Intergenerational Conflict between Young and Old on Public Education Spending: A Revisit

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Abstract – The intergenerational conflict over public education allocation has remained to be a subject of contentious debate. As such, this study aimed to examine the impact of the elderly population and young population growth that could potentially affect educational spending within the context of Malaysia. This study will employ the Autoregressive Distributed Lag (ARDL) method to determine the intergenerational conflict on public education expenditure in Malaysia. The empirical finding from this study demonstrated the significant influence of both the elderly and young population on public education spending. Any increase in the young population was followed by a proportional increase in education expenditure. Meanwhile, the increase in the elderly population does not appear to reduce public education spending. This implied that there is intergenerational conflict which would put pressure on public education spending. The changes in population structure could bring implications as to how the public expenditure will be allocated. The evidence from this paper will further provide useful insight and policy recommendations to policymakers on how to improve education financing in the future.

Keywords *- Public Education Spending, Elderly, Children, Population, Malaysia*

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I. Introduction

According to Jalil and Kamaruddin (2018), the average years of education will have a direct significant impact on the human development index, hence, any improvement in the HDI will require sufficient facilities to be provided for the education system. Hence, it is imperative to have a sufficient allocation to provide food education facilities that would lead to the achievement of a high score of HDI. Another recent study by Maneejuk and Yamaka (2021) advocated that higher education is the key to future growth and sustainability. Meanwhile, Zainudin *et al.* (2021) suggested that investment in human capital will tend to lower household income disparity in Malaysia. Economists had in recent years renewed their interest in the role of human capital in economic growth. Table 1 showed the trend of government allocation in the education sector from 1971 to 2017. As observed from the graph, a clear increasing pattern can be seen from the year 1971 to 2002 with ups and downs in certain years. However, a drop in the allocation can be observed from 2002 to 2005 followed by an increase from 2006 to 2010 and a decline again from 2011 to 2016. But a substantial increase in the allocation can be observed in the subsequent year.

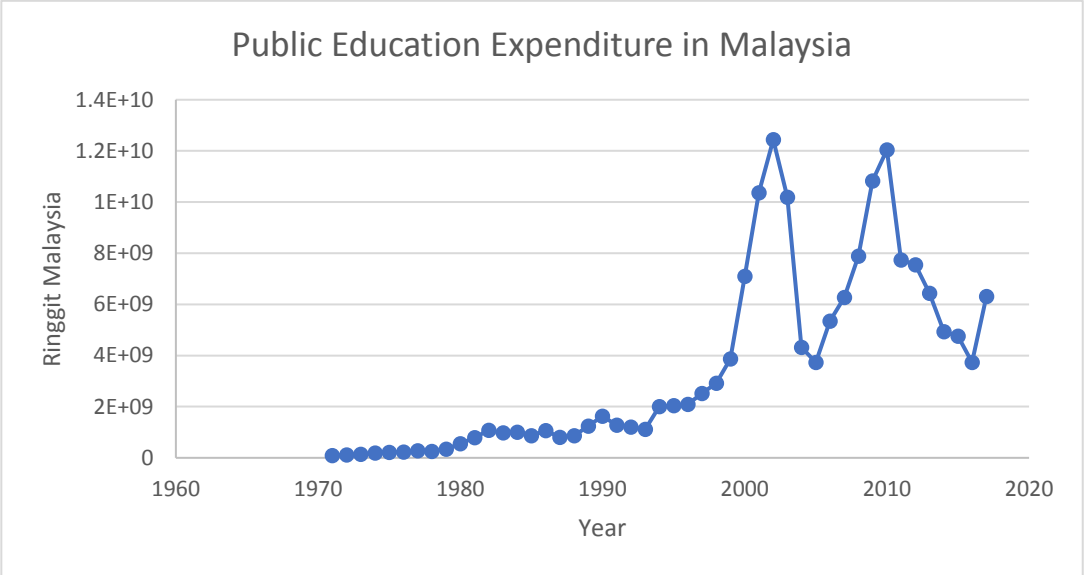

Figure 1. Government Allocation for Education Sector from 1971 to 2017
Source: Economic Planning Unit (2018)

In the past, studies such as Kelley (1976), Echevarria (1995), Epple *et al.* (2012), and Yun and Yusoff (2018), had established the significance of demographic factors in influencing government spending. According to Kelley (1976), failure to account for systematic demographic changes taking place during the process of economic development can yield a biased analysis of factors that brings about changes in the size of the government sector. It was demonstrated that the impact of age population changes on government allocation shifted the demand for government services in sensitive age cohorts' needs. For example, in a situation of rising population growth rates of the young dependent population (age under 15), there will be an increasing demand for youth-related public services such as education.

