“Surveying sources of economic growth: empirical evidence from Malaysia”

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SURVEYING SOURCES OF ECONOMIC GROWTH: EMPIRICAL EVIDENCE FROM MALAYSIA

Abstract

The main objective of this study is to evaluate the effect of various economic and social factors namely (foreign direct investment (FDI), energy consumption, exports, tourism, foreign remittances, human capital represented by educational expenditure and health expenditure) on economic growth represented by GDP per capita in Malaysia. Annual time series data during the period 1995–2015 and the Cobb-Douglas production function with Ordinary Least Squares (OLS) based on various analytical tests are used for empirical investigation. The empirical results confirm that incoming foreign direct investment, human capital, energy consumption, and tourism are the main sources of economic growth in Malaysia during the period under study. Findings of the study suggest to initiate a motivational promotion for the inhabitant towards utilization of high competence technology, constructing solid policy for export promotion, creating conducive environment for inward foreign investment, introducing effective educational and health policies for further enhancement of the pace of economic growth.

Keywords determinants of growth, FDI, time series data, Malaysia

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INTRODUCTION

Achieving higher level of economic growth is always a prime goal of every country in the world as it produces an enhanced standard of living for society. In the classic production, aggregate output depends on human capital and physical capital. However, there are several factors determining simultaneously economic growth of a country. Thus, the economic growth's measurement of a specific country is a complex phenomenon, because numerous factors of growth contribute concurrently to the aggregate output of a country. It is important to understand which factors are largely accountable for the increase in real output or which variables are driving forces of real economic growth. This study will mainly evaluate the impact of education, health, foreign direct investment, tourism, exports, foreign remittances, energy consumption variables on economic growth and to investigate their contribution in the process of economic development of Malaysia. Economic growth usually measured through gross domestic product (GDP), gross national product (GNP) and real GDP per capita. Any increase or decrease in these variables brings increase or decrease in the national income and thereby in the social welfare of society. Economic growth is indispensable for attaining economic, social, and political development (see Barro, 1996; Dollar & Kraay, 2002; Loayza & Soto,

2002). Loayza and Soto (2002, p. 1) noted that "Economic growth is not a panacea; but it greatly facilitates the implementation of public programs that complement its effects and correct its deficiencies, even if its direct beneficial impacts are modest".

Undeniably, economic growth plays a crucial role in the improvement of any country including Malaysia, as it increases per capita income, encourages business opportunities, generates employment opportunities, economic and political stability, and thereby improves standard of living, etc. Real GDP of Malaysia grew by an average of 6.5 percent per annum during 1957–2005. In the early 1980s to the mid-1990s, the prompt growth continued close to an average of 8 percent per year. Malaysia intends and makes effort is to accomplish high-income status by 2020 (Lia et al., 2013). The World Bank (2017) reported that Malaysia is upper-middle income and highly open economy. Malaysian economy was one of 13 countries classified to have estimated average growth of above 7 percent per year for 25 years or even more. Malaysian economic growth was inclusive, as Malaysia also flourished in closely eliminating poverty. In 1997–1998, after the Asian financial crisis, Malaysia sustained to post compact growth rates, averaging 5.5 percent per annum from 2000–2008, while, since 2010, Malaysia continued rapidly growth rates averaging 5.7 percent. Koen et al. (2017) expound that Malaysia has continued over four decades its rapid, inclusive growth, decreasing its reliance on agriculture and commodity exports to become a more expanded, modern and open economy. Malaysia's GDP per capita is greater than in a many OECD countries, while both income inequality and poverty have decreased substantially. In addition, reforms are required for Malaysia to become a high-income nation by 2020. Figure 1 in Appendix shows trend analysis of world GDP growth rate (annual %) and Malaysian growth rate.

