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Earmarking Tax for Indonesia's Economic Growth through the Education and Health Sector in the Long and Short Term Period

Faishal Fadli (Corresponding author)

PhD student, School of Economics

Huazhong University of Science and Technology, Wuhan, China

Junior Lecturer, School of Economics and Business

Brawijaya University, Malang Indonesia

Tel: 86-130-1647-9315 E-mail: faishalfadli@ub.ac.id

Ouyang Hongbing

Professor; School of Economics

Huazhong University of Science and Technology, Wuhan, China

Tel: +8613995573589 E-mail: ouyanghb@126.com

Yaqing Liu

Associate Professor; School Medicine and Health Management

Huazhong University of Science and Technology, Wuhan, China

E-mail: anny375@126.com

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Abstract

The earmarking tax policy is expected to provide quality improvements as a result of the certainty of fund allocation. There are two examples of the government undertaking an earmarking tax approach in Indonesia, where 20% of funds are allocated for education, and 5% of funds are allocated for health. This measure of quality improvement can be seen from the improvement of the Human Development Index (HDI), Expected Years of Schooling (EYS), and Life Expectancy at Birth (LEB) that in turn impacts increasing economic growth (EG) during the period of earmarking tax policy in Indonesia. This research uses Path Analysis and Error Correction Model. Earmarking tax cause a negative indirect effect on EG through the education and health sector. However, in the long term, it has a positive effect on both sectors, while EYS and LEB has a negative effect. In the short term, only the health sector can increase EG.

Keywords: Earmarking tax, Human Development Index, Expected Years of Schooling, Life Expectancy at Birth, Economic Growth

1. Introduction

The budget allocation for the education and health sector is one of the earmarking tax policies that applied in Indonesia. 20% is allocated for the education sector, and 5% is allocated for the health sector, with all funds sourced from the central government budget. The basis of the application of the policy is Article 49 of Law Number 20 of 2003 Article 1 for the education sector and Law Number 9 of 2009 for the health sector. The law was created to provide a central government legal certainty. With the existence of such legal certainty, the education sector and the health sector can obtain certainty in the budget allocation of funds from the central government. Although the certainty is limited by tax compliance and tax collection, 20% of the funds allocated to the education sector and 5% of the funds allocated to the health sector will still be available regardless of the income from tax or non-tax collected.

The education and health sectors has become the primary concern of the Indonesian government as these two sectors have an essential role in economic growth (EG). Both sectors are significant contributors to human capital (Neamtu, 2015; Ogundari & Awokuse, 2018). The general agreement amongst economists is that human capital is an essential component of a country's different growth rates (Hanushek, 2013).

The Human Development Index (HDI) can be used as a benchmark for the development of human capital. HDI is a comparison of life expectancy, literacy, education and living standards for all countries throughout the world (Albarr ́an, 2018; Anand & Sen, 2000). Based on the United Nations Development Programme (UNDP), HDI is considered a central indicator of the Human Development (HD) paradigm. The HDI is also used to classify whether a country is a developed country, a developing country, or an underdeveloped country and measures the influence of economic policy on quality of life (Davies & Quinlivan, 2006).

Human Development Report included Indonesia in the category of Medium Human Development. In the implementation period of earmarking tax policy for the education sector (2003), HDI Indonesia marked 0.617, an increase of 0.005 from the previous period of 0.612 (2002). In the implementation period of earmarking tax policy for the health sector (2009) HDI Indonesia was 0.658. Increased 0.011 from the previous period of 0.647 (2008).

The education and health sector based on HDI also showed the same growth. Life Expectancy at Birth (LEB) as a representative of the health sector was 67.964 (2009) increased 0.189 from the previous year of 67.775 (2009) while Expected Years of Schooling (EYS) as a representative of the education sector marked 9.6 (2003), an increase of 0.240 from the previous year of 9.359 (2002).

Comparable to the growth of HDI, Indonesia's economy has also experienced growth. Indonesia's economic growth in 2003 was 4.78%, an increase of 0.28% compared to 4.5% in 2002. In 2009, Indonesia's economic growth amounted to 4.63%, having decreased by 1.38% when compared to the figure in 2008 of 6.01% (Indonesian Statistic Bureau).

Based on the data above, it can be seen that in the period of implementation of the earmarking tax policy, the education and health sectors experienced growth. Besides, economic growth has also increased. However, for more details, a more in-depth analysis is needed.

By using path analysis, this research aims to determine the direct or indirect effect of the intervening variable, in this case, of HDI while the ECM method is used to determine the long-term and short-term relationships between these variables.

The organisation of this paper is as follows: We start with a literature review and discuss earmarking tax policy. Secondly, order identifies the significant link between earmarking tax, HDI, and economic growth. Thirdly, we describe the methodology and the data, and fourthly, we discuss the main result and its interpretations. Finally, we assess the research in the conclusion.

2. Literature Review

2.1 Earmarking Tax Policy

Earmarking is a routine with regards to assigning or devoting particular revenue to the financing of particular public service. An earmarked approach is to design a policy for specific income sources of funding for public service activities that are additionally determined (Buchanan, 1963). In a more subtle sense, earmarking tax is money deliberately separated from income as a whole and can only be used for special government programs, and is used entirely for the program (Clague & Gordon, 1940). Earmarking is intended to gradually and continuously improve the quality of service, and at the same time, create good governance and clean government (Deran, 1965; Eklund, 1972). This policy includes typically depositing tax or other revenues into an exceptional record from which the legislature appropriates money for the assigned reason. Earmarking should be possible either in the constitution or by resolution (Michael, 2015).

Earmarking isolates the budgeting procedure (Buchanan, 1963). Instead of essentially casting a yes/no ballot on a whole spending plan, earmarking makes singular votes on specific public goods. By giving the public a voice in the spending choice, earmarking helps counter the conceivable propensities of governments to develop without check, in this way expanding productivity (Bhatt, Rork, & Walker, 2011).

2.2 Types of Earmarking Tax Policy

Some experts present different opinions about the types of earmarking tax. According to one stud, earmarking tax can be divided into two forms (Bird & Jun, 2005):

1. Substantive earmarking tax is the practice of strongly linking the source of funds to their expenses. If the funds increase, then the expenditure will also increase proportionally to the increase;
2. Symbolic earmarking tax is the practice of linking funding sources with expenditure with loose rules so that the proportion of funds spent on taxed expenditure items earmarking depends on policymakers (flexible).

There are 8 (eight) categories of Earmarking Tax, as follows:

Table 1. Earmarking Tax Categories

Varieties of Earmarking	Expenditure	Linkage	Rationale	Example
A	Specific	Tight	Benefit	Public enterprise
B	Specific	Loose	Benefit	Gasoline tax and road finance
C	Broad	Tight	Benefit	Social security
D	Broad	Loose	Benefit	Tobacco tax and health finance
E	Specific	Tight	None	Environmental taxes and clean-up programs
F	Specific	Loose	None	Payroll tax and health finance
G	Broad	Tight	None	Revenue sharing to localities
H	Broad	Loose	None	Lottery revenues to health

Source: (Bird & Jun, 2005)

Another opinion, earmarking tax is divided into two, namely full earmarking and partial earmarking (Michael, 2015). Full earmarking means that earmarking tax is the only source of financing for programs that is the government's priority, while partial earmarking means that earmarking tax is not the only financing for the program; the government can look for other funding sources to finance the government program.

Based on the types and categories described above, the earmarking tax in this research is the substantive and partial type of earmarking tax. If categorised, category C is included in this earmarking tax.

2.3 The Significant Link between Earmarking Tax Policy, HDI, and Economic Growth

Gross Domestic Product (GDP) comes from the sum of consumption, investment, government expenditure, and the difference between export and import (Y=C+I+G+(X-M)) (Arsyad, 2014; Keynes, 1937; Kuznets, 1966). The higher the value of these factors, the higher the value of GDP. Earmarking tax policy can change the value of government expenditure. However, the earmarking tax policy only allocates the amount of budget by the amount applied in the constitution (Dye, 1992). The aim of implementing the earmarking tax policy is to grow the education and health sectors (Bhatt et al., 2011). While education and health sectors are related to human resources.

There is no doubt about the significance of human resources in improving the material prosperity of society and significant developments of the economy. Three components can divide human capital: health, education, and experience/training. Its stock could increase through better education, higher health status, and new learning (Becker, 1962; Walker, 1986). Perhaps because new learning, experience, or training cannot be estimated effectively, it is the status of health and education that are utilised to measure human capital in past examinations on the connection between human capital and economic growth (Ogundari & Awokuse, 2018). As an essential means of human capital, education and health enhance general welfare and encourages development.

The positive externalities related to human capital accumulation and the contrast among social and private education frequently cannot be solved with an “invisible hand” as they require government intervention. Several studies have proposed that government spending on education and health improve economic growth (Dissou, Didic, & Yakautsava, 2016; Fan, Yu, & Jitsuchon, 2008; Glomm & Ravikumar, 1997, 1998; Sequeira & Martins, 2008; Widodo et al., 1999).

While the advantages of government spending on education and health are broadly settled upon, there is no agreement on the fiscal instrument that is most appropriate for financing this spending. That is because in assessing financed increments in government spending on education and health influence people's utilisation sparing choices. Additionally, choices are identified with the measure of time given to the amassing of human capital. For instance, labour income tax may give a disincentive to people to collect human capital because the tax will reduce future net income (Annabi, Harvey, & Lan, 2011; Blankenau, Simpson, Blankenau, & Simpson, 2004; Del Rey & Lopez-Garcia, 2013; Verbic, Majcen, & Cok, 2009; Yeldan, 2000).

There are some recommendations from those studies regarding the most efficient fiscal instrument for increasing growth and welfare through higher public spending on education. There is a study which recommends a decrease in the personal income tax (Verbic et al., 2009). Some studies suggest an increase in the consumption tax (Blankenau et al., 2004; Yeldan, 2000). Another proposes a reallocation of public spending without changing the tax structure at all, and this is what the earmarking tax policy does (Annabi et al., 2011).

3. Methodology and Data

3.1 Path Analysis

Path analysis is a statistical analysis technique developed from multiple regression analysis (Wright, 1934). Below is a path analysis model in this research.

