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The Effect of Government Expenditure on Education on the Enrollment Rate of Different Educational Levels in Selected OECD Countries

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Abstract
One of the most important factors in economic, social, and cultural development is to create a development plan to acquire knowledge, and govern the spirit of learning in the society, leading to the strengthening of human capital, and increasing the quality of the educational system in accordance with the needs of economic, and social development.
Regarding this, and also based on the recognition of the importance of education in economic growth, economists, and economic development planners have paid special attention to the basics of resource allocation in the education sector.
Therefore, according to the fact that government expenditure on education can be an effective factor to encourage people to acquire knowledge, and improve their level of education, and on the other hand, based on the fact that the improvement of people's level of education in the society shows the increase of human capital in the country, which itself has a positive effect on the economic growth of the country, and the inequality reduction, this paper aims to investigate the effect of government expenditure on education on the enrollment rate in different educational levels in selected OECD countries from 2010 to 2019.
The results show that the effect of all coefficients of the variables is expected based on the theoretical foundations, and the government expenditure on education has a significant positive effect on the enrollment rate in the primary, secondary, and tertiary levels.

Keywords: Government Expenditure on Education, Enrollment rate, OECD, GDP

1. Introduction

Fair distribution of resources is one of the most important goals in modern economy. These distribution policies are not only related to the distribution of the results, and the ultimate benefits of the economy (such as income), but also include items, such as social security, and the development of equal opportunities for progress. Therefore, programs, and policies related to education, health, social services, unemployment insurance, retirement rights, and children's rights can also be considered as another part of policies that can have a significant distributional role on the economic distribution in the society.

Many empirical evidence indicate the importance of education in economy. Education not only affects human development, health improvement, and labor market conditions, but also affects the economic performance of countries, so that when economy enters a knowledge-oriented stage, education, and human capital play a critical role in the economic growth of the countries, because government's high expenditure on education often has a significant impact on people's income, and economic growth, as well as poverty reduction. (Coulomb, 2004)

Most of the empirical studies have investigated the effect of two important parts of the government expenditure (education, and health expenditures) in the form of causal relationships, or their effect on other indicators, but due to the use of statistical methods, and data from different countries they have had different

results. On the other hand, the concerns related to human development indicators, whose manifestation can be seen in the Millennium Development Goals of the United Nations, have prompted governments to provide a major part of the expenditures related to these indicators.

Therefore, regarding the importance of education in economy, this research sought to investigate the effect of government expenditure on education on the enrollment rate in different educational levels in selected OECD[1] countries using the panel data approach from 2010 to 2019, and the required statistics, and data were extracted from the OECD Statistics website.

In the following, the theoretical foundations, and research background are presented in the second part. In the third part, the research method is given. The fourth part deals with the estimation of the model, and in the fifth part, conclusions, and suggestions are presented.

2. Theoretical foundations and literature review

2.1 Theoretical framework

The increase in the role of education in socio-economic dynamics has increased the need to pay attention to the economic effects of education, and its cost-benefit analysis for the government, and people. The constant changes in the technology, and the competitiveness of countries to achieve economic development, and social welfare as quickly as possible, and the impact of these changes attracted more attention to the role, and functions of public, and tertiary education. In this regard, it is necessary for the governments to pay more attention to their education system, and allocate a significant budget to it to achieve the desired level of development at the right time. Many experts in the field of human development believe that education is the first, and most important step in planning human resources development, and the foundation of the economic, and social development of any society is formed by skilled, and trained human resources. In other words, training people by using their talent provide the basis for the growth, and development of the country.

Education is a process during which knowledge, information, and cultural heritage, and traditions are transferred to a person. In this process, individuals generally prepare themselves mentally for social life, and in other words, they become sociable. In other words, the main axis of education is the expansion, and evolution of human wisdom, science, information, and knowledge.

Education empowers the human through knowledge, training, skills, and smooth's her/his personality, attitudes, talents, and behaviors. It creates awareness, patience, self-esteem, and confidence in people because of their rights. Education is one of the valuable factors to evaluate the level of a society (UNDP, 1990). There are several advantages of education, and thereby has positive effect on overall quality of our life

Regardless of which aspect of development is considered, education is the root of all of the developments, and it improves the quality of human skills, and talents, which in turn causes the formation of human capital, and accelerates the process of economic, and social progress, and development of the society.