Motivated from the works done by Barro (1996), Jajri (2007), Kogid et al. (2010), Lenka and Sharma (2014) and Giap et al. (2016), this study aims to evaluate empirically the various sources of economic growth in the context of Malaysia. Annual time series data over the period ranging from 1995 to 2015 are used for empirical analysis. The present study makes contributions to the literature in two ways. First, this study includes some other main sources, which have been overlooked in the prior studies on Malaysia. Second, we included latest data and different estimation techniques. Therefore, the empirical outcomes are expected to guide the management authorities of Malaysia and can be extended to other countries in the region.

The present study is organized as follows. Section 1 presents prior studies on the sources of economic growth. Section 2 discusses the materials and methods. Section 3 presents the results and the discussion. Final section covers the summary and conclusion.

1. PRIOR EMPIRICAL STUDIES

The roles played by various variables in economic growth have been long discussed in the empirical literature. For example, Barro (1996) carried out an empirical study on the determinants of growth using a panel of almost 100 countries from 1960–1990. Results reveal that the growth rate is improved by lower fertility, higher initial schooling, life expectancy, lower government, consumption, better continuation of the rule of law, lesser inflation, and enhancements in the terms of trade. Havi et al. (2013) observe that foreign aid and physical capital had a significant positive impact on growth in real GDP per capita. Similarly, in the long run, labor force, physical capital, FDI inflows, foreign aid, inflation, military rule and government spending are the noteworthy determinants of economic growth in real GDP per capita in Ghana during 1970–2011. Lenka and Sharma (2014) examine factors explaining economic growth using panel data during 1991–2010. The study also uses explanatory variables such as real GDP per capita, secondary school attainment, FDI inflows, population, national savings, and inflation. The empirical findings show that along with other factors, FDI inflow is a key determinant for economic growth during the period under study. Azam (2015) study suggests that foreign remittances, infrastructure investment, FDI and openness to trade contrib-

ute positively to economic growth in four Asian countries (Bangladesh, India, Pakistan and Sri Lanka) during 1976–2012. Azam and Ahmad (2015) observe that FDI and human capital have a significant positive impact on economic growth in ten Commonwealth of Independent States countries during 1993–2011. Ali et al. (2015) find that the market capitalization, real interest rate and FDI inflows are the main determinants and have strong effects on economic growth, but only in the long run, in Bangladesh during 1988–2012. Azam (2016a) finds that energy use, FDI inflows, human capital, and gross savings have a significant positive impact on economic growth of 11 Asian countries during 1990–2011. Wang and Choi (2016) examined the impacts of population, FDI, official development assistance, exports, and raw materials prices on economic growth in 21 Asian countries during 2002–2013. Empirical results reveal that FDI, official development assistance, exports, and raw materials prices are the key factors affecting economic growth in Asia; however, the magnitude of impact varies among group of countries. Altaee et al.'s (2016) find that fixed capital formation, and export have a positive impact on economic growth of Kingdom of Saudi Arabia during 1980–2014. Bahattab et al. (2016) results reveal that inward FDI and worker's remittances are also the main factors contributing positively to economic growth in Republic of Yemen during 2003–2014. The empirical findings of Azam et al.'s (2016a) study indicate that stock market development and incoming FDI contribute positively to economic growth in four Asian countries such as Bangladesh, India, China and Singapore during 1991–2012.