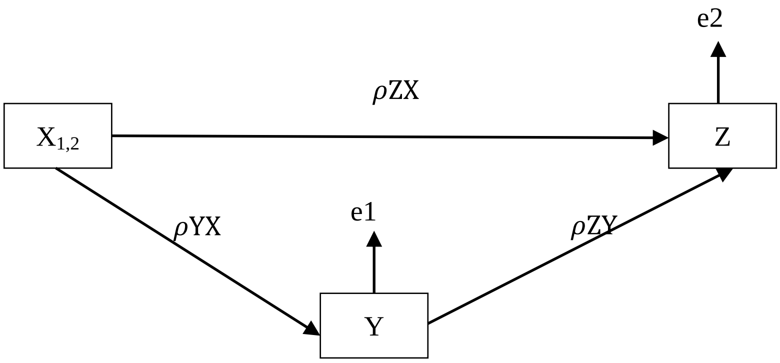

Figure 1. Path Analysis

The sub-structural equations 1 are as follows:

$$Y = \rho YX + \rho ye1 \quad (1)$$

The sub-structural equations 2 are as follows:

$$Z = \rho ZX + \rho ZY + \rho ze2 \quad (2)$$

In the model above, the exogenous variable (X) in the model has a direct or indirect impact (via Y) on Z (two dependent or 'endogenous' variables). In most real models, factors external to the model (including measurement errors) influence endogenous variables. The influence of the external variable is denoted by "e.", where X_1 is the earmarking tax variable that uses the amount of the budget for education (EDUC), and X_2 is the earmarking tax variable that uses the amount of the budget for health (HEALTH) as a variable proxy. Y is the variable Human Development Index (HDI). Z is a variable of economic growth.

3.2 Error Correction Model

The Error Correction Model method can be used to investigate whether there is a long-term or short-term relationship of variable HDI in the education and health sectors with economic growth (Hashimzade, Thornton, & Davidson, 2013). The HDI variable is replaced with the variable of Expected Years of Schooling (EYS) to represent the education sector and Life Expectancy at Birth (LEB) to represent the health sector. The two substitute variables are components in the calculation of HDI.

The state of integration in the ECM model is seen in its residual stationarity. ECM requires that all variables are not stationary at the level. However, the residual / error (e) of the regression equation for those variables is stationary at the level.

ECM Implementation Stages:

1. Check that all variables are stationary. Stationary data is sequential time data that does not contain unit roots (Rothenberg & Stock, 1997). If the mean, variance and covariance of the data are constant over time for non-stationary data, then the ECM method cannot be used (Shively & Kohn, 1997).
2. Estimate long-term equations. The long-term equation on ECM is the usual regression equation with variables y and x, which are not stationary at the level. Error (e) in this

long-term regression equation determines whether or not there is cointegration in the y and x variables. If e is stationary at the level, y and x are mutually integrated. This long-term equation is often referred to as a balanced equation and can only be used if the residual / error (e) is stationary at the level.

Long-term equation:

$$\text{Education Sector: } EG_t = \beta_0 + \beta_1 EYS_t + \beta_2 EDUC_t + e_t \quad (5)$$

$$\text{Health Sector: } EG_t = \beta_0 + \beta_1 LEB_t + \beta_2 HEALTH_t + e_t \quad (6)$$

Residual:

$$\text{Education Sector: } e_t = EG_t - \beta_0 - \beta_1 EYS_t - \beta_2 EDUC_t \quad (7)$$

$$\text{Health Sector: } e_t = EG_t - \beta_0 - \beta_1 LEB_t - \beta_2 HEALTH_t \quad (8)$$

EG is Economic Growth. EYS (Expected Years of Schooling) are the number of years during which a 2-year-old child can expect to spend in schooling, based on the school enrolment rates at a given date. EDUC is the amount of the budget for education. LEB (Life Expectancy at Birth) is defined as how long, on average, a newborn can expect to live, if current death rates do not change. HEALTH is the amount of the budget allocated for health.

3. Cointegration test. Check stationarity of the residual / error (e); if stationarity is at the level, the ECM is continued.
4. Estimate short-term equations. Value e (which is stationary in the long-term equation) is not used only to determine whether there is cointegration or not. Value e is also used as one of the variables in short-term equations. Short-term equations also use the same variables as the variables in the long-term equation. However, the variables are stationary, all in the same order.

Short-term equation:

$$\text{Education Sector: } \Delta EG_t = \beta_0 + \beta_1 \Delta EYS_t + \beta_2 \Delta EDUC_t + \gamma e_{t-1} + v_t \quad (9)$$

$$\text{Health Sector:} \Delta EG_t = \beta_0 + \beta_1 \Delta LEB_t + \beta_2 \Delta HEALTH_t + \gamma e_{t-1} + v_t \quad (10)$$

Where ΔEG_t, ΔEYS_t, ΔLEB_t, $\Delta EDUC_t$, and $\Delta HEALTH_t$ are a variable EG, EY, LEB, EDUC, and HEALTH are differentiated in the first order. Also, e_{t-1} is a long-term residual or error equation in period t-1.v_t is an error of short-term equations. The coefficient γ in the above equation (often referred to as the speed of adjustment) is the speed of the residual / error (e) in the previous period to correct the change in variable y to the balance in the next period. The coefficient γ must be significant and negative (Baltagi, Badi H., 2010).

3.3 Data

The data used in this research is secondary data. The type of data used is time-series data. The data is sourced from the budget allocation issued by the Indonesian government for the education and health sector, The Indonesian Human Development Index, Indonesian population life expectancy at birth, expected Indonesian years of schooling, and Indonesia's economic growth. All the variables are transformed into a log to follow the normal distribution. The period of data collection was linked to the implementation of earmarking tax policy. For the education sector the implementation started in 2003-2017(60 number of observations), and for the health sector the implementation started in 2009-2017(36 number of observations). Data was changed from annual data to quarterly data using the interpolation method. The interpolation method used is the Quadratic Match Sum. The result of interpolation with this method raises proportional differences in each quarter. However, if the quarterly data is added up, the result will be the same as the original data. The Quadratic Match Sum will not change the nature of the shape of the data and will assume a linear data alignment exists. Data is interpolated to increase the number n. This research obtained data from the Ministry of Finance, the Indonesian Statistical Center, and the United Nations Development Program.

4. Result and Discussion

Because we use parametric statistics, the first step is to do a normal test distribution (Gujarati, 2004). The result of calculations using the Jarque-Bera test is as follows.

Table 2. Normality Data Test

	Jarque-Bera	Probability
Education Sector		
EDUC	4,692483	0,095728
HDI	2,807893	0,245626
EG	4,749375	0,093044
Health Sector		
HEALTH	3,711194	0,156360
HDI	3,075663	0,214846
EG	3,842006	0,146460

All these variables are normally distributed and can be continued using path analysis concluded in these result. The path analysis can see the effect simultaneously or in combination and look at the influence partially or individually to determine the path coefficient value.

4.1 Path Analysis

In the first model regression output in the coefficient table, it is known that a p-value of 0.000 is less than 0.05. This result concludes that in the first model regression, the education and health variables have a significant effect on HDI variables.

Table 3. Sub-structural equations 1 output

Variable	R Squared	p-value	Standardized Coefficients Beta	$\varepsilon 1$ $(\sqrt{(1-R^2})$
Education	0,981	0,000	0,990	0,137
Health	0,987	0,000	0,994	0,114

Table 4. Sub-structural equations 2 output

Sector	Variable	R Squared	p-value	Standardized Coefficients Beta	$\varepsilon 2\ (\sqrt{(1-R^2)}$
Education	Educ	0,273	0,000	3,724	0,852
	HDI		0,000	-3,619	
Health	Health	0,304	0,036	1,705	0,834
	HDI		0,010	-2,126	

Based on the regression model output II in the table section coefficient, note that the p-value of all variables is smaller than 0.05. These results conclude that the Education, Health and HDI variables have a significant effect on EG. Thus, the model path diagram is obtained as follows:

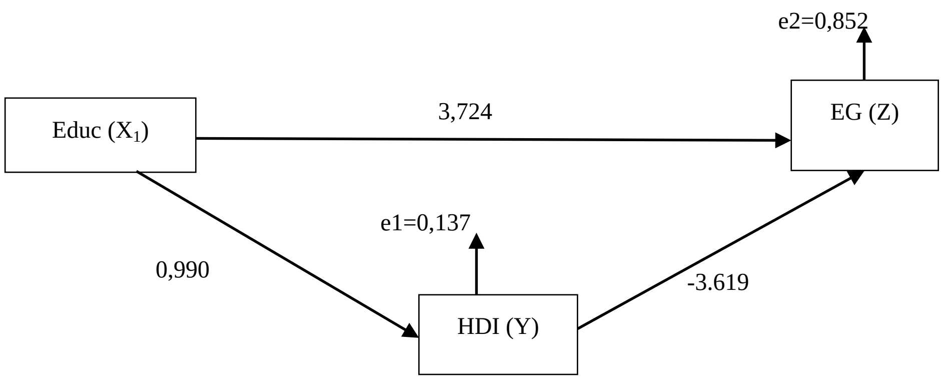

Figure 2. Education Sector path diagram

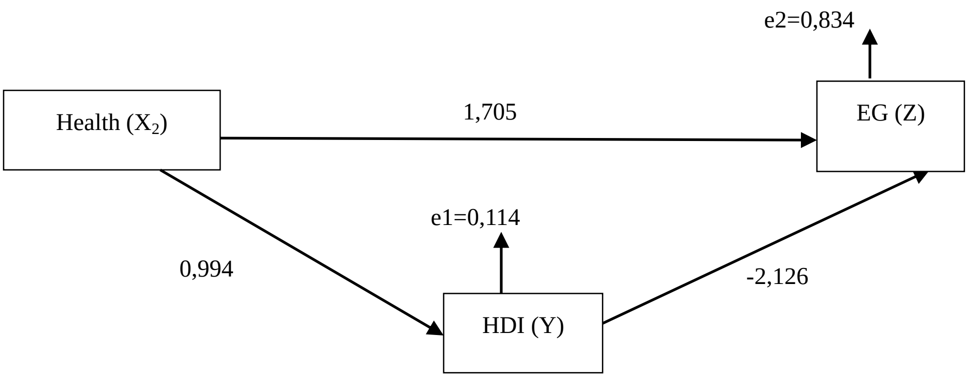

Figure 3. Health sector path diagram

The results of the research in Table 5 show a positive direct effect between variable education (0.980) and health (0.988) with the HDI. It is by the objectives in implementing the earmarking tax policy, which is to create a better growth (Clague & Gordon, 1940). Earmarking tax policy provides certainty in budget allocations to facilitate the planning process. While success in planning is the key to growth in a better direction, the higher the budget allocation for the education and health sectors means the easier it is for both sectors to be able to create new, improved programs.

Based on the results in Table 5, it is clear that the earmarking tax policy has a direct positive impact on economic growth. Both sectors, education (13,868) and health (2,907), generate a positive direct effect. The effect of the education sector is greater than the effect of the health sector because the budget allocation by the government for the education sector is higher at 20%, compared to the health sector at 5%.

