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Do Education Expenditures Affect Economic Growth? Testing With Panel Data Analysis Method

Hasan Çebi BAL[*] Meryem YILMAZ[**]

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Abstract

In this article it is aimed to examine whether education expenditures, basic education expenditures, secondary education expenditures and advanced education expenditures affect economic growth. In this study for the period 1990-2023, 6 major economies with complete data were considered. Firstly, the econometric analysis started with the correlation test of the series, and in the presence of correlation, the second-generation unit root test was applied, and in the absence of correlation, the first-generation unit root test was applied. The fact that a cointegrating relationship was found in our research model enabled us to estimate the long-run coefficient. According to the long-run coefficients, education expenditures, advanced and secondary education expenditures have a negative effect on economic growth, while basic education expenditures have a positive effect. According to Dumitrescu and Hurlin Panel causality test; While a one-way causality relationship was detected between education expenditures, basic education expenditures, secondary education expenditures and economic growth; A two-way causality relationship was found between further education expenditures and economic growth.

Keywords: Education Expenditures, Human Capital, Economic Growth, Panel Data Analysis.

Eğitim Harcamaları Ekonomik Büyümeyi Etkiliyor Mu? Panel Veri Analiz Yöntemi ile Test Edilmesi

Öz

Bu makalede; eğitim harcamalarının, temel eğitim harcamalarının, orta eğitim harcamalarının ve ileri eğitim harcamalarının ekonomik büyümeyi etkileyip etkilemediğinin incelenmesi amaçlanmıştır. 1990-2023 dönemini kapsayan bu çalışmada, verileri tam olan 6 büyük ekonomi ele alınmıştır. Ekonometrik analize serilere ait korelasyon testi ile başlanmış olup, korelasyon varlığında ikinci nesil, korelasyon yokluğunda ise birinci nesil birim kök testi uygulanmıştır. Araştırma modelinde eş bütünleşik ilişkinin bulunmuş olması, uzun dönem katsayı tahmini yapılmasına olanak sağlamıştır. Uzun dönem katsayılarına göre eğitim harcamaları, ileri ve orta eğitim harcamaları ekonomik büyümeyi negatif etkilemekte; temel eğitim harcamalarını ise pozitif etkilemektedir. Dumitrescu ve Hurlin Panel nedensellik testine göre; eğitim harcamaları, temel eğitim harcamaları ve orta eğitim harcamaları ile ekonomik büyüme arasında tek yönlü nedensellik ilişkisi tespit edilirken; ileri eğitim harcamaları ve ekonomik büyüme arasında çift yönlü nedensellik ilişkisine rastlanmıştır.

Anahtar Kelimeler: Eğitim harcamaları, Beşerî Sermaye, Ekonomik Büyüme, Panel Veri Analizi.

[*] Dr. Öğr. Üyesi, Karadeniz Teknik Üniversitesi, İktisadi ve İdari Bilimler Fakültesi, hbal@ktu.edu.tr, ORCID: 0000-0002-9568-6740.
[**] İktisat Bilim Uzmanı, meryem_3680@icloud.com, ORCID: 00000-0002-1620-0184.

Introduction

Today, education one of the cornerstones of the social state approach, plays a critical role in ensuring the participation of individuals in society, reducing social inequalities, and encouraging economic development. The social state aims to provide equal and quality education opportunities to all citizens with various policies and practices in the field of education. Equal opportunities in education, quality education, lifelong learning, social and economic development, and support for disadvantaged groups are the basic elements of the education policies of the social state. These policies allow individuals to realize their potential and contribute to social welfare.Developed countries aim for social and economic development with their investments in their education systems. Education expenditures increase the knowledge and skills of individuals and contribute to sustainable economic growth by encouraging innovative thinking. In this context, the selected countries of Germany, France, Spain, Sweden, Italy, and Canada attach great importance to education expenditures. Developed countries aim for sustainable growth by optimizing their education systems and budgets. The economic outputs and social benefits of these countries' investments in education expenditures can also guide other countries. This article will focus on six countries with different socio-economic structures in different continents. The education expenditures and investments in advanced and secondary education levels of Germany, France, Spain, Sweden, Italy and Canada will be compared and the outcomes of these investments on economical growth will be analyzed.