1.1. Literature on Malaysia

However, prior studies on Malaysia covered limited economic variables impacts on economic growth. Jajri (2007) conducted a study on the determinants of total factor productivity growth rate in Malaysia over the period 1971–2004. Results show that economy needs enhancement of its productivity based on catching-up capability particularly the efficient utilization of capital in the human labor market. Kogid et al. (2010) investigate the impacts of consumption spending, government spending, export, exchange rate, and FDI and find that consumption spending and export are main determinants of economic growth in Malaysia during 1970–2007. Kamaruddin and Masron's (2010) results suggest that domestic consumption is the significant source of growth in Malaysia. Hussin and Saidin (2012) empirically evaluated the effects of FDI inflows, trade openness and gross fixed capital formation on economic growth of ASEAN-4 countries such as Malaysia, Indonesia, Thailand and Philippines during 1981–2008. Empirical results show that only gross fixed capital formation has a significant positive impact on economic growth measured by GDP. Wahyudi and Jantan (2012) find labor and capital having a significant positive impact on economic growth ASEAN-4 countries include Malaysia, Indonesia, Thailand and Philippines during 1980–2004. Error correction model for short run dynamic in Lia et al.'s (2013) study reveals that tourism receipts and government tourism spending have a significant positive effect on economic growth in Malaysia during 1974–2010. Shaari et al. (2013) find that energy consumption is a source of economic growth in Malaysia during 1991–2011. Lean et al. (2014) observe that tourism and exchange rate significantly contribute to the economic growth of Malaysia and Singapore during the period 1980–2009. Empirical results of Hashim and Masih's (2014) study suggest the bidirectional long-run associations between the economic growth and exports, exports and imports, economic growth and imports in Malaysia during 2005Q1 to 2014Q3. The study of Giap et al. (2016) finds that government spending on tourism promotion, as well as infrastructure development, are the significant determinants of economic growth in the travel and tourism industry of Malaysia in the period 2000–2012. Recently, Bakari (2017) finds that exports, domestic investment, and labor are the important sources of economic growth in Malaysia during 1960–2015.

2. DATA AND EMPIRICAL METHODOLOGY

Annual time series data for the sample period 1995 – 2015 is used. The data set was obtained from the World Bank Development Indicators. The variables used in this study are real GDP per capita, education expenditures, FDI, health expenditures, tourism (tourist arrivals), exports, energy use

(kg of oil equivalent) and foreign remittances. To analyze the long-run association among the determinants of growth, i.e., labor and capital and economic growth, the Cobb-Douglas production function is used in this study. More specifically, the following forms of Cobb-Douglas production function are used for estimation:

$$EG = AT^{a_1} \cdot K^{a_2} \cdot L^{a_3} \cdot e^{u}, \quad (1)$$

where EG is economic growth; T, K, L designate technology, capital and labor, respectively.

The output elasticity with respect to technology, capital and labor is a_1, a_2, a_3, respectively. In the model developed, all three determinants of growth were allowed to be endogenously determined. Technology was determined by the level of energy use, capital was decomposed by the level of FDI, tourism, exports, and foreign remittances, and labor was determined by the level of education expenditures and health expenditures within an extended Cobb-Douglas production function.

Following the studies of Lean and Smyth (2010), Azam et al. (2015), and Rafindadi and Ozturk (2015), in this study, each variable is divided by the total population so that to obtain each series in per capita terms. Following is the log-linearized Cobb - Douglas production function:

$$\begin{aligned} \mathrm{Ln}EG_t &= \beta_1 + \beta_2 \ln EU_t + \beta_3 \ln FDI_t + \\ &+ \beta_4 \ln Tor_t + \beta_5 \ln Exp_t + \beta_6 \ln FR_t + \\ &+ \beta_7 \ln EE_t + \beta_8 \ln HE_t + \mu_t, \end{aligned} \quad (2)$$

where $\mathrm{Ln}EG$ is the real GDP per capita, $\ln EU$ is energy consumption used as a proxy for technology contribution in economic growth, $\ln FDI$, $\ln Tor$, $\ln Exp$, $\ln FR$ are foreign direct investment, tourism, export and foreign remittances, respectively, representing capital contribution in growth. $\ln EE$, $\ln HE$ are the educational expenditures and health expenditures representing labor contribution in economic growth. The term μ_t is the error term. Before checking the cointegration amongst the variables and any empirical estimation of the model, stationarity of the variables is checked using Augmented Dickey-Fuller (ADF) (Dickey & Fuller, 1981), Phillips and Perron (1988) test with intercept and trend. The ADF model can be presented within a parametric adjustment for higher-order association framework as follows:

$$\begin{aligned} \Delta y_t &= \alpha y_{t-1} + x'\delta + \beta_1 \Delta y_{t-1} + \beta_2 \Delta y_{t-2} + \ldots \\ &+ \beta_p \Delta y_{t-p} + v_t, \end{aligned} \quad (3)$$

where in equation (3) the assumption that y follow a process of autoregressive (AR) is restrictive and also demonstrates that the test provides validity in presence of moving average (MA) component.