Table 5. The Value of Direct and Indirect Effect

Variable	Effect	
	Direct	Indirect
Education Sector		
Educ - HDI	$(\rho YX)^2 = (0,990)^2 = 0,980$	-
Educ – EG	$(\rho ZX)^2 = (3,724)^2 = 13,868$	$(\rho YX \times \rho ZY) = 0,990 \times (-3,619) = -3,582$
	Effect through correlative relations with HDI : ρZX x rxy x ρZy = 3,724 x 0,990 x (-3,619) = -13,342	
	Total Effect : 13,868 + (-13,342) = 0,525	
HDI – EG	$(\rho ZY)^2 = (-3,619)^2 = 13,097$	-
The effect of other variables outside of research		
ε1	0,137	-
ε2	0,852	-
Health Sector		
Health - HDI	$(\rho YX)^2 = (0,994)^2 = 0,988$	-
Health – EG	$(\rho ZX)^2 = (1,705)^2 = 2,907$	$(\rho YX \times \rho ZY) = 0,994 \times (-2,126) = -2,113$
	Effect through correlative relations with HDI : ρZX x rxy x ρZy = 1,075 x 0,994 x (-2,126) = -2,271	
	Total Effect : 2,907 + (-2,271) = 0,635	
HDI – EG	$(\rho ZY)^2 = (-2,126)^2 = 4,519$	-
The effect of other variables outside of research		
ε1	0,114	-
ε2	0,834	-

Earmarking tax policy can provide a positive effect on economic growth because earmarking tax policy reallocates public spending without addressing the tax structure at all. That is why the earmarking tax policy is the most efficient fiscal instrument for increasing growth and welfare through higher public spending on education and health (Annabi et al., 2011; Ranis, Stewart, & Ramirez, 2000). If the budget allocation comes from an increase in taxes, it will cause a significant effect out of crowding-out, with a higher disposable income and lower savings (Blankenau et al., 2004; Del Rey & Lopez-Garcia, 2013).

In Table 5, the education sector (13,097) and the health sector (4,519) show a positive direct effect on economic growth, in alignment with the theory of economic growth that states human capital can increase economic growth (Barro, 1991; Neamtu, 2015). The education sector has a more significant effect than the health sector because the calculation of HDI by the UNDP in the education sector has two components, namely the expected years of schooling and the average length of the school. The average length of school is the length of school (in years) that is expected to be felt by children at a certain age in the future. The health sector only has one component factor in the calculation of HDI, namely life expectancy at birth.

The surprising finding of this research is the indirect negative effect of the earmarking tax policy on economic growth through HDI. According to Table 5, both the education sector (-13,342) and the health sector (-2,271) produce negative effects indirectly through HDI. It can occur because government spending on the education sector and the health sector is a manifestation of government investment (Neamtu, 2015; Weil, 2014). Government investment in the education and health sectors has positive impacts on economic growth in the long run only (Dissou et al., 2016).

The implementation of the earmarking tax policy allocates 20% of the government budget for the education sector and 5% for the health sector. As a result, a negative impact in the short run will reduce the portion of the government budget allocation for other sectors. One effect is the Indonesian government budget allocation for personnel expenditure (employee salaries). In 2017, the average salary saw a loss of 50% to 30.8% in the first year of implementation of the policy. However, employee expenditure can positively impact short term growth of Indonesia's economy through private consumption (Kim, 2017).

The negative effect on the implementation of earmarking tax policy on economic growth through HDI in the education sector is greater than the health sector because the increase in funds leads to an increase in Gross school enrollment ratio in Indonesia. According to the UNICEF, Gross school enrollment ratio is the number of children enrolled in a level regardless of age divided by the population of the age group that officially corresponds to the same level. The following describes the Gross school enrollment ratio in Indonesia for ages 15 years above male and female between 2010-2017, as a result of the earmarking tax policy: 55,83%; 57,69%; 61,30%; 63,64%; 70,13%; 70,32%; 70,68%; 71,20% (Indonesia statistical center). As a result, the labour force absorbed by companies is reduced because children continue their education to a higher level (Wolf, 2003). The Indonesian labor force participation rate in the period of implementation of the earmarking tax policy from 2010-2015 was 69,939; 69,841; 69,729; 69,599; 69,336; 67,944 (World Bank). The decrease in the labour force is on average due to the lower-middle level workforce or labourers. Although machine can replace the position of the labourer, the development of machines is costly and takes a long period.

The reduced supply of labour companies in Indonesia also tends to increase the labour force bargaining position. It resulted in increased costs incurred by these companies. Moreover, the supply has been slowed down by the economic growth from the supply side to the company (Wolf, 2003).

Apart from that, the quality of education is more important than the quantity of education (Barro, Lee, Barro, & Lee, 1996; Hanushek & Kimko, 2000). While the quality of education in Indonesia can be said to be still low because of the unequal level of education in Indonesia, it is caused by a large number of human populations (fourth in the world) and the geographical conditions of Indonesia which is an archipelago. As a result, Indonesia's Global Talent Competitiveness Index (38.61) in 2019 is still ranked sixth in ASEAN countries (Singapore 77.27, Malaysia 58.62, Brunei Darussalam 49.9, Philippines 40.94, and Thailand 38.62). Although with the implementation of earmarking tax in 2003 the allocation funds for the education sector were the largest among the other sectors (20% of the government budget), it still needed a long time for the quality of education to compete with developed countries. Therefore, the education sector has not been able to make a positive contribution to economic growth.

The indirect effect of the earmarking tax policy on the health sector with economic growth through HDI is smaller than the education sector due to the tradeoff between economic growth and population health (Wang, Danish, Zhang, & Wang, 2018). High economic growth will cause a decline in the level of public health. High economic growth can improve the production process resulting in higher levels of pollution. The following shows PM2.5 air pollution micrograms / m3 in Indonesia during the period of implementation of the earmarking tax policy in 2010-2016: 14,488; 14.83; 14,931; 15,557; 15,222; 16,661; 16,746 (World Bank).

The earmarking tax policy for the health sector makes it easier for the health sector to design a program and implement new technology to increase the level of health of the population. For example, by introducing a regulation to control the maximum air pollution limit to 10 micrograms / m3 and by installing a water pollution measuring device, additional costs are required by the company to meet these standards. Also, the company can reduce its production capacity to meet these pollution standards. Consequently, this can slow economic growth.

Besides, the results of implementing earmarking tax can cause an increase in the health sector. An increase in the health sector led to an increase in life expectancy which increased the number of the human population (Cervellati, 2013). Increasing the number of human populations who have not yet entered the productive age (under the age of the labour force) or who have entered the middle age (retirement) will become a burden in the economy and it will slow the economic growth (Breyer, Costa-Font, & Felder, 2010; Eggleston & Fuchs, 2012). Besides, children and seniors are vulnerable to disease and thus need more intense health protection. As a result, it uses more portion of the funds allocated for the health sector.

4.2 Error Correction Model

The stationarity test is the first test that researchers must carry out to identify the existence of a unit’s root in each variable. The stationary test in this research is conducted by the Augmented Dickey-Fuller (ADF) method. This ADF test of the significance level will be used at the error rate of 5% so that if the probability value is higher than the critical value at $\alpha = 5\%$ the data is not stationary. The following table shows the data from the stationarity test results.

To avoid the existence of a spurious correlation, three variables were tested for stationary data. Tests were carried out to achieve stationary data using integration tests. By entering the order of integration until the variable studied reaches stationary is the correct method to conduct this level of integration testing.

Table 6. Data Stationarity Results

Variable	1st difference		2nd difference	
	Probability	Result	Probability	Result
Education Sector				
EDUC	0,5600	Non-stationary	0,0001	Stationary
EG	0,0317	Stationary	0,0000	Stationary
EYS	0,4289	Non-stationary	0,0000	Stationary
Health Sector				
HEALTH	0,6826	Non-stationary	0,0000	Stationary
LEB	0,7195	Non-stationary	0,0000	Stationary
EG	0.1348	Non-stationary	0,0000	Stationary

The stationarity test results show the variables meet the requirements in stage 1. In the next stage, a regression equation will be created. EG is the dependent variable. Educ and EYS for the education sector or Health and LEB for the Health sector are independent variables. This equation is used to determine the long-term relationship between these variables.

Table 7. Long-term relationship results

Variable	R-Squared	Coefficient	Prob.
Education Sector			
EYS	0,585543	-32,67545	0,0000
EDUC		5,479062	0,0000
Health Sector			
LEB	0,272646	-142,2290	0,0231
HEALTH		2,676996	0,0862

Cointegration tests are conducted to test the integration of long-term relationships between the three research variables. If it is proven that there is a cointegration relationship between the three research variables, then there is a stable long-term relationship between these variables. The cointegration test results below show these results. The cointegration test in this research used the ADF test on residual values. The results are as follows:

Table 8. Cointegration test results

Sector	Coefficient	t-Statistic	Prob.
Education	-0,261119	-3,164004	0,0282
Health	-0,101737	-3,014767	0,0449

By using the ECM method, the same results are obtained with the path analysis. In the long run, earmarking tax can affect economic growth. It can be seen from the budget coefficient for education, which has a positive influence on economic growth (Educ 5.479). It takes a long time so that spending on education can have a positive impact on economic growth (Dissou et al., 2016). Making the workforce into an educated workforce takes a long time through the process of education and training. Waiting for an infant to be ready to become a workforce also takes a long time.

In the long-run, EYS variable can negatively affect economic growth because the individuals who have the labour force to pursue higher education will eventually return to the labour force. However, these individuals return with a higher level of education. The company's capacity to absorb the labour force at a more educated level is minimal, thus creating skilled unemployment (Wolf, 2003). Based on Okun's Law, an increase in the unemployment rate of 1% can reduce economic growth by 2% (Levine, 2013). It is why the EYS variable coefficient is negative and significant (-32.67545) and in line with the path analysis results.

While the LEB variable can negatively affect long-term economic growth due to the increase in the human population, one per cent increase in life expectancy leads to a 1.7-2 per cent increase in population (Acemoglu & Johnson, 2007). The increase in population can be a burden because it has not entered the productive age (Bloom, Canning, & Fink, 2010). An increase in LEB can also result in a decrease in the amount of parental bequest given to their children which results in a decrease in physical capital accumulation (Kunze, 2014). Based on the Solow growth model, physical capital accumulation is one of the determinants of economic growth (Mankiw, Romer, & Weil, 1992). The decrease in the amount of bequest devoted to their children also slower the private saving (Kunze, 2014). Private saving provides funds for investors to increase economic growth (Najarzadeh, Reed, & Tasan, 2014). These results are in line with the findings of the path analysis above.

The next stage is to assess the short-term relationships of the three variables for each sector. The following are the results of the short-term analysis with the second level difference and lag two according to the results of previous calculations.

The results of the short-term analysis show compatibility with previous path analysis results. The earmarking tax policy only affects the long term for the education sector. Spending the budget for the education (EDUC) sector and Expected Year of Schooling (EYS) does not have a significant impact in the short term for economic growth. In the health sector, Life Expectancy at Birth (LEB) does not have a significant impact on economic growth in the short term. It takes a long time for the education and health sector to contribute to economic growth. These results are in line with the results of the path analysis path above. Only budget spending for the health sector (HEALTH) has a positive influence on economic growth in the short term. Because with the earmarking tax policy, budget spending for the health sector gets certainty in increasing the amount of the allocation. It can be used by the health sector to maintain society health. A healthy society can contribute directly to economic growth (Weil, 2014).

