THE RELATIONSHIP BETWEEN PUBLIC EDUCATION EXPENDITURES AND WELFARE INDEX IN OECD COUNTRIES

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ABSTRACT

Education is one of the most important factors determining the increment of prosperity in a country. Therefore, expenditures on education are of great importance. In this study; it is aimed to investigate the relationship between the share of public education expenditures in GDP and the welfare index prepared by the British think tank "The Legatum Institute" in the period of 2007-2014 in the 31 OECD countries where the data is accessible. As a result of the analysis made by using the Panel Vector Autoregression method, causality relationship between the public expenditures made by the countries and the welfare index and the welfare education index has been put forward.

Keywords: OECD countries, Education expenditures, Welfare index, Panel-VAR

Jel Codes: I22, I25, I31.

ÖZET

Eğitim bir ülkede refahın artmasını belirleyen en önemli faktörlerden biridir. Bu sebeple eğitime yapılan harcamalar büyük önem taşımaktadır. Bu çalışmada verilerine ulaşabildiğimiz 31 OECD ülkelerindeki 2007-2014 dönemini kapsayan süre içinde kamu eğitim harcamalarının GSYH içindeki payı ile İngiliz düşünce kuruluşu "The Legatum Institute" tarafından hazırlanan refah endeksi arasındaki ilişkinin varlığını araştırmak amaçlanmaktadır. Araştırma da Panel Vektör Otoregresyon yöntemi kullanılmaktadır. Analiz sonucunda ülkelerin yapmış oldukları kamu harcamaları ile refah endeksi ve refah eğitim endeksi arasında nedensellik ilişkisi bulunmuştur.

Anahtar Kelimeler: OECD ülkeleri, Eğitim harcamaları, Refah Endeksi, Panel-Var

Jel Kodları: I22, I25, I31.

1. INTRODUCTION

Education, which is a process that enables individuals to develop their skills and to socialize while acquiring knowledge and skills, is closely related to development (Arabacı: 2011). First of all, education, which determines the nature of the workforce used in production, contributes positively not only to the individual himself but also to the social and economic structure of the society. As the level of education increases, workforce productivity will increase and thus the competitiveness of the countries will be affected positively and this will bring significant advantages to the countries in the globalizing world.

Education is the basis of the technological development of the country. Given the importance of technology nowadays, procuring technological development is possible by possessing the knowledge and by producing as much information as possible. The most significant term for producing information in a country is the quality of the education system. The education system must adapt to the changing

conditions of modern-day and should be able to renew itself continuously by following up-to-date information. In our era, rapid changes in economic, social and technological areas affect social institutions and education systems are faced with the need for re-formation (Alkan, 1982).

Education has a direct impact on the individual's own welfare level, as well as, plays an important role over the indirect effects of the social capital accumulation (happiness, health, aesthetics, trust and stability in relations, ability to organize, conservation of nature, political independence, reduction of fertility and crime rate etc.) (Baş, 2001). It is one of the important duties of the state to ensure and increase this welfare. Therefore, education in many countries is considered as the duty of the state and financing is provided by public resources. Efforts to allocate more resources to education services are aimed at creating a more qualified education system and, consequently, in the perspective of the economy, an increase in labor productivity, and technological innovation and production (Kılıçaslan 2016).

Differences in educational level are one of the main variables among countries' economic performances. For this reason, countries are constantly trying to improve their education systems. In many poor countries, many studies have shown that education is considered a priority for reducing poverty and increasing welfare (Jung and Thorbecke: 2003). In 2017, the share of education was 8.2% of GDP in Denmark and 7.6% in Sweden; in contrast, for Myanmar and Chad, these shares for education were only 1.8% and 2.8% of GDP (UNDP 2018 and World Bank 2018). With the increase in the share allocated to education in underdeveloped and developing countries, economic development will be possible, unemployment and poverty reduction will be possible and welfare will be increased. Table 1 shows the share of public education expenditures in GDP in 31 OECD member countries.

