International Scholars Journals

Global Journal of Business Management ISSN 6731-4538 Vol. 5 (5), pp. 001-010, May, 2011. Available online at www.internationalscholarsjournals.org © International Scholars Journals

Full Length Research Paper

Impact of labour quality on labour productivity and economic growth

Idris Jajri[1]* and Rahmah Ismail[2]

[1]Faculty of Economics and Administration, University of Malaya, Kuala Lumpur, Malaysia.
[2]Faculty of Economics and Business, Universiti Kebangsaan Malaysia.

Accepted 18 March, 2011

The growth of the Malaysian economy has gone through several phases and strategies from input-driven to productivity-driven and knowledge-based-driven, which is in line with the world scenario. The knowledge-based-driven of economic growth is crucial as it will raise level of competitiveness of the country, especially in facing the world challenges. This paper attempts to observe to what extent the Malaysian economy has benefited from educational expansion. The production and productivity functions are estimated using the quality of labour together with the capital stock as independent variables. The effective labour and the level of education obtained by the employment are used as indicators to measure quality of labour. The data used for the analysis are gathered from various government agencies and world reports and the coverage is from 1981 to 2007. The study reveals that the capital stock and capital-labour ratio played a major role in contributing to the Malaysian economic growth and labour productivity respectively. The effective labour did play a positive role in determining economic growth but its contribution is less than the physical labour. This paper suggests that the education system must be geared towards producing workforce that can efficiently be used in the labour market.

Key words: Human capital, economic growth, labour productivity, effective labour.

INTRODUCTION

The growth of the Malaysian economy has gone through several phases from emphasizing the role of inputs to the role of productivity and knowledge. In the era of knowledge-based economy, the role of human capital is becoming more important. As suggested by Becker (1964), Schultz (1961) and Mincer (1974), human capital has a direct relationship with workers' productivity, hence contributing positively to economic growth. Therefore, enhancement in human capital attainment among the population is by means to achieve higher competitive-ness through increasing workers' efficiency and producing better quality products at cheaper production cost. The government's commitment to upgrade level of human capital especially education among the population is viewed from its large expenditure allocated to this sector. For example, in 1980 the education and training development expenditure was 14.7% of the total government expenditure and was the highest in the category of social services expenditure. This percentage had increased to 18.3% in 1990, 19.1% in 2000 and 23.2% in 2009 (Ministry of Finance) . The composition of education also changes towards higher percentage enrolment at higher level of education. For example, in 1975 enrolment at the tertiary level was about 15,000 students increased to 75,000 in 1993, but in 2007, it increased to 382,997. Enrolment at the primary level increased to 97.8% in 2002 but decreased 94.2% in 2007, (Malaysia, 1996, 1998, 2008).

As a result of changes in the educational structure, employment by level of education has also changed towards higher percentage of those with higher educational achievement. For example, employment with tertiary qualification increased from 275,900 in 1981 to 1.13 million in 1998 and 2.12 million in 2007 (Department of Statistics, The Labour Force Survey, various years). On the contrary, employment with no formal education and with primary level of education decreased (see Figure 1). This change is consistent with industrial

*Corresponding author. E-mail: ibjajri@um.edu.my.

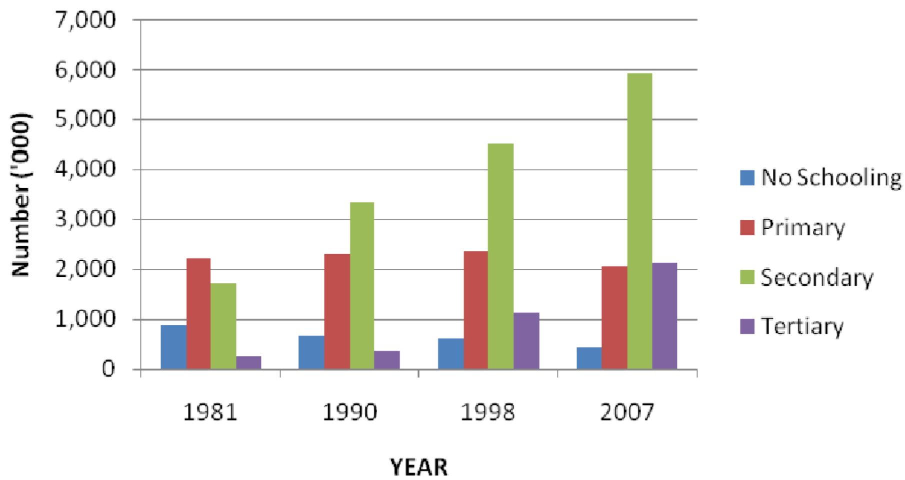

Figure 1. Employment by level of education.

development that is moving towards a more-capital intensive and higher technological adoption, which require more skilled workforce. The objective of the economy to move ahead towards knowledge- based economy also resulted in greater demand for more educated workers.

