

## SECONDARY EDUCATION, ECONOMIC GROWTH AND FINANCE <sup>1</sup>

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### ABSTRACT:

The purpose of this research is to determine the relationship among education, education finance and economic growth on the basis of secondary education. In the research, the number of students enrolled in secondary education is the indicator of education, net government education expenditures per student is the education finance variable and per capita GDP is the growth variable. The research included on 30 countries participating in the PISA 2015 exam. The data cover between the years 1998-2015. Since the study has unit and time data, panel model was preferred and cointegration test was applied. DOLS and FMOLS methods were used to estimate the coefficients. Our findings suggest, there is a negative relationship between education and education finance across the panel. However, there is a mutual positive relationship between 'finance and growth' and 'education and growth'. In countries that have higher scores than the OECD average, the situation is the same as that of the overall panel. In countries that have lower scores than the OECD average, it has been obtained no relationship between growth and education. According to the results we get before the crisis of 2008, education finance affects both education and economic growth negatively. At the same time economic growth only has a positive effect on education finance. Likewise, we were found a positive relationship between education finance and economic growth after the crisis of 2008. This relationship is mutually positive. This study contributes to do relevant literature on the fact that secondary education is financed by the public, reducing the inequality of opportunity in education and contributing to human capital positively affecting economic growth.

**Keywords:** Secondary Education, Economic Growth, Finance, Panel Analysis, PISA 2015

**Jel classification:** A20, C33, H52, I22, N30

### 1. INTRODUCTION

The relationship between education and the economy has a long history. Education in the Mercantilist period was seen as a means of developing the skills and abilities

<sup>1</sup> This study has been produced from the first author's doctoral dissertation.

of the manpower needed by the economy. It was stated that studies on physical capital were insufficient during the analysis and estimation of the determinative factors of economic growth and development, and one of the determining factors of the role of physical capital in the production process was its knowledge and ability. It has been argued that the acquisition of this knowledge and ability can be obtained through education. So, as Adam Smith put it, education was seen as an investment in human and was considered as the concept of human capital (Woodhall, 1987).

Among the classical economists, R. Malthus, D. Ricardo, W. Feriur and J. S. Mill emphasized, the relationship between education and economy. However, Russian economist Strumilin studied a detailed account of the importance of the relationship between education and the economy. Strumilin (1924: 29) analysed the effect of the complex functioning of the education system on the productivity of the workforce and total production. According to his study, the state's spending on vocational education for one and a half years yields a 73% return to the national economy over the following 35.5 years. On the other hand, Schultz explained the relationship between education and economic growth and he provided the concept of human capital to the literature. Schultz (1961) studied that the obstacle of underdeveloped countries in the development process is the quality of human capital, which is more important than the other factors of production.

The significance of education in the development process of a nation has been focused in relevant literature. 'Does education provide highly qualified manpower in the development process?'. This qualified manpower owes its fast adaptation to the working environment and innovations in education. Including the concept of human capital in economic growth theories, education plays a positive and effective role in the development process by affecting production in terms of process, quality and component (Saygılı et. al., 2006: 25). Education is the most important factor in the development of human capital. For this reason, countries want to reach a sustainable level of economic growth can prioritize education policies. They allocate great shares to education in public spending. According to Tural (2002: 193), if a large part of a nation's educational spending is covered by the public, this provides equal opportunities for income and positive externalities in social life. It also creates a decision-making mechanism within the framework of knowledge based on the human capital market. Finally, it provides educational planning application, through economics of scale.

In this study, the relationship between education and economic growth with the data of 30 countries participating in the PISA 2015 exam has been investigated with three variables. This research is important in providing empirical evidence. It provides an international comparison between the variables used in the research and selected countries. It is especially important in terms of being an econometric study within

the framework of both the "Human Capital Model" of Lucas (1988) and the "Public Policy Model" of Barro (1990). The results are expected to shed light on the development of educational policies of countries.

The research consists of an introduction, literature review, method, findings, discussion and conclusion. In the literature review, studies examining the relation between education and economy are included. The method of the research is explained. In the following section, there are findings of the research. Then, comparison of the findings with the literature is presented in the discussion section. Finally, conclusion and suggestions are brought forward at the last chapters.

## **2. LITERATURE REVIEW**

Studies on the relationship between education and economic growth have been carried out both national and on an international basis. Denison's (1962) study is accepted as a pioneering study on this subject. Between the years 1909-1957, the increase of the GDP in US tried to reveal the effects of production factors. The number of employees and the increase in physical capital in the findings of Denison's research are insufficient to explain the entire increase in national income. This residual factor, he has accepted employees' quality improvement. According to the results obtained, the quality increase in education has a 23% share in the increase of the GDP of the US. Studies that examined the impact of education on economic growth stepped up in the 1960s. In this regard, Becker (1964) states that education's to be 'the engine of economic growth'. At the same time, Becker (1992) argues that countries with a limited number of other inputs in the production function will grow faster thanks to their investments in human capital.