Achieving the millennium development goals will require serious attention to the efficiency, and effectiveness of government expenditure on education, and health sectors. Examining the state of education, and health from a macroeconomic point of view shows that the growth in human capital will increase the return period of investment in human resources, and ultimately, the investment of the entire economy; as it increases the years of exploitation of this resource, and the number of years that the investment has a positive return. With the increase in life expectancy, private sector savings, and investment, as well as foreign direct investment are encouraged, and a great step will be made toward the improvement of the country's economic conditions. This improvement in the next stage will have a positive effect on the improvement of health, and educational indicators. On the other hand, low health, and education costs will reduce the rate of return on investment in human resources. This negative effect will be revealed first on the profitability of investment in health, and education, and in the next stage on the whole economy, and a

[1] Organization of Economic Cooperation and Development

closed circuit will be formed related to the lack of investment growth in human capital. One of the most important solutions for this problem is the government's involvement in providing the necessary costs to improve the health, and education status in the society.

The organization of education systems varies between countries, as does the length of time for a student to complete an educational level. This makes primary, and secondary programs more costly in some countries than others. The length of the program thus affects the amount of educational investment per education level, and does not necessarily reflect a country's policy to place more importance on one part of the education system than another.

On the same note, although participation in primary, and secondary education is very high in most OECD countries, the proportion of students enrolled in tertiary programs varies considerably, which obviously affects spending differentials across countries (see OECD Education at a Glance 2021 for more detailed information).

All OECD countries invest a substantial proportion of national resources in education. In 2018, OECD countries spent, on average, 3.4% of GDP on primary, secondary, and post-secondary non-tertiary education, with 3.1% coming from public sources, and further 0.3% from private sources

In the same year, OECD average spending on tertiary education came to 1.4% of GDP, of which 1% came from public sources, and 0.4% from private sources. On average, OECD countries spend, each year, USD 11 700 per student enrolled in education. However, the actual amount spent can differ substantially across levels of education, with per-student spending often far higher for students in tertiary education than for students in primary, and secondary education. In fact, in several OECD countries (Canada, Estonia, Luxembourg, Mexico, Sweden, Turkey, the United Kingdom, and the United States), the average per-student spend in tertiary education is at least double the average per-student spend in primary, secondary, and post-secondary non-tertiary education.

However, benefits of education are more likely to have a long-term effect, not only within a country's growth, and development, but also with regard to social sector, and personal development. If investments on education generate educated workers, they will be able to make other workers also more productive. Thus, the overall level of education can benefit society because human capital spillovers are likely to increase productivity above the direct effect on individual productivity (NBER, 2005). Therefore, the magnitude of social returns to education is a crucial tool to assess the efficiency of public investment in education (NBER, 2005). Education rewards, not only the individual, but it also creates benefits that are shared by society at large (NBER, 2005). Since there are evidences in regard to human capital increasing productivity, we can say that education is productivity-enhancing.

Education affects both short run, and long run growth, although with a different degree of effectiveness. It is estimated that one year more of education would increase the per capita output by between three, and six percent (augmented neo-classical growth theory), and by an over one percentage point (new growth theories) (Sianesi & Van, 2003).

2.2 Literature review

Gupta et al. (1997) in a research titled "The Efficiency of Government Expenditure: Experiences from Africa" investigated the effect of government expenditure on education, and health in 38 African countries from 1984 to 1995, and their results show that the government expenditure of African countries are less efficient than Asian countries, and the improvement of access to education, and health needs to allocate more funds to them.

McMahon (1999) finds a negative, and significant relationship between per pupil expenditures, and the primary gross enrolment rate, and a positive, and significant impact of total education expenditure as a proportion of GNP. The results of the McMahon study suggest that increasing primary education expenditure while holding per pupil expenditures constant, has a positive, and significant impact on the

primary gross enrolment rate. However, this study does not include income per capita as a separate explanatory variable, and it may be the case that these resource variables are proxy for income per capita.