The objective of this paper is to analyze the contribution of human capital to the Malaysian economic growth and labour productivity. Two concepts are adapted to measure human capital variables that are effective labour and number of employment at various levels of educational achievement. The analysis is based on Cobb-Douglas production function using macro level data covering from 1981 to 2007. This paper is organized into five sections. The following sections include theoretical framework and literature review; model specification; analysis of the results; summary and conclusions.

THE THEORETICAL FRAMEWORK AND REVIEW OF LITERATURE

The neoclassical growth model of Solow (1956) focused on exogenous technological or population factors that determine output-input ratio. In this model the balanced path growth is achieved when the output and physical capital grow in tandem at the constant rate of the labour force growth. This condition is also known as the Golden Age. Two key variables that determine growth are physical capital stock and quantity of labour.

The empirical results of this model indicate that physical capital and labour inputs cannot explain completely the growth of output (Schultz 1961, Denison 1962). The findings show that the growth rate of output exceeds the relevant input measures suggesting that investment in human capital is probably the major explanation factor for the difference (Lucas, 1988; Romer, 1989). The extended neoclassical growth model adopts an endogenous growth concept by introducing effective labour as factor of production, where human capital is embodied in this measure. This model suggests that endogenously accumulated human capital has a direct impact on the productivity of labour, while the exogenous growth model regards human capital as given and it is not determined within the system.

Effective labour is different from physical labour because the former is computed by considering labour quality whether by educational attainment, training attended or skill acquired. It can easily be differentiated from skilled labour, which comprises a portion of physical labour with a certain criteria like training attended, experience and so forth, where as an effective labour includes all physical labour available in the economy and taking into consideration their quality. Theoretically, when the effective labour is used, output growth is enhanced and will be achieved at a higher rate than the labour force growth. The productivity difference between physical (raw) labour and effective labour attributes to this higher growth rate.

Many studies have been conducted to look at the relationship between human capital and economic growth. Educational level is always used as a proxy to human capital. Other variables, like literacy rate, mean year of schooling, enrolment rate and government expenditure on education, training and health are often used to indicate human capital. Some studies incorporate other variables that can enhance human capital like improvement in the capital market, foreign policies and trade policies (see Tallman and Wang, 1994; Lee and Barro, 1998; Sacerdoti et al., 1998).

The empirical results from the studies in this area show inconclusive relationship between human capital and economic growth. While some studies show a positive relationship, other studies conclude the reverse. There are also studies that show unstable relationship between these two variables indicating a positive relationship in the early stage of development but a negative relationship in the later stage (Iyigun and Owen, 1996).

Studies in this area can be divided into two categories, namely cross-country studies and single country studies. Cross country studies that show a positive relationship between human capital and economic growth include studies by Denison (1967), Barro (1990), Mankiw et al. (1992), De Gregario (1992), Otani and Villanueva (1990), Hansen and Knowles (1998), Murthy et al. (1997), Barro and Lee (1996) and Pritchett (1996).

A single-country study is always considered to have more advantages as compared to the cross-country studies. This is due to the fact that a long time series data for a single country can easily be gathered (Tallman and Wang, 1994). Furthermore the relationship between human capital and economic growth may change over time. Therefore, to capture this relationship, one may need a time series data. Among the studies for a single-country that show a positive relationship between human capital and economic growth are Walter and Rubinson (1983), Liu and Armer (1993), Tallman and Wang (1994), Lau et al. (1993), and Fernandez and Mauro (2000). Among the empirical results that show a negative relationship between human capital and economic growth includes studies by Sacerdoti et al. (1998) and Knowles and Owen (1997).

MODEL SPECIFICATION

In a traditional aggregate production theory, there are two kinds of input, namely, physical capital and quantity of labour used as output determinants. In this paper we employ a new measure of labour to construct an effective labour for more efficient estimation as suggested by the endogenous growth model. The importance of this approach arises from the arguments of Lucas (1988) and Romer (1989) that suggests endogenously accumulated human capital has a direct impact on the productivity of labour. Human capital is assumed to be specific to the individual, while technology innovation as the stock of knowledge is assumed to be an exogenous factor.

A Cobb-Douglas production function with two inputs is written as below,

$$Y_t = AK_t^{\alpha} L_t^{\beta} \quad \text{……………………………………………..(1)}$$

Where Y is output, K is physical capital stock, L is quantity of labour and t is time trend. This production function does not take into account the quality of labour, but instead assumes that labour is homogenous. According to Lucas (1988) a production function that takes into account the quality of labour can be written as follows,

$$Y_t = AK_t^{\alpha} (uhL)_t^{\beta} \quad \text{………………………………………..(2)}$$

Where $\alpha+\beta = 1$ (constant returns to scale), A is efficiency parameter, K is physical capital stock, u is time spent to produce output, (1 - u) is time spent for human capital investment, h is stock of human capital, L is labour force or employment and uhL = L* is effective labour.