Phillips and Perron (1988) suggest a nonparametric test for controlling a serial correlation when performing a unit root test. The Phillips and Perron statistics based test is presented as follows:

$$\tilde{t}_\alpha = t_\alpha \left(\frac{\gamma_0}{f_0} \right)^{1/2} - \frac{T\left(f_0 - \gamma_0\right)\left(se\left(\hat{\alpha}\right)\right)}{2 f_0^{1/2} s}, \quad (4)$$

where γ_0 is the estimate of error variance calculated as

$$\gamma_0 = \frac{\left(T-k\right)\cdot s^2}{T}, \quad (5)$$

where k is the number of regressors.

In equation (4), f_0 is the residual scale at zero frequency. The f_0 is the kernel-based estimator of the zero frequency bands and takes the following form:

$$f_0 = \sum_{j=-(T-1)}^{T-1} \hat{\gamma}\left(j\right) \cdot K \cdot \left(\frac{j}{l} \right), \quad (6)$$

where K is a kernel function, l is a specturm parameter and $\gamma\left(j\right)$ is the j[th] autocovariance of the residual.

Johansen (1988) Likelihood Ratio (LR) test and Trace statistic are used to detect the presence of a long-run relationship among the variables. The test assumes that the linear combination of independent variables $\left(k\right)$ is related to non-stationary processes $\left(p\right)$ with three possible outcomes as follows:

$$p = m - k. \quad (7)$$

The outcomes of the test are as follows:

(i) when $k = 0$, $p = m$, the variables are not cointegrated;

(ii) when $0 < k < m,\ 0 < p < m,$ the variables are cointegrated; and

(iii) when $k = m,\ p = 0$, the variables are stationary at level and there is no need for checking the cointegration.

Johansen test is applied in two forms: the maximum eigenvalue test and the Trace test. Both of the tests are applied for cointegration analysis, but each one based on different hypotheses as follows:

Maximum eigenvalue test

H0: $K = K_0$,

H1: $K = K_0 + 1$,

where K is the number of linear combination and starting with $K_0 = 0$ and rejecting null hypothesis indicates the existence of one linear combination.

Trace test

H0: $K = K_0$,

H1: $K > K_0$.

Setting $K_0 = 0$ and rejection of null hypothesis indicates the presence of at least one cointegrating relationship.

3. RESULTS AND DISCUSSION

3.1. Unit root analyses

Table 1 presents the results of the unit root test for the variables included in the study. GDP per capita and health expenditures become stationary after taking first difference, while intercept is included in ADF test and when the trend is included along with the intercept in ADF test, GDP per capita and health expenditures become stationary after tak-

Table 1. ADF and Phillips and Perron (PP) unit root tests

Variables	ADF		PP		Results
	Intercept	Int. and Trend	Intercept	Int. and Trend	
GDP per capito	–0.40 –3.15**	–3.06 –3.06 –8.79*	–0.44 –3.81*	–2.10 –3.75**	ADF I(1) (Int) I(2) (Int and T) PP I(1) (Int) I(1) (Int and T)
EU	–2.39 –4.88*	–3.12 –4.76*	–2.35 –8.90*	–3.11 –9.84*	ADF I(1) (Int) I(1) (Int and T) PP I(1) (Int) I(1) (Int and T)
FDI	–4.25**	–4.41**	–4.24**	–4.73**	ADF I(0) (Int) I(0) (Int and T) PP I(0) (Int) I(0) (Int and T)
Tor	–0.86 –3.57**	–2.25 –3.44**	–0.86 –3.47**	–2.29 –3.26**	ADF I(1) (Int) I(1) (Int and T) PP I(1) (Int) I(1) (Int and T)
Exp	–1.25 –4.13**	–1.51 –4.07**	–1.23 –4.10**	–1.59 –4.03**	ADF I(1) (Int) I(1) (Int and T) PP I(1) (Int) I(1) (Int and T)
FR	–1.59 –3.29**	–1.18 –2.36 –5.12*	–2.24 –3.29**	–1.27 –3.49*	ADF I(1) (Int) I(2) (Int and T) PP I(1) (Int) I(1) (Int and T)
EE	–2.94 –4.84*	–3.86 –4.80*	–2.28 –4.81*	–2.23 –4.77*	ADF I(1) (Int) I(1) (Int and T) PP I(1) (Int) I(1) (Int and T)
HE	0.06 –3.41**	–2.53 –3.43 –5.89*	0.02 –3.36**	–2.56 –3.42**	ADF I(1) (Int) I(2) (Int and T) PP I(1) (Int) I(1) (Int and T)