Bergh and Frink (2004) in a study titled "Tertiary education: Does Public Expenditure Increase Enrollment rate?" investigated the effect of educational expenditure on the enrollment rate of students in tertiary education. They conducted their study in 132 countries, and concluded that public spending on primary, and secondary education has a positive impact on the enrollment rate in tertiary education; while the subsidies paid to the tertiary education do not have a significant impact on the enrollment rate in tertiary education. Therefore, it is recommended that more attention be paid to the allocation of public resources to education, especially in less developed countries.

Anyanwu and Erhijakpor (2007) in a research titled "Education expenditures, and school enrolment in Africa: Illustrations from Nigeria, and other SANE[2] countries" investigated the effect of government expenditure on education on school enrollment rate from 1990 to 2002, and their results show that government expenditure on education has a significant positive effect on the enrollment rate in primary, and secondary education, and among the SANE countries, the government expenditure on education in Nigeria had the biggest positive, and increasing effect on the enrollment rate in primary, and secondary education. In addition, in their study, they concluded that other variables such as political interventions such as unification, and supported freedom, national income, and international charity associations have positive impact on achieving the MDG[3], and education expenditure alone cannot provide high-quality human capital for this purpose.

Using panel data from 118 developing countries in 1971–2000, Baldacci et al. (2008) estimate a non-linear model to capture the spending-outcome relationship. They account for the interaction between education, and health, and control for governance, and the higher growth attributable to better human capital, and country income levels. The fixed-effects model is utilized to make the most out of limited cross-country time series data, and minimize distortions from heterogeneity. Baldacci et al. find strong evidence that public expenditure on education directly results in increased better educational outcomes.7 However, the positive effects of education spending are reduced in countries suffering from poor governance. The authors further find that higher spending alone is insufficient; other policy interventions, such as improving governance, and taming inflation, must be incorporated to achieve the MDGs.

Okezie A. et al. (2019) investigated Government education expenditure, and primary school enrolment in Nigeria for the period of 1970-2017 using ARDL. It was observed that an insignificant relationship exists between government education expenditure on primary school enrolment while a positive relationship exists between remittances, and primary school enrolment. Population growth has positive relationship in the short run, but a negative relationship in the long run. In this country, Primary schooling is managed, and received funds mainly from the local governments (indirectly through deducting teacher salaries from their entitlement from the Federation Account), and from the state governments. The result also shows that parents/guardians play more role than the government in providing primary education in the country.

Idrees et al. (2021) conducted a study on analysis of the effect of government expenditure on school enrollment rate in Pakistan. In this study data was used over the period of 2000 to 2017, and the method of Least Square is applied to obtain empirical results. The result shows that national income, and government expenditure have positive effects on school enrollment rate, indicating when national, and government expenditure increase, ultimately school enrolment also increases in Pakistan.

Shafuda, and De (2020) examined the impact of public spending on human capital on human development indicators such as health care outcomes, educational attainment, and national income growth in Namibia using time series data from 1980 to 2015. The results were mixed, revealing a significant positive long-run relationship of public spending on education with primary net enrollment rate, and tertiary gross enrollment

[2] South Africa, Algeria, Nigeria, Egypt
[3] Millennium Development Goals

rate. In contrast, no cointegration was observed between public education spending, and primary, and secondary gross enrollment rate.

Nenbee and Danielle (2021) carried out a research with the subject of the Primary School Enrolment, Public Spending on Education, and Economic Growth in Nigeria. Using ARDL over the period of 1987-2017 they recommend that there should be re-design of educational strategies by the government to include enrolment campaigns, and alternative learning programs especially at the basic education level, and also increased her budgetary allocation to education sector in line with UNESCO recommendation of about 26%.

2.3- Research hypotheses

- Government expenditure on education has a significant positive effect on the enrollment rate in primary education.
- Government expenditure on education has a significant positive effect on the enrollment rate in secondary education.
- Government expenditure on education has a significant positive effect on the enrollment rate in tertiary education.