In accordance with the purpose of the research, the relationship between education and economic growth is presented here on the basis of secondary education. Keller (2006) analysed the relationship between education and economic growth using data from 107 developing and developed countries between the years 1960 and 2000. In the research, he used the schooling rate, total education expenditure by the public, education expenditure per student and GDP per capita. According to the research findings, public education expenditures per student positively affect economic growth. At the same time, the enrollment rate is the most important factor affecting economic growth.

Afzal, et al. (2012) investigated the relationship between education and economic growth based on data from four South Asian countries (Bangladesh, India, Pakistan and Sri Lanka) between the years 1995 and 2013. According to the research findings used in the panel model, population policies play an important role in ensuring the sustainability of economic growth. On the other hand, according to the study of

Ahmad and Luqman (2012), the increase in secondary education has an important share in the development of Pakistan economy.

Kesikoğlu and Öztürk (2013), examined the relationship between education, health and economic growth of 20 OECD countries, used the data for the years 1999-2008 in their research. In the study using the panel causality model, variables of GDP growth and total education expenditures in GDP were preferred. According to the research findings, "economic growth" and "education" have a mutual causality relationship. On the other hand, Karaçör, et al. (2017), researched the relationship between 19 OECD countries' educational spending and economic growth. In the research used in the panel model, it was concluded that education expenditure positively affected economic growth. Lenkei, et al. (2018) researched the growth relationship of 14 Asian countries with secondary education. They concluded that secondary education positively affected growth.

### 3. RESEARCH METHODOLOGY

In this study, which aims to investigate the relationship between education and economic growth on the basis of secondary education, the panel model was preferred because it has both cross-section and time data. The mathematical expression of the method used in the research is as follows:

$$y_{it} = \alpha_{it} + \beta_1 x1_{it} + \beta_2 x2_{it} + \varepsilon_{it}$$

The dependent variable in the method is “y”. “α” has a constant effect on the dependent variable. “x1” and “x2” are independent variables. “ε” is the error term in the method. “i” is the section unit and “t” is time data (Baltagi, 2001: 306). In this study, the cross-section unit is PISA 2015 participant 30 countries and it is shown in Table 1.

**Table 1: Selected Country Group**

No	Country	No	Country	No	Country
1	Australia*	11	Finland*	21	Norway*
2	Austria*	12	France*	22	Peru
3	Belgium*	13	Hungary	23	Poland*
4	Brazil	14	Iceland	24	Portugal*
5	Bulgaria	15	Ireland*	25	South Korea*
6	Chile	16	Italy	26	Spain
7	Colombia	17	Japan*	27	Sweden*
8	Denmark	18	Mexican	28	Switzerland*
9	England*	19	Moldova	29	Turkey
10	Estonia*	20	New Zealand*	30	USA

The countries indicated by "\*" in Table 1 show the countries that achieved success above the OECD average [OECD. (2018). PISA 2015: Results in focus. OECD Publishing]. Time data in the research are the data between the year 1998-2015.

Variables are, respectively, the number of students enrolled in secondary education (SEC), net (US dollar) government expenditure per student (SFIN), and real GDP per capita (PGDP). Primary data on variables were obtained from the World Bank [<https://data.worldbank.org>] and UNESCO [<https://data.uis.unesco.org>]. The secondary data are the statistical institutions of the countries and the ministries of education. Based on the defined variables, the models of the research are expressed as follows using the method:

$$\Delta \ln PGDP_{it} = \alpha_{it} + \beta_1 \Delta \ln SEC_{it} + \beta_2 \Delta \ln SFIN_{it} + \varepsilon_{it} \quad (1. \text{ Model}) \quad (1)$$

$$\Delta \ln SEC_{it} = \alpha_{it} + \beta_1 \Delta \ln SFIN_{it} + \beta_2 \Delta \ln PGDP_{it} + \varepsilon_{it} \quad (2. \text{ Model}) \quad (2)$$

$$\Delta \ln SFIN_{it} = \alpha_{it} + \beta_1 \Delta \ln SEC_{it} + \beta_2 \Delta \ln PGDP_{it} + \varepsilon_{it} \quad (3. \text{ Model}) \quad (3)$$

The variation of time data variables used in econometric studies as a unit may result in nonlinearity. One of the variables used in this research is quantity, and two of them are monetary expression. In order to ensure linearity, the data in models 1, 2, and 3 were transformed as natural logarithms (Ln). Information about the log-based data set is given in Table 2.