Table 9. Short-term Analysis with the 2nd level difference results

Variable	R-Squared	Coefficient	Prob.
Education Sector			
EYS	0,140830	4,441259	0,8282
EDUC		2,263022	0,0682
Res		-0,124189	0,0102
Health Sector			
LEB	0,458824	724,2549	0,2346
HEALTH		14,57191	0,0002
Res		-0,088459	0,0311

4.3 Linearity Test

This linearity test is not necessarily done by researchers because the purpose of this test depends on the purpose of the linear regression test. If the purpose is to form a new and Best Linear Unbiased Estimation (BLUE) model, then this test must be done (Gujarati, 2004). The linearity test in this research was done using the Ramsey Reset Test. The test results can be seen in the value of the p-value shown in the probability column F-statistics. The results in this study were 0,2889 for the education sector and 0,4689 for the health sector which are > 0,05. Thus, it can be concluded that the independent variables are linear with the dependent variable.

Table 10. Ramsey RESET Test

	Value	Df	Probability
Education Sector			
t-statistic	1,078531	32	0,2889
F-statistic	1,163229	(1,32)	0,2889
Likelihood ratio	1,730077	1	0,2569
Health Sector			
t-statistic	0,729665	56	0,4686
F-statistic	0,532412	(1,56)	0,4686
Likelihood ratio		1	0,4512

4.4 Heteroscedasticity Test

The Heteroscedasticity test is a test that assesses whether there is an inequality of variance from the residual for all observations in the linear regression model (Greene, 2012). This test is one of the standard assumption tests that must be done in linear regression. If heteroscedasticity assumptions are not fulfilled, then the regression model is declared invalid as a forecasting tool. This research uses the Breusch Pagan Godfrey test, along with the results:

Table 11. Breusch Pagan Godfrey Test Results

	Education Sector	Health Sector
F-statistic		
Obs*R-Squared	1,448473	1,185538
Scaled explained SS	2,901930	2,415763
Probability	2,728264	1,069612
Prob. Chi-Square(2)	0,2434	0,3191
Prob. Chi-Square(2)	0,2343	0,2988
Prob. Chi-Square(2)	0,2556	0,5858

The p-value is indicated by the value of the Probability, which is equal to 2,728264 for the education sector and 1,069612 for the health sector which are > 0,05. It means that the regression model shows homoscedasticity, or in other words, there is no problem with the assumption of non-heteroscedasticity.

4.5 Multicollinearity Test

Multicollinearity tests assess whether there is a correlation or intercorrelation between independent variables in the regression model (Baltagi, Badi H., 2010). The multicollinearity test in this study used Variance Inflation Factors (VIF). The results are as follow:

Table 12. VIF Results

Variable	Centered VIF	Uncentered VIF	Coefficient Variance
Education Sector			
EDUC	1,049204	1,187400	12,30544
EYS	1,002039	1,179424	356484,9
Health Sector			
HEALTH	1,187116	1,050006	1,049204
LEB	1,170558	1,008785	1,002039

The results of the multicollinearity test above indicate that the Centered VIF value for all variables are below 10. Then it can be stated that there is no multicollinearity problem in the prediction model.

4.6 Normality Test

The Normality Test is a test carried out to assess the distribution of data in a group of data or variables where it is normally distributed or not (Greene, 2012). The assumption of normality in OLS linear regression is based on the residual, not the variable. Based on the practical experience of some statisticians, data with more than 30 digits (n> 30) can already be assumed to be normally distributed (Gujarati, 2004). The results are as follow:

Table 13. Normality Test

	Jarque-Bera	Probability
Education Sector	0,970370	0,615583
Health Sector	1,500248	0,472308

The normality test in this study used the Jarque-Bera Test. All of the significant values of the test are <0.05. It results in acceptance of H0 which means the residual is normally distributed.

4.7 Autocorrelation Test

Autocorrelation Test is a statistical analysis performed to find out whether there are variable correlations in the prediction model with changes in time (Enders, 2004). Therefore, if the assumption of autocorrelation occurs in a prediction model, then the disturbance value no longer pairs freely, but pairs in autocorrelation. An autocorrelation test in a linear regression model must be done if the data are time-series data or sequential time.

The Durbin-Watson Stat value in the model in this study are 2,307903 for the education sector and 2,383645 for the health sector. This value are the value of the Durbin Watson (DW) Calculate. The value are compared with the DL=1, 54853 and DU=1, 61617 (education sector) and DL=1, 41065 and DU=1.52451 (health sector) values in the Durbin Watson table. The results are DW> DU and value (4-DW)> DU, indicating there is no autocorrelation problem, in terms of both positive and negative autocorrelation.

Another autocorrelation test is a serial correlation. This research uses the Breusch-Godfrey Serial Correlation LM Test method. The value of Prob Chi-Square (2) is the value of the Breusch-Godfrey Serial Correlation LM test value, which are equal to 0,3819 for the education sector and 0,2776 for health sector where > 0.05, meaning that H0 accepted; in other words, there is no problem with serial autocorrelation.

5. Conclusion

The earmarking tax policy in the education sector and the health sector can bring direct positive effects on economic growth. However, the earmarking tax policy also brings negative indirect effects on economic growth in both sectors through the HDI variable. For the education sector, it is caused by the reduced supply of labour companies in Indonesia also tends to increase the labour force bargaining position and the quality of education in Indonesia is still low. For the health sector, it is caused by enforcement of regulations on air pollution can slowing down the level of production and increase production costs. Besides, an increase in the health sector can increase Life Expectancy thereby increasing the human population that can burden the economy. To further explain the effect of each sector, more specifically, using Expected Years of Schooling (EYS) variables represents the education sector and Life Expectancy at Birth (LEB) represents the health sector. A negative relationship with economic growth occurs in the long run for EYS and LEB variables. It is because an increase in EYS can reduce the workforce. Whereas an increase in LEB can decrease the amount of parental bequest given to their children which results in a decrease in physical capital accumulation. The budget for spending on the education sector gives positive relations to economic growth occurs on long terms. Because it takes a long time for the health sector to have an impact on economic growth. However, in the short term budget for spending on the health sector give positive relations to economic growth. The availability of excellent health services for the community can improve public health resulting in increased productivity.

The recommendations from the results of the research are to provide advice that the budget issued by the state using the Earmarking Tax Policy must be competent in each sector. The Ministry of Education must be able to allocate a budget to develop human resources that can be absorbed directly by the company, for example, the development of vocational schools. For the health sector, the budget allocation from the earmarking tax policy can be used for research and development to develop waste processing technology for environmental reasons. These budget allocations can create sustainable economic growth.

Economic growth is not only influenced by Human Capital. The earmarking tax policy also can not only affect Human Capital. It is a limitation of this research. Further research can be developed to assess the Earmarking Tax Policy Effect on economic growth by using other variables and case studies of other countries.

Conflict of interest

The authors declare no potential conflict of interest.

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Appendix

Data

Year	20% Education	5% Health	HDI	EG	LEB	EYS
2000Q1	9.671628528	8.978481354	4.17524	5.9025	66.1485	8.69725
2000Q2	9.786552895	9.09340572	4.177911	5.575	66.194	8.7575
2000Q3	9.901477263	9.208330087	4.180581	5.2475	66.2395	8.81775
2000Q4	10.01640163	9.323254453	4.183252	4.92	66.285	8.878
2001Q1	10.131326	9.43817882	4.185923	4.5925	66.3305	8.93825
2001Q2	10.24625037	9.553103186	4.188594	4.265	66.376	8.9985
2001Q3	10.36117473	9.668027553	4.191265	3.9375	66.4215	9.05875
2001Q4	10.4760991	9.782951919	4.193936	3.61	66.467	9.119
2002Q1	10.46969093	9.776543744	4.192107	3.8325	66.511	9.179
2002Q2	10.46328275	9.770135569	4.190278	4.055	66.555	9.239
2002Q3	10.45687458	9.763727395	4.188449	4.2775	66.599	9.299
2002Q4	10.4504664	9.75731922	4.18662	4.5	66.643	9.359
2003Q1	10.47236801	9.779220826	4.19589	4.57	66.68725	9.41925
2003Q2	10.49426961	9.801122431	4.20516	4.64	66.7315	9.4795
2003Q3	10.51617122	9.823024037	4.21443	4.71	66.77575	9.53975
2003Q4	10.53807282	9.844925642	4.223701	4.78	66.82	9.6
2004Q1	10.56917551	9.876028328	4.225213	4.8425	66.8655	9.66025
2004Q2	10.6002782	9.907131014	4.226725	4.905	66.911	9.7205
2004Q3	10.63138088	9.938233701	4.228237	4.9675	66.9565	9.78075
2004Q4	10.66248357	9.969336387	4.229749	5.03	67.002	9.841
2005Q1	10.73239258	10.03924539	4.232895	5.195	67.04925	9.901
2005Q2	10.80230158	10.1091544	4.236041	5.36	67.0965	9.961
2005Q3	10.87221059	10.1790634	4.239187	5.525	67.14375	10.021
2005Q4	10.94211959	10.24897241	4.242333	5.69	67.191	10.081
2006Q1	10.99533038	10.3021832	4.244231	5.6425	67.23975	10.14125
2006Q2	11.04854117	10.35539399	4.246128	5.595	67.2885	10.2015
2006Q3	11.10175196	10.40860478	4.248025	5.5475	67.33725	10.26175
2006Q4	11.15496275	10.46181557	4.249923	5.5	67.386	10.322
2007Q1	11.17332272	10.48017554	4.251664	5.7125	67.43475	10.38225
2007Q2	11.1916827	10.49853552	4.253406	5.925	67.4835	10.4425
2007Q3	11.21004267	10.51689549	4.255147	6.1375	67.53225	10.50275