3. Research methodology

Given that the purpose of this research was to investigate the effect of government expenditure on education on the enrollment rate in different educational levels in selected OECD countries[4]; the effect of government expenditure on education on the enrollment rate was investigated by panel data, and Anyanwu and Erhijakpor (2007) model in primary, secondary, and tertiary education in the form of three econometric models according to equations 1, 2, and 3, respectively. The data used is for the time period ....., and on an annual basis.

$$Lenrp_{it} = \beta_1 + \beta_2 ledexpp_{it} + \beta_2 Lpopr_{it} + \beta_3 Ldemoc_{it} + \beta_4 Lgdpper_{it} + U_{it} \quad (1)$$

$$Lenrs_{it} = \beta_1 + \beta_2 ledexps_{it} + \beta_2 Lpopr_{it} + \beta_3 Ldemoc_{it} + \beta_4 Lgdpper_{it} + U_{it} \quad (2)$$

$$Lenrt_{it} = \beta_1 + \beta_2 ledexpt_{it} + \beta_2 Lpopr_{it} + \beta_3 Ldemoc_{it} + \beta_4 Lgdpper_{it} + U_{it}$$

(3)

Lenrp: Logarithm of education (primary) enrolment;

Lenrs: Logarithm of education (primary) enrolment;

Lenrt: Logarithm of education (primary) enrolment;

β_1 : Regional/Country-specific effect;

Ledexpp: Logarithm of government expenditure on primary education as percent of GDP;

Ledexps: Logarithm of government expenditure on secondary education as percent of GDP;

Ledexpt: Logarithm of government expenditure on tertiary education as percent of GDP;

Ldemoc: Lograrithm of democracy index;

Lpopr: Logarithm of population rate;

Lgdpper: GDP per capita in international dollars;

U_{it}: Error term

[4] List of Countries Included in the sample used in the estimations: Austria, Australia, Canada, Chile, Denmark, Finland, France, Germany, Iceland, Korea, Mexico, Norway, Sweden, Switzerland, Turkey, USA, UK.

Cross-sectional data, time series, and panel data consisting of time series or the combination of cross-sectional data, and time series are used for analyzing the relationship between economic variables statistically, and econometrically. The functional form of panel data econometrics is as follows;

$$Y_{it} = \propto + \beta_t X_t + \mu_i + \Upsilon_t + e_i$$

t= 1,2, … N

t= 1,2, … N

As it can be seen in the functional form of panel data econometrics, t shows the time, and i shows the sections. In this equation, an individual effect exists. This effect cannot be observed by independent variables, does not change depending on time, but includes characteristics peculiar to sections (Baltagi, 2005). In panel data econometrics, the next step after converting cross-sectional data, and time series data to the panel system is to determine if the cross-section, and period effects can be explained by the fixed effects model or the random-effects model. The fixed effects model creates a different fixed value for each cross-sectional unit. In the fixed effects model, it is assumed that the slope coefficients do not change, but fixed coefficients show differences among only cross-sectional data or time data or among both types of data. If the differentiation occurs only depending on time, these types of models are named as one-way time dependent fixed effect models. If a differentiation occurs in panel data depending on both time, and section, these models are named as two-way fixed effects model. However, because the cross-sectional effect is generally investigated more in panel data studies, panel data models are generally considered as one-way models (Hsiao, 2002). One-way, and two-way fixed effects models can be seen in the Eq. (2), and (3) given below:

$$Y_t = (a_t + \mu_i) + \beta_{1t} X_{1t} + \cdots + \beta_{kit} X_{kit} + e_t$$

$$Y_t = (a_t + \mu_i + \lambda_t) + \beta_{1t} X_{1t} + \cdots + \beta_{kit} X_{kit} + e_t$$

In this equations, it is considered that the error terms are distributed independently, and identically in such that their variances equal to zero. In the fixed effects model, the fixed effects estimator allows the fixed constant to differ across cross-section units by estimating different constants for each cross-section (Baltagi, 2005). The changes that occur depending on cross-sections or both cross-sections, and time are observed when they are integrated into the model as a component of the error terms. The advantage of random effects model over the fixed effects model is that, without loss of degree of freedom, the random effects model allows the inclusion of the effects that are out of the sample to the model. The functional relation for the mentioned models can be demonstrated as follows:

$$Y_t = a_t + \beta_{1t} + X_{1t} + \cdots + \beta_{kit} X_{kit} + (\mu_i + v_t)$$
$$Y_t = a_t + \beta_{1t} + X_{1t} + \cdots + \beta_{kit} X_{kit} + (\mu_i + v_t + \lambda_t)$$

4. Experimental findings

According to Granger, and Newbold (1974), a regression analysis between the variables does not provide reliable results in case non-stationary data is used. For this reason, stationary should be checked before performing the regression analysis. The studies conducted by Levin, and Lin (1992, 1993), Breitung, and Meyer (1994), Quah (1994), Maddala, and Wu (1999), Hadri (2000), and Im et al. (2003) suggest the use of unit root tests in panel data models.