**Table 2: Descriptive Statistics for the DataSet**

	lnSEC	lnSFIN	lnPGDP
Mean	14.23	8.48	10.01
Median	14.02	8.91	10.45
Maximum	17.11	10.19	11.42
Minimum	10.38	5.23	6.85
Std. Dev.	1.51	1.14	0.97
Skewness	-0.21	-0.72	-0.95
Kurtosis	2.81	2.50	3.39
Jarque-Bera	4.62	53.08	84.05
Probability	0.01	0.00	0.00

Due to the time data of the panel model, there may be regression errors in the findings. Stationarity of data is provided to eliminate these regression errors. Unit root tests are applied to ensure stationarity. All PP, ADF, LLC and IPS unit root tests [For detailed information on unit root tests, see: Baltagi, B. H. (2013). *Econometric analysis of panel data*. Chichester: John Wiley and Sons] were used to increase the validity of the research. Stationarity in research models is expressed by the symbol " $\Delta$ ".

When stationarity is applied to variables, their relationships are affected. In other words, the relationship that really exists can disappear with stasis. Cointegration is carried out to determine the existing relationship after stationary. Although cointegrated variables have an unstable relationship in the short term, it can be stated that they have real relations in the long term (Güvenek and Alptekin, 2010: 180). In

this study, tests [For detailed information on cointegration tests, see: Baltagi, B. H. (2013). *Econometric analysis of panel data*. Chichester: John Wiley and Sons.] of Pedroni (2004), Kao (1999) and Johansen Fisher (1988) were performed to determine cointegration and increase reliability.

After determining that the variables are stationary and cointegration, the coefficient of the relationship between these variables can be estimated. DOLS (2001) and FMOLS (2000) coefficient estimators [For coefficient estimation methods, see: Baltagi, B. H. (2013). *Econometric analysis of panel data*. Chichester: John Wiley and Sons] developed by Pedroni were used to determine the relational coefficient in the study. DOLS reveals dynamic effects, FMOLS reveals modified effects. Therefore, both methods are preferred.

#### 4. FINDINGS

In this study, which aims to investigate education and economic growth on a 'triple variable basis'; The variables of 'education', 'finance' and 'growth' were made stationary at first. Unit root tests were applied to ensure stationarity. The findings are included in Table 3.

**Table 3: Unit root test**

Test	Case	Variable					
		lnSEC		lnSFIN		lnPGDP	
		Ind. interc.	Ind. interc. and trend	Ind. interc.	Ind. interc. and trend	Ind. interc.	Ind. interc. and trend
PP	I(0)	52.65	40.57	78.47*	62.36	138.25***	74.40*
	I(1)	368.67***	351.30***	168.38***	172.26***	200.24***	183.44***
ADF	I(0)	49.52	36.23	61.68	37.89	87.42**	50.27
	I(1)	199.80***	229.87***	96.81***	112.21***	173.21***	130.65***
LLC	I(0)	-2.22**	-1.70**	-3.88***	0.02	-6.41***	-3.39***
	I(1)	-11.54***	-15.35***	-3.25***	-6.33***	-11.48***	-11.43***
IPS	I(0)	1.62	3.16	0.54	3.10	-1.13	0.72
	I(1)	-7.84***	-11.10***	-3.21***	-3.82***	-7.92***	-4.80***

\*, \*\*, and \*\*\* are respectively 10%, 5% and 1% significance levels. The lag length was determined by the Modified Schwarz Information criterion. Bartlett Kernel method was used in LLC and PP tests and Bandwidth width was determined by Newey-West method.

According to Table 3 with unit root test results, there is no stationarity in the level values [I (0)] for lnPGDP, lnSEC and lnSFIN. Stationarity was achieved by taking the first difference [I(1)] of the variables. In order to reveal the relational state of the variables with the values obtained by the first-degree difference, models 1, 2, and 3 were established and cointegration test was performed. The findings are included in Table 4.

**Table 4: Cointegration test**

Model	Case	Pedroni Cointegration Test						
		Panel v	Panel rho	Panel PP	Panel ADF	Group rho	Group PP	Group ADF
Model 1	Ind. interc.	-1.98	-3.89***	-11.21***	-11.25***	-0.22	-9.03***	-7.69***
	Ind. interc. and trend	-5.29	-1.44*	-12.92***	-12.50***	1.96	-11.38***	-8.17***
Model 2	Ind. interc.	-2.15	-6.61***	-25.72***	-16.45***	-2.96***	-23.26***	-16.92***
	Ind. interc. and trend	-5.53	-3.27***	-33.69***	-17.73***	0.57	-30.81***	-16.62***
Model 3	Ind. interc.	-0.95	-2.33**	-8.40***	-8.87***	0.26	-9.15***	-9.16***
	Ind. interc. and trend	-4.34	0.53	-8.24***	-8.64***	2.90	-9.62***	-7.83***
		Kao Cointegration Test						
		ADF				Residual variance		HAC variance
Model 1	Ind. interc.	-3.77***				0.004		0.000
Model 2	Ind. interc.	-8.31***				0.020		0.003
Model 3	Ind. interc.	-2.70***				0.001		0.000
		Johansen Fisher Cointegration Test						
		None		At most 1		At most 2		
		from trace t	max-eigen t	from trace t	max-eigen t	from trace t	max-eigen t	
Model 1	Ind. interc. and trend	488.7***	382.4***	194.0***	147.1***	158.2***	158.2***	
Model 2	Ind. interc. and trend	488.7***	382.4***	194.0***	147.1***	158.2***	158.2***	
Model 3	Ind. interc. and trend	488.7***	382.4***	194.0***	147.1***	158.2***	158.2***	

\*, \*\*, and \*\*\* are respectively 10%, 5% and 1% significance levels. Bartlett Kernel method was used and Bandwidth width was determined by Newey-West method.

