6.171	Cointegrate and stationary
Gross Domestic Savings	-	6.849	7.562	Cointegrate and stationary
Unemployment Rate	-	3.735	10.688	Cointegrate and stationary
Reject hyphotesis null when $t \geq t_c$ and $t \leq t_c$				

### Durbin Watson

Rule of Durbin Watson,  $d$  is if there is no autocorrelation,  $p = 0$ ,  $d$  should be close to 2. Then, if have or positive autocorrelation,  $d$  should be less than 2 and if did not have or negative autocorrelation,  $d$  should be greater than 2. The output shown in concise form gives the result of a logarithmic regression of gross domestic product per capita on literacy rate, life expectancy, number of immigration, gross domestic savings and unemployment rate in Sabah. The Durbin Watson is 2.636 shows that greater than 2 and there is no autocorrelation in the regression result. This test will reject null hypothesis,  $H_0: p = 0$  that no autocorrelation and not reject  $H_0: p \neq 0$  that positive autocorrelation.

### Goodness-of-fit

Following the logarithm regression in concise form,  $R$ -squared,  $H^2$  is equal to 0.9976. Meaning that, 99.76 per cent of the economic development is explained by literacy rate, life expectancy at birth, number of immigration, gross domestic savings and unemployment rate. Another 0.24 per cent is explained by other factors.  $PF$ -statistic is equal to 2112.891 is greater than 2 and have positive significant relationship economic development regressing five explanatory variables. Thus, this model is good and fit where the data of each variable have related to each other and influence year by year.

## 5 Discussion of the Findings

The following results and analyses by regression three hypothesis tests, the effects of independent variables to economic development in Sabah for annual time series data from year 1980 to 2010 explains that the related macroeconomic environment depends on research objectives and problem statements.

## **The Relationship between Literacy Rate and Economic Development**

The human capital investment on education is the acquisition of human capital through workers with abilities, knowledge and skills. The potential educated workers may increase the economic development in Sabah as referred to the labour productivity. Labor productivity may increase by the contribution of both capitals which are the physical capital and human capital. Physical capital is machinery and tool. Human capital is the idea and intellectual property used in production. Physical capital may not produce production without labour control. However, particular labors with skill and expertise are able to manage physical capital in the process of production. Because of that, they are rewarded with additional income for the accumulation of knowledge. The result for the two-tail test of significance showed that literacy rate influences on the gross domestic product per capita in Sabah. The time series of the literacy rate data is stationary and no unit root problem is detected. Then, literacy rate is stationary and cointegrated to gross domestic product per capita. Therefore, human capital investment on education has positive relationship with economic development depending on the literacy rate in Sabah. The high literacy rate show more educated workers with higher ability, skills and knowledge as the indication for general education. Literacy rate encourages entrepreneurs to create employment opportunities and increase the gross domestic product for Sabah. This will lead to job opportunities piloting to lower the poverty rate and removing Sabah's title as 'Poorest State in Malaysia' and to achieve the vision of 'Upper Middle Income Nation' by the year 2020.

## **Relationship between Life Expectancy at Birth and Economic Development**

Human capital investment on health is referring to the sanitation of the population from diseases where prevention is better than cure. Healthier workers are able to stay longer at their workplace by increasing the hours of work and rewarded by higher income thanks for the good health. With higher income people could afford to give more attention to medical care by taking nutrition and supplement with the increasing of life expectancy at birth. This is one of the other human capital investments as referred to labor productivity that influence the economic development. Two-tail test of significance has proven that life expectancy at birth influences gross domestic product per capita in Sabah from year 1980 to 2010. Plus, the time series data for life expectancy at birth is stationary and no unit root problem is detected. Cointegration by augmented Dickey Fuller test using residual series in ordinary type has shown that life expectancy at birth cointegrates with gross domestic product per capita. Therefore, human capital investment on health has a positive relationship with economic development as seen in life expectancy at birth in Sabah. The increasing of ageing population is referring to the decreasing number of mortality. Health care prevention from early stage of life influences better body nutrition that could boost higher production of labor productivity.

Furthermore, the increasing of population will increase the number of labors as one of the factor of productions and is useful for labor-intensive country. Earlier prevention will influence future human development through health especially on the longevity of life that may contribute for economic development.