Note: * shows significance at 1% level, ** Shows significant at 5% level.

Table 2. Cointegration test results

Hypotheses		Trace statistic	Maximum eigenvalue
r = 0	r = 1	174.9041*	65.22118*
r ≤ 1	r = 2	109.6830*	35.77005
r ≤ 2	r = 3	73.91291*	23.23213
r ≤ 3	r = 4	50.68078*	18.97221
r ≤ 4	r = 5	31.70857*	17.00425
r ≤ 5	r = 6	14.70432	10.90504
r ≤ 6	r = 7	3.799276	3.799276

Note: * denotes rejection of null hypothesis at 5% level of significance.

ing second difference. All other variables, including energy consumption, export, tourism, foreign remittances and educational expenditures, are becoming stationary after taking the first difference both when the intercept and trend are also included in ADF test. Similarly, all variables become stationary after taking the first difference in PP test both when the intercept is included as well when intercept and trend is also included. Foreign direct investment in both ADF and PP tests is stationary at level both when the intercept and trend are also included.

3.2. Cointegration test results

Table 2 presents the result of cointegration among the variables. For trace statistic first five null hypotheses are rejected, as Trace statistics values are greater than critical value at 5 percent level of significance indicating that there exists five cointegrating relationship among the variables. For the maximum eigenvalue test the first null hypothesis is rejected, as ML ratio is greater than critical value at 5 percent level of significance, showing the existence of one cointegrating relationship among the variables.

3.3. Model stability test

It is imperative to test model stability, as structural shift of model might affect the result. For this purpose, Brown et al. (1975) proposed Cumulative Sum of Recursive Residuals (CSUSM) and their squares (SUCUSM), whose result are given in Figures 1 and 2 below.

Cumulative sum of recursive residuals (CSUSM) and their square (SUCUSM) show that the residuals of the model lie in the critical region indicating the model stability.

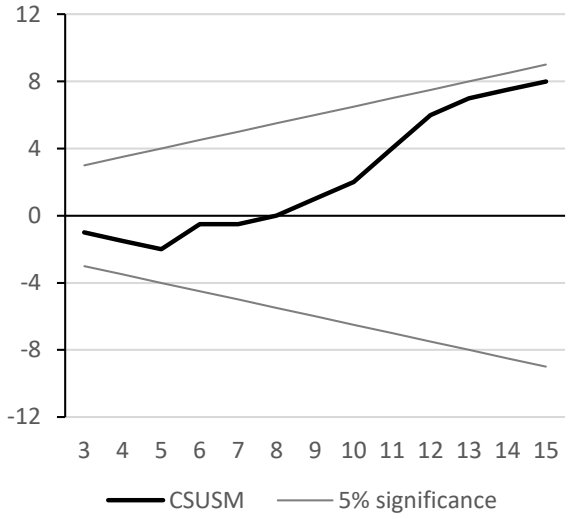

Figure 1. Cumulative sum of recursive residuals (CSUSM)