Echevarria (1995) also maintained that the population's size and age distribution whose requirements the expenditure was intended to meet will significantly affect the public allocation's pattern. It was, as such, the public education expenditure has been considered and assumed as an age-related expenditure. This was confirmed by Auerbach et al. (1989) who make a similar assumption. For instance, the education expenditure will be devoted to the younger population. In such cases, any changes to the age structure and its composition may cause the government to experience different pressures coming from different age groups of the population. On the other hand, it should be noted that the public cost of financing public programs for the elderly was much higher than the public cost of financing the children population. The changing of the age structure and the age composition such as the aging population may thereafter, cause a shift of resources from the young to the old. There will be a reduction of finance in the public program directed to the young to allow the transfer of funding to the programs directed toward the elderly.

It is noteworthy to shed light on the debate on the issue of competition for resources allocation between the elderly population and the young population which has remained unresolved. It was claimed by some that the increases in the elderly population may cause an expansion in demands for the financing of specific public services such as health care and welfare. According to Grob and Wolter (2005), the relative weightings of age-specific groups will experience a fundamental shift in favor of the elderly population when demographic transitions run their course. This simply mean the increasing population aging could cause transfer of resources resulting in a decline of funding for another sector such as education. Meanwhile, the rising of young populations portends a relatively higher allocation of public programs such as education oriented towards this age-specific group. The intergenerational rivalry over public education spending has been highlighted by Epple et al. (2012). The conflict was discovered to occur especially within older households with childless homes, which have lower incentives to support high-quality public educational services. Communities were found to have disparate educational practices as a result of the age stratification and predominance of older voters.

In Malaysia, Yun and Yusoff (2018) demonstrated the effects of demographic factors as one of the factors public education spending. The demographic change as observed in the children population and elderly population growth could result in a substantial effect on the allocation of education spending. This supported the hypothesis

made by Holtz-Eakin et al. (2004) that the demographic shift will probably change public support for government initiatives and endogenously change fiscal policy. A study of the literature on the factors influencing public education spending conducted by Yun (2019) revealed that economic conditions and demographic factors consistently had a substantial role in shaping the patterns of public education spending for many different countries. However, there have been relatively few empirical papers in Malaysia that have examined the existence of intergenerational conflict in the public education spending and the focus on this conflict has been less of a limelight despite its importance. In addition, Jabbar and Selvaratnam (2017) pointed out in their study that policymakers hardly take into account demographic factors, in particular, the demand from the education sector. This showed that the demographic factors have been largely overlooked. Hence, this study will be highly interesting to revisit the implications of the increase in the young population and the aging population in determining whether there would be a proportional change to education spending.

The remainder of the paper is organized as follows: The literature review was presented in Section II. The examination of technique and model specification takes up Sections III and IV. Section VI closes with some policy implications and recommendations after Section V covers the empirical findings.

II. Literature Review

The literature examined has been found to largely discuss the potential conflict between elderly dependents and young dependents in the allocation of education spending. As public education expenditure was considered as an age-specific item, this expenditure will be by its nature to be aimed at satisfying the needs of the specific age cohorts. The increase in the elderly population may potentially draw some of the expenditures to be devoted to other social welfare programs. As suggested by Grob and Wolter (2005), there may be a conflict between the young and old regarding resource allocation. Foot (1982) similarly posited that the aging population may be expected to exert upward pressures on government expenditure as there was an increased contribution to the relatively more costly elderly programs.