Table 1: Percentage of public education expenditure in GDP in Oecd countries

Country/Year	2007	2008	2009	2010	2011	2012	2013	2014
Germany	4,35	4,41	4,88	4,91	4,81	4,93	4,93	4,95
America	5,23	5,30	5,26	5,43	5,21	5,20	4,93	5,38
Australia	4,65	4,63	5,09	5,56	5,10	4,90	5,29	5,23
Austria	5,18	5,30	5,77	5,72	5,61	5,51	5,56	5,50
Belgium	5,84	6,29	6,41	6,41	6,38	6,37	6,65	6,59
Czech Republic	3,88	3,75	4,18	4,08	4,28	4,25	4,09	4,07
Denmark	7,61	7,48	8,51	8,61	8,56	7,30	8,63	8,10
Estonia	4,66	5,52	5,95	5,53	5,02	4,71	4,85	5,48
Finland	5,67	5,84	6,49	6,54	6,48	7,19	7,17	7,17
France	5,43	5,43	5,74	5,68	5,51	5,53	5,49	5,54
South Korea	3,53	3,53	4,01	4,12	3,96	3,91	4,09	4,24
Netherlands	4,94	5,09	5,49	5,55	5,53	5,48	5,59	5,53
Ireland	4,72	5,44	6,14	6,06	5,78	5,74	5,32	5,60
Britain	4,97	4,96	5,17	5,81	5,71	5,43	5,64	5,73
Israel	5,48	5,52	5,48	5,54	5,57	5,75	5,83	5,76

Country/Year	2007	2008	2009	2010	2011	2012	2013	2014
Spain	4,24	4,49	4,86	4,82	4,87	4,43	4,31	4,27
Swedish	6,21	6,39	6,85	6,62	6,49	7,67	7,72	7,68
Switzerland	4,71	4,90	5,06	4,95	5,00	5,05	5,07	5,10
Italy	4,12	4,41	4,54	4,36	4,14	4,26	4,18	4,08
Iceland	7,08	7,26	7,35	7,21	7,05	7,86	7,81	7,37
Japan	3,33	3,32	3,55	3,64	3,65	3,70	3,67	3,59
Canada	4,79	4,65	4,86	5,36	5,28	4,99	4,99	4,99
Latvia	4,66	5,41	5,57	5,08	4,95	6,61	6,99	5,29
Hungary	5,16	5,00	4,99	4,79	4,62	4,78	4,22	4,66
Mexican	4,73	4,84	5,21	5,18	5,13	5,17	4,75	5,31
Norway	6,53	6,28	7,10	6,75	6,46	7,36	7,37	6,84
Poland	4,86	5,03	5,00	5,05	4,81	4,81	4,93	4,91
Portugal	4,94	4,70	5,58	5,40	5,13	4,96	5,29	5,13
Slovakia	3,53	3,53	4,01	4,12	3,96	3,91	4,09	4,24
Slovenia	5,11	5,11	5,57	5,56	5,57	5,66	5,49	5,44
Chile	3,22	3,79	4,24	4,18	4,08	4,58	4,56	4,75
New Zealand	5,92	5,50	6,27	7,01	6,95	7,16	6,69	6,34

(https://www.worldbank.org)

It is seen that they allocate significant resources to education in the member countries of the Organization for Economic Co-operation and Development (OECD). Considering the fact that the member states are developed countries, it can be said that there is a direct relationship between welfare levels and education expenditures. The aim of this study is to determine the effect of the share allocated to education within the Gross Domestic Expenditures between 2007-2014 of OECD member states (31 member countries) to the points of welfare index. The lack of a study examining the existence of a relationship between education expenditures and the welfare index has been considered a deficiency in the literature, and the deficiency has been eliminated and a contribution has been made to the literature.

2.   LITERATURE

In their study, Sang Jung and Thorbecke (2003) evaluate the effects of public education expenditures on the labor force skills, macroeconomic indicators and human capital in less developed countries such as Tanzania and Zambia with the "Computable general equilibrium" model. As a result of the study, it has been revealed that education expenditures can increase economic growth, a well-targeted education expenditure model can be effective for poverty reduction, and the poverty and growth effects of education expenditures may vary between countries.