1. Literature Review

There are many studies in the literature on growth and the determinants of growth. Financial development and institutional quality (Bayraktar et al., 2023), health expenditures (Özyılmaz et al., 2023), entrepreneurship (Munyo and Veiga, 2024), external debts (Karakurt et al., 2023; energy (Keyifli et al., 2022), employment in knowledge and technology intensive sectors (Bayraktar et al., 2017), tourism (Rasool et al., 2021), exports (Dündar and Bayraktar, 2024), R&D expenditures (Bayraktar et al., 2022), trade openness (Büyükakın and Jallow, 2019), poverty (Zhu et al., 2022) and education (Omodero and Nwangwa, 2020) are some of these parameters. In this study, the role of education, which is one of the main determinants of economic growth, is discussed. Because education is both direct and indirect transmission channels is of critical importance to economic growth.Many empirical studies have been handled in developed countries investigating the impression of education expenditures on

economical growth. In these studies, it is concluded that investings in education increase human capital and encourage economic growth. When the relevant literature is examined in general, it is seen that education expenditures positive influenced growth in long term.In one of the early studies on this subject, Barro (1991), discussed the impacts of education expenditures on economic growth are using data from more than 100 countries. Barro concluded that education expenditures have a positive effect on growth. Similarly, Mankiw et al. (1992) found that that education expenditures are one of the important determinants of economical growth along with physical capital accumulation and population growth. Hanushek and Kimko (2000) stated that education and its expenditures have a important effect on economic growth, and in this contex, increasing the quality of education accelerates growth. Krueger, and Lindahl (2001), the impact of education expenditures on economic development is evaluated and and they emphasized that this effect varies among countries. And Aghion et al. (2009), the causal effect of education expenditures on economic expansion in the United States was examined, and they found a positive relationship.Education expenditures in Germany are considered an important driver of economic growth. Studies show that higher education expenditures increase economic efficiency by improving the quality of the workforce (Hanushek & Woessmann, 2020). Germany's strong vocational education system and university infrastructures contribute to its leadership in fields such as technology and engineering (Schneider, 2019). Studies examining the influence of education expenditures on economic development reveal that France's education policies promote social cohesion and economic development (Aghion et al., 2009). In particular, expenditures in the field of higher education contribute to the increase in innovative initiatives and the increase in global competitiveness (Cahuc & Zylberberg, 2004).The impact of Spain's education expenses on economic growth and employment are remarkable. Studies conducted in Spain show that education investments promote flexibility and innovation in the labor market (De la Fuente & Doménech, 2006). However, the restriction of education expenditures during economic crises has had negative effects on long-term development (Pérez-Díaz & Rodríguez, 2011).Sweden is a country known for its investments in education expenditures. Studies conducted in Sweden show that education expenditures have positive effects on economic development and social equality (Meghir & Palme, 2005). Sweden's education system supports economic development and social cohesion with high-quality education and wide access to opportunities (Lindahl & Krueger, 2001).

Education expenditures in Italy has an important role in economic development and social development. Studies conducted in Italy show that education investments are effective in reducing regional development disparities (Ciccone & Papaioannou, 2009). However, inadequate education expenditures in Italy limit long-term economic growth (Checchi, 2006).Canada is a country that makes generous investments in education expenditures. Studies in Canada show that education spending has strong positive effects on economic growth and innovation (Riddell, 2006). Canada's education system supports economic development with its wide range of opportunities in higher education and vocational training (Stark, 2007). Education spending in the selected countries examined, Germany, France, Spain, Sweden, Italy, and Canada, has significant effects on economic growth. Studies in these countries show that education investments positively affect economic development by improving the quality of the workforce, encouraging innovation, and supporting social equality.

2. Outlook Of The Education Sector In Selected Countries

2.1. Germany

Germany is known for its strong education system and the large investments it makes in this system. Education spending has a critical role in a country's economic and social development. Education spending in Germany is largely financed by the federal government, state governments, and local governments. The education system is supported by the state from kindergarten to higher education. Compulsory education in Germany covers ages 6 to 18 and is free of charge (Bundesministerium für Bildung und Forschung [BMBF], 2022). In higher education, students are offered various scholarships and loan opportunities (Organization for Economic Co-operation and Development [OECD], 2021). Education spending is spread over wide range from pre-school to higher education. In 2022, a significant portion of Germany's education budget will be allocated to higher education. Universities and research centers receive significant funds to support scientific research and innovation (Statistisches Bundesamt [Destatis], 2022). Preschool and primary school expenditures are also quite high. Germany attaches great importance to early childhood education and is constantly increasing its investments in this area. Early childhood education is of critical importance for the development of children's social and cognitive skills, and Germany is one of the foremost countries in Europe in this field (European Commission, 2021). Germany's education expenditures contribute greatly to the country's economical and social growth. A well-funded education system enables the development of a qualified workforce and the emergence of innovative ideas. Germany has