Adding the external effect to equation (2), we derive,

$$Y_t = AK_t^{\alpha} L^{*}{}_t^{\beta} ha_t^{\gamma} U^{\lambda} \quad \text{………………………………… (3)}$$

Where ha is workers' mean year of schooling or human capital, U= human capital gained from learning-by-doing. Difficulty in measuring U especially to represent the whole economy, it is commonly substituted by previous year output level, Y_{t-1} and equation (3) is written as,

$$Y_t = AK_t^{\alpha} L^{*}{}_t^{\beta} ha_t^{\gamma} Y_{t-1}^{\lambda} \quad \text{……………………………….(4)}$$

The concept of effective labour in equation (2) can also be measured by level of education as follows (Corvers, 1997):

$$Y_t = A_t K_t^{\alpha} (L_t^{*})^{\beta} \quad \text{………………. ……………..………………..(5)}$$

Where,

$L_t^{*} = L_t L_{t1}^{\theta1} L_{t2}^{\theta2} L_{t3}^{\theta3}$ is effective labour ……………….(6)

Substituting equation (6) into equation (5), we derive,

$$Y_t = A_t K_t^{\alpha} (L_t L_{t1}^{\theta1} L_{t2}^{\theta2} L_{t3}^{\theta3})^{\beta} \quad \text{.................................... (7)}$$

Where Y is real output; K is the physical capital stock; L is labour input; L_i^{θ} is number of employees with levels of education i.e. 1=primary level, 2=secondary level, 3= tertiary level; θ_i is share of labor at different levels of education; A is an exogenous knowledge and technological factor; α and β are the capital and labour shares respectively.

In order to derive labour productivity equation, we divide both sides of equation (7) by L_t,

$$Y_t/L_t = A_t K_t^{\alpha} (L_t L_{t1}^{\theta1} L_{t2}^{\theta2} L_{t3}^{\theta3})^{\beta} / L_t \quad \text{………………………..(8)}$$

$$Y_t/L_t = A_t (K_t/L_t)^{\alpha} L_t^{\alpha+\beta-1} L_{t1}^{\beta\theta1} L_{t2}^{\beta\theta2} L_{t3}^{\beta\theta3} \quad \text{........................ (9)}$$

In order to test the robustness of the estimation, additional macroeconomic variables, namely, percentage of real export-import, percentage of money supply-GDP, real government expenditure-GDP ratio and real public-private capital stock are added to equation (3) as explanatory variables.

A dummy variable is incorporated into the model to examine the impact of the 1997/1998 financial crisis on GDP growth. Dummy has a value 1 for year 1997 onward and 0 otherwise. An interaction term between dummy variable and capital is also introduced to examine whether the structural break affects the contribution of capital stock on the GDP growth.

Before we specify the model for the analysis, we check data stationary because non-stationary data may result in spurious regression. For this purpose, we employ the Phillips-Perron (PP) (1988) approach, which is superior to the Augmented Dickey-Fuller (Dickey and Fuller, 1979) approach, because the latter assumes that the disturbance terms are not correlated and their variance are constant. In contrast, the PP approach takes into account the problem of disturbance terms especially when the variances are not constant. A PP test with intercept and time trend was adopted by means of estimation of the following equation:

$$\Lambda Y_t = \mu_t + \alpha_1 Y_{t-1} + \alpha_2 t + \varepsilon_t \quad \text{…………………………..(10)}$$

Where, Y_t is the first difference of variable Y at time t. For Y_t to be stationary, the value of t statistics, $_1$ must be negative and significantly different from zero. The critical value for the PP test is also the MacKinnon (1991) critical value. The results from this test suggested that most variables had stochastic trends except the government expenditure-GDP ratio.

Estimation model

Based on the discussion above, the estimation models are been specified as follows:

$$\ln GDP_t = \beta_{10} + \beta_{11} \ln LABOUR_t + \beta_{12} \ln CAPITAL_t + \mu_0 \ldots$$
………………………… (11)

$$\ln GDP_t = \beta_{20} + \beta_{21} \ln ELABOUR_t + \beta_{22} \ln CAPITAL_t + \mu_1$$
……………………………………………………………..(12)

$$\ln GDP_t = \beta_{30} + \beta_{31} \ln LABOUR_t + \beta_{32} \ln CAPITAL_{t-1} + \mu_2$$
………………………...(13)

$$\ln GDP_t = \beta_{40} + \beta_{41} \ln ELABOUR_t + \beta_{42} \ln CAPITAL_{t-1} + \mu_3$$
……………………………………………………………..(14)

$$\ln GDP_t = \beta_{50} + \beta_{51} \ln ELABOUR_t + \beta_{52} \ln CAPITAL_{t-1}$$
$$+ \beta_{54} \ln GDP_{t-1} + \mu_4$$ …………………………………...(15)