Adel and İmen (2018) examined the effects of public education expenditures on GDP per capita between 1980 and 2015 in Tunisia and Morocco with ARDL approach. In the short term, the relationship between public education expenditures and GDP per capita in Morocco was positive, while in Tunisia it was

negative. In the long term, public education expenditures has helped to increase the per capita GDP of the two countries, but in Morocco more intensely than those in Tunisia.

Kızılkaya and Koçak (2014) analyzed the relationship between public education expenditures and economic growth in the period of 1990-2009 by using the method of co-integration by using the data of GDP, public education expenditures and fixed capital investments in the selected 11 OECD countries. As a result of the analysis, it has been revealed that public education expenditures have a positive impact on economic growth. This situation is supportive of the Endegenous Growth Theory, which states that the expenditures made for education enhance labor productivity by increasing human capital.

Pamuk and Bektaş (2014) have analyzed the relationship between education spending and economic growth in Turkey with the ARDL bounds testing approach. In this study, seasonally adjusted real GDP and seasonally adjusted real education expenditures have been used quarterly between 1998 and 2012. At the end of the study, it has been concluded that there is no long-term relationship between education expenditures and economic growth. According to the results of Granger causality test, causality relation between increase in GDP and education expenditures has been found.

In the study of Wolff E.N. (2015), educational expenditures of 31 OECD countries between 1988-2008 were analyzed using conventional GDP deflator in PISA math points. In this study, the regression of labor productivity, total education expenditures, compensation of education personnel and total education expenditures were analyzed according to GDP components. Also, regression of PISA mathematics and literacy scores and total secondary education expenditures and actual education expenditure per student were analyzed according to schooling level. In addition, there was an increase in education expenditures, even though there wasn't an increase in PISA test results.

Education doesn't just affect labor productivity, GDP, economic growth, etc. Besides, factors like democratization, crime rates, fertility and infant mortality rate are also affected. Apergis (2017) examined the relationship between education and democracy in 161 countries through ARDL analysis between 1970 and 2013. Democracy, education, population and GDP per capita variables were used in the analysis. As a result, it has been revealed that education affects the functioning of democracy very much. Especially, policies to promote democratic values should be accepted in developing countries by increasing investments in education at all stages.

3. DATA SET AND METHOD

In this study, three variables have been used, namely education expenditures in GDP and Welfare Index general scores and education scores. The presence of the relationship between the share of public education expenditures in GDP and welfare index general scores and education scores of 31 OECD members between 2008 and 2014 has been studied, if any, the direction and magnitude of the relationship has been discussed. Although there are 35 member states in OECD, Luxembourg, Greece, Turkey and Korea were not included in the analysis due to the absence of data or insufficient year data. The panel VAR analysis was used as the econometric method.

Data on the share of public education expenditures in GDP in the 31 OECD countries are taken from the World Bank and the Welfare Index data are taken from the British think tank "The Legatum Institute". The data set included in the analysis for the period 2008-2014 is as in Table 2.

Table 2: Definition of Variables

Variables	Variable Definition and Type	Explanation
Expenditure	Public Education Expenditure in GDP (%)	Public Expenditures
Total	Welfare Index Total Score	Score Used in General Ranking
Educationscore	Welfare Index Education Score	Score Used in Education Ranking

Analysis methods used in the study are;

-Panel Var: The vector autoregressive model system (var) proposed by Sims (1980) as a critique of the system of concurrent equations is used to demonstrate the interactions of variables thought to be in mutual relation with each other, and each variable in the model is explained by its own delayed values (Tatoğlu, 2017). VAR analysis is often preferred because it does not impose any restrictions on the model, as it allows for the analysis of moving data (Keating, 1990). At the same time, due to the delayed values of the dependent variables, it is possible to make strong predictions for the future (Kumar, Leona, Gasking: 1995). In the VAR model, all selected variables are evaluated together and there is no internal or external distinction between the variables used (Özgen, Güloğlu, 2004).