Contrary to what is customary in the case of time-series data, in the case of panel data, Dickey-Fuller, and augmented Dickey-Fuller tests cannot be used to test the reliability, but it is necessary to test the collective reliability of the variables. Although the time course of this research is not very long, the stationary test of the variables was performed first to prevent the development of spurious regression for the estimation of the models. The most common tests used for this purpose were Levin, Lin, and Chu, Im, Pesaran, and Shin, Breitung, and Hadri. In the first three mentioned tests, the null hypothesis is based on non-stationarity, and

in Hadari's test statistic, the null hypothesis is based on stationarity. In this research, the test of Levin et al. (2002) was used, which is more applicable to examine the reliability of variables in panel data, and the tests were examined using EViews 9. If the calculated P-value is less than five percent, the hypothesis of a single root for that variable is rejected. The results of the stationarity test of variables according to Levin et al. (2002) method is given in Table (1). Given that the probability values are less than 0.05, H_0 related to the existence of a single root is rejected at 95% confidence level, and except for the Lpopr (population rate) variable, all the variables of the model are stationary at the I(0) level[5].

Table1- Unit Root Test

Variable	Stationary test Levin, Lin and Chu	Differentiation order I(d)	Significance level	Test statistic
Lenrp	Individual intercept, and trend	I(0)	0.000	-6.7873
Lenrs	Individual intercept, and trend	I(0)	0.000	-10.417
Lenrt	Individual intercept, and trend	I(0)	0.0004	-3.386
Ledexpp	Individual intercept, and trend	I(0)	0.000	-73.704
Ledexps	Individual intercept, and trend	I(0)	0.001	-3.0838
Ledexpt	Individual intercept, and trend	I(0)	0.000	-26.625
Lgdpper	Individual intercept, and trend	I(0)	0.0412	-1.7365
Lpopr	Individual intercept, and trend	I(1)	0.000	-7.8941
Ldemoc	Individual intercept, and trend	I(0)	0.0013	-3.0132

4.1. Cointegration test

Cointegration is the study of the stability of long-term correlations between non-stationary time series variables. Cointegration approach is a solution to spurious regression problem in time series. Cointegration is when two, or more time series variables are related based on a theoretical foundations to form a long-term balancing relationship, although these time series may have a random trend (would be non-stationary), they follow each other well over time, so that the difference between them is stationary. Therefore, the concept of cointegration implies the existence of a long-term balancing relationship towards which the economic system moves over time. (Noferesti, 1999, p. 76). Since panel data may be non-stationary, cointegration, checking its presence, and testing it in this type of data is also very important. Like stationarity test, cointegration test in panel data is stronger than cointegration tests for individual cross-sectional units, because these tests can be used even in situations where the time period is short, and the sample size is small. (Baltagi, 2005, p. 252) In this regard, in this part of the research, cointegration test in panel data is discussed.

According to the results of the stationarity test in Table (1), the Lpopr variable is not at a significant level, and with one-time differentiation it becomes stationary. To investigate the presence, or absence of spurious regression, cointegration test is performed before model estimation. In this study, Pedroni's test was used to examine the cointegration between research variables. The results of this test are presented in Table (2).

Table (2) shows the results of Pedroni's cointegration test for panel data in the three models of this study. The significance of most of the statistics indicates that the null hypothesis of this test, that there is no cointegration relationship, is rejected, and the existence of cointegration relationship between the variables is confirmed, and it can be said that there is a long-term balancing relationship between the enrollment rate, and the independent variables.

Table 2- results of Pedroni's cointegration test for panel data in the three models

[5] It was investigated in all three states of Individual Intercept, Individual Intercept and Trend, and None and became stationary at Individual Intercept and Trend.