$$\ln GDP_t = \beta_{60} + \beta_{61} \ln ELABOUR_t + \beta_{62} \ln CAPITAL_t + \beta_{63} \ln XMGDP_t$$
$$+ \beta_{64} \ln MSGDP_t + \beta_{65} \ln CPP_t + \mu_5$$ …………….(16)

$$\ln GDP_t = \beta_{60} + \beta_{61} \ln ELABOUR_t + \beta_{62} \ln CAPITAL_t + \beta_{63} \ln XMG$$
$$+ \beta_{64} \ln MSGDP_t + \beta_{65} \ln CPP_t + \beta_{66} D + \beta_{67} D\_CAPITAL + \mu_5$$
……………………………………………………………(17)

$$\ln GDP_t = \beta_{70} + \beta_{71} \ln LABOUR_t + \beta_{72} \ln LABPRIM_t + \beta_{73} \ln LABSE_t$$
$$+ \beta_{74} \ln LABTER_t + \beta_{75} \ln CAPITAL_t + \mu_6$$ ………..(18)

$$\ln GDP_t = \beta_{70} + \beta_{71} \ln LABOUR_t + \beta_{72} \ln LABPRIM_t + \beta_{73} \ln LABSE_t$$
$$+ \beta_{74} \ln LABTER_t + \beta_{75} \ln CAPITAL_{t-1} + \mu_7$$ ……..(19)

$$\ln(GDPL)_t = \beta_{80} + \beta_{81} \ln LABOUR_t + \beta_{82} \ln LABPRIM_t + \beta_{83} \ln LABSE_t$$
$$+ \beta_{84} \ln LABTER_t + \beta_{85} \ln(KL)_t + \mu_8$$ …………… (20)

$$\ln(GDPL)_t = \beta_{90} + \beta_{91} \ln LABOUR_t + \beta_{92} \ln LABPRIM_t + \beta_{93} \ln LABSE_t$$
$$+ \beta_{94} \ln LABTER_t + \beta_{95} \ln KL_{t-1} + \mu_9$$ ……………...(21)

Where,

GDP = real gross domestic product in Malaysian ringgit
CAPITAL= real physical capital stock. The Malaysian data does not provide physical capital stock but data on capital formation (investment) is available. For the purpose of the analysis, capital stock is computed using the formula

$K_t = \quad (I-d)^{t-j} (I_j / P_j)$ (Kydland and Prescott, 1982).

$J=0$

LABOUR = Quantity of labour.
ELABOUR = Quantity of effective labour.
LABPRIM = Number of employment with primary education.
LABSEC = Number of employment with secondary education.
LABTER = Number of employment with tertiary education.
CPP = Real government-private capital stock ratio.
MSGDP = Money stock-real GDP ratio.
XMGDP = (Export + import) - GDP ratio.
GDPL = Gross domestic product-labour ratio.
KL = Capital-labour ratio.
D= 1 for observations 1997 onward and 0 otherwise.
t = Time.

Equations (11) to (21) are estimated using ordinary least squares (OLS) procedure. For the estimation purpose we use Malaysian data of 1981 to 2007. Even though data on other variables are available before 1981, but data on employment by level of education are not available. However, there is an advantage from choosing this duration because it can avoid economic transformation, which entails heavily between the period of 1970 and 1980. This study improves with greater advantage over the earlier studies since it uses physical capital stock rather than investment (Rahmah 1998, 1999). Data have been gathered from the Ministry of Finance Malaysia, the Department of Statistics Malaysia, Bank Negara Malaysia and the World Bank.

ANALYSES OF RESULTS

The overview of the annual average growth rate of the variables is presented in Table 1. During the four periods, that is 1981 - 1985, 1986 - 1990, 1991 - 1995 and 1996 - 2000 the real GDP growth continuously increased and then followed by a slower growth rate of 5.1% per annum in 2001 - 2007. Annual growth rate of employment increased slightly until 1986 - 1990 and then followed by a slower growth rate of 2.1 and 1.2% per annum in 1991 - 1995 and 1996 - 2000 respectively. During the period 2001 - 2007 the employment grew faster at 3.0% per annum. During these periods the growth of employment with tertiary level of education increased tremendously as a result of educational expansion. In contrast, the growth of employment with primary level of education decreased. The annual average growth rate of year of schooling, however, increased very slightly during the period under study. The annual growth rate of the physical capital stock followed an unstable trend but its ratio to the private capital stock increased tremendously during the 1996 - 2000 period as a result of public capital injection to counter the economic crises that occurred during 1997/1998.

Table 1. Average annual growth rate of the variables.

