THE IMPACT OF ECONOMIC GROWTH, FERTILITY AND THEIR CONSEQUENCES ON RESOURCE USE IN PROJECTING DEMAND FOR EDUCATION IN MALAYSIA

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Abstract

Population structures and population increase have been one of the major concerns of not only policy makers of developing nation but also the world at large such as UNDP. Economic development and economic activity have been closely associated with population growth. The basic objective of any government has been catering for its citizens. Rapid increase in population may deplete the country's resources thereby inviting the dreaded onset of depression and inflation. Factors affecting population growth have been considered as important elements in economic planning in most countries including Malaysia. Unplanned population growth all adversely affects resources use as well as creates insaiable demand particularly for education. This study attempts to investigate the fields of natality (fertility), economic growth and contribution of education indicator as a parsimonious model. Basically, this study tested the postulate that population growth (birth rates) is positively associated with increasing mortality rates and later followed by declining in mortality rates. The study also shed light on the essentials of the relation between economic growth and population growth (birth rates). Using recently applied econometrics techniques, namely ARDL bounds test based on UECM proposed by Pesaran et al. (2001), and the long-run Granger non-causality popularized by Toda-Yamamoto (1995), the model was significant in investigating the contributions of natality, growth and education in Malaysia. The significance of the model indicated strong policy implications with regard to future planning of education requirements in the country.

Introduction

Growth and industrialization are closely connected to falling fertility rates. This was true for 19th century England and other Western countries, where industrialization once started, and it applied in the same way to the Asian countries that only recently began to grow at high rates and catch up with

Western countries. Thomas Malthus's theory on his "Essay on Population" was an accurate description of population dynamics before the industrial revolution, and it seems to apply in many countries even today. However, in the extend of expanding literature on the fertility transition, the causal roles of economic forces, once commonly viewed as dominant, have become uncertain and controversial.

Interrelation between population and education on nation wealth are going hand in hand all over the time. More specifically it is much focus in higher education learning. Ivan (2001) claimed if the higher education fails, we all fail. It is clear that skilled manpower or quality population is employable and is capable of generating wealth. Hence it is a resource. Malaysia has independent over 40 years, the allocation for education has increase all over the years. It is contended that the education indicators should continuously paid severe attention compared to other growth indicators. This is crucial as education is a backward linkage for other indicators such as, research and development, training, skills, ability to operate high technology instruments and so forth.

Appropriate planning of education policy is to ensure greater growth in the future achieved. Meanwhile, it favors to make Malaysia as an excellent education centre (Abdullah, 2004). However, the major indicators leading the way in the long-run are vaque. Hence, proper injection would favor guaranteed the result. Lastly, a set of investigationon natality, growth and education has conduct to further confirm or disregard these phenomena.

Objectives

The aim of this study is to determine whether an equilibrium relationship exists between certain combinations of :

a. Education expenditure, fertility/natality, income and mortality for fertility measurement.
b. Education expenditure, fertility/natality, income and unemployment for growth measurement.
c. Education expenditure, primary school pupils' enrolment and income for education measurement.

The specific objectives are as follow :

a. Economic growth is expected to exert non-monotoniceffects o fertility. Preliminary gains in income would increase parents' demand for numbers of children. As level of income rise continuously until a point where the positive income effect should be out weighted by the growing substituition of child quality for child quantity, causing fertility to decline.
b. The epidemiological transition has brought death rates down from very high levels in which people die young, primarily from communicable diseases, to low levels with deaths concentrated among the elderly, who doe from degenerative disease. As the environment being control population will living longer, the tendency of the need to replenish society will be weakened.
c. To examine the role of education spending and the factor of unemployment as an appropriate measure of growth.
d. To investigate the significance of primary school pupils' environment variable in the education spending measure.

In this study, bounds test co-integration technique proposed by Pesaran et al. (2001) is being used to estimate a set of funtions, namely natality, growth and education spending in Malaysia.

Significance of the Study

Finding on this study is essential to view that teeming millions of people in Malaysia weather constitute a useful resource base for effective participation in globalization. In particular, it suggests that the rate of growth should be surveillance to a level that can be accommodated. There is a need to improve the quality of the people through qualitative education, proper skill training, and adequate population projection. Hence the authorities can then adjust the right proxies accordingly.