In a different study, Chakrabarti and Joglekar (2006) found no reason for the elderly to support political parties that promoted increased public spending on the education sector. The empirical evidence from their panel regression analysis on 15 major Indian states provided a new explanation of the significant negative implications associated between the increasing elderly population and public education expenditure. Similarly, Poterba (1996) had earlier also shown a significant negative impact of the increasing elderly dependents towards the public education allocation in the United States. Meanwhile, Borge and Rattsø (1995) and Borge and Rattsø (2008) also provided robust support for negative findings found with the elderly population on education spending in Norway and Switzerland respectively. Their study's results showed that the rapid shift in the population's age structure from young to old resulted in higher education spending per student but fewer health services provided for the elderly. Borge and Rattsø (2008) extended their empirical research on the competition between young and old for public welfare services. They added that the generational disparity between the young and the old will probably have an impact on the availability of social welfare services. In other words, it was believed that the public education budget was at risk due to the growing proportion of elderly people. The panel data analysis performed on Denmark for a period between 1989 to 1996 showed that the share of elderly does cause a decline in educational spending. However, a rising share of the young population did not pose any similar threat to the elderly care allocation.

Other studies such as Goldin and Katz (1996) presented interesting empirical evidence which illustrated a positive association between the increasing number of elderly voters and education allocation. This implied that the increasing elderly population had led to the expansion of more high schools. Similarly to this, Richman and Stagner (1986) suggested that any increase in the number of dependent elderly people could lead to increased efforts in education for the younger population. By doing so, the pool of resources will be raised and the quality of services received by society as a whole will also improve. They also reported that variations in the number of children attending school will not affect education spending proportionally. This implied that a larger school-age population in states may receive lower per-student spending, and vice-versa. Meanwhile, Kurban et al. (2015) suggested that the elderly population negatively influences public education expenditure. Kurban et al. (2015) had previously shown through a re-estimation of the U.S. population that any increase in the proportion of the elderly age people would led to an increase in per-student education spending instead of an anticipated drop. The unfavorable results also introduced a fresh argument for the hypothesis that aging populations may have slowed the rise in per-pupil spending. Such an argument raised a new set of questions regarding the effect of an aging population on government allocation to the education sector. The mechanics of the shifting age distribution, according to Harris et al. (2001), were such that any increase in per-pupil education expenditure, as opposed to a

decline, would have been the outcome. Despite the elderly population's growing political influence, it was insufficient to exert downward pressure on the whole public education budget.

Meanwhile, Stromberg (1998) suggested altruism as the underlying reason for the favorable correlation found between the senior population and public education expenditure. Altruism reduced the inter-generational conflict and solved the problem of competition for resources between the two dependent groups of the elderly and children population. According to Duncombe et al. (2003), grandparents were more likely to favor education spending compared to other elderly. In this case, the cohort size's cost effect may include economies of scale that have an impact on cost-effectiveness. The certain paper developed an overlapping generation (OLG) framework to analyze how aging affected school spending. An example of such analyses includes Holtz-Eakin et al. (2004) and Gradstein and Kganovich (2004).

Holtz-Eakin et al. (2004) suggested that aging has a negative output effect through lower school expenditure to highlight the effect of an aging population on educational spending. In general, if the elderly opposed funding for programs from which they had no direct benefit, it raised the potential that the level of public investment for social infrastructure that increased productivity may have been undermined by the rise in the senior population. This in turn may even harm the long-run economic welfare. Meanwhile, Gradstein and Kaganovich (2004) developed an OLG model to demonstrate that the aging population had in a way produce a positive effect on public education. They suggested that working adults upon retirement will likely support public education to obtain higher returns on their retirement savings. The shifting of public spending's composition could come at the expense of lower spending on the young, such as on education. However, Gradstein and Kaganovich (2004) objected to this ideology and argued that the altruistic concerns that the elderly had for the young may have brought a different finding. In other words, the considerations of the elderly in seeing education spending as an important tool to improve productivity and hence obtain a higher return on retirement savings offered a relatively new explanation. With the contending results found in this literature, the intergenerational conflict between young and old regarding public expenditure becomes an interesting issue.

III. Theoretical Model

The demographic effect on public expenditure allocation has been examined by several past researchers such as Kelley (1976), Poterba (1997), Okafor and Eiya (2011), Bischoff and Prasetyia (2015). A disaggregate study of the population distribution being broken down into children population and elderly population cohorts was then explored in a number of past studies. The aging population's predicted negative impact on public education spending was discovered by Poterba (1997). According to Poterba (1997), the senior population did not favor education spending, which led to a bad effect. The increase in the elderly population may cause a reduction in the public financing on programs directed toward the young being transferred to these programs directed towards the elderly. Meanwhile, Chatterji, Mohan, and Dastidar (2014) claimed that the young population negatively affects the public education allocation. They suggested that child population growth may lead to a decline in education expenditure allocation.