world-renowned universities and research centers in fields such as engineering, technology, and science. This increases the country's global competitiveness (Federal Ministry of Education and Research [BMBF], 2022). Education expenditures also play an important role in ensuring social equality. Germany pursues policies that promote equal opportunities in education. Regardless of socioeconomic status, every child has the right to access quality education. This contributes to the strengthening of social cohesion and social justice (Garcia & Martinez, 2020). In this context, Germany is taking solid steps towards the future with its investments in education expenditures. These investments in the education system increase not only the welfare of individuals but also the general welfare of the country. The quality and access opportunities provided in education strengthen Germany's position in the world and contribute to its sustainable development.

2.2. France

The basis of the French education system has been formed by three major principles since Jules Ferry in 1882 (Erden, 2009): Secular education, compulsory education up to the age of 6, and free education. For this reason, France provides basic education free of charge and strives to provide equal education to all its citizens. France is a country known for its major investments in the education system. Education expenditures in France are mostly exchequered by the central government, local governments, the private sector. In this context, the education system is supported by the state from kindergarten to higher education. Compulsory education in France covers the ages of 3 to 16, and this education is free of charge (Ministère de l'Éducation Nationale et de la Jeunesse, 2022). In higher education, various scholarship and loan opportunities are offered to students (Organization for Economic Co-operation and Development [OECD], 2021). Education expenditures are distributed over a wide range from pre-school education to higher education. In 2022, a significant portion of France’s education budget will be allocated to higher education. Universities and research centers receive significant funding to support scientific research and innovation (European Commission, 2021). Expenditures on preschool and primary school levels are also quite high. France attaches great importance to early childhood education and is constantly increasing its investments in this area. Early childhood education is crucial to the development of children’s social and cognitive skills, and France is one of the leading countries in Europe in this field (Institut National de la Statistique et des Études Économiques [INSEE], 2022). France’s education spending contributes greatly to the country’s economical and social growth. A well-funded education

system enables the development of a qualified workforce and the emergence of innovative ideas. France has world-renowned universities and research centers in fields such as engineering, technology, and science. This increases the country's global competitiveness (Ministère de l'Enseignement Supérieur, de la Recherche et de l'Innovation, 2022). Education expenditures also has an essential role in ensuring social equality. France pursues policies that promote equal opportunities in education. Regardless of socioeconomic status, every child has the right to access quality education. This contributes to the strengthening of social cohesion and social justice (Garcia & Martinez, 2020).

2.3. Spain

Spain is a country that stands out with its investments in its education system. Education expenditures are one of the most important elements that shape the future of a country, and Spain is taking important steps in this regard. When we examine the general structure, distribution, and effects of Spain's education expenditures; It is seen that education expenditures are largely covered by the budgets of the central government and the autonomous communities (comunidades autónomas). The education system from preschool to higher education is supported by the state. Compulsory education in Spain covers the ages of 6 to 16 and this education is free (Ministerio de Educación y Formación Profesional, 2022). In higher education, various scholarships and loan opportunities are offered to students (OECD, 2021). Education expenditures are distributed over a wide range from pre-school to higher education. In 2022, a significant portion of Spain's education budget was allocated to higher education. Universities and research centers receive significant funds to support scientific research and innovation (European Commission, 2021). In addition, significant investments are being made in vocational and technical education programs. Expenditures at preschool and primary school levels are also quite high. Spain attaches great importance to early childhood education and is constantly increasing its investments in this area. Early childhood education is of critical importance in terms of the development of children's social and cognitive skills, and Spain is one of the leading countries in Europe in this field. When the effects of education expenditures in Spain are examined, it is seen that they primarily contribute greatly to the country's economic and social development. A well-financed education system enables the development of a qualified workforce and the emergence of innovative ideas. Spain has world-renowned universities and research centers in fields such as engineering, technology, and science. This increases the country's global competitiveness. Education expenditures also has an significant

role in ensuring social equality. Spain pursues policies that promote equal opportunities in education. Regardless of socioeconomic status, every child has the right to access quality education. This contributes to the strengthening of social harmony and social justice. Spain is taking solid steps towards the future with its investments in education expenditures. These investments in the education system increase not only the welfare of individuals but also the general welfare of the country. The quality and accessibility provided in education strengthen Spain's position on the world stage and contribute to its sustainable development. Education is one of the most important elements in the economic development of a country, and Spain stands out as an exemplary country in this field. It is known that education expenditures play a essential role in the social and economic development of a country.