Household and private firm beneficial from the investigation that increase their awareness about rapid rate of growth requires some form of birth projection and backed by enlightenment campaign. To improve the quality of the Malaysian person through education and training, adequate funding and a system that efforts, quality recognition and merit should be put in place. Qualitative education should also produce proper skilled manpower such as medical doctors, engineers, scientist and other fields of expertise that will event, develop, adapt and maintain technologies that can propel Malaysia advantageously into global village.

A stable set of functions (natality, growth and education spending) form the care in the conduct of policies (population,growth and education) as it enables a policy driven change in a particular structure to have predictable influences on education spending, primary school enrolment, growth, mortality, natality and unemployment and vice versa. Therefore, feasibility in formulating policy is determined by a long-run and short-run dynamic equilibrium relationship between regressand and regressors estimated.

Review of Related Literature

Simon (1992) contended that in addition to the acceleration of progress in knowledge-creation and technology, a large population also achieves economies of scale. A large population implies a larger total demand for goods – with large demand and higher production come division of labor and specialization, larger plants, larger industries, more learning-by-doing and others related to the economics of scale. Congestion is a temporary cost of this great efficiency but it does not seem to present an on going difficulty in the context of production. All these show that population growth have a positive relation-ship with economic growth.

Furthermore, Kravdal (1994) in his study indicates a relationship between the population and the economy. He observed that micro-economic theories in which high direct costs and opportunity cost of childbearing reduce the probability of having additional child whereas higher income has the opposite effect at least with a fixed level of children quality equipment. Unfortunately the theoretical studies have largely dealt with lifetime fertility and may not be altogether relevant to the thought about entry into parenthood. For a childless couple the fundamental issue is not only "Do we have a child now or do not?" The decision problem may equally will be formulaed as "Do we have child now or later?" Valuating childless is not very common and it had, in fact been suggested that it often is result sequential postponements. This would lead to economically rational couple paying special attention to the cost of having a child now compared to those they would incur if they had the child later. This study had shown that income has a relationship with the decision to have a children or not and reduce the timing of birth and this decision will affect the population growth. Overall, economic activity (growth) will reduce the timing of first births and limit the total of child birth for one family (Blossfeld and Huinik, 1994; Kravdal, 1994).

Economic activity influences a couple's decision not to marry or to delay their marriage. Eventually, it reduces the number of birth in the following year. This reduction in baby birth leads to deterioration of population (Polloni et. al., 1996). Further, the relation between economic conditions and deterioration in mortality is mediated changes in exposure and resistance to diseases, and by the capacity to recover from illness. Hence, economic growths go hand in hand with health care – good medical care can reduce mortality rates.

The presumption that economic development leads to net decline in mortality as technology progresses and as greater amount of resources become available, manifest itself in the form of better working conditions, improvements to sanitation, higher levels of nutrition, advances in medical knowledge and so forth. Empirically, it shows strong positive relationship between per capita level of income and expenditure on health care, as well as strong positive relationship between health expenditure and life expectancy (Blackburn and Cipriani, 1998). In short, the greater the expenditure on health means that people are taking care themselves leading to reduced rate of mortality.

Moreover, economic growth worked against the fertility transition until that transition was well under way. It further implies that economic growth serves as neither a necessary nor a sufficient condition for the emergence of the historical fertility decline. However, in the later stages of the transition, income gains did apparently act to accelerate the downtrend in birth rates to a significant extend (Winegarden and Wheeler, 1992)

Defining school enrolment are regular schools including nursery schools, kindergartens, and those which may advance a person towards an elementary or high school diploma, or college, university, or professional school degree but not for technical or vocational qualifications. Although there are no such specific theory that concludes population as having a positive relationship with demand for education, recent literature has shown that population and the demand for education have a positive relationship (Jamieson et al., 2001).