Bischoff and Prasetyia (2015) contested the idea that there is a negative link between spending on public education and the proportion of children in society. Their findings corroborated that a positive relationship was found instead between the children population and public education expenditure. An increase in the children population would likely increase the demand for education. Therefore, a need to increase public education expenditure would arise. The detrimental effects of the aging population on public education spending were the topic of a dispute by Kurban, Gallagher, and Persky (2015). Their research offered a counterargument in favor of a positive correlation between public education spending and the older population. Kelley (1976) too demonstrated that the elderly cohorts exerted a relatively strong positive effect on public expenditure. Many yet controversial studies on the relationship found would be worth investigating within Malaysia context. The opposing and varied findings in this area highlighted the importance to revisit the intergenerational conflict on the allocation of education spending.

IV. Research Methodology

This study employs annual time series data from 1971 to 2017. The primary objective of this model was to shed light on the conventional thought of the potential competition between young and old populations for public allocation. Hence, the elderly population and young population were introduced as independent variables. In the developed model, the real GDP per capita (GDPCAP), tax revenue (TAX), children's population (POP14), and elderly population (POP65) were included in the estimation of this model. To reduce the heteroscedasticity issue, the series was converted into logarithmic form. Table 1 shows a description of each variable.

Table 1: Variables Description and Source

Variable	Description of Variable	Measurement of Variable	Source	Expected Finding
Public Education Expenditure (EDU)	Public education expenditure is defined as part of government development expenditures in the education sector.	Ratio to GDP	Economic Planning Unit	Dependent Variable
Real Gross Domestic Product Per Capita (GDPCAP)	Real gross domestic product divided by midyear population	Real GDP Per Capita (Constant LCU)	World Bank	Positive
Tax Revenue (TAX)	Mandatory payments are made to the federal government for public purposes.	Ratio to GDP	Economic Planning Unit	Positive
Population ages 0 – 14 (POP14)	Total residents of age below 15 years old.	Growth Rate	Economic Planning Unit	Positive
Population ages ≥ 65 (POP65)	Total residents of age above 64 years old.	Growth Rate	Economic Planning Unit	Negative

The underlying theories proposed by Chatterji, Mohan, and Dastidar (2014), Bischoff and Prasetyia (2015), and Kurban, Gallagher, and Persky serve as the foundation for the model used in this study. The logarithm equation for this study is set up as follows:

$$\ln EDU_t = \beta_1 + \beta_2 \ln GDPCAP_t + \beta_3 \ln TAX_t + \beta_4 \ln POP14_t + \beta_5 \ln POP65_t + e_t \quad (1)$$

The study will employ the Autoregressive Distributed Lag (ARDL) approach which is highly suited to examine the relationship in the long run and short run for a small sample size of data. In addition, ARDL bound testing approach can be applied when the regressors are of mixed order I(0) and I(1). The ARDL model representation for bound testing modeling framework of the public education expenditure and its determinants relationship was constructed as follows:

$$\begin{aligned}\Delta \ln EDU_t = \delta_2 &+ \sum_{i=0}^{l} \alpha_{11} \Delta \ln EDU_{t-i} + \sum_{i=0}^{h_1} \alpha_{12} \Delta \ln GDPCAP_{t-i} + \sum_{i=0}^{h_2} \alpha_{13} \Delta \ln TAX_{t-i} + \sum_{i=0}^{h_3} \alpha_{14} \Delta \ln POP14_{t-i} \\ &+ \sum_{i=0}^{h_4} \alpha_{15} \Delta \ln POP65_{t-i} + \gamma_{11} \ln EDU_{t-1} + \gamma_{12} \ln GDPCAP_{t-1} + \gamma_{13} \ln TAX_{t-1} \\ &+ \gamma_{14} \ln POP14_{t-1} + \gamma_{15} \ln POP65_{t-1} + e_t\end{aligned}$$

(2)

V. Empirical Results and Findings

The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) were conducted to first ensure that none of the variables are integrated of order two I(2). The unit root tests revealed that the variables are of mixed order of integration, I(0) and I(1). Hence, the ARDL approach can be applied in this study. Table 1 and Table 2 showed the unit root tests.