It is also seen in Table 4 that the cointegration test findings include that there is a long-term relationship between all three variables. As a matter of fact, according to the findings of Pedroni cointegration test,  $H_0$  hypothesis was rejected in 10 of 14 tests that measured individual intercept, and individual intercept and trending situations for model one. An alternative hypothesis showing that there is cointegration is accepted. Likewise, 11 tests for model two and 9 tests for model three show that there is a cointegration relationship. Kao cointegration test findings, it is seen that in the model one where education is considered as a dependent variable, it is associated with long-term education finance and growth. Alternative hypothesis is accepted in model two, where financing is considered as the dependent variable, and in model three, where growth is dependent. In the findings of the Johansen Fisher cointegration test, the last of the cointegration tests, it was concluded that education, finance and growth are in mutual relationship for all three models.

After determining that there is a long-term relationship between the variables, the direction and values of this relationship can be estimated. For this, DOLS and FMOLS methods are used. The results obtained are presented in Table 5.

**Table 5: DOLS and FMOLS findings**

Sample Group	Variable	Method	Model 1		Model 2		Model 3	
			Coef.	t-stat.	Coef.	t-stat	Coef.	t-stat
Panel	$\beta_1$	DOLS	-0.16	-8.10***	-0.44	-3.01***	0.10	1.45
		FMOLS	-0.16	-9.26***	-0.36	-3.05***	0.13	2.38**
	$\beta_2$	DOLS	0.04	0.61	0.57	3.73***	0.09	4.31***
		FMOLS	0.12	1.75*	0.71	5.77***	0.10	6.28***
Above Average Perf.	$\beta_1$	DOLS	-0.23	-7.82***	-0.47	-2.51**	0.12	1.44
		FMOLS	-0.25	-9.11***	-0.46	-3.02***	0.18	2.81***
	$\beta_2$	DOLS	0.03	0.28	0.65	2.73***	0.11	3.63***
		FMOLS	0.15	1.36	0.95	5.55***	0.13	5.36***
Below Average Perf.	$\beta_1$	DOLS	-0.07	-2.99***	-0.41	-1.77*	0.07	0.67
		FMOLS	-0.06	-3.06***	-0.27	-1.35	0.08	0.85
	$\beta_2$	DOLS	0.05	0.77	0.48	2.63***	0.06	2.37**
		FMOLS	0.09	1.12	0.44	2.47**	0.08	3.40***
1998-2007	$\beta_1$	DOLS	-0.20	-6.95***	-0.30	-1.33	-0.10	-1.17
		FMOLS	-0.21	-10.68***	-0.30	-1.44	-0.09	-1.73*
	$\beta_2$	DOLS	0.05	0.37	0.63	2.41**	0.02	0.58
		FMOLS	0.11	0.94	0.61	1.73*	0.02	1.08
2010-2015	$\beta_1$	DOLS	-0.05	-1.01	-0.17	-0.39	0.04	0.35
		FMOLS	-0.05	-1.07	-0.10	-0.24	-0.06	-0.43
	$\beta_2$	DOLS	-0.00	-0.02	1.17	2.40**	0.12	5.02***
		FMOLS	-0.02	-0.10	1.32	2.49**	0.13	5.64***

\*, \*\*, and \*\*\* are respectively 10%, 5% and 1% significance levels. Bartlett Kernel method was used and Bandwidth width was determined by Newey-West method

The relational direction and value of the variables are presented as a panel to cover 30 countries. In addition, the countries were distinguished as upper and lower from the OECD average on the PISA exam and analysed. On the other hand, the years 1998-2007 and 2010-2015 distinctions were made to show the direction of the relationship between variables pre and post the 2008 crisis. According to the results in Table 4, financing across the panel affects the education negatively, at a level of 0.16% when viewed with both the DOLS and FMOLS method. The impact of growth in education is not statistically significant in the DOLS model. According to the FMOLS method, 10% significance level, growth leads to a positive change of 0.12 on education. Considering the model, in which financing is considered as a dependent variable, as the number of students enrolled in secondary education increases, the expenditure per student decreases by the public. This decrease is seen as -0,44 in DOLS method and -0,36 in FMOLS method at 1% significance level. The increase in GDP per capita, which is an indicator of growth, positively affects public education expenditures per student, which is an indicator of finance. In other words, 1% significance level, growth affects the finance 0.57 positively in the DOLLs method and 0.71 in the FMOLS method. When the model is analysed in three, secondary education affects growth positively. Although this effect is not statistically significant in DOLS method, it increases 0.13 values with 5% significance level compared to FMOLS method. On the other hand, has a 1% significance level, financing has a positive effect growth on both models.