	1981 - 1985	1986 - 1990	1991 - 1995	1996 - 2000	2001 - 2007
GDP	3.7	6.5	6.9	9.9	5.1
CAPITAL	9.2	4.0	12.4	3.2	2.7
LABOUR	2.4	3.0	2.1	1.2	3.0
LABPRIM	-3.2	0.7	-1.5	0.6	-2.5
LABSEC	0.1	1.1	3.6	2.8	2.5
LABTER	4.6	5.4	8.0	5.2	7.4
XMGDP	1.6	7.0	5.6	2.8	1.08
MSGDP	5.5	2.8	7.9	-0.02	0.01
CPP	1.8	-0.09	-0.02	23.0	5.5
KL	6.6	1.0	10.1	1.9	5.7

Source: Computed from the data.

Table 2. Mean and standard deviation of the variables (1981-2007).

Variable	Mean	Standard deviation
GDP	265,823 (RM mill)	124,125 (RM mill)
CAPITAL	704,283 (RM mill)	360,163 (RMmill)
LABOUR	7798.45 (thou)	2006.05 (thou)
LABPRIM	2235.51 (thou)	126.45 (thou)
LABSEC	3831.49 (thou)	1356.80 (thou)
LABTER	937.98 (thou)	607.74 (thou)
XMGDP	1.6985	0.4354
MSGDP	4.145	1.078
CPP	0.824	0.370
KL	RM92,766	RM3,046

Source: Computed from the data.

The mean and standard deviation of the variables used in the analysis are shown in Table 2. During the period of 1981 - 2007, the mean value of real gross domestic product was RM 265,823 million and the physical capital stock was RM 704,283 million. During that period, the average quantity of labour was 6,887.59 thousand. Number of workers with secondary education was the highest as a result of higher enrolment and completed their studies at that level followed by number of workers with primary and tertiary education. On average, export plus import is 1.6985 times higher than GDP, money is 4.145 higher than GDP, government expenditure forms 45.1% of GDP and government capital stock is 82.4% of the private capital stock. The mean of capital-labour ratio was RM 92,766.

The methods of estimations

First, the augmented Dickey-Fuller (ADF) and Phillips-Perron unit root test were conducted to examine whether each series of interest are stationary or not. The ADF and PP tests showed that all the series were non-stationary in level but stationary in the first difference (Tables 3a and

Table 3a. τ ratios from ADF unit root tests.

Variables	ADF tests including intercept and trend	
	Level*	First difference**
ELABOUR	-2.359	-6.298
GDP	-1.510	-4.583
CAPITAL	-1.803	-4.110
CAPGOV	-2.246	-4.331
CAPPRIVATE	-1.739	-4.071
EXPORT	-2.369	-4.442
IMPORT	-2.291	-4.420
LABOUR	-2.044	-5.734
LABPRIM	-3.336	-8.531
LABSEC	-0.313	-8.806
LABTER	-1.668	-7.395
KL	-1.541	-4.156
MSGDP	-2.648	-3.819

b) . In other words all the series are said to be integrated of order one. Thus the study proceeds to the co-integration test.

Table 3b. Adj t-stat from Phillips-Perron unit root tests.

Variables	PP tests including intercept and trend	
	Level*	First difference**
ELABOUR	-0.195	-8.650
GDP	-1.354	-8.803
CAPITAL	-0.939	-4.351
CAPGOV	-2.287	-3.926
CAPPRIVATE	-1.908	-4.161
EXPORT	-1.537	-4.82
IMPORT	-1.739	-4.773
LABOUR	-1.884	-6.285
LABPRIM	-0.412	-3.317
LABSEC	0.8403	-4.732
LABTER	-1.541	-4.179
KL	-1.777	-4.326
MSGDP	0.2671	-3.781

Table 4. τ ratios from ADF unit root tests of the residuals.

Variables	ADF TEST	PROB	ECM ($_{t-1}$)
EQ 11	-3.507	0.0011	-0.178
EQ 12	-4.488	0.0001	-0.087
EQ 13	-5.141	0.0000	-0.028
EQ 14	-5.345	0.0000	-0.182
EQ 15	-4.336	0.0000	-0.102
EQ 16	-4.306	0.0001	-0.723
EQ 17	-5.470	0.0000	-0.518
EQ 18	-5.185	0.0000	-0.079
EQ 19	-4.727	0.0000	-0.375
EQ 20	-4.953	0.0000	-0.351
EQ 21	-4.180	0.0002	-0.531

To test for cointegration between two or more non-stationary time series, it simply requires running an OLS regression, saving the residuals and then running the ADF test on the residual to determine if it is stationary. The time series are said to be cointegrated if the residual is itself stationary. In effect the non-stationary I (1) series have cancelled each other out to produce a stationary I (0) residual. The ADF tests showed that all the residuals for all the equations are stationary; hence we conclude that the variables are cointegrated (see Table 4). According to the Granger Representation Theorem, if two variables *y* and *x* are cointegrated, then the relationship between the two can be expressed as an error correction model (ECM), in which the error term from the OLS regression, lagged once, acts as the error correction term. In this case the cointegration provides evidence of a long-run relationship between the variables, whilst the ECM provides evidence of the short-run relationship. The paper proceeds with the estimation of the ECM.