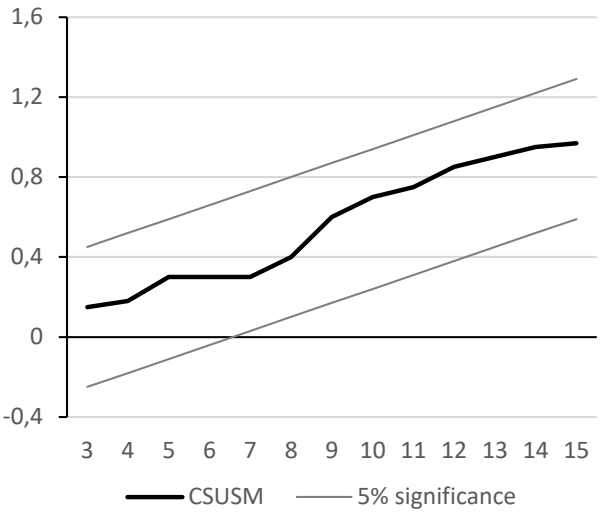

Figure 2. Cumulative sum of squares of recursive residuall (SUCUSM)

Table 3. Regression results

Variables	Coefficient	T-statistic	Probability
C	5.572779	2.202567	0.0463
EU	0.486094***	2.081151	0.0578
FDI	0.002088*	3.227220	0.0067
TOR	0.001752	0.025713	0.9799
EXPO	0.556936*	4.082468	0.0013
FR	0.192351*	5.559835	0.0001
EE	0.068956**	2.197293	0.0467
HE	0.664283*	10.69428	0.0000
R^2		0.995567	
adj. R^2		0.993180	
DW		2.094827	
F-stat		417.1076	
Prob.		0.000000	

Note: * indicates statistical significance at the 1% level, ** indicates statistical significance at 5% level.

3.4. Linear regression result

The result of the linear regression model is presented in Table 3. Overall, the results are reasonable, as value of R^2 is fairly high and there is no problem of autocorrelation, as shown from Durban Watson Statistics.

The estimates of linear regression indicate that GDP per capita is positively related to energy usage, the coefficient of energy usage is statistically significant at the 10% level. The result shows that 1% increase in energy usage (improvement in technology), as energy is used as a proxy for technology, leads to increase GDP per capita by 0.49 percent. The result appears consistent with the result of Kuppusamy et al. (2009) for Malaysia. The capital growth relationship with GDP per capita is mixed, as capital is decomposed into four factors namely: foreign direct investment, tourism, export and foreign remittances. The relationship of foreign direct investment and tourism with GDP per capita is positive but statistically insignificant; the relationship of export is positive and significant, while the relationship of foreign remittance with GDP per capita is negative and significant. The result reveals that 1% increase in export will lead to increase of GDP per capita by 0.55 percent, while 1 percent increase in foreign remittances will reduce GDP per capita by 0.19 percent. These results look consistent with the result of Homaifer et al. (1994), Rajan and Zingales (1995), and Baskin (1989). The estimated coefficient of health expenditures is highly significant with expected positive signs, but the coefficient of educational expenditures is insignificant with an unexpected negative sign. The magnitude of health expenditures is 0.66; it means that 1 percent increase in health expenditures will increase GDP per capita by 0.66 percent. This result is consistent with Otsuka et al. (1998) for Japan, Nagaraj et al. (2014) for Malaysia and Ismail and Yussof (2010). Moreover, overall empirical results on the significantly positive impact of human capital, inward FDI, exports, energy consumption and tourism on economic growth are consistent with the findings of Hussin and Saidin (2012), Shaari et al. (2013), Lia et al. (2013), Haseeb et al. (2014), Haseeb and Azam (2015), Azam and Gavrila (2015), Bahattab et al. (2016), Azam et al. (2016b), and Bakari (2017).