Table 1: Augmented Dickey-Fuller (ADF) Result

Variable	Level		First Difference	
	Intercept	Trend and Intercept	Intercept	Trend and Intercept
LNEDU	-2.575597	-2.976264	-4.748463*	-4.754423*
LNGDPCAP	-1.499907	-2.531534	-5.874883*	-5.920573*
LNTAX	-3.498864**	-2.454482	-5.677973*	-6.394300*
LNPOP14	-2.461844	-6.829161*	-5.124210*	-5.393271*
LNPOP65	-2.453562	-5.421704*	-10.51076*	-10.38790*

*Significant at 1% significance level, **Significant at 5% significance level

Table 2: Phillips Perron (PP) Test Result

Variable	Level		First Difference	
	Intercept	Trend and Intercept	Intercept	Trend and Intercept
LNEDU	-2.409762	-2.252747	-4.373514*	-4.308992*
LNGDPCAP	-1.456925	-2.538837	-5.840723*	-5.919681*
LNTAX	-3.498864**	-2.457196	-5.681341*	-6.394615*
LNPOP14	-5.482116*	-6.867796*	-23.65136*	-23.39756*
LNPOP65	-4.190270*	-5.430290*	-10.51076*	-10.38790*

*Significant at 1% significance level, **Significant at 5% significance level

The Akaike Information Criteria (AIC) was used to select the optimal lag length of the variables (k) in the subsequent stage. The appropriate lag length selection was necessary to whiten the residuals (Lee et al, 2011). AIC tends to select the maximum relevant lag length (Marashdeh, 2005). The selected model of ARDL should correspond to the smallest AIC value. Figure 2 showed the best 20 models based on the Akaike Information Criterion (AIC) selection. As illustrated in Figure 3, the optimal lag length selection by using Akaike Information Criterion (AIC) selected the ARDL (1,3,2,4,4) model as the most appropriate model. Table 3 showed the estimation of the ARDL bound testing cointegration results for the model estimated.