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2007Q4	11.22840264	10.53525546	4.256888	6.35	67.581	10.563
2008Q1	11.2968929	10.60374572	4.258934	6.265	67.6295	10.62325
2008Q2	11.36538317	10.67223599	4.26098	6.18	67.678	10.6835
2008Q3	11.43387343	10.74072625	4.263026	6.095	67.7265	10.74375
2008Q4	11.50236369	10.80921651	4.265071	6.01	67.775	10.804
2009Q1	11.50521503	10.81206785	4.267135	5.665	67.82225	10.864
2009Q2	11.50806636	10.81491918	4.269199	5.32	67.8695	10.924
2009Q3	11.5109177	10.81777052	4.271263	4.975	67.91675	10.984
2009Q4	11.51376903	10.82062185	4.273327	4.63	67.964	11.044
2010Q1	11.54325854	10.85011136	4.275098	5.0275	68.0105	11.1055
2010Q2	11.57274804	10.87960086	4.276868	5.425	68.057	11.167
2010Q3	11.60223755	10.90909037	4.278639	5.8225	68.1035	11.2285
2010Q4	11.63172705	10.93857987	4.280409	6.22	68.15	11.29
2011Q1	11.67157684	10.97842966	4.284039	6.2875	68.19525	11.3275
2011Q2	11.71142664	11.01827946	4.287669	6.355	68.2405	11.365
2011Q3	11.75127643	11.05812925	4.291299	6.4225	68.28575	11.4025
2011Q4	11.79112622	11.09797904	4.294929	6.49	68.331	11.44
2012Q1	11.8308671	11.13771991	4.297319	6.4325	68.3755	11.5
2012Q2	11.87060798	11.17746078	4.299709	6.375	68.42	11.56
2012Q3	11.91034886	11.21720165	4.302099	6.3175	68.4645	11.62
2012Q4	11.95008974	11.25694252	4.304489	6.26	68.509	11.68
2013Q1	11.97727803	11.28413082	4.306856	6.1275	68.55275	11.785
2013Q2	12.00446632	11.31131911	4.309224	5.995	68.5965	11.89
2013Q3	12.0316546	11.33850741	4.311591	5.8625	68.64025	11.995
2013Q4	12.05884289	11.3656957	4.313959	5.73	68.684	12.1
2014Q1	12.07976528	11.38661809	4.316304	5.5625	68.727	12.1725
2014Q2	12.10068766	11.40754048	4.318649	5.395	68.77	12.245
2014Q3	12.12161005	11.42846286	4.320994	5.2275	68.813	12.3175
2014Q4	12.14253243	11.44938525	4.323339	5.06	68.856	12.39
2015Q1	12.15642831	11.46328113	4.325663	5.015	68.89825	12.43
2015Q2	12.17032418	11.477177	4.327986	4.97	68.9405	12.47
2015Q3	12.18422006	11.49107288	4.33031	4.925	68.98275	12.51
2015Q4	12.19811593	11.50496875	4.332633	4.88	69.025	12.55
2016Q1	12.21026447	11.51711729	4.334935	4.9175	69.0665	12.5925
2016Q2	12.22241301	11.52926583	4.337237	4.955	69.108	12.635
2016Q3	12.23456155	11.54141437	4.339539	4.9925	69.1495	12.6775
2016Q4	12.24671009	11.55356291	4.341841	5.03	69.191	12.72
2017Q1	12.24641013	11.55326295	4.344122	5.04	69.2465	12.7525
2017Q2	12.24611017	11.55296298	4.346403	5.05	69.302	12.785
2017Q3	12.2458102	11.55266302	4.348684	5.06	69.3575	12.8175
2017Q4	12.24551024	11.55236305	4.350965	5.07	69.413	12.85

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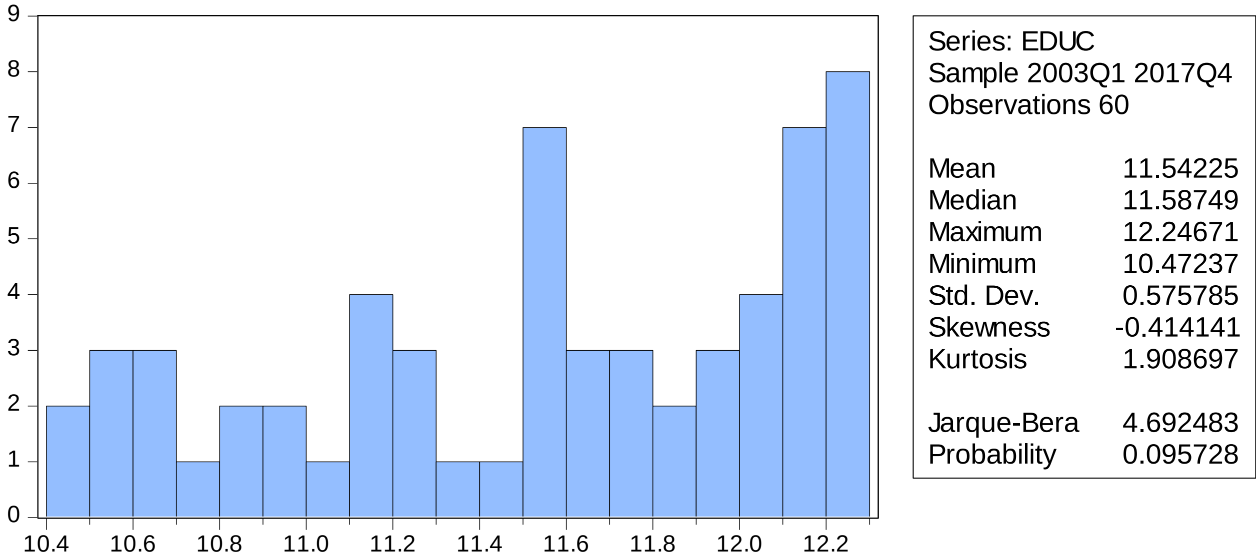
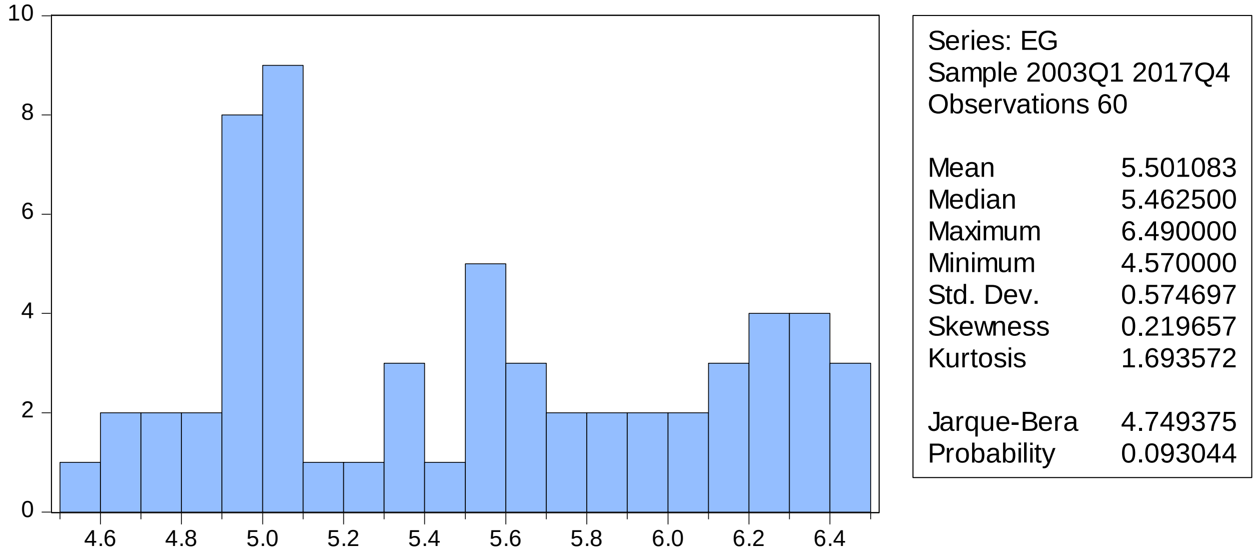
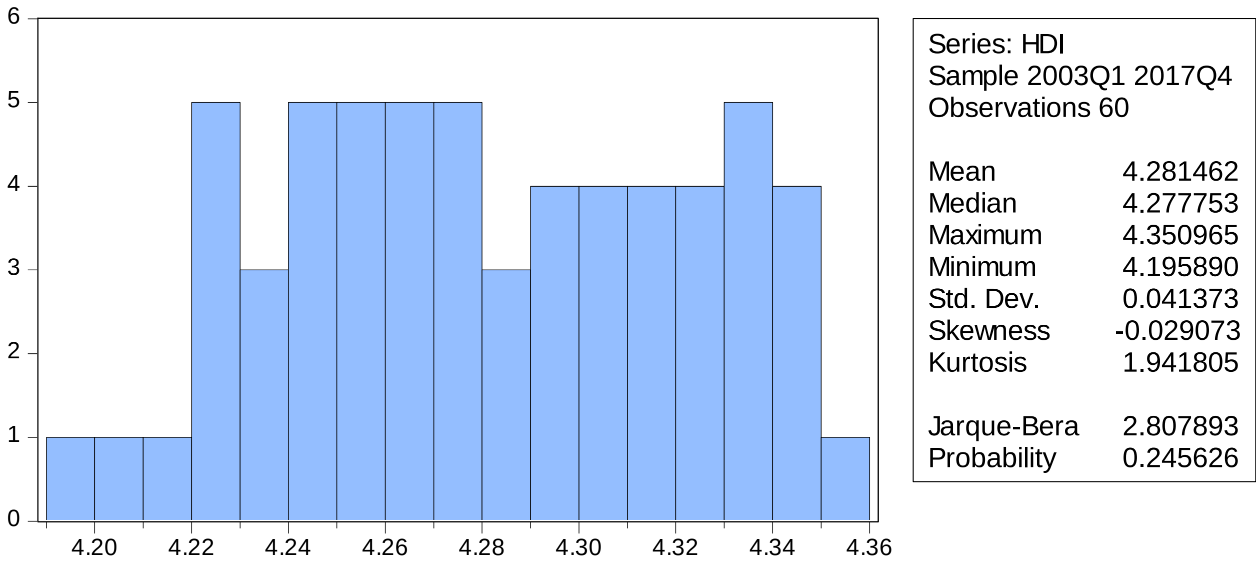
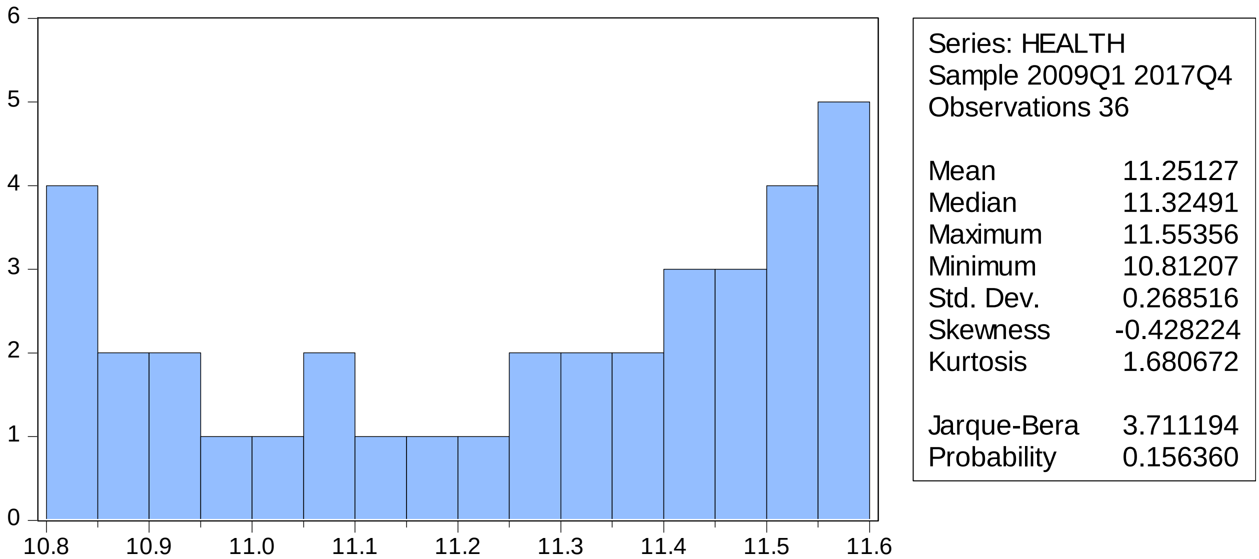
Appendix