Table 5 shows the estimation results of equation (11) to equation (16). Serial correlation tests of the first and higher order were carried out. The test indicated the absence of serial correlation in equation 11, 12, 14, 15 and 16. The residuals showed strong evidence of second order serial correlation in equation 13. Therefore, further estimation using Gauss-Newton procedures was performed to correct this problem. The values of R^2 are greater than 90% indicating that the independent variables have high explanatory power on the variation of dependent variable.

The quantity of labour and the effective labour significantly determine the GDP growth in all cases. The coefficient of physical labour is higher than the effective labour. When the effective labour was combined with the lagged GDP, its coefficient decreased significantly and the level of significance also decreased to 5%. The major determinants of GDP growth is the lagged GDP, while lagged capital stock is no longer significant. The current capital stock is found to be a better explanation of economic growth as compared to the capital stock lagged one year and the physical labour is better than the effective labour.

All variables are in logarithm. When the additional variables are added to the regression (15 and 16), the results show that they add little explanatory power. The coefficient of export-import-GDP ratio is positive and statistically significant at 15% level in determining the GDP growth. An increase of 1% in this ratio will increase GDP growth by 0.0358%. The coefficient of money-GDP ratio is positive and significant, which implies that an increase in money supply will increase the output growth. This is consistent with the Keynesian macroeconomic theory. The coefficient of the government- private capital stock ratio is significant at 5% level. Despite the significant coefficient of some additional variables, the capital stock and human capital embodied labour measures retain their statistical significance.

The estimation result of equation (17) shows that the coefficient of dummy and the interaction between dummy and capital are not statistically different from zero. This implies that the impact of capital on GDP growth does not significantly differ before and after the economic crisis.

The estimations of equation (18), (19), (20) and (21) also indicate the problem of second order serial correlation and it was corrected using the same procedure as above. The results of the estimation are presented in Table 6 and 7. In Table 6 the R^2 decreased slightly when the lagged capital was used in the regression. The result shows that employment at each level of education does not play a significant role in determining the GDP growth except labour with secondary education when combined with lagged capital. The sign of the coefficients are all positive except for the labour with primary education. This indicates that an increase in number of employment independently at any educational level (except labour with secondary education) will not affect output, but their combination contribute positively to output growth as shown in

Table 5. Regression estimates of the production function.

Variable	Equation						
	11	12	13	14	15	16	17
CONSTANT	2.603 (0.633)****	7.650 (0.664)****	-2.992 (0.529)****	7.643 (0.681)****	1.834 (0.635)****	8.895 (0.348)****	9.097 (0.731)****
LABOUR	0.729**** (0.26)		0.752 (0.108)****				
ELABOUR		0.209 (0.041)****		0.216 (0.371)****	0.059 (0.022)**	0.065 (0.023)**	0.059 (0.028)**
CAPITAL	0.409 (0.127)****	0.493 (0.008)****				0.281 (0.034)****	0.332 (0.102)****
$CAPITAL_{t-1}$			0.185 (0.046)****	0.482 (0.061)****	0.057 (0.049)		
GDP_{t-1}					0.813 (0.079)****		
XMRATIO						0.035 (0.024)*	0.041 (0.019)**
MSGDP						0.607 (0.062)***	0.581 (0.142)****
CPP						0.046 (0.022)**	0.043 (0.024)**
D							-0.584 (0.387)
D_CAPITAL							0.081 (0.051)
R^2	0.996	0.969	0.992	0.992	0.995	0.994	0.996
Adj R^2	0.996	0.966	0.991	0.991	0.994	0.993	0.994
D-Watson	2.3597	1.839		2.171	1.933	1.858	1.974

Note: The figures in the parentheses below the estimated coefficients are their standard errors. All variables are in logarithm. ****significant at 1% significance level. *** significant at 5% significance level. **significant at 10% significance level. * significant at 15% significance level.

Table 5. The capital stock either as contemporaneous or one year lag still plays a significant role in determining the output growth. The only exception is in equation (16), lagged capital stock is insignificant when lagged GDP is added into the equation. The results in this table again show that the fitness of the model is better when the current capital stock is used in the estimation, which reflect its better explanation to GDP growth as compared to its lag.

Table 7 shows the estimation results of equation (20) and (21). It is shown that the capital-labour ratio and quantity of labour significantly determines the productivity of labour. An increase of 1% quantity of labour and capital-labour ratio will increase the productivity 0.912 and 0.1664% respectively. When capital-labour ratio lagged one year is used in the regression, the value of R^2 reduces and these two variables are still significant but the coefficient for the capital-labour ratio slightly increased. In this model, an increase of 1% in employment and capital-labour ratio will increase productivity

Table 6. Results of regression estimates of production function using effective-labour for different level of education.