The impact of education on economic development has been proven in many empirical analyses, indicating the positive association between these two variables. Evolution from human capital research to theories of endogenous growth, education has been considered as an additional input in the production function. An increase in the stock of physical capital per se implies an increment of qualified labour demand. Besides, the rise of educational standards has impacted a better socio-cultural environment that tends to favor innovation and investment (Guisan and Frias, 1996).

Empirical research works done according to these principles has not always produced significant results. In fact, in many of them, education is not significant in explaining the evolution of GDP, which has been explained many times through the interaction between human capital and R&D, pointing out the possibility that human capital operate through the R&D instead of being an additional input in the production function.

Neira et al. (1999) offered an alternative proposal in which interaction between human and physical capital, previously hinted by Barro (1996) and Romer (1990) was included. An analysis of physical and human capital was estimated for 10 Latin American countries (Argentina, Chile, Colombia, Dominican Republic, Ecuador, Guatemala, Mexico, Panama, Peru and Venezuela). The results confirm the initial hypothesis about a positive interaction between human and physical capital, which imply an indirect effect of human capital in the production function through the effect it exerts over physical capital.

Guisan (1976a) and (1976b) made an international comparison of educational levels and growth using data from OECD countries. The analyses show that a high degree of complementarily exists between human and physical capital, and the important role of education in order to improve economic growth. Recent studies found that the role of education as an accelerator of investment in physical capital to be of significance, and thus contributing to the improvement of both human and physical stocks of capital (Guisan, 1997; Neira et al. 1999).

Method and Data
The Econometric Model

Severe limitations on the supply of data are a major constraint on the design of our models. For the purpose of this study, we have used low frequency data (annual time series) of sufficient length relevant variables, namely real government's education expenditure, real per capita income, morality rates, natality primary school pupil's enrolment (standard one) and unemployment. The result is the parsimonious model displayed in Figure 1. In this model income, natality and education expenditure are endogenous; mortality, primary school pupils' enrolment and unemployment are treated as exogenous.

Figure 1: The Model

(1)	$If_t = a_0 + a_1 ly_t + a_2 ledu_t + a_3 lm_t + \mu_{at}$
(2)	$ly_t = b_0 + b_1 lf_t + b_2 lunemp_t + \mu_{bt}$
(3)	$ledu_t = c_0 + c_1 lenrm_t + c_2 ly_t + \mu_{ct}$

where:

$ledu_t$	=log of real government's education expenditure at time t –data for real government's education expenditure is computed from nominal government's education expenditure divided by log of price level;
$lernm_t$	= log of primary school pupils' enrolment at time t;
lf_t	= log of natality at time t –births per 1000 population;
ly_t	= log of real per capita income at timet t –real GDP per capita;
lm_t	= log of morfality at time t –deaths per 1000 population;
$lunemp_t$	= log of unemployment at time t;
$\mu 1_{at} / \mu_{bt} / \mu_{ct}$	= error term at time t

Economic reasoning suggests that $a_1>0$ while $a_2<0$, $a_3>0$, $b_1>0$, $b_2>0$, $b_3<0$, $c_1>0$ and $c_2>0$.

3.2.1 Bounds testing approach

The empirical analysis is well documented that co-integration statistical concept is able to investigate the relationship between non-stationary time series.

Formally, if the series being estimated are integrated of different order, in such cases the estimated series cannot be co-integrated (Enders, 1995). To investigate robustness of our results, we employed the Pesaran et al. (2001) ARDL bounds tests procedure to analyze the model's relationship for equation (1), (2) and (3), The advantage of this testing is the regressors are not necessitate to satisfy certain non-stationarity conditions which requires the classification of the variables into I(0) and I(1) (Mah, 2000; Abbott, 2001).

Preliminary, the ARDL bounds test procedure is based on unrestricted error-correction Model (UECM) using the Ordinary Least Squares (OLS) estimator. An UECM for the model as equation (1), (2) and (3) where Δ is a first difference operator and disturbance term (εt, vt and μt) is assuming white noise and normally distributed. The ARDL bounds test based on UECM proposed by Pesaran et al. (2001) is essentially to capture the short-run and long-run relationship in between regressors and regressand for each equation (equation (4), (5) and (6)). The coefficients of the first difference variables on the left-hand side of the expression in equation (4), (5) and (6) capture the short-run effects. While the derivation of the long-run lgdp, ledu and lm elasticities in equation (4) is – ($\alpha 6/ \alpha 5$), - ($\alpha 7/ \alpha 5$) and ($\alpha 8/ \alpha 5$) respectively.