The panel VAR model was created by combining the traditional VAR approach and panel data models (Inessa and Lea, 2006). From this point of view, it can be said that it has the features and advantages of both the panel VAR model and the panel data model. The model was first worked on by Douglas, Whitney and Harvey, in 1988.

Panel VAR model can be written as follows.

$$Y_{it} = Y_{it-1}A_1 + Y_{it-2}A_2 \ldots \ldots Y_{it-p+1}A_{p-1} + Y_{it-p}A_p + X_{it}B + u_i + e_{it}$$

To be able to perform Panel Var analysis among the variables, the following operations should be done in order (Mucuk and Alptekin, 2008).

- To perform the unit root tests of all variables to be used in the model and check the stationarity

- Testing the optimal delay length

- Estimation of the VAR model

- Determination of causality tests between variables

- Determination of impulse response functions and performing variance decomposition

-Granger Test: The relationship between two variables is investigated in Granger-Causality test. If the value of an existing y value is estimated better than the current value of the other variable (x) rather than the previous value of the circuit, then it can be mentioned that there is a causality relation from x to y variables (Pamuk and Bektaş, 2014).

The model to be used here can be expressed as follows.

$$y_{it} = \alpha_i + \sum_{k=1}^{k} \gamma^k y_{it-k} + \sum_{k=1}^{k} \beta^{(k)} x_{it-k} + \epsilon_{it}$$

-Impulse Response Analysis: Impulse response functions show the impulse of a standard false shock in one of the random error terms on the present and future value of internal variables. Variance decomposition determines which variable is the most effective on an macroeconomic value and impulse-response functions determine whether this effective variable can be used as a policy instrument or not (Özgen and Güloğlu, 2004). In other words, the impulse-response analysis analyzes the effect of a random shock in a variable on other variables and therefore plays an important role in directing economic policies (Barışık & Kesikoglu, 2006).

-Variance Decomposition: The variance decomposition obtained from the moving averages section of the VAR model shows the sources of the shocks occurring in the variables themselves and in the other variables by percentage. Variance decomposition analysis shows what percentage of a change which will occur in used variables stems from itself or other variables. At the same time, it provides information about the degree of causality between variables (Enders, 1995).

4. FINDINGS

Stationarity analysis of our variables should be done before the analysis. Because econometric models to be meaningful, variables used should be stationary (Berber, Artan, 2004). If the variables are not stationary, the problem of false regression occurs. The results of the stationarity test for our variables are shown in Table 3.

Table 3: Panel Unit Root Test –Levin-Lin-Chu (LLC)

Variables	Constant-No Trend	Constant and Trend
Public Education Expenditures	-21.3561 (0.0000)	-23.0361 (0.0000)
Welfare Index	-5.6409 (0.0000)	-7.3092 (0.0000)
Welfare Index Education	-6.3030 (0.0000)	-13.1955 (0.0000)

According to the results of stationarity test, all variables are stationary at their own levels.

The delay length must be determined after the stationary test and before the estimation of the panel VAR model. Calculated delay lengths are shown in Table 4 below. Since the table has the smallest MBIC, MAIC and MQIC, it is clear that the first panel VAR is the preferred model.

Table 4: Panel VAR Lag Length Selection Criteria

Lag	CD	J	J pvalue	MBIC	MAIC	MQIC
1	9999912	2.124.849	.774514	-101.1317	-32.75151	-60.36148
2	.9999891	5.555.025	.9976927	-76.03177	-30.44497	-48.85162
3	.9999938	2.266.675	.9865149	-38.52672	-15.73333	-24.93665

Based on the multiple selection criteria, the first row panel-VAR model has been applied with a delay for all variables using the GMM model prediction. At the end of calculation, the results of the prediction are given in Table 5.