According to the findings of countries with higher scores than the OECD average on the PISA exam, the increase in the number of students enrolled in secondary education negatively affects education financing, and the increase in education financing affects secondary education negatively. This effect is on the average -0.46 level of secondary education in education finance. From financing to secondary education, it is -0.24. When looking at the relationship between finance and growth, both variables affect each other positively. While the 1 % increase in financing with 1% significance increases the growth at an average level of 0.12. 1% increase in growth increases education finance 0.65 according to the DOLS method and 0.95 according to the FMOLS method. Even though the effect of growth on education is positive, it is not statistically significant. However, according to FMOLS method, the effect of education on economic growth of 0.18 and positive. In countries with lower scores than the OECD average, the impact of financing of education is the same as in the other country group. However, it has a lower coefficient. The effect of education on financing is only negative at -0.41% at 10% significance level according to the DOLS method. The relationship between finance and growth affects each other positively. However, it is at a lower level compared to the situation in top performing countries.

Considering the situation before and after the crisis, financing in the pre-crisis situation affects education at the level of 1% in the DOLS method -0.20, and -0.21 in the FMOLS method negatively. In both periods, growth has a positive effect on finance. In the pre-crisis DOLS method and 5% significance, this effect is 0.63. In FMOLS method and 10% significance level, the effect was found to be 0.61. Post-crisis growth is seen as 1,17 in the DOLS method and 1,32 in the FMOLS method, with a 5% significance level of financing. Education before the crisis has a negative impact on growth. In the DOLS method, this effect is not statistically significant. However, according to the FMOLS method, it is -0.09 at a 10% significance level. Financing does not affect growth statistically. While the impact of education on growth in the post-crisis situation is not statistically significant, financing has a positive effect on economic growth. This effect is 0.12% in DOLS method and 0.13 in FMOLS method. Besides the above-mentioned coefficient estimation, education, financing and growth relationship have been handled separately for 30 countries. The situation on a country basis is given in Table 6.