A similar long-run elasticity derivation can be applied to the equation (5) and equation (6). Schwarz Bayesian criterion (SBC) is used to select the optimal lag structure for the ARDL procedure of the UECM. The bounds test for the presence of a long-run relationship between regressors and regressand for each equation (equation (4), (5) and (6)) is captured using the Wald test (F-statistic). The asymptotic of nonstandard distribution of F-statistic under null hypothesis indicate no co-integration relationship between the examined variables. This allow for the possibility that the series can be either I(0) or I(1) (see Pesaran and Shin, 1999; Pesaran et al., 2001). F-test on the join null hypothesis that the coefficients on the lagged level variables are jointly equal to zero (null hypothesis of $\alpha 5 = \alpha 6 = \alpha 7 = \alpha 8 = 0$ against the alternative that $\alpha 5 \neq \alpha 6 \neq \alpha 7 \neq \alpha 8 \neq 0$ for equation (4); null hypothesis of $\delta 5 = \delta 6 = \delta 7 = \delta 8 = 0$ against the alternative that $\alpha 5 \neq \alpha 6 \neq \alpha 7 \neq \alpha 8 \neq 0$ for equation

(5); null hypothesis of n4 = n5 = n6 = 0 against the alternative that n4 ≠ n5 ≠ n6 ≠ 0 for equation (6)). For significance level (1, 5 and 10 percent), if the test statistic exceed their respective upper bound critical values, then the null hypothesis of no co-integration can be rejected. However, we fail to reject the null hypothesis of no long-run relationship if the test statistic is lower than the lower bound critical values. In an exceptional case, when the test statistic is lies between the bounds, inference is inclocusive (see Paseran at al., 2001, Table (i) – (v)).

Granger long run non-causality test

Besides, in an attempt to investigate the equilibrium relationship for the model (equation (1), (2) and (3)), the causality tests are also conducted by using the traditional bivariate VAR model (see Sim, 1972). A recent modified version of the Granger causality test proposed by Toda-Yamamoto (1995) is employed, as the procedure is robust to the integration and co-integration features of the process. The author indicates that even when the time series are non-stationary, a level vector autoregressive (VAR) model and standard Wald criterion still can be performed. All we need to do is determined the maximal order of integration dmax of the series in the model that we suspect to occur in the system. Later, we estimate augmented Granger causality test –modified WALD (MWald) test introduced by Toda-Yamamoto (1995) and extended by Rambaldi and Doran (1996), So that the VAR order now is p = k =dmax, where k is the optimal lag length chosen using SBC. The advantage of this technique lies in its simplicity that the MWald statistic is valid regardless whether a series is I(0), I(1) or I(2), non-cointegrated or cointegrated of an arbitrary order.

To examine the causality from primary school pupils' enrolment to education expenditure and the causality from income to education expenditure, we used a system of three (p=3) variables; education expenditure (ledu), primary school pupils' enrolment (lenrm) and income (ly). Suppose we want to test that lenrm does not Granger cause ledu for equation (3). With this aim, we employed a system using unrelated regression (SUR) technique. Our set of estimation of the system of SUR for equation (3) is as follow:

(7)

$$\begin{bmatrix} ledu_t \\ lernm_t \\ ly_t \end{bmatrix} = A_0 + A_1 \begin{bmatrix} ledu_{t-1} \\ lernm_{t-1} \\ ly_{t-1} \end{bmatrix} + A_2 \begin{bmatrix} ledu_{t-2} \\ lernm_{t-2} \\ ly_{t-2} \end{bmatrix} + A_3 \begin{bmatrix} ledu_{t-3} \\ lernm_{t-3} \\ ly_{t-3} \end{bmatrix} + A_5 \begin{bmatrix} \ell_{ledu} \\ \ell_{lernm} \\ \ell_{ly} \end{bmatrix}$$