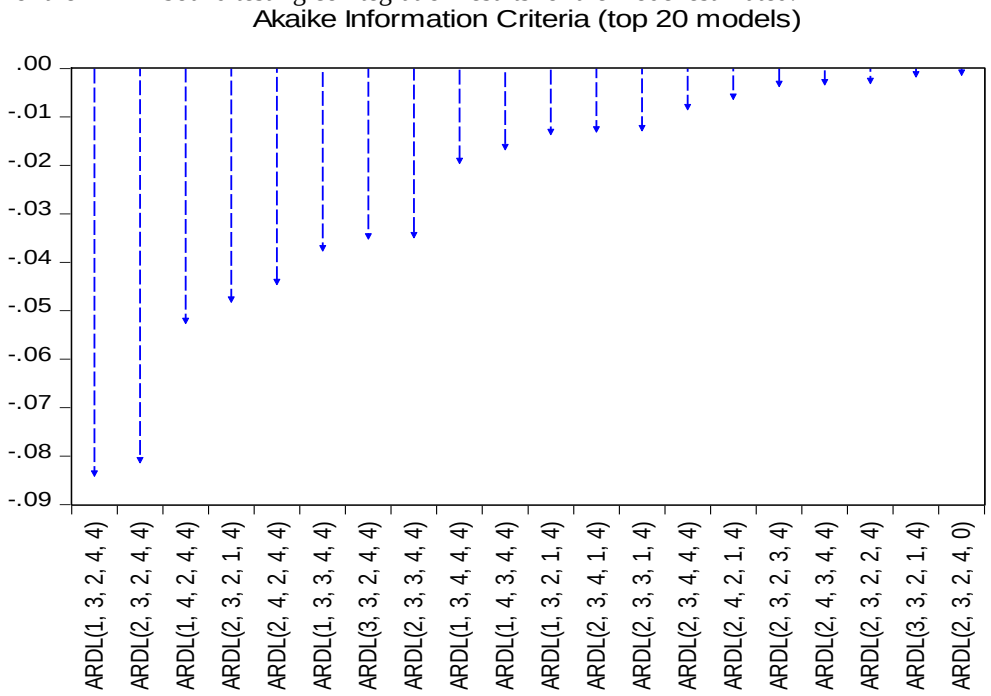

Figure 2. Top 20 ARDL models based on AIC

Table 3: ARDL Bound Testing Cointegration

MODEL (1,3,2,4,4)				
Test Statistic	Value	Significance Level	Bound Critical Values	
			I(0)	I(0)
F-Statistic	4.720575**	10%	2.402	3.345
		5%	2.850	3.905
		1%	3.892	5.173

**Significant at 5% significance level, *Significant at 1% significance level.

The two sets of asymptotic critical value bounds were tabulated by Narayan (2004). The upper critical value assumes all the variables are I(1), while the low critical value assumes that all variables are I(0). The null hypothesis of no cointegration is rejected based on the estimated F-statistics value if it is greater than the upper critical value. It was evident from Table 3 that the F-statistic was found relatively greater than the upper bound

critical value at a 5% significance level. Hence, rejecting the null hypothesis of no cointegration and establishing a long-run relationship.

Table 4: Long Run Coefficients Estimates of ARDL Model (1,3,2,4,4)

Dependent Variable: LNEDU			
Independent Variables	Coefficient	T-Statistic	Probability
LNGDPCAP	3.251063**	2.139296	0.0428
LNTAX	-1.528672	-1.112577	0.2769
LNPOP14	0.293226	0.913682	0.3700
LNPOP65	-1.617273	-1.509095	0.1443
C	-25.97607**	-2.510308	0.0192

**Significant at 5% significance level, *Significant at 1% significance level

ARDL long run model (1,3,2,4,4) can be formed in equation (3) providing new findings on the past arguments on the potential competition between the young dependents and elderly dependents for budgetary allocation. Although a number of past literature had pointed out that the increasing elderly population may lead to a decline of the public allocation for the education sector. However, the insignificant finding in this result showed that the potential competition for resources did not exhibit a significant effect on Malaysia's education spending. Meanwhile, the increase in the children population is likely to lead to a hike in the public education expenditure allocation. On another note, the estimated long-run coefficients demonstrated a positive relationship between real GDP and public education spending. Every single percent increase in the real GDP per capita may lead to a 3.25% increase in government education spending. However, the tax revenue was not significant in explaining the relationship with public education expenditure.

$$LNEDU_t = 3.251063LNGDPCAP_t - 1.528672LNTAX_t + 0.293226LNPOP14_t - 1.617273LNPOP65_t - 25.97607 \quad (3)$$

Table 5: Error Correction Model (ECM)

Dependent Variable: D(LNEDU) D(LNEDU) = f(D(LNGDPCAP), D(LNTAX), D(LNPOP14), D(LNPOP65))			
Independent Variables	Coefficient	T-Statistic	Probability
ECT(-1)	-0.359332*	-5.850143	0.0000
ΔLNGDPCAP	-1.764609**	-2.284135	0.0315
ΔLNGDPCAP(-1)	-3.922834**	-3.650152	0.0013
ΔLNGDPCAP(-2)	-2.586758**	-2.511577	0.0192
ΔLNTAX	1.202923**	2.255347	0.0335

ΔLNTAX(-1)	1.973685	3.644367	0.0013
ΔLNPOP14	0.054297	1.276988	0.2138
ΔLNPOP14(-1)	0.029668	0.433012	0.6689
ΔLNPOP14(-2)	0.081895	1.071068	0.2948
ΔLNPOP14(-3)	0.158983**	2.587205	0.0162
ΔLNPOP65	-0.051597	-0.485213	0.6319
ΔLNPOP65(-1)	0.606452*	4.586935	0.0001
ΔLNPOP65(-2)	0.325919*	2.897855	0.0079
ΔLNPOP65(-3)	0.266495**	2.766935	0.0107