**Table 6: DOLS and FMOLS findings by country**

Country	Variable	Method	Model 1		Model 2		Model 3	
			Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.
Australia	$\beta_1$	DOLS	-0.26	-1.66	-0.56	-1.66	0.05	0.58
		FMOLS	-0.32	-2.11*	-0.75	-2.34**	0.04	0.52
	$\beta_2$	DOLS	0.57	0.68	0.98	0.81	0.04	0.68
		FMOLS	0.14	0.15	2.06	1.56	0.08	1.48
Austria	$\beta_1$	DOLS	0.01	0.08	0.11	0.14	0.26	0.76
		FMOLS	0.01	0.09	-0.05	-0.08	0.52	1.72
	$\beta_2$	DOLS	0.12	0.46	-0.31	-0.59	-0.06	-0.57
		FMOLS	0.32	1.12	-0.43	-0.95	-0.07	-0.81
Belgium	$\beta_1$	DOLS	-0.95	-9.10	-0.91	-9.64***	0.03	0.34
		FMOLS	-0.95	-13.15***	-0.91	-14.30***	0.04	0.69
	$\beta_2$	DOLS	0.31	0.32	0.78	0.89	0.07	0.89
		FMOLS	0.71	0.98	1.19	1.87*	0.10	1.52
Brazil	$\beta_1$	DOLS	-0.16	-1.49	-0.69	-1.36	0.21	2.03*
		FMOLS	-0.19	-1.98*	-0.89	-2.03*	0.21	2.53**
	$\beta_2$	DOLS	0.69	1.72	2.22	2.88**	0.16	3.73***
		FMOLS	0.57	1.61	2.58	3.74***	0.19	5.48***
Bulgaria	$\beta_1$	DOLS	-0.01	-0.32	-1.11	-0.82	0.26	0.58
		FMOLS	-0.02	-0.51	-1.13	-0.85	0.44	1.26
	$\beta_2$	DOLS	0.13	0.52	1.26	1.32	0.08	0.58
		FMOLS	0.23	0.85	1.61	1.38	0.03	0.97
Chile	$\beta_1$	DOLS	-0.24	-2.20**	-1.50	-3.31***	-0.02	-0.08
		FMOLS	-0.30	-2.86**	-1.01	-2.00*	0.02	0.10
	$\beta_2$	DOLS	-0.03	-0.06	-0.355	-0.51	-0.04	-0.43
		DOLS	-0.24	-2.20**	-1.50	-3.31***	-0.02	-0.08
Colombia	$\beta_1$	DOLS	-0.02	-0.25	-0.50	-0.44	0.06	0.21
		FMOLS	-0.02	-0.31	-0.15	-0.18	0.09	0.55
	$\beta_2$	DOLS	0.07	0.17	-1.17	-1.00	-0.04	-0.71
		FMOLS	0.53	0.73	-1.73	-1.18	-0.04	-1.10
Denmark	$\beta_1$	DOLS	-0.16	-2.32**	-1.07	-2.25**	-0.15	-0.42
		FMOLS	-0.15	-2.56**	-1.19	-2.81**	-0.24	-0.69
	$\beta_2$	DOLS	-0.09	-0.62	0.40	1.00	0.09	0.70
		FMOLS	-0.10	-0.78	0.51	1.42	0.13	1.01
England	$\beta_1$	DOLS	-0.58	-4.36***	-0.77	-3.67***	0.01	0.06
		FMOLS	-0.54	-4.35***	-0.85	-4.43***	0.05	0.46
	$\beta_2$	DOLS	0.07	0.10	-0.08	-0.10	-0.01	-0.07
		FMOLS	0.51	0.84	0.42	0.51	0.01	0.13
Estonia	$\beta_1$	DOLS	0.04	0.45	0.60	0.84	0.81	1.70
		FMOLS	0.09	0.86	0.80	1.48	0.97	2.27**
	$\beta_2$	DOLS	0.22	1.24	0.25	0.68	0.07	0.49
		FMOLS	0.30	1.69	0.21	0.74	0.05	0.40
Finland	$\beta_1$	DOLS	-0.63	-2.74**	-0.33	-2.36**	-0.01	-0.51
		FMOLS	-0.73	-3.23***	-0.38	-2.70**	0.02	0.14
	$\beta_2$	DOLS	-0.03	-0.07	0.44	1.33	0.18	1.09
		FMOLS	0.08	0.21	0.65	1.93*	0.30	1.88*
France	$\beta_1$	DOLS	-0.14	-3.00***	-2.12	-2.81**	0.00	0.00
		FMOLS	-0.15	-3.28***	-2.24	-3.42***	0.17	0.43
	$\beta_2$	DOLS	-0.63	-2.74**	-0.33	-2.36**	-0.01	-0.5
		FMOLS	-0.73	-3.23***	-0.38	-2.70**	0.02	0.14
Hungary	$\beta_1$	DOLS	-0.01	-0.22	-0.24	-0.25	-0.02	-0.06
		FMOLS	-0.00	-0.03	-0.41	-0.45	0.07	0.19
	$\beta_2$	DOLS	-0.01	-0.09	2.00	2.75**	0.09	1.55
		FMOLS	0.03	0.17	2.17	3.14***	0.13	2.11*
Iceland	$\beta_1$	DOLS	-0.24	-2.31**	-1.13	-2.43**	0.09	0.25
		FMOLS	-0.24	-2.42**	-1.15	-2.32**	0.24	0.58
	$\beta_2$	DOLS	0.05	0.26	0.75	2.12*	0.29	1.92*
		FMOLS	0.11	0.59	0.88	2.49**	0.38	2.42**
Ireland	$\beta_1$	DOLS	-0.01	-0.07	-0.07	-0.07	-0.35	-0.44
		FMOLS	-0.01	-0.13	-0.18	-0.23	-0.29	-0.53
	$\beta_2$	DOLS	-0.06	-0.41	0.70	2.52**	0.58	2.54**
		FMOLS	-0.10	-0.96	0.79	3.31***	0.56	3.75***