Model 1	Intraclass					Interclass	
	Statistic	Prob.	Weighted Statistic	Prob.		Statistic	Prob.
Panel v-Statistic	-1.059849	0.8554	-1.638188	0.9493	Group rho-Statistic	4.190175	1.0000
Panel rho-Statistic	2.704958	0.9966	3.140876	0.9992	Group PP-Statistic	-26.79305	0.0000*
Panel PP-Statistic	-4.008542	0.0000*	-7.960458	0.0000*	Group ADF-Statistic	-9.046550	0.0000*
Panel ADF-Statistic	-4.006446	0.0000*	-4.903564	0.0000*			

Model 3	Intraclass					Interclass	
	Statistic	Prob.	Weighted Statistic	Prob.		Statistic	Prob.
Panel v-Statistic	3.847851	0.0001*	-0.649301	0.7419	Group rho-Statistic	4.245036	1.0000
Panel rho-Statistic	3.384512	0.9996	3.499733	0.9998	Group PP-Statistic	-10.14775	0.0000*
Panel PP-Statistic	-8.880119	0.0000*	-6.336743	0.0000*	Group ADF-Statistic	-3.976031	0.0000*
Panel ADF-Statistic	-3.107731	0.0009*	-2.263396	0.0118			

Model 2	Intraclass					Interclass	
	Statistic	Prob.	Weighted Statistic	Prob.		Statistic	Prob.
Panel v-Statistic	5.369321	0.0000*	4.377392	0.0000*	Group rho-Statistic	3.489290	0.9998
Panel rho-Statistic	2.214401	0.9866	2.794959	0.9974	Group PP-Statistic	-4.832892	0.0000*
Panel PP-Statistic	-3.299969	0.0005*	-2.398313	0.0082*	Group ADF-Statistic	-1.465612	0.0714
PanelADF-Statistic	-2.691923	0.0036*	-0.970711	0.1658			

* They are significant at 95% confidence level.

4.2. Selection of the model type

Before fitting the models, three tests were used to determine the appropriate model:

• In the first stage, F-test was used to distinguish between the integrated model (data integration), and panel data;

• Then, if there was panel data, in the second step, the type of fixed, or random effects was determined by the Hausman test;

• If the effect of the model was random in the second stage, the Breusch-Pagan test was used to choose between the integrated model, or the random effect.

4.2.1. Chow test or Limer's F-statistics

Limer's F-statistics was used to choose between panel data, and integrated data methods. In this test, H_0 indicates the equality of the intercepts (integrated data), and the opposite H_1 indicates the heterogeneity of the intercepts (panel data).

$H_0: \alpha_i = \alpha_j \Rightarrow$ Integrated data methods

$H_1: \alpha_i \neq \alpha_j \Rightarrow$ Panel data methods (fixed effects)

If the calculated P-value is greater than 0.05% error level, the null hypothesis is not rejected, and the estimation is performed by integrated methods model; otherwise, panel data with fixed effects are used.

Table 3- confirmation of the panel data model with fixed effects

	value	p-value	Test result
Model 1	11.38	0.000	Rejection of the integrated model, and confirmation of the panel data model with fixed effects
Model 2	27.46	0.000	Rejection of the integrated model, and confirmation of the panel data model with fixed effects
Model 3	112.69	0.000	Rejection of the integrated model, and confirmation of the panel data model with fixed effects

Since the F-statistics is significant in the three studied models, with a probability level of more than 99%, H_0 is rejected, and panel data with fixed effects can be used to estimate the model.

4.2.2. Hausman Test

In the second step, the Hausman test was used to determine which of the fixed, and random effects models could be expressed, and investigated. The null hypothesis of the Hausman test indicates the use of the random effects method, and the opposite hypothesis indicates the use of the fixed effects method.

If the P-value is greater than 5% error level, the H_0 is not rejected, and the random method will be used; otherwise, H_1 is confirmed, and fixed effects method is used.