### **Relationship between Number of Immigration and Economic Development**

Human capital investment on immigration in Sabah needs a large number of immigrations for the economic development of Sabah. This is necessary since there is no local workers that are willing to work on 3D (Dirty, Difficult and Danger) jobs. Unskilled immigrant workers from Indonesia and the Philippines are hired by local employers in Sabah rather than the unskilled local worker that prefer more income. Unskilled immigrant workers are able to improve their standard of living by working in Malaysia rather than facing the higher cost of living in their country. Following the result and output from the hypothesis tests, two-tail test of significance show that the number of immigration has influence on gross domestic product per capita. Time series data on the number of immigration has no unit root problem and is stationary. Cointegration test proves that the number of immigration variable is stationary and cointegrate with gross domestic product per capita in Sabah. Therefore, human capital investment on immigration has positive relationship with economic development in Sabah depending on the number of immigration. Human capital investment on immigration is contributed to the study depending on the number of immigration in Sabah as the new introduced variable. Unskilled immigrant workers could manage and generate production to increase the gross domestic product in Sabah. Hence, the increment of gross domestic product may increase the gross domestic product per capita based on the population in Sabah.

### **Relationship between Gross Domestic Saving and Economic Development**

Physical capital grows faster thanks to the additional savings that generates economic development through the investment of more capital. The two-tail test of significance shows that gross domestic saving has influence on gross domestic product per capita in Sabah. In time series data, the gross domestic savings has no unit root problem and is stationary. After that, gross domestic savings is stationary and cointegrates with the gross domestic product per capita. Therefore, the growth rate of capital has a positive relationship with the economic development based on gross domestic savings in Sabah. Physical capital such as machinery and tools may produce more quantity and better quality in production. The increment in productivity is referring to the increasing of real wages and living standard of Sabah's population. The increasing of nominal wage may repair the anti-inflationary state to achieve high productivity. Gross domestic savings in Sabah is the long term finance for productive investment in

future including the long term capital such as water, road, energy, public transportation, telecommunication and others. The increase in economic development is influenced by the increasing investment and domestic savings which shows productive assets and state's wealth.

### **Relationship between Unemployment Rate and Economic Development**

Labors are those who produce and manage the production process. Full employment influences negative impact for those who did not get any jobs and they are actively seeking it. The minimum wage implementation does not influence to the increase in the unemployment rate. This implementation shows that minimum wage increases the standard of living for the population. Awareness of the minimum wage risk of RM800 is important to ensure that it does not burden private companies in Sabah and to avoid workers from losing their job. Losing job may increase the number of unemployment and poverty in Sabah. However, Sabah faces an increasing number of unemployment at diminishing rate every year. This is good for the economic condition in the future. Following the result and output of the investigation, the decreasing unemployment rate has influence on gross domestic product per capita in Sabah using the two-tail test of significance. In addition, time series data for unemployment rate has no unit root problem and is stationary. Moreover, the unemployment rate is stationary and cointegrates with the gross domestic product per capita in Sabah. Therefore, growth rate of labor has a positive relationship with economic development based on the unemployment rate in Sabah. Economic development may create jobs opportunities for those who are unemployed to enter the labor market. These jobs created may produce sufficiency in the aggregate demand for production and increase the gross domestic product.

## **6 Conclusion**

Without a doubt, the human capital investment has a positive relationship with the economic development in Sabah. The human capital investment that emphasized on education, health and immigration may rapidly develop the economy of Sabah through labor productivity to pursue the 'Upper Middle Income Nation' title by the year 2020. Human capital investment on education may increase literacy rate regarding the additional schooling attained for knowledge and skills. Furthermore, the increase in human capital may increase job opportunities because people are willing to carry out business. Entrepreneurs are able to create job opportunities for the unemployed and avoid wastage of intellectual human capitals. Other than that, human capital investment on health is referring to the prevention of diseases by taking any medical care supplements and obtaining better health. Good nutrition absorbed by the body may

increase the labor productivity through the ability to work longer hours and rewarded additional income for health. Moreover, this research put human capital investment on immigration as a contribution of the study using the number of immigration in Sabah. The necessity to hire unskilled immigrants generate gross domestic product per capita since there are no local workers willing to work on 3D (Dirty, Difficult and Danger) jobs. Cost of hiring immigrant workers is lower and quite enough for employers to generate profit and increase productivity in Sabah rather than hiring local worker with higher demand for income. By maintaining the roles of physical capital and labor in the production processes including the human capital investment may increase economic development. In conclusion, human capital investment is important for added values in the gross domestic product per capita through education, health and migration as labor productivity. Thus, the theory of the augmented Solow growth model relied on the results of the study that there is a positive relationship between human capital investment and economic development in Sabah.

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