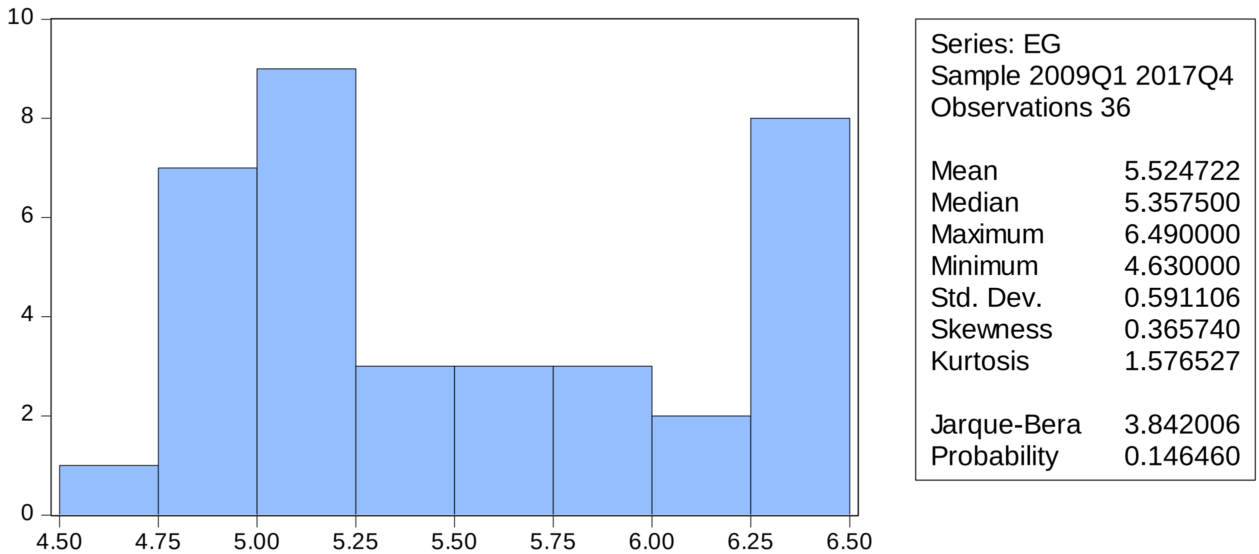
Normality Test

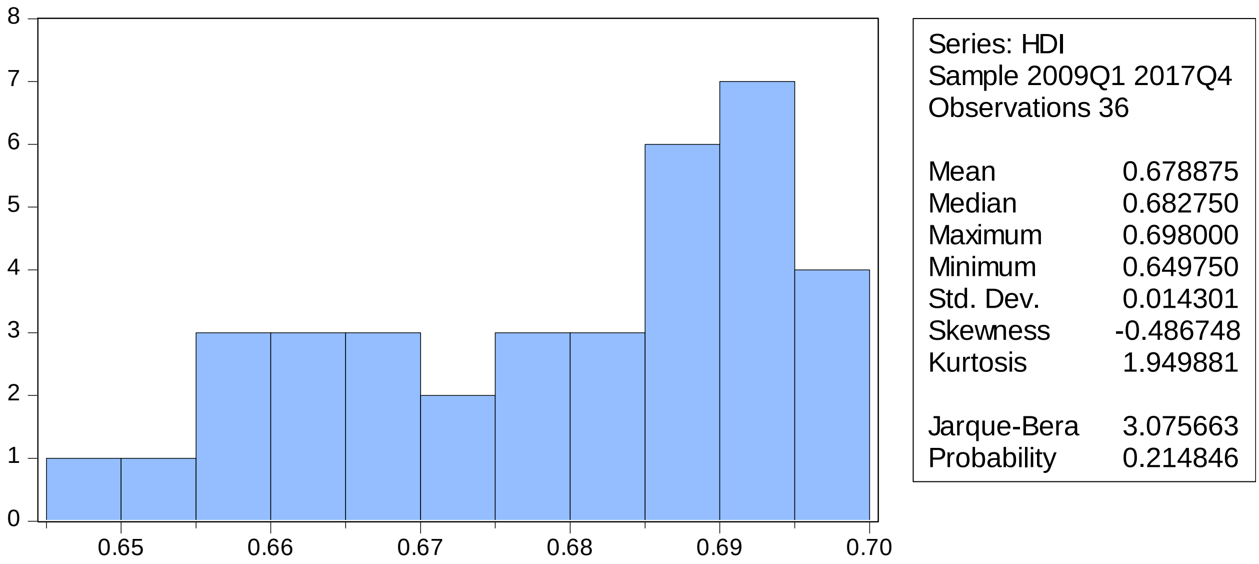





Series: HDI
Sample 2003Q1 2017Q4
Observations 60
Mean 4.281462
Median 4.277753
Maximum 4.350965
Minimum 4.195890
Std. Dev. 0.041373
Skewness -0.029073
Kurtosis 1.941805
Jarque-Bera 2.807893
Probability 0.245626
0 1 2 3 4 5 6
4.20 4.22 4.24 4.26 4.28 4.30 4.32 4.34 4.36


Series: HEALTH
Sample 2009Q1 2017Q4
Observations 36
Mean 11.25127
Median 11.32491
Maximum 11.55356
Minimum 10.81207
Std. Dev. 0.268516
Skewness -0.428224
Kurtosis 1.680672
Jarque-Bera 3.711194
Probability 0.156360
0 1 2 3 4 5 6
10.8 10.9 11.0 11.1 11.2 11.3 11.4 11.5 11.6


Series: EG
Sample 2009Q1 2017Q4
Observations 36
Mean 5.524722
Median 5.357500
Maximum 6.490000
Minimum 4.630000
Std. Dev. 0.591106
Skewness 0.365740
Kurtosis 1.576527
Jarque-Bera 3.842006
Probability 0.146460
0 2 4 6 8 10
4.50 4.75 5.00 5.25 5.50 5.75 6.00 6.25 6.50



Regression Education Sector

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.990[a]	.981	.980	.08081

a. Predictors: (Constant), HDI, Educ

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19.181	1	19.181	2937.256	.000[b]
	Residual	.379	58	.007		
	Total	19.560	59			

a. Dependent Variable: EG

b. Predictors: (Constant), HDI, Educ

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-2.030	.251		-8.100	.000
	Educ	20.594	.380	.990	54.196	.000
	HDI	-2.030	.251		-8.100	.000

a. Dependent Variable: EG

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.523[a]	.273	.248	.49846

a. Predictors: (Constant), HDI, Educ

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.324	2	2.662	10.714	.000[b]
	Residual	14.162	57	.248		
	Total	19.486	59			
a. Dependent Variable: EG						
b. Predictors: (Constant), HDI, Educ						

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	12.113	2.257		5.367	.000
	Educ	3.717	.810	3.724	4.589	.000
	HDI	-75.129	16.844	-3.619	-4.460	.000
a. Dependent Variable: EG						

Regression Health Sector

Model Summary						
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		
.994[a]	.987	.987	.03051	.994[a]		
a. Predictors: (Constant), HDI, Educ						

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.492	1	2.492	2676.673	.000[b]
	Residual	.032	34	.001		
	Total	2.524	35			
a. Dependent Variable: EG						
b. Predictors: (Constant), HDI, Educ						

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1.415	.245		-5.778	.000
	HDI	18.657	.361	.994	51.737	.000
a. Dependent Variable: EG						

Model Summary						
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		
1	.552[a]	.304	.262	.50773		
a. Predictors: (Constant), HDI, Educ						

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.722	2	1.861	7.219	.003[b]
	Residual	8.507	33	.258		
	Total	12.229	35			

a. Dependent Variable: EG

b. Predictors: (Constant), HDI, Educ

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	172.442	57.805		2.983	.005
	Educ	3.752	1.715	1.705	2.188	.036
	HDI	-48.532	17.788	-2.126	-2.728	.010

a. Dependent Variable: EG

Level Unit Root

Null Hypothesis: Unit root (individual unit root process)				
Series: EDUC, EG, EYS				
Date: 09/22/19 Time: 14:54				
Sample: 2003Q1 2017Q4				
Exogenous variables: Individual effects				
Automatic selection of maximum lags				
Automatic lag length selection based on SIC: 1 to 5				
Total number of observations: 170				
Cross-sections included: 3				
Method			Statistic	Prob.**
ADF - Fisher Chi-square			15.1317	0.0193
ADF - Choi Z-stat			-2.15330	0.0156
** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.				
Intermediate ADF test results UNTITLED				
Series	Prob.	Lag	Max Lag	Obs
EDUC	0.0292	5	10	54
EG	0.0370	1	10	58
EYS	0.4803	1	10	58

Null Hypothesis: Unit root (individual unit root process)		
Series: EG, ELB, HEALTH		
Date: 09/22/19 Time: 14:49		
Sample: 2009Q1 2017Q4		
Exogenous variables: Individual effects		

Automatic selection of maximum lags				
Automatic lag length selection based on SIC: 1 to 5				
Total number of observations: 98				
Cross-sections included: 3				
Method			Statistic	Prob.**
ADF - Fisher Chi-square			11.5672	0.0724
ADF - Choi Z-stat			-0.02756	0.4890
** Probabilities for Fisher tests are computed using an asymptotic Chi				
-square distribution. All other tests assume asymptotic normality.				
Intermediate ADF test results UNTITLED				
Series	Prob.	Lag	Max Lag	Obs
EG	0.1766	5	8	30
ELB	0.9986	1	8	34
HEALTH	0.0174	1	8	34

1st Difference Unit Root

Null Hypothesis: Unit root (individual unit root process)				
Series: LEB, HEALTH, EG				
Date: 09/22/19 Time: 14:51				
Sample: 2009Q1 2017Q4				
Exogenous variables: Individual effects				
Automatic selection of maximum lags				
Automatic lag length selection based on SIC: 0 to 4				
Total number of observations: 98				
Cross-sections included: 3				
Method			Statistic	Prob.**
ADF - Fisher Chi-square			5.43019	0.4899
ADF - Choi Z-stat			-0.02754	0.4890
** Probabilities for Fisher tests are computed using an asymptotic Chi				
-square distribution. All other tests assume asymptotic normality.				
Intermediate ADF test results D(UNTITLED)				
Series	Prob.	Lag	Max Lag	Obs
D(LEB)	0.7195	0	8	34
D(HEALTH)	0.6826	0	8	34
D(EG)	0.1348	4	8	30