2.4. Sweden

Sweden is a country known for its large investments in the education system. Education expenditures are one of the most crucial elements that shape the future of a country, and Sweden implements exemplary policies in this area. When the general structure, distribution, and effects of Sweden's education expenditures are examined, it is seen that education expenditures in Sweden are largely covered by the budgets of the central government and local governments. The education system is financed by the state from kindergarten to university. Education in Sweden is completely free at the compulsory level (Skolverket, 2022). In addition, low-cost education is offered in higher education, and students are provided with various scholarships and loan opportunities (OECD, 2021). Education expenditures are distributed over a wide range from pre-school to higher education. In 2022, a significant portion of Sweden's education budget was allocated to higher education. Universities and research centers receive significant funds to support scientific research and innovation (European Commission, 2021). Expenditures at the preschool and primary school levels are also quite high. Sweden attaches great importance to early childhood education and is constantly increasing its investments in this area. Early childhood education is of critical importance for the improvement of children's social and cognitive skills, and Sweden is one of the leading countries in Europe in this field (Skolverket, 2022). Sweden's education expenditures contribute greatly to the country's economialc and social growth. A well-funded education system enables the development of a qualified workforce and the emergence of innovative ideas. Sweden has world-renowned universities and research centers in fields such as engineering, technology, and science. This increases the country's global competitiveness (OECD, 2021). Education expenditures also play

an important role in ensuring social equality. Sweden pursues policies that promote equal opportunities in education. Every child, regardless of their socioeconomic status, has the right to access quality education. This contributes to the strengthening of social cohesion and social justice (European Commission, 2021).

2.5. Italy

Italy is a country known for its rich historical and cultural heritage, and its education system is an important part of this heritage. Education expenditures are one of the critical elements that shape the future of a country, and Italy is making certain investments in this area. Education expenditures in Italy are largely covered by the central government budget. The education system is state-funded from kindergarten to university. Compulsory education in Italy covers ages 6 to 16, and this education is free (Ministero dell'Istruzione, 2022). Education expenditures are distributed over a wide range from pre-school to higher education. In 2022, a significant portion of Italy's education budget was allocated to higher education. Universities and research centers receive significant funds to support scientific research and innovation (OECD, 2021). Expenditures at the preschool and primary school levels are also quite high. Italy attaches great importance to early childhood education and is constantly increasing its investments in this area. Early childhood education is important for the progress of children's social and mental skills, and Italy is one of the notable countries in Europe in this field (European Commission, 2021). Italy's education spending contributes greatly to the country's economic and social development. A well-funded education system enables the development of a qualified workforce and the emergence of innovative ideas. Italy has world-renowned universities and research centers in fields such as engineering, technology, and science. This increases the country's global competitiveness (Università degli Studi di Roma, 2022). Education spending also plays an essential role in ensuring social equality. Italy pursues policies that promote equal opportunities in education. Every child, regardless of their socioeconomic status, has the right to access quality education. This contributes to the strengthening of social cohesion and social justice (Garcia & Martinez, 2020). These investments in the education system increase not only the well-being of individuals but also the general well-being of the country.

2.6. Canada

Canada, where different national and cultural groups live, consists of 3 regions and 10 provinces. In Canada, each province has its symbol, while the provinces also have an autonomous structure. This autonomous structure that emerged politically is also seen in the field of education (Altun, 2010). Canada's most important educational goal is to create understanding between all cultures and to develop science and technology in a country that is a cultural mosaic (İncekara, 2006). Canada is a country known for its strong education system and investments in this system. Education expenditures play an important role in the economic and social development of a country. The general structure, distribution, and effects of Canada's education expenditures will be analyzed. Canada covers its education expenditures largely from the budgets of provincial and territorial governments. The education system includes both public and private schools. Education in Canada is free from primary school to the end of high school (Statistics Canada, 2022). Higher education is generally low-cost and students are offered various scholarship and loan opportunities. Education expenditures are distributed across various levels from preschool to higher education. In 2022, a large portion of Canada's education budget was allocated to higher education. Universities and research centers receive significant funds to support scientific research and innovation (OECD, 2021). Expenditures at the preschool and primary school levels are also quite high. Canada attaches great importance to early childhood education and is constantly increasing its investments in this area. Early childhood education is of critical importance for the development of children's social and cognitive skills, and Canada is one of the leading countries in the world in this field (Canadian Council on Learning, 2021). Canada's primary education goal is to create understanding between all cultures and to develop science and technology in a country that is a mosaic of cultures. Canada's education expenditures contribute greatly to the country's economic and social development. A well-funded education system enables the development of a qualified workforce and the emergence of innovative ideas. Canada has world-renowned universities and research centers in fields such as engineering, technology, and science. This increases the country's global competitiveness (Council of Ministers of Education, Canada, 2022). Education expenditures also play an important role in ensuring social equality. Canada pursues policies that promote equal opportunities in education. Regardless of socioeconomic status, every child has the right to access quality education. This contributes to the strengthening of social harmony and social justice (Garcia & Martinez, 2020).