where A's are three by three matrices of coefficient with A_0 an identity matrix. Pre-testing on SBC for the lag length selection for equation (3) indicates that k=2. Because d_{max} =1, we must estimate a VAR (3) and test that $lenrm_{t-1}$, $lenrm_{t-2}$, and $lenrm_{t-3}$ does not appear in the ledut equation. Therefore, the null hypothesis is H_0: $\alpha^1_{12} = \alpha^2_{12} = 0$, where α^1_{12} are coefficient of $lenrm_{t-1}$, i=1 and 2, in the first equation of the system. A similar testing procedure can be applied to the alternative hypothesis that ledu does not Granger cause lenrm, is to test H_0: $\alpha^1_{12} = \alpha^2_{12} = 0$, where α^1_{12} are coefficient of $ledua_{t-1}$, i=1 and 2, in the second equation of system equation (7) where the system is being estimated as a VAR (3). Analogously, the testing procedure is repeated to test Granger non-causality for the remaining variables, namely past value of ledu and lgdp.

All the data sources are yearly from 1970 to 2003. For the purpose of this study, governments education expenditure, primary school pupils' enrolment, natality real GDP per capita mortality, price level and unemployment are extracted from various sources, namely International Financial statistic published by International Monetary Fund (IMF), Department of statistic Malaysia, Ministry of Education Malaysia and Ministry of Health Malaysia.

Empirical Results

To ensure that the results area sturdy, bounds test based on a set of UECMs proposed by Pesaran et al. (2001) was applied. For the cointegration tests, the appropriate lag length for ARDL bounds approach was selected based on SBC. As noted by Pesaran et al. (2001), it is particularly important to ensure there is no serial correlation, for the bounds test to be valid. This process suggests a lag length up to 2 would be optimal and produces a serially-uncorrelated error term. The estimated ARDL bounds test based on UECM for equations (1), (2) and (3) are reported in Tables 1, 2 and 3.

The estimated short-run elasticities for the natality model are reported in Table 1. The estimated signs are consistent with the literature that education expenditure impacted natality negatively and mortality impacted natality positively – except for income which is statistically insignificant. The final UECM passes a battery of diagnostic tests. In particular, the UECM is free of the problem of functional form, normality and heteroscedasticity.

Table 1: The Estimated UECM for Natality Model.

Regressor	ARDL (2, 1, 1, 2)	
	Coefficient	t-statistic
Dependent variables: Δlf_t		
Method least squares		
Δlf_{t-1}	-0.4262	-2.0562***
Δly_t	0.0352	0.4178
$\Delta ledu_t$	-0.1593	-2.0190***
Δlm_t	-0.1228	-0.9717
Δlm_{t-1}	0.4329	3.1452*
lf_{t-1}	-0.2853	-2.7422**
ly_{t-1}	0.2142	2.7583**
$ledu_{t-1}$	-0.1448	-2.1596**
lm_{t-1}	-0.4104	-2.7211**
Constant	7.1392	3.9557*

Notes:

1. The adjusted sample is 1970 – 2003. R-squared: 0.7104; adjusted R-squared: 0.5571; Durbin – Watson statistic: 1.9396; sum squared residual: 0.0062; F-statistic: 4.6344(0.003), Normality [2]: 0.0494(0.976); Serial Correlation [1]: 0.0043(0.948); Functional Form [1]: 0.3611(0.541); Heteroscedasticity [1]: 1.2011(0.201). The figures reported in [ ] and ( ) refer to the lag order and P-value, respectively.

2. * indicates significant at the 1% level, ** indicates significant at the 5% level and ***indicates significant at the 10% level.