SUMMARY AND CONCLUSION

This study only focuses mainly on evaluating the impacts of education, health, inward foreign direct investment, tourism, exports, foreign remittances, energy consumption variables on economic growth by real GDP per capita in Malaysia. Annual time series data during the period 1995–2015 and the Cobb-Douglas production function with Ordinary Least Squares (OLS) based on various time series data tests are used for empirical investigation. In first step, time series data were checked for stationarity purpose

using implemented standard ADF and PP tests. Unit root test reveals that variables were non-stationary, while all variables become stationary after taking the first difference in PP test both when the intercept and trend are included. Regarding the results of cointegration, Trace statistic, first five null hypotheses are rejected, as Trace statistics values are greater than critical value at 5 percent level of significance indicating that there exist five cointegrating relationship among the variables. For the maximum eigenvalue test, the first null hypothesis is rejected, as ML ratio is greater than critical value at 5 percent level of significance, showing the existence of one cointegrating relationship among the variables. The empirical results confirm that incoming foreign direct investment, human capital, energy consumption, and tourism are the main sources of economic growth in Malaysia during the period under study. Empirical results strongly support the study hypotheses and are consistent with the findings in other studies, as well theoretical expectation.

Undeniably, Malaysia is an emerging economy and included in top 25 developing countries. Like other developing countries, Malaysia is also at the hard-core progression of economic development. Researchers explore that economic development potentially increase the demand for energy use, while in the present study, we found that energy consumption is an important factor in the economic growth. It looks apparent that Malaysia will face the international challenge of environmental improvement, as well as deficiency of energy accessibility for commercial and domestic usage linked with a persistent endeavor for economic development. To alleviate the impact of energy use on economic growth, the Malaysian governments should formulate capital and labor supportive fiscal policies. The result for Malaysia shows a continual positive contribution of energy use, inward FDI, export, education and health expenditures in economic growth. As a result, the excessive use of energy for captivating economic growth may deteriorate the environment. The government of Malaysia should introduce environment friendly measures to tackle the side effects of energy use along with other fiscal policies for export promotion and health improvement. Meanwhile, the findings of the study suggest to initiate a motivational promotion for the inhabitant towards utilization of high competence technology, constructing solid policy for export promotion, create conducive environment for inward foreign investment, introducing effective educational and health policies for further enhancing the pace of economic growth and thereby improving social welfare.

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APPENDIX

Source: World Development Indicators (2017).

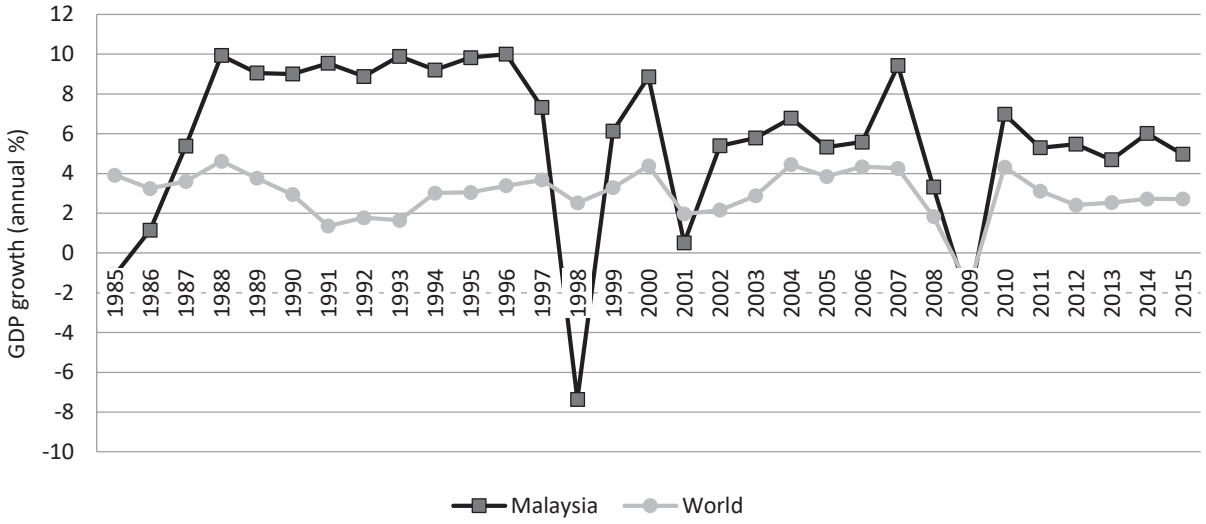

Figure 1. Trend in GDP growth rate (annual %) in the period 1985–2015