Null Hypothesis: Unit root (individual unit root process)		
Series: EDUC, EG, EYS		
Date: 09/22/19 Time: 14:56		
Sample: 2003Q1 2017Q4		
Exogenous variables: Individual effects		

Automatic selection of maximum lags				
Automatic lag length selection based on SIC: 0 to 4				
Total number of observations: 170				
Cross-sections included: 3				
Method			Statistic	Prob.**
ADF - Fisher Chi-square			9.75498	0.1354
ADF - Choi Z-stat			-1.08801	0.1383
** Probabilities for Fisher tests are computed using an asymptotic Chi				
-square distribution. All other tests assume asymptotic normality.				
Intermediate ADF test results D(UNTITLED)				
Series	Prob.	Lag	Max Lag	Obs
D(EDUC)	0.5600	4	10	54
D(EG)	0.0317	0	10	58
D(EYS)	0.4289	0	10	58

2nd Difference Unit root

Null Hypothesis: Unit root (individual unit root process)				
Series: EDUC, EG, EYS				
Date: 09/22/19 Time: 14:57				
Sample: 2003Q1 2017Q4				
Exogenous variables: Individual effects				
Automatic selection of maximum lags				
Automatic lag length selection based on SIC: 0 to 7				
Total number of observations: 164				
Cross-sections included: 3				
Method			Statistic	Prob.**
ADF - Fisher Chi-square			88.5535	0.0000
ADF - Choi Z-stat			-8.45639	0.0000
** Probabilities for Fisher tests are computed using an asymptotic Chi				
-square distribution. All other tests assume asymptotic normality.				
Intermediate ADF test results D(UNTITLED,2)				
Series	Prob.	Lag	Max Lag	Obs
D(EDUC,2)	0.0001	7	10	50
D(EG,2)	0.0000	0	10	57
D(EYS,2)	0.0000	0	10	57

Null Hypothesis: Unit root (individual unit root process)		
Series: LEB, HEALTH, EG		
Date: 09/22/19 Time: 14:58		
Sample: 2009Q1 2017Q4		
Exogenous variables: Individual effects		

Automatic selection of maximum lags				
Automatic lag length selection based on SIC: 0 to 3				
Total number of observations: 96				
Cross-sections included: 3				
Method			Statistic	Prob.**
ADF - Fisher Chi-square			61.3846	0.0000
ADF - Choi Z-stat			-6.87190	0.0000
** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.				
Intermediate ADF test results D(UNTITLED,2)				
Series	Prob.	Lag	Max Lag	Obs
D(LEB,2)	0.0000	0	7	33
D(HEALTH,2)	0.0001	0	7	33
D(EG,2)	0.0000	3	7	30

Long term

Dependent Variable: EG				
Method: Least Squares				
Date: 09/22/19 Time: 15:01				
Sample: 2003Q1 2017Q4				
Included observations: 60				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
EDUC	5.479062	0.611153	8.965130	0.0000
EYS	-32.67545	3.703513	-8.822827	0.0000
C	21.05039	2.179464	9.658519	0.0000
R-squared	0.585543	Mean dependent var		5.501083
Adjusted R-squared	0.571000	S.D. dependent var		0.574697
S.E. of regression	0.376415	Akaike info criterion		0.932460
Sum squared resid	8.076248	Schwarz criterion		1.037177
Log likelihood	-24.97380	Hannan-Quinn criter.		0.973421
F-statistic	40.26461	Durbin-Watson stat		0.226913
Prob(F-statistic)	0.000000			

Dependent Variable: EG				
Method: Least Squares				
Date: 09/22/19 Time: 15:04				
Sample: 2009Q1 2017Q4				
Included observations: 36				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LEB	-142.2290	59.67342	-2.383456	0.0231
HEALTH	2.676996	1.513503	1.768741	0.0862
C	576.8128	235.7275	2.446948	0.0199

R-squared	0.272646	Mean dependent var	5.524722
Adjusted R-squared	0.228564	S.D. dependent var	0.591106
S.E. of regression	0.519177	Akaike info criterion	1.606512
Sum squared resid	8.894979	Schwarz criterion	1.738472
Log likelihood	-25.91721	Hannan-Quinn criter.	1.652569
F-statistic	6.184952	Durbin-Watson stat	0.127806
Prob(F-statistic)	0.005234		

ADF Cointegeration Test

Null Hypothesis: RES has a unit root				
Exogenous: Constant				
Lag Length: 9 (Automatic - based on SIC, maxlag=10)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-3.164004	0.0282
Test critical values:	1% level		-3.568308	
	5% level		-2.921175	
	10% level		-2.598551	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(RES)				
Method: Least Squares				
Date: 09/22/19 Time: 15:18				
Sample (adjusted): 2005Q3 2017Q4				
Included observations: 50 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
RES(-1)	-0.261119	0.082528	-3.164004	0.0030
D(RES(-1))	0.945093	0.130268	7.254990	0.0000
D(RES(-2))	0.171459	0.139573	1.228457	0.2266
D(RES(-3))	0.171107	0.137984	1.240052	0.2224
D(RES(-4))	-0.647513	0.138130	-4.687699	0.0000
D(RES(-5))	0.741250	0.152312	4.866648	0.0000
D(RES(-6))	0.086894	0.130541	0.665642	0.5096
D(RES(-7))	0.086623	0.129696	0.667894	0.5081
D(RES(-8))	-0.646002	0.130112	-4.964982	0.0000
D(RES(-9))	0.610199	0.122128	4.996375	0.0000
C	0.002199	0.012203	0.180161	0.8580
R-squared	0.832080	Mean dependent var		0.002478
Adjusted R-squared	0.789023	S.D. dependent var		0.187448
S.E. of regression	0.086099	Akaike info criterion		-1.875103
Sum squared resid	0.289107	Schwarz criterion		-1.454458
Log likelihood	57.87757	Hannan-Quinn criter.		-1.714919
F-statistic	19.32528	Durbin-Watson stat		2.095436

Prob(F-statistic)	0.000000			

Null Hypothesis: RES has a unit root				
Exogenous: Constant				
Lag Length: 5 (Automatic - based on SIC, maxlag=9)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-3.014767	0.0449
Test critical values:	1% level		-3.670170	
	5% level		-2.963972	
	10% level		-2.621007	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(RES)				
Method: Least Squares				
Date: 09/22/19 Time: 15:16				
Sample (adjusted): 2010Q3 2017Q4				
Included observations: 30 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
RES(-1)	-0.101737	0.033746	-3.014767	0.0062
D(RES(-1))	0.697941	0.165286	4.222634	0.0003
D(RES(-2))	0.167929	0.161617	1.039055	0.3096
D(RES(-3))	0.046893	0.103480	0.453165	0.6547
D(RES(-4))	-0.240001	0.103493	-2.319007	0.0296
D(RES(-5))	0.263747	0.089244	2.955363	0.0071
C	0.004736	0.011049	0.428629	0.6722
R-squared	0.871287	Mean dependent var		0.021666
Adjusted R-squared	0.837709	S.D. dependent var		0.141902
S.E. of regression	0.057166	Akaike info criterion		-2.684757
Sum squared resid	0.075162	Schwarz criterion		-2.357811
Log likelihood	47.27135	Hannan-Quinn criter.		-2.580164
F-statistic	25.94864	Durbin-Watson stat		2.300310
Prob(F-statistic)	0.000000			

Short term

Dependent Variable: D(D(EG))				
Method: Least Squares				
Date: 09/23/19 Time: 09:35				
Sample (adjusted): 2009Q3 2017Q4				
Included observations: 34 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(D(HEALTH))	14.57191	3.507910	4.154016	0.0002
D(D(LEB))	724.2549	597.0636	1.213028	0.2346

LTRRESID	-0.088459	0.039099	-2.262440	0.0311
C	0.011952	0.019401	0.616068	0.5425
R-squared	0.458824	Mean dependent var		0.010441
Adjusted R-squared	0.404706	S.D. dependent var		0.145804
S.E. of regression	0.112496	Akaike info criterion		-1.421672
Sum squared resid	0.379659	Schwarz criterion		-1.242100
Log likelihood	28.16842	Hannan-Quinn criter.		-1.360433
F-statistic	8.478261	Durbin-Watson stat		2.383645
Prob(F-statistic)	0.000314			

Dependent Variable: D(D(EG))				
Method: Least Squares				
Date: 09/23/19 Time: 09:29				
Sample (adjusted): 2003Q3 2017Q4				
Included observations: 58 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(D(EDUC))	2.263022	1.215874	1.861230	0.0682
D(D(EYS))	4.441259	20.36851	0.218045	0.8282
LTRESID	-0.124189	0.046630	-2.663289	0.0102
C	0.002254	0.016524	0.136414	0.8920
R-squared	0.140830	Mean dependent var		-0.001034
Adjusted R-squared	0.093099	S.D. dependent var		0.131430
S.E. of regression	0.125163	Akaike info criterion		-1.251930
Sum squared resid	0.845950	Schwarz criterion		-1.109831
Log likelihood	40.30598	Hannan-Quinn criter.		-1.196580
F-statistic	2.950461	Durbin-Watson stat		2.307903
Prob(F-statistic)	0.040732			

Linearity Test

Ramsey RESET Test				
Equation: UNTITLED				
Specification: EG HEALTH LEB C				
Omitted Variables: Squares of fitted values				
	Value	df	Probability	
t-statistic	1.078531	32	0.2889	
F-statistic	1.163229	(1, 32)	0.2889	
Likelihood ratio	1.285409	1	0.2569	
F-test summary:				
	Sum of Sq.	df	Mean Squares	
Test SSR	0.311999	1	0.311999	
Restricted SSR	8.894979	33	0.269545	
Unrestricted SSR	8.582980	32	0.268218	

Unrestricted SSR	8.582980	32	0.268218	
LR test summary:				
	Value	df		
Restricted LogL	-25.91721	33		
Unrestricted LogL	-25.27451	32		
Unrestricted Test Equation:				
Dependent Variable: EG				
Method: Least Squares				
Date: 09/23/19 Time: 09:47				
Sample: 2009Q1 2017Q4				
Included observations: 36				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
HEALTH	-26.21219	26.82820	-0.977039	0.3359
LEB	1409.122	1439.624	0.978813	0.3350
C	-5689.788	5815.068	-0.978456	0.3352
FITTED^2	1.039858	0.964143	1.078531	0.2889
R-squared	0.298158	Mean dependent var		5.524722
Adjusted R-squared	0.232361	S.D. dependent var		0.591106
S.E. of regression	0.517898	Akaike info criterion		1.626361
Sum squared resid	8.582980	Schwarz criterion		1.802308
Log likelihood	-25.27451	Hannan-Quinn criter.		1.687772
F-statistic	4.531440	Durbin-Watson stat		0.111646
Prob(F-statistic)	0.009312			