Table 2: The Estimated UECM for Growth Model

Regressor	ARDL (2,1,1,2)	
	Coefficient	t-statistic
Dependent variables:Δlf_t		
Method least squares		
$\Delta ledu_t$	0.2222	1.3348
$\Delta ledu_{t-1}$	0.0521	0.4089
$\Delta ledu_{t-2}$	0.0158	0.1024
Δlf_t	0.7666	1.9932***
$\Delta lunemp_t$	-0.3071	-5.6084*
ly_{t-1}	-0.2887	-1.8123***
$ledu_{t-1}$	0.8088	2.2354**
$lunemp_{t-1}$	0.1667	1.2177
Constant	-0.0994	-2.6401**
	-8.0230	-2.0419***

Notes:

1. The adjusted period is 1970 – 2003. R-squared: 0.7551; adjusted R – statistic: 0.6501; Durbin- Watson statistic: 2.1055; sum squared residual: 0.04251; F-statistic: 7.1924(0.000); Normality [2]: 0.8106(0.667); Serial Correlation [1]:0.1401(0.708); Functional Form [1]: 0.0010(0.975); Heteroscedasticity [1]: 0.4594(0.498). The figures reported in [ ] and ( ) refer to the lag order and P-value respectively.
2. * indicates significant at the 1% level, ** indicates significant at 5% level and *** indicates significant level at 10% level.

The estimated UECM for a simplistic growth model is presented in Table 2. The estimated signs for short-run elasticity are consistent with the literature that natality impacted income positively and unemployment impacted national income negatively – except for education expenditure which is statistically insignificant. Again, the final UECM passes a battery of diagnostic tests.

Table 3: The Estimated UECM for Education Expenditure Model

Regressor	ARDL (2, 1, 1, 2)	
	Coefficient	t-statistic
Dependent variables: Δledut Method least squares		
$\Delta lenrm_t$	2.8396	4.7747*
Δly_t	0.2490	1.7169***
Δly_{t-1}	0.1581	1.0847
Δly_{t-2}	-0.0701	-0.5056
$ledu_{t-1}$	-0.5807	-3.8745*
$lenrm_{t-1}$	1.6215	3.0001*
ly_{t-1}	0.1901	2.1202**
Constant	-18.1107	-3.0970*
$lunemp_{t-1}$	-0.0994	-2.6401**
Constant	-8.0230	-2.0419***

Notes:

1. The adjusted period is 1970 – 2003. R-squared: 0.64432; adjusted R-statistic: 0.5361; Durbin-Watson statistic: 1.9206; sum squared residual: 0.0599; F-statistic: 5.9522(0.000); Normality [2]: 1.1791(0.555); Serial Correlation [1]: 0.0152(0.902); Functional Form [1]: 0.3709(0.531); Heteroscedasticity[1]: 1.1430(0.295). the figures reported in [ ] and ( ) refer to the lag order and P-value respectively.

2. * indicates significant at the 1% level, ** indicates significant at 5% level and

*** indicates significant at 10% level.

Table 3 presents the estimated UECM for education expenditure. The estimated short-run elasticity's sign are consistent with the expectation that primary school enrolment impacted education expenditure positively and national income impacted education expenditure positively. The final UECM passess a battery of diagnostic tests.

Table 4: The Result of Bounds Test for Cointegration Analysis

UECM		Computed F-statistic (Wald test)
Equation 4	(H0: δ7 = δ9 = δ9 = δ10 = 0)	5.8225 [4]*
Equation 5	(H0: δ7 = δ8 = δ9 = δ10 = 0)	6.7086 [3]*
Equation 6	(H0: δ6 = δ7 = δ8 = 0)	5.2374 [2]**

Notes:

1. The number in the bracket is l regressors. See Pesaran et al.(2001,p.300), Table CI. iii: unrestricted intercept and no trend.

2. * indicates significant at the 1% level, ** indicates significant at 5% level, and *** indicates at 10% level.

To ascertain the presence of long-run equilibrium relationship among regressand and regressors for a set of UECMs estimation, a joint significance test (Wald test) was performed. The results of bounds test are reported in Table 4. The computed F-statistics for equation 4, 5 and 6 are 5.8225, 6.7987 and 5.2374 respectively. The values exceed the upper critical value for some significance level set at 1 percent for the models of natality and growth, and 5 percent for education expenditure. This indicates the regressand and regressors are cointegrated in all estimation. The estimated long-run regressors are presented in Table 5.