Table 5: Prediction Results-Var (gmm) delayed (1)

Dep. Var.	r.h.s.var	Coef.	Corr. S.E.	Z	P. Value
RefEnd	RefEnd	1.47	0.64	2.28	0.023
RefEnd	EğiEnd	-1.31	0.60	-2.17	0.030
RefEnd	KamHar	0.16	0.04	3.68	0.0000
EğiEnd	RefEnd	0.30	0.57	0.52	0.595
EğiEnd	EğiEnd	-0.20	0.48	-0.42	0.669
EğiEnd	KamHar	0.14	0.03	4.64	0.0000
KamHar	RefEnd	-0.24	3.24	-0.08	0.939
KamHar	EğiEnd	-1.69	2.77	-0.61	0.540
KamHar	KamHar	0.68	0.16	4.06	0.0000

According to the results, there is a statistically significant relationship between welfare index and welfare education index and public expenditures. While the coefficient of the education index is negative, the coefficient of public expenditures is positive. These results show that as the share of public education expenditures in GDP increases, countries will be in a better position in the welfare index, and this supports our hypothesis.

After Gmm style Panel-Var analysis, Granger causality test is performed. Table 6 shows the results of the causality test.

Table 6: Panel Var Granger Causality Wald Test Results

Equation	Excluded	chi2	df	Prob>chi2
RefEnd	EğiEnd	4.710	1	0.030
RefEnd	KamHar	13.534	1	0.000
RefEnd	ALL	13.792	2	0.001
EğiEnd	RefEnd	0.283	1	0.595
EğiEnd	KamHar	21.547	1	0.000
EğiEnd	ALL	21.769	2	0.000
KamHar	RefEnd	0.006	1	0.939
KamHar	EğiEnd	0.376	1	0.540
KamHar	ALL	3.622	2	0.164

According to the results, when there is causality between welfare index and public education expenditures, there is a causality relationship between welfare education index and public education expenditures. On the other hand, there is no causality between the public education expenditures and the welfare index and the welfare education index.

After this step, the predicted panel VAR model should first be tested for the eigenvalue stability conditions and then the impulse response functions should be determined. The stationarity or stability of the model depends on the eigenvalues of the coefficient matrix. If all of the eigenvalues of the coefficient matrix are within the unit circle, the system is stationary or stable, or at least one of the eigenvalues is on or outside the unit circle, the system is not stationary or shows an expansive feature.

Figure 1 shows the graph of eigenvalues. As can be seen in the graph, all eigenvalues are within unit circle except one. Therefore, the result is that Panel-Var does not meet the stability conditions.
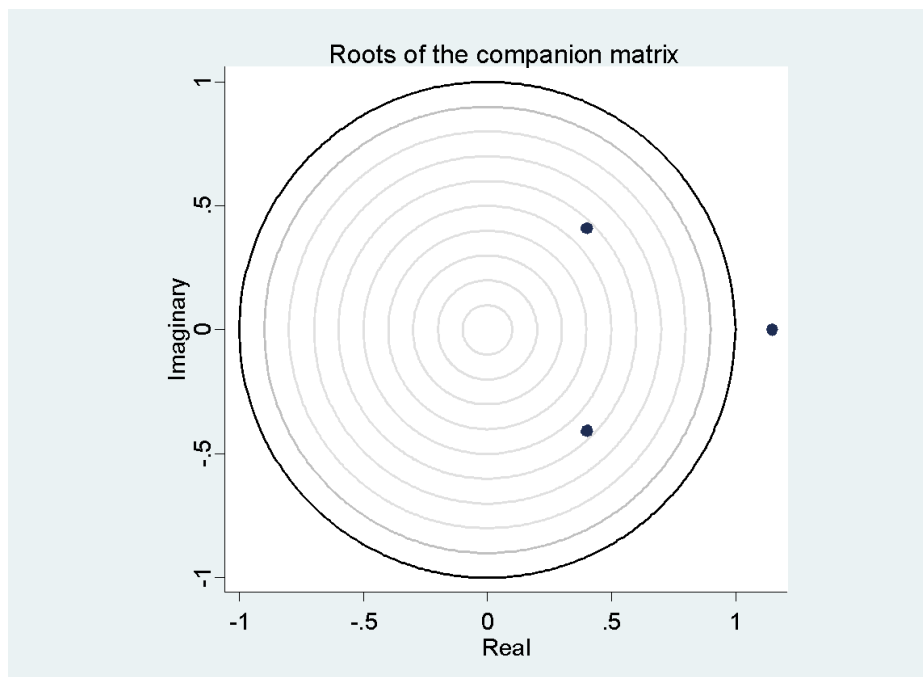
Figure 1: Roots of Companion Matrix