Table 4- confirmation of the panel data model with random effect

	x^2 -value	p-value	Test result
Model 1	1.59	0.8099	Rejection of the panel data model with fixed effect, and confirmation of the panel data model with random effect
Model 2	23.91	0.0001	Confirmation of the panel data model with fixed effect
Model 3	2.35	0.6718	Rejection of the panel data model with fixed effect, and confirmation of the panel data model with random effect

4.2.3. Breusch-Pagan test

Since in the previous stage random effect model was determined for the three models according to the Hausman test, Brioche-Pagan test was used for the final model selection between integrated data, and panel data with random effects, the result of which is summarized in Table (5) for the three studied models. The null hypothesis of this test indicates the use of integrated data method, and the opposite hypothesis indicates the use of panel data with random effect.

Table 5- final model selection between integrated data, and panel data with random effects

	x^{-2} value	p-value	Test result
Model 1	172.08	0.0000	Rejection of the integrated model, and confirmation of the panel data model with random effects
Model 2			In model 2, fixed effects were selected
Model 3	209	0.000	Rejection of the integrated model, and confirmation of the panel data model with random effects

If P-value is greater than 5% error level, the null hypothesis is not rejected, and the estimation is performed by the integrated methods model; otherwise, panel data with random effects are used.

4.3. Modified Wald test

In the second model, where the fixed effects were determined, to investigate the heterogeneity of variance, the modified Wald test is used, and the null hypothesis implies the homogeneity of variance. It can be seen in Table (6) that H_0 is rejected with a probability level of 99%, and Model 2 does not have homogeneity of variance.

Table 6- heterogeneity of variance

	LR X^2 -value	p-value	Test result
Model 2	6094.6	0.0000	Variance heterogeneity

4.4. Likelihood-ratio (LR) test

Generally, when the number of periods studied in panel data is greater than the number of time periods, the probability of variance heterogeneity is increased. Therefore, the heterogeneity of variance in the models of this study was analyzed by LR test.

Table 7- Likelihood-ratio (LR) test

Model	LR X^{2-} value	p-value	Test result
Model 1	27.46	0.0000	Variance heterogeneity
Model 2	136	0.0000	Variance heterogeneity
Model 3	139.08	0.0000	Variance heterogeneity

4.5. Model Estimation

The required tests were investigated, and the estimation results of models 1, and 3 using the random effect panel data method, and model 2 using the fixed effect panel data method are summarized in the following tables:

Table 8- Models Estimation

Variable/Model 1	**Coefficient**	**z statistic**	**P-value**
The logarithm of government expenditure on education at primary level, Ledexpp	0.0150*	-4.81	0.0000
The logarithm of population growth rate, Lpopr	0.0187*	6.83	0.0000
The logarithm of GDP per capita, constant 2015, lgdpper	0.0288*	-3.29	0.001
Ldemoc, democracy index	0.0536*	3.39	0.001
Intercept	2.1527*	50.98	0.0000
Wald X^2		77.85	0.0000
Variable/Model 2	**Coefficient**	**z statistic**	**P-value**
The logarithm of government expenditure on education at secondary level, Ledexps	0.098*	2.86	0.004
The logarithm of population growth rate, Lpopr	0.053*	5.12	0
Logarithm of GDP per capita, constant 2015, lgdpper	0.121*	3.61	0
Ldemoc, democracy index	0.138*	2.9	0.004
Intercept	1.463*	9.34	0
Wald X^2		123.62	0.000

Variable/Model 3	Coefficient	z statistic	P-Value
The logarithm of government expenditure on education at tertiary level, Ledexpt	0.399*	8.27	0.0000
The logarithm of population growth rate, Lpopr	-0.039***	-1.59	0.1130
The logarithm of GDP per capita, constant 2015, lgdpper	0.325*	4.81	0.0000
Ldemoc, democracy index	0.212**	1.8	0.0720
Intercept	0.265	0.84	0.3980
Wald X^2		160.13	0.000

* They are significant at 95% confidence level.
** They are significant at 90% confidence level.
* They are significant at 85% confidence level.

In the following, the sign of the coefficients, and its compatibility with the expected theoretical foundations is interpreted. As seen in Tables 1, 2, and 3, 1% increase in government expenditure leads to an increase of 0.01% in the Enrollment rate in primary level, 0.09% in the Enrollment rate in secondary level, and 0.39% in the Enrollment rate in tertiary level. On the other hand, one percent increase in the population growth rate has caused an increase of 0.01%, and 0.05% in the enrollment rate in primary, and secondary levels, respectively, and a decrease of 0.03% in the enrollment rate in tertiary level. In addition, one percent increase in GDP per capita has led to an increase of 0.02%, 0.12%, and 0.32% in the enrollment rate in primary, secondary, and tertiary levels, respectively. One percent increase in the democracy index also leads to an increase of 0.05%, 0.13%, and 0.21%, respectively, in the enrollment rate in primary, secondary, and tertiary levels.