Variable	Equation	
	18	19
INTERCEPT	-1.610 (1.463)	-0.435 (2.053)
LABOUR	1.029 (0.203)****	0.921 (0.235)****
LABPRIM	-0.018 (0.141)	-0.014 (0.187)
LABSEC	0.111 (0.099)	0.293 (0.121)***
LABTER	0.037 (0.038)	0.054 (0.050)
CAPITAL	0.168 (0.048)****	
$CAPITAL_{t-1}$		0.193 (0.042)****
R^2	0.986	0.985
Adjusted R^2	0.985	0.984

Note: The figures in the parentheses below the estimated coefficients are their standard errors. All variables are in logarithm. **** significant at 1% significance level. ***significant at 5% significance level.

Table 7. Results of regression estimates of productivity function.

Variable	Equation	
	20	21
INTERCEPT	-2.609 (1.123)**	-1.608 (2.161)
LABOUR	.912 (0.235)****	0.922 (0.246)****
LABPRIM	0.035 (0.102)	-0.042 (0.192)
LABSEC	0.098 (0.064)	0.300 (0.123)**
LABTER	0.073 (0.028)**	0.059 (0.051)
KL	0.166 (0.016)****	
KL_{t-1}		0.188 (0.042)****
R^2	0.9857	0.981
Adjusted R^2	0.9756	0.972
D-W Stat	1.9809	1.685

Note: The figures in the parentheses below the estimated coefficients are their standard errors. All variables are in logarithm. ****significant at 1% significance level. ** significant at 10% significance level.

by 0.9229 and 0.188% respectively.

SUMMARY AND CONCLUSION

In the era of knowledge-based economy, the role of human capital is becoming more important. It is theoretically believed that human capital is associated positively to labour productivity, hence increase its efficiency and the growth of the economy. The new growth theory incorporates human capital variables into the production function using several measures. This analysis uses two concepts of human capital variables, that is, effective labour and level of educational attainment among workers.

The study shows that the physical capital is an important factor to Malaysian economic growth. The statistically significant and positive relationship between physical capital and economic growth is found in almost all regression estimates either when it is measured at the current year or lagged one year. In equation 15, lagged capital stock is insignificant when lagged GDP is added into the equation. The effective labour does play a positive role in determining economic growth but its contribution is less than the physical labour. But when labour is measured at each educational level, it is not statistically significant except for the labour with secondary education when combined with lagged of capital labour ratio. This implies that the combination of labour at varies levels of education that contains in the effective labour is important determinant of economic growth. Further, the study reveals that an increase in the level of openness of the Malaysian economy as measured by the export-import-GDP ratio will increase the growth of the economy. As predicted, an increase in the money stock-GDP ratio will raise the growth of the economy. The capital-labour ratio is found to be a significant determinant of labour productivity.

The result from this study shows that the role of effective labour is lower than the physical labour. This finding contradicts the results from other countries (Tallman and Wang, 1994). This may be due to the fact that the value of effective labour differs between these two countries. It is also evident that the knowledge workers (senior officials and managers, professionals, technicians and associate professional) have been growing very slowly. For example during the ninth Malaysia plan its average growth rate is about 2.5% (Malaysia, 2006). The existence of foreign labour of which more than 95% are unskilled and semiskilled may also lower the value of effective labour for the Malaysian labour market. In 2007 there are about 2.06 millions foreign labour in Malaysia which constitutes about 18% of total employment (Ministry of Finance 2009).

Empirical results in this paper suggest that Malaysian education system must produce more efficient workforce to increase the contribution of human capital to its economic growth. A large budget allocation to education sector must be utilized optimally through providing education that tailored to the nation's need. Further human capital investment in the labour market is also needed to produce skilled workers. Some studies in other countries also suggest that the level of effective human capital in the economy depends on total skills of the workforce and not just only based on formal education (Iyigun and Owen, 1996). In this respect, the workforce must be trained to be skilled workers. The employers both in the public sector and the private organisations must be responsible equally in providing training facilities to their workers.

The study shows that capital- labour ratio plays an important role in determining labour productivity. Therefore, this ratio must be increased through utilisation of more advanced technology. In this respect, again human capital investment becomes relevant to produce more skilled manpower as needed by the sophisticated technology. Further, the results from this study suggest that human capital variables do not directly play a major determinant of the economic growth and labour productivity, but the role of physical capital is still dominant. The technical innovation, which undertaken through utilizing more capital, however needs large number of labour force with higher education. Therefore education is important as indirect means to promote the growth of the economy.

REFERENCES

Barro R, Lee JW (1996). International measures of schooling years and schooling quality. Am. Econ. Rev. May. 80: 218-228.

Barro RJ (1990). Government spending in a single model of endogenous growth. J. Polit. Econ. 98: S103-S125.

Becker GS (1964). Human capital: A Theoretical and Empirical Analysis, with Special Reference to Education. Chicago, University of Chicago Press. ISBN 978-0-226-04120-9.

Bank Negara Malaysia. Annual report, various years.