Italy	$\beta_1$	DOLS	0.02	0.65	1.28	0.96	0.10	0.12
		FMOLS	0.02	0.76	1.50	1.43	-0.28	-0.33
	$\beta_2$	DOLS	0.01	0.14	0.61	1.43	0.08	0.84
		FMOLS	0.02	0.33	0.71	2.21**	0.13	1.42
Japan	$\beta_1$	DOLS	0.09	0.62	0.74	1.18	-0.27	-0.70
		FMOLS	0.13	0.94	0.82	1.29	-0.25	-0.67
	$\beta_2$	DOLS	-0.10	-0.40	1.03	3.06***	0.32	2.86**
		FMOLS	-0.19	-0.69	1.02	3.05***	0.33	3.17***
Mexican	$\beta_1$	DOLS	-0.01	-0.19	-0.52	-0.42	0.52	0.10
		FMOLS	-0.01	-0.22	0.39	0.24	0.39	0.72
	$\beta_2$	DOLS	0.11	0.77	-0.27	-0.46	-0.02	-0.27
		FMOLS	0.13	0.89	-0.48	-0.64	-0.03	-0.40
Moldova	$\beta_1$	DOLS	0.09	0.93	1.38	2.32**	0.14	0.35
		FMOLS	0.16	1.80*	1.67	2.88**	0.52	1.45
	$\beta_2$	DOLS	0.04	0.18	-0.05	-0.14	-0.01	-0.10
		FMOLS	0.13	0.63	-0.14	-0.40	-0.05	-0.58
New Zealand	$\beta_1$	DOLS	-0.16	-1.61	-1.04	-1.65	0.17	0.97
		FMOLS	-0.17	-1.87*	-0.80	-1.60	0.26	1.92*
	$\beta_2$	DOLS	0.60	1.24	1.02	0.82	0.04	0.63
		FMOLS	1.13	2.16*	1.23	1.06	0.05	0.95
Norway	$\beta_1$	DOLS	-0.03	-0.41	-0.44	-0.45	0.02	0.06
		FMOLS	-0.03	-0.41	-0.19	-0.21	0.11	0.33
	$\beta_2$	DOLS	0.02	0.07	-0.64	-0.62	-0.04	-0.45
		FMOLS	0.13	0.42	-0.28	-0.29	-0.02	-0.19
Peru	$\beta_1$	DOLS	-0.20	-3.12***	-1.71	-2.55**	-0.07	-0.21
		FMOLS	-0.19	-2.74***	-1.82	-3.11***	-0.01	-0.04
	$\beta_2$	DOLS	-0.07	-0.30	0.07	0.09	0.01	0.08
		FMOLS	-0.06	-0.23	0.08	0.11	0.06	0.52
Poland	$\beta_1$	DOLS	0.03	0.41	0.33	0.35	-0.12	-1.30
		FMOLS	-0.07	-0.40	0.45	1.03	-0.11	-1.00
	$\beta_2$	DOLS	-0.88	-1.43	2.85	1.17	0.03	1.36
		FMOLS	-0.872	-1.39	2.95	2.67**	0.09	1.25
Portugal	$\beta_1$	DOLS	-0.22	-1.29	-0.52	-1.41	-0.14	-1.16
		FMOLS	-0.29	-1.68	-0.60	-1.66	-0.18	-1.69
	$\beta_2$	DOLS	-0.69	-1.19	-0.15	-0.18	-0.01	-0.16
		FMOLS	-0.74	-1.19	0.51	0.58	-0.00	-0.05
South Korea	$\beta_1$	DOLS	-0.07	-0.86	-1.49	-2.20**	-0.09	-0.37
		FMOLS	-0.11	-1.41	-1.60	-2.22**	0.01	0.04
	$\beta_2$	DOLS	-0.12	-0.27	2.60	3.49***	0.08	1.86*
		FMOLS	0.20	0.32	3.59	3.65***	0.09	3.03***
Spain	$\beta_1$	DOLS	-0.08	-1.05	-0.98	-1.07	-0.57	-1.43
		FMOLS	-0.06	-0.80	-0.74	-1.01	-0.92	-2.53**
	$\beta_2$	DOLS	-0.26	-1.44	0.38	0.60	0.07	0.58
		FMOLS	-0.40	-2.44**	0.37	0.75	0.08	0.75
Sweden	$\beta_1$	DOLS	-0.88	-13.10***	-1.06	-12.60***	0.39	1.51
		FMOLS	-0.87	-13.54***	-1.05	-13.38***	0.31	1.44
	$\beta_2$	DOLS	0.30	1.27	0.37	1.42	0.41	1.77*
		FMOLS	0.43	1.86*	0.54	2.13*	0.35	1.77*
Switzerland	$\beta_1$	DOLS	-0.00	-0.01	-0.01	-0.01	1.21	2.82**
		FMOLS	-0.00	-0.01	0.41	0.30	1.17	3.12***
	$\beta_2$	DOLS	0.24	2.46**	0.42	0.54	0.02	0.44
		FMOLS	0.30	2.99**	0.44	0.74	0.03	0.57
Turkey	$\beta_1$	DOLS	-0.12	-0.60	-0.19	-0.51	-0.01	-0.05
		FMOLS	-0.04	-0.23	-0.07	-0.19	-0.02	-0.15
	$\beta_2$	DOLS	-0.02	-0.05	0.72	1.18	0.16	1.28
		FMOLS	0.01	0.01	0.64	0.99	0.16	1.36
USA	$\beta_1$	DOLS	0.10	1.19	1.21	1.59	0.50	1.03
		FMOLS	0.14	1.70	1.21	1.75	0.63	1.41
	$\beta_2$	DOLS	0.16	0.92	0.09	0.21	0.03	0.18
		FMOLS	0.30	1.76	0.24	0.55	-0.01	-0.09

\*, \*\*, and \*\*\* are respectively 10%, 5% and 1% significance levels. Bartlett Kernel method was used and Bandwidth width was determined by Newey-West method