After reviewing the stability status, the results of the impulse response analysis are examined. Figure 2 shows the impulse response functions. Accordingly, the effect of shock among all variables occurs after 5 years.
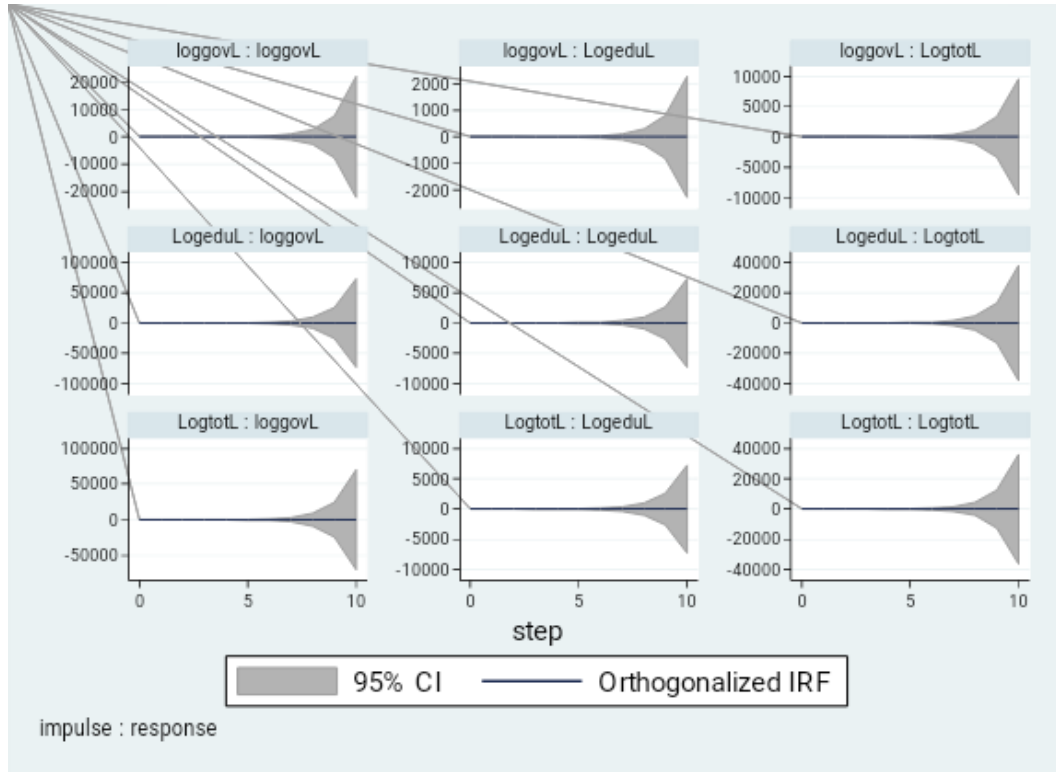
Figure 2: Impulse-Response Graph

5. CONCLUSION

In a country, education affects many factors such as the economic growth, development, formation of human capital, more equitable distribution of income, democratization, decrease in crime rates, fertility and decrease in infant mortality rates, and ability to compete against other countries in the period of increasing globalization. For this purpose, countries allocate a significant amount of resources to education and try to use these resources effectively. It can be said that education expenditures are the most profitable investment for politicians.

This study, which aims to determine the causality relationship between the welfare index general results of public education expenditures in GDP and the welfare index education results in OECD countries, has been used Panel-Var model. The data set in the study is annual and covers the period 2007-2014. As a result of the analysis, causality relationship has been found between public expenditures and welfare index, and between public expenditures and welfare education index. When the findings are evaluated, it has been found that the welfare levels of the countries increase as the public education expenditures increase and countries get closer to the top in the welfare index. It should be kept in mind that the welfare index consists of nine subheadings.

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