Corvers F (1997). "The Impact of Human Capital on Labour Productivity in Manufacturing Sectors of the European Union", Appl. Econ. 29: 975-87.

De Gregorio J (1992). Economic growth in Latin America. J. Dev. Econ. 39(1): 59-84.

Denison EF (1962). The source of economic growth in the U.S. and the alternative before U.S. New York: Committee for Economic Development.

Denison EF (1967). Why growth rates differ: Post war experience in nine western countries. Brookings Institution, Washington DC.

Department of Statistics Malaysia. The labour force survey, various years.

Dickey DA, Fuller WA (1979). "Distribution of the Estimators for Autoregressive Time Series with a Unit Root," J. Am. Stat. Assoc. 74: 427–431.

Fernandez E, Mauro P (2000). The role of human capital in economic growth: The case of Spain. IMF Working Paper. Wp/100/8: 1-27.

Hansen P, Knowles S (1998). Human capital and return to scale. J. Econ. Stud. 25: 118-123.

Iyigun MF, AL Owen (1996). Alternatives in human capital accumulation: implication for economic growth. Int. Financ. Discuss. Pap. 550: 1-18.

Knowles S, Owen PD (1997). Education and health in an effective labour empirical growth model. Econ. Record 73: 314-328.

Kydland F, Prescott E (1982). Time-to-build the aggregate fluctuations, Economectrica 50: 1345-1370.

Lau LJ, Jamison DT, Rivkin S (1993). Education and economic growth. J. Dev. Econ. 14:45-70.

Lee JW, Barro RJ (1998). Schooling quality in a cross section of countries. Development Discussion Paper No: 659. Harvard Institute for International Development, Harvard University pp. 1-42.

Liu C, Armer JM (1993). Education effect on economic growth in Taiwan. Comp. Educ. Rev. 22:3-42.

Lucas RE Jr. (1988). On the mechanics of economic development. J. Monet. Econ. 22: 3-42.

MacKinnon J (1991). Critical values for cointegration tests, in Engle, R and Granger, C (eds) Long-run Economic Relationships: Readings in Cointegration, 267–276. Oxford University Press, Oxford.

Malaysia (1996). Seventh Malaysia Plan. Kuala Lumpur: Govt. Press.

Malaysia (1998). Mid-term Review of the Seventh Malaysia Plan, 1996-2000. Kuala Lumpur: Government Publication.

Malaysia (2001). The Eight Malaysia Plan, 2001-2005. Kuala Lumpur:Government Publication.

Malaysia (2006). The Nineth Malaysia Plan, 2006-2010. Kuala Lumpur:Government Publication.

Malaysia (2008). Mid-term Review of the Nineth Malaysia Plan, 2006-2010. Kuala Lumpur: Government Publication.

Ministry of Finance Malaysia (2009). Economic Report. Kuala Lumpur:Government Publication.

Mankiw NG, Romer D, Weil DN (1992). A Contribution to the empirics economic growth. Q. J. Econ. 107(2): 407-437.

Mincer J (1974). Schooling, experience and earning. New York: NBER.

Ministry of Finance. Economic report, various years.

Murthy N, Vasudeva R, Chien IS (1997). The empirical of economic growth for OECD Countries: Some new findings. Econ. Letter. 55: 425-429.

Otani I, Villanueva D (1990). Long-term growth in developing countries and its determinants: An empirical analysis. World Dev. 18(6): 769-783.

Phillips PCB, Perron P (1988). "Testing for a Unit Root in Time Series Regression", Biometrika 75: 335-346

Pritchett L (1996). Where has all the education gone? World Bank Working Paper. no. 1581.

Rahmah I (1998). Sumbangan pendidikan kepada pertumbuhan ekonomi Malaysia. J. Ekonomi Malaysia 32: 3-20.

Rahmah I (1999). Sumbangan productiviti kepada pertumbuhan ekonomi Malaysia. Working Paper presented at the Faculty of Economics Workshop, Sustainable Development: Malaysia Towards New Era. 19-21 Jun Port Dickson.

Romer P (1989). Capital accumulation and long-run growth, in R.J. Barro ed. Modern Business Cycle theory, MA Cambridge, MA: Harvard University Press.

Sacerdoti E, Brunshwig S, Tang J (1998). The impact of human capital on growth: evidence from West Africa. IMF Working Paper. WP/98/162:1-32.

Shultz TW (1961). Investment in human capital. Am. Econ. Rev. 161: 1-17.

Solow RM (1956). A contribution to theory of economic growth. Q. J.

Econ. 70: 65-94.
Tallman EW, Wang P (1994). Human capital and endogenous growth. Evidence from Taiwan. J. Monetary Econ. 34: 101-124.
Walter PB, Rubinson R (1983). Educational expansion and economic output in the U.S. 1890-1969: A production function analysis. Am. Sociol. Rev. 48: 480-493.