Given that logarithm is taken of the model variables, the coefficients also represent elasticity. Accordingly, the elasticity of the enrollment rate in tertiary level is higher than that of the enrollment rate in other levels with respect to each of the independent variables (except the population rate). The elasticity of the enrollment rate in secondary level to government expenditure is higher than that of the enrollment rate in primary level to the same variable. This issue indicates that to increase the enrollment rate in higher levels, increase in government expenditure is leveraged.

5. Conclusion and policy suggestions

The purpose of this research was to investigate the effect of government expenditure on education on the Enrollment rate in different educational levels in selected developed OECD countries. According to the findings, the research hypotheses were confirmed.

According to the findings, in the three estimated models, the sign of the coefficients is in accordance with the expected theoretical foundations, and the variable of government expenditure on education has a direct relationship with the enrollment rate in each of the primary, secondary, and tertiary levels.

Regarded to the positive effect of GDP per capita in the three educational levels, it can be said that as GDP per capita is a standard to show the economic power of countries, and their people, with the increase of GDP per capita, these countries will better meet the educational needs, and since the purchasing power of people increases with the increase of this variable, the enrollment rate increases in the three levels, and given that the coefficient of this variable is higher in the tertiary level than the secondary, and primary levels; it can be said that people's interest in enrolling in tertiary level is much higher than the changes in GDP per capita, because the higher the income, and purchasing power of people, the more capable, and interested they will be in tertiary level. In relation to the positive effect of urban population on the Enrollment rate in both primary, and secondary education, it can be said that as with the increase in population, the possibility of gathering people increases in larger groups, and in certain places, and the possibility of providing services for people becomes easier, and the number of people who enjoy these services increases, the positive effect of this variable on the enrollment rate is not far from expected at different education levels, and this is also confirmed by other researchers.

In relation to the positive effect of government expenditure on education on the Enrollment rate in the three educational levels, since people and the economy have realized that the government expenditure in the education sector is a capital expenditure that will have long-term benefits for the economy, and individuals, with the increase of the government expenditure in the education sector, people are very motivated, and interested to enroll in different educational levels, especially in tertiary education. So, in general, it can be concluded that government expenditure on education, and GDP per capita, and population have played an important role in improving the status of the investigated educational indicators (enrollment rate in different education levels). Therefore, according to the results of the economic policy-makers to achieve the goals of the third millennium, and better development indicators, it is recommended that appropriate policies be developed to increase the GDP per capita, and the purchasing power, and the ability of people to provide the necessary expenses for education, especially in tertiary education. In addition, since the population growth is inevitable over time, and due to the positive effect of this variable on the enrollment rate, it is suggested that the policy-makers help the country to achieve better development indicators using appropriate plans in the field of controlling, and guiding the immigrant population to the cities by instilling an appropriate educational culture; in addition to reducing the negative aspects of the issue. In addition, it is recommended that government expenditure be increased in the education sector, as according to the findings, and the basics of macroeconomics, with the increase in government expenditure on education, and the subsequent increase in the enrollment rate in different educational levels; the growth of human capital increases, and the period of investment return in human power, and finally the total investment in the economy will increase, and this increase in investment will improve the economic conditions of the country, and this chain of improvement will have a positive effect on the improvement of all educational indicators, as with the reduction of government expenditure on education, which is considered as a long-term investment, the enrollment rate in different levels, and then the efficiency rate of human resources will decrease, and this negative effect will put the economy in a closed circle of lack of investment growth in human capital that one of the most important solutions to get out of this problem is the government intervention in providing the necessary expenses to improve the educational situation.

This paper also found that democracy has a significant positive effect on the enrolment rate in primary, secondary, and tertiary levels. Needless to say that the level of democracy, and government expenditure on education in OECD countries is high enough to be translated into human capital accumulation, and economic growth.

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