Ramsey RESET Test				
Equation: UNTITLED				
Specification: EG EDUC EYS C				
Omitted Variables: Squares of fitted values				
	Value	df	Probability	
t-statistic	0.729665	56	0.4686	
F-statistic	0.532412	(1, 56)	0.4686	
Likelihood ratio	0.567746	1	0.4512	
F-test summary:				
	Sum of Sq.	df	Mean Squares	
Test SSR	0.076061	1	0.076061	
Restricted SSR	8.076248	57	0.141689	
Unrestricted SSR	8.000188	56	0.142860	
Unrestricted SSR	8.000188	56	0.142860	
LR test summary:				
	Value	df		
Restricted LogL	-24.97380	57		

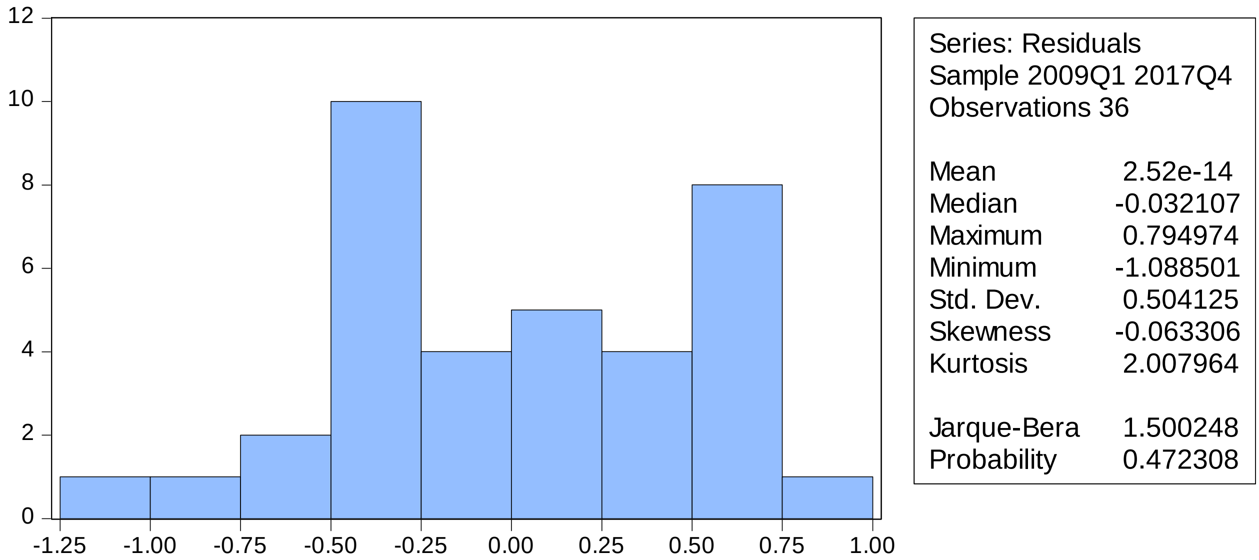
Unrestricted LogL	-24.68993	56		
Unrestricted Test Equation:				
Dependent Variable: EG				
Method: Least Squares				
Date: 09/23/19 Time: 09:50				
Sample: 2003Q1 2017Q4				
Included observations: 60				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
EDUC	-6.403254	16.29617	-0.392930	0.6959
EYS	38.22022	97.23302	0.393079	0.6958
C	-18.78422	54.63684	-0.343801	0.7323
FITTED^2	0.198122	0.271524	0.729665	0.4686
R-squared	0.589446	Mean dependent var		5.501083
Adjusted R-squared	0.567452	S.D. dependent var		0.574697
S.E. of regression	0.377969	Akaike info criterion		0.956331
Sum squared resid	8.000188	Schwarz criterion		1.095954
Log likelihood	-24.68993	Hannan-Quinn criter.		1.010945
F-statistic	26.80034	Durbin-Watson stat		0.236238
Prob(F-statistic)	0.000000			

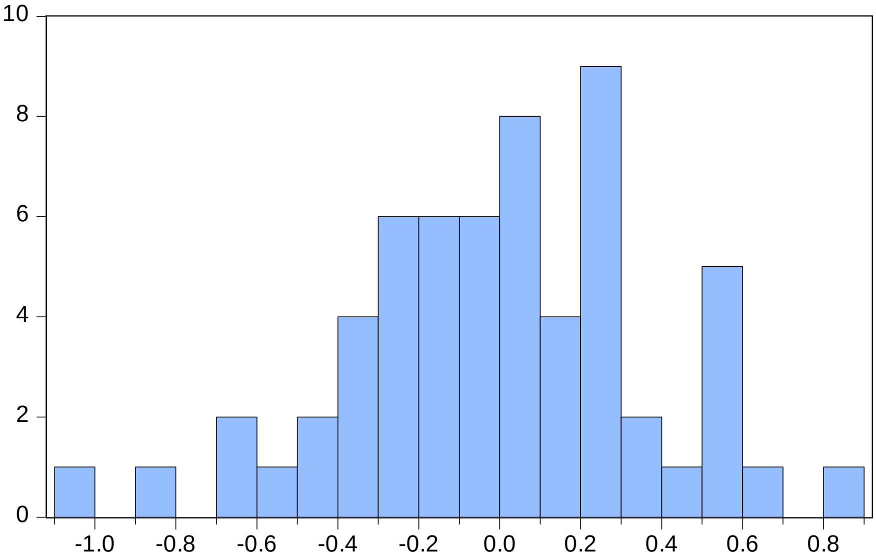
Heteroscedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey				
F-statistic	1.448473	Prob. F(2,57)		0.2434
Obs*R-squared	2.901930	Prob. Chi-Square(2)		0.2343
Scaled explained SS	2.728264	Prob. Chi-Square(2)		0.2556
Test Equation:				
Dependent Variable: RESID^2				
Method: Least Squares				
Date: 09/23/19 Time: 09:54				
Sample: 2003Q1 2017Q4				
Included observations: 60				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.040651	1.125914	1.812440	0.0752
EDUC	0.470009	0.315722	1.488680	0.1421
EYS	-3.040286	1.913239	-1.589078	0.1176
R-squared	0.048365	Mean dependent var		0.134604
Adjusted R-squared	0.014975	S.D. dependent var		0.195929
S.E. of regression	0.194457	Akaike info criterion		-0.388508
Sum squared resid	2.155364	Schwarz criterion		-0.283791
Log likelihood	14.65524	Hannan-Quinn criter.		-0.347547
F-statistic	1.448473	Durbin-Watson stat		0.703846
Prob(F-statistic)	0.243445			

Heteroskedasticity Test: Breusch-Pagan-Godfrey				
F-statistic	1.185538	Prob. F(2,31)		0.3191
Obs*R-squared	2.415763	Prob. Chi-Square(2)		0.2988
Scaled explained SS	1.069612	Prob. Chi-Square(2)		0.5858
Test Equation:				
Dependent Variable: RESID^2				
Method: Least Squares				
Date: 09/23/19 Time: 09:56				
Sample (adjusted): 2009Q3 2017Q4				
Included observations: 34 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.251477	0.044082	5.704741	0.0000
D(D(HEALTH))	9.125110	7.913842	1.153057	0.2577
D(D(LEB))	-690.9173	1356.468	-0.509350	0.6141
R-squared	0.071052	Mean dependent var		0.248529
Adjusted R-squared	0.011120	S.D. dependent var		0.257463
S.E. of regression	0.256027	Akaike info criterion		0.197032
Sum squared resid	2.032049	Schwarz criterion		0.331711
Log likelihood	-0.349539	Hannan-Quinn criter.		0.242961
F-statistic	1.185538	Durbin-Watson stat		0.787415
Prob(F-statistic)	0.319057			

Normality Test





Series: Residuals
Sample 2003Q1 2017Q4
Observations 60

Mean	-2.21e-14
Median	0.045466
Maximum	0.806210
Minimum	-1.022293
Std. Dev.	0.369980
Skewness	-0.308701
Kurtosis	3.083446
Jarque-Bera	0.970370
Probability	0.615583

Autocorrelation Test

Breusch-Godfrey Serial Correlation LM Test:				
F-statistic	1.141362	Prob. F(2,28)		0.3338
Obs*R-squared	2.562934	Prob. Chi-Square(2)		0.2776
Test Equation:				
Dependent Variable: RESID				
Method: Least Squares				
Date: 09/23/19 Time: 10:48				
Sample: 2009Q3 2017Q4				
Included observations: 34				
Presample missing value lagged residuals set to zero.				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(D(HEALTH))	-0.986563	3.553885	-0.277601	0.7834
D(D(LEB))	-106.8481	598.6812	-0.178472	0.8596
LTRRESID	-0.000774	0.038926	-0.019872	0.9843
C	-0.000114	0.019310	-0.005916	0.9953
RESID(-1)	-0.247548	0.187852	-1.317784	0.1983
RESID(-2)	-0.190359	0.188011	-1.012489	0.3200
R-squared	0.075380	Mean dependent var		3.06E-18
Adjusted R-squared	-0.089730	S.D. dependent var		0.107260
S.E. of regression	0.111969	Akaike info criterion		-1.382398
Sum squared resid	0.351040	Schwarz criterion		-1.113040
Log likelihood	29.50076	Hannan-Quinn criter.		-1.290539
F-statistic	0.456545	Durbin-Watson stat		2.012536
Prob(F-statistic)	0.804958			

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.892676	Prob. F(2,52)	0.4157

Obs*R-squared	1.925254	Prob. Chi-Square(2)		0.3819
Test Equation:				
Dependent Variable: RESID				
Method: Least Squares				
Date: 09/23/19 Time: 10:48				
Sample: 2003Q3 2017Q4				
Included observations: 58				
Presample missing value lagged residuals set to zero.				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(D(EDUC))	0.031174	1.220198	0.025549	0.9797
D(D(EYS))	0.327864	20.41465	0.016060	0.9872
LTRESID	0.020549	0.050434	0.407449	0.6854
C	-0.000573	0.016566	-0.034561	0.9726
RESID(-1)	-0.182628	0.142536	-1.281283	0.2058
RESID(-2)	-0.096947	0.147372	-0.657838	0.5135
R-squared	0.033194	Mean dependent var		2.75E-18
Adjusted R-squared	-0.059768	S.D. dependent var		0.121825
S.E. of regression	0.125412	Akaike info criterion		-1.216722
Sum squared resid	0.817869	Schwarz criterion		-1.003573
Log likelihood	41.28495	Hannan-Quinn criter.		-1.133696
F-statistic	0.357071	Durbin-Watson stat		1.958006
Prob(F-statistic)	0.875372			