**Significant at 5% significance level, *Significant at 1% significance level

The short-run elasticity coefficients as estimated by the error correction model (ECM) highlighted that short-run relationship existed. Estimation of the short-run analysis revealed a significant negative error correction term (ECT) coefficient. The highly significant and negative value of the error correction term (ECT) illustrated a high speed of adjustment to the long-run equilibrium after a shock. The estimated error correction term (ECT) of -0.3593323 implied that 36 of disequilibrium is adjusted after the past year's shock. The lag-three short-run coefficient of the children population showed that a 1 percent increase in the children population leads to a 0.16 percent increase in the public education expenditure. This finding was consistent with Bischoff and Prasetyia (2015), and Grob and Wolter (2005). In addition, the short-run coefficient of the elderly population was highly significant. Lag-one, lag-two, and lag-three of the elderly population were also found positively significant at a 1% significance level and 5% significance level respectively. The estimated short-run coefficients indicated that the elderly population positively affects public education expenditure in the short run. The increase in the elderly population leads to increase in government allocation to education sector. This result was contradicted to conventional thoughts of the potential competition between young dependents and elderly dependents. Instead, the positive result lends support to the new idea of altruism which reduced the intergenerational conflict for allocation as suggested by Stromberg (1998).

Meanwhile, the short-run estimation also showed that real GDP per capita and tax revenue had a significant short-run effect on government education spending. The short-run coefficients of lag-two real GDP per capita reported a negative result that implied that a 1 percent increase in GDP per capita will be followed by a 2.59% decline in public education expenditure. The negative finding provided robust support to the Keynesian Counter Cyclical theory which argued that government spending should respond to economic conditions accordingly. On the other hand, the tax revenue was positively significant in the short run. Thus, implying that the increase in tax revenue leads to more public education allocation to education. Thus, suggesting that tax revenue played an important role in financing the education sector during the short run. Hence, any changes to the tax revenue will imply changes to the public expenditure allocated to education in the short run. The estimated ARDL model was then tested for its specification and goodness of fit by conducting several diagnostic testing such as heteroscedasticity test, autocorrelation test, normality test, and stability test respectively. The following Table 6 illustrated the model specification tests conducted to ascertain that the model was relatively stable and free from any misspecification problems.

Table 6: Diagnostic Tests

Breusch-Pagan-Godfrey Heteroscedasticity Test			
F-statistic	0.395053	Prob. F (18,24)	0.9763
Obs*R-squared	9.828396	Prob. Chi-Square (18)	0.9374
Autoregressive Conditional Heteroscedasticity (ARCH) Test			
F-statistic	1.864347	Prob. F (1,40)	0.1798
Obs*R-squared	1.870388	Prob. Chi-Square (1)	0.1714
Breusch-Godfrey Serial Correlation LM Test			
F-statistic	0.992695	Prob. F (2,22)	0.3866
Obs*R-squared	3.559323	Prob. Chi-Square (2)	0.1687
Normality Test			
Jarque-Bera	0.363351	Probability	0.833872

VI. Discussion and Conclusion

The examination of the effect of the children population and elderly population on public education spending was performed to uncover the potential conflict between the young and old for higher public allocations. Although, a long-run relationship was not found. However, the significant short-run elasticity coefficients demonstrated that public education expenditure was affected by the increasing trend in the children and elderly population in the short run. The short-run elasticity coefficient of lagged children age cohort indicated a positive significant impact in the short run. Public education spending increase as the children population rises. Meanwhile, the increasing trend of the elderly population does not appear to shrink the public education expenditure contrary to the prior expectation. Instead, the increase in the elderly population leads to increases in public education allocation. This finding was consistent with positive findings as presented by Kelley (1976), and Kurban, Gallagher, and Persky (2015).

The research results highlighted a flaw in the existing education policymakers who might have failed to consider the population of youngsters while formulating their decisions. This could perhaps explain the insignificant findings found with the children population in the long run. Contrary to the belief that the government would likely respond to the demands of society especially the age-specific recipients of education, an insignificant result was found in the long run. Isaac (2009) has previously emphasized that investing in education throughout childhood is thought of as a human capital investment that provides considerable returns on investment in adulthood, for both individuals themselves and society. Meanwhile, the United Nations (2003) underlined earlier researchers that had shown how effective primary education was at lowering inequality and poverty. Early childhood education investments helped improve the management of natural resources and increase future productivity. Therefore, this finding's policy implications suggested that the government should be more sensitive to the needs and demands of the growing share of young dependents.

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