Table 5: Long-run – Estimated Coefficient of a Set of UECMs

Variables	UECM		
	Equation 8	Equation 9	Equation 0ij
ledu	-0.5075	0.8595	-
lenrm	-	-	2.7923
lf	-	2.2710	-
ly	0.7508	-	0.3274
lm	1.4385	-	-
lunemp	-	0.2364	-

Determining the optimum lag length is important to estimate the system of VAR ($p=d_{max} + k$) that is essential to compute the MWald test statistic. After determining that $d_{max}=1$, the lag structure estimation of VAR system levels for equation (3) is based on the SBC. The results for Granger non-causality test for education expenditure, primary school enrolment and income are presented in Table 6.

Table 6 : Granger Noncausality Tests (edut, enrmt and yt)

H_0:	Lag length/ VAR order	Mwald test	p-value
past $ledu_t$ does not cause $ledu_t$	2/3	14.0964	0.0009*
$lenrm_t$ does not cause $ledu_t$	2/3	11.2955	0.0035*
$ledu_t$ does not cause $lernm_t$	2/3	1.0574	0.594
ly_t does not cause $ledu_t$	2/3	14.7698	0.0006*
$ledu_t$ does not cause ly_t	2/3	5.3581	0.0486*

Notes:

1. To determine the appropriate lag length, we employ Schwarz Bayesian Criterion (results were not reported here). * denotes statistically significant at 5% level.

Table 6 suggests that null hypothesis of Granger long-run non-causality from primary school enrolment to education expenditure and from income to education expenditure can be rejected at 5 percent level. However, Granger long-run non-causality from both education expenditure to primary school enrolment and education expenditure to income cannot be rejected. One of the interesting finding is that past value of education expenditure can affect current education expenditure.

Results of the ARDL bounds tests are equally optimistic for estimated equations namely, equation (1), (2) and (3). The significance level of the F-statistic for a set of UECMs indicates long-run relationship between the regressand and regressors. These results are also true for short-run relationship except income for natality estimation and education expenditure for growth estimation. Bearing the critique in mind, one can draw the conclusion that our simplistic model for education is more reliable if precedence Granger non-causality in Table 3 implies causation. The evidence more strongly supports the notion that primary school pupils' enrolment causes the education expenditure than vice-versa. However, for income and education expenditure, we find evidence that there is a bidirectional causal relationship. Evidently, this would further support the growth estimation that existence a long-run relationship between education expenditure and income. Finally, we may conclude that the parsimonious model displayed in Figure 1 is valid and reliable for the Malaysian case as a developing country at least in the long-run.

Conclusion

The main objective of the present study is to determine the short-run and long-run relationship between our parsimonious models (natality, growth and education) and some key variables, namely primary school enrolment, education expenditure, fertility, income, mortality and unemployment). Also, the education expenditure model tried to investigate the lead and lag relationship between Malaysian education expenditure and two key variables (primary school enrolment and income).

The methodology of bounds test proposed by Pesaran et al. (2001) and long-run Granger causality popularize by Toda-Yamamoto (1995) were employed to test these hypothesis. The sample period used for this study was from 1970 to 2003.

In this study, the infant birth was used as a proxy for fertility/natality, GDP per capita for income and government allocation in education for education spending. The three important variables included in the study are primary school enrolment, mortality and unemployment.

The results are summarized as follows:

a. The results strongly support that economic growth – gauged by the real per capita incomes – does not a cause of fertility change in Malaysia. It is possible that Malaysia is a developing country and has hot reached the turning point as yet.

b. The effect of per capita income on birth rates is not consistent with the contemporary microeconomic theory of fertility, particularly with respect to trade-off between child quantity and child quality.

c. The epidemiological transition has brought high death rates to low death rates in relation to better quality of living standard.

d. The education spending leads to better economic growth as spending tends to enhance human development through quality education and training.

e. Primary school enrolment tends to lead the education spending as the number of pupils increase over the year.

In addition, the results of each model exhibit a long-run equilibrium relationship, where the variables play a significant role in our parsimonious models. Finally, our result of unidirectional causality running from primary school enrolment to education spending further exhibits the potential of projecting the need of education backward linkages in the future.

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