According to Table 6, which shows the relationship between education, finance and growth on the basis of countries, in the model one where education is considered as a dependent variable, finance affects education negatively at -0.32 level at 10% significance in FMOLS method. In Belgium, it has a negative effect on FMOLS method and %1 significance at the level of -0,95. For Brazil, this value is -0.19 in FMOLS method and 10% significance level, -0.17 in New Zealand. However, financial education for Moldova positively affects the FMOLS method and 10% significance at the level of 0.16. Considering the results of the second model in which finance is a dependent variable, education in FMOLS method has a negative effect on financing at -0.75 level in Australia with a 5% significance. In Brazil, it is -0.89 in 10% significance. According to the findings of both methods, education financing affects negatively between -1.49 and -1.60 in 5% significance level in South Korea. In Sweden, this negative effect is between -1.06 and -1.05 with a significance of 1%. In terms of Moldova, education finance has a positive effect between 1,38-1,67 in both methods with 5% significance. On the other hand, education and finance affect each other negatively in Denmark, France, Finland, England, Sweden, Iceland, Peru and Chile.

According to the findings obtained in Spain, Sweden, Switzerland and New Zealand, growth has a positive effect to education. In contrast, education in Brazil, Estonia and New Zealand has a positive impact on economic growth, while in Spain this is negative. According to another finding, growth and finance in Brazil, Finland, South Korea, Ireland, Sweden, Iceland, Japan and Hungary mutually affect each other positively. While growth in Australia, Belgium and Poland has a positive impact on financing, the impact of finance on growth is not statistically significant. In Spain, finance has a negative impact on growth.

## 5. DISCUSSION

The similarities and differences of the results obtained from the research in the literature, especially endogenous growth theories are discussed in this section. In the human capital model of Lucas (1988) information gained within the educational levels of individuals has a positive effect on economic growth by strengthening the interaction between individuals and adapting to the working conditions quickly during the production process in which they work as a workforce. As a result of this research, change in the education obtained changes the growth positively and it coincides with the model of Lucas. At the same time, there is a positive change in growth with the effective workforce in Lucas' model. If the process is followed, this change may increase the enrollment rate in the countries. The result of this research coincides with the economic growth and education relationship with Lucas. Because, according to the findings, the increase in economic growth affects education positively as well as education finance positively.

According to another result, education finance affects economic growth positively, while secondary education affects negatively. This result can be explained by the public policy model of Barro (1990). In the public policy model, public expenditures are evaluated according to their usage areas. If public benefit is a priority, consumption expenditure in terms of social benefit has a less positive impact on economic growth. Public spending has a more positive impact on economic growth when investment spending for the benefit of the state is a priority. From this perspective, public education finance is considered as social benefit in countries with a high population growth rate. Because the demand for education is high in these countries. In this case, public education policy focuses on inequality of opportunity. Thus, it is aimed to spread the positive externality of education. In this case, public expenditure is a consumption / current expenditure. As public education expenditure; current expenditures such as teacher salaries, teaching materials, and public expenditures of the school building etc. may have a low level of positive impact on education financing growth. Thus, the cost of human capital can increase for individuals and the working population can participate in the production process with lower human capital. As a result, the effect of education finance on education may turn negative.

Looking at the situation pre and post of the crisis 2008, post-crisis education finance has a significant positive effect on economic growth. This situation coincides with Keynes's (1936) economic growth process realized by state intervention. As a matter of fact, according to the research findings, educational financing affects economic growth positively and public expenditures increase with the development of economic growth.

## **6. CONCLUSION**

In the study, the relationship between education and economic growth has been conducted in the axis of education, finance and growth based on secondary education data. The data for the years 1998-2015 and exam scores of 30 countries participating in PISA 2015 were used in the research. In the study designed with panel econometric model, the variables were first made stationary with a difference from first degree difference. The relationship among education, finance and growth have been demonstrated by cointegration methods. DOLS and FMOLS methods were used to determine the direction and value of the relationship. In the estimation including the overall panel, the situation of 30 countries was evaluated separately, whether to be above or below the OECD averages in PISA exam or to be before and after the 2008 crisis. In general, there is a significant relationship between all three variables. The fact that education affects growth and finance affects growth positively reveals the importance of the relationship between education and growth.

In the forecasting method, making various samples provides empirical evidence important for educational policy practitioners. In terms of human capital, although secondary education is currently costly in public spending in the short term, it is important in terms of investment in the long term because of the transition to higher education and participation in the working population. For this reason, it is recommended that countries concentrate on secondary education and ensure the participation of especially socio-economically disadvantaged groups. Based on the findings of the research, allocating a budget to encourage secondary education by the public can reduce the inequality of opportunity in education. It can also have a positive impact on the country's economic growth. Thanks to these two effects, significant increases in human capital stock can be achieved.

In terms of secondary education, it is recommended to examine the effect of school dropouts on growth. Total education expenditures in GDP can be preferred as the variable of finance. The relationship between growth and education is may be to be made on the basis of education indicators of the working population. In general, research is suggested using different variables and different time series.

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