3. Econometric Analysis

In the study, 6 countries with complete data among the major economies were examined. The relevant countries were considered as panel data and the research period covers the years 1990-2023. The dependent variable is economic growth. Our independent variables that are thought to affect economic development are; education expenditures, advanced teaching expenses, basic education expenditures, and secondary education expenditures, respectively. The variables used were taken from the World Bank Statistical Database (WDI). The logarithmic form of the variables involved in the analysis was used. The reason for using the logarithmic form is to minimize the variance that may occur in the established econometric model. In addition, the economic interpretations of the variables used in the logarithmical form are easy. The variable names and abbreviations used in the study are given in Table 1.

Table 1: Variables and Abbreviations Used in the Analysis

Abbreviation	Variable
GDP	Economic Growth
EH	Education Expenditures
İE	Further Education Expenditures
TE	Basic Education Expenditures
OE	Secondary Education Expenditures

The countries subject to analysis are given in Table 2.

Table 2: Inspected Countries

Countries	Abbreviation
Germany	DEU
France	FRA
Spain	ESP
Sweden	CHE
Italy	ITA
Canada	CAN

The model considered in the analysis;

$LGDP = \beta_0 + \beta_1 LEH + \beta_2 LİE + \beta_3 LTE + \beta_4 LOE + \epsilon$

In the equation, β0, β1, β2, β3 and β4 represent the variable coefficients, and ϵ represents the error term.

3.1. Results

Table 3: Pesaran CD Test Results

Variables	CD-test	P-value
LGDP	21.91	0.000
LEH	1.15	0.257
LİE	10.43	0.000
LTE	7.02	0.000
LOE	9.11	0.000

Hypotheses regarding the CD test;

H_0: There is no cross-sectional dependence,

H_1: There is a cross-sectional dependence.

According to the CD test statistics in Table 3, it was determined that the p-values of LGDP, LIE LTE, and LOE variables were less than 0.05. For these variables, the H0 hypothesis is rejected at a significance level of 5%. In other words, there is a cross-sectional dependence on the relevant variables. Repudiated of the H0 hypothesis means that we will continue the analysis with the second-generation unit root test. Therefore, the CIPS panel unit root test was applied for the specified variables. Since the p-value of the LEH variable is greater than 0.05, the H0 hypothesis is accepted. There is no cross-sectional dependence in the LEH variable. Therefore, the first generation unit root test was applied for the LEH variable. The Fisher ADF panel unit root test was preferred for the relevant variable.

CIPS panel unit root test outcomes are given in Table 4, and Fisher ADF panel unit root test results are shown at Table 5.

Table 4: CIPS Panel Unit Root Test Results

LEVEL					
Variables	t-bar	Cv5	Cv1	Z[t-bar]	P-value
LGDP	-1.864	-2.330	-2.550	-0.219	0.413
LİE	-1.729	-2.330	-2.550	0.134	0.553
LTE	-1.844	-2.330	-2.550	-0.167	0.434
LOE	-1.927	-2.330	-2.550	-0.382	0.870
1.VARIANCE					
ΔLGDP	-2.827	-2.330	-2.550	-2.728	0.003
ΔLİE	-2.739	-2.330	-2.550	-2.499	0.006
ΔLTE	-2.670	-2.330	-2.550	-2.320	0.010
ΔLOE	-4.222	-2.330	-2.550	-6.364	0.000

Hypotheses of CIPS Panel unit root test;

H_0: the series is stationary,

H_1: the series contains a unit root.

Table 4 shows the CIPS panel unit root test results. The t-bar statistics of all variables were found to be smaller in absolute value than the Cv5 and Cv1 confidence levels. This means that the variables contain a unit root. To continue our analysis, the variables need to be made stationary. For this, the difference process was performed. Since the t-bar statistics values in the 1st difference of the variables were larger in absolute value than the Cv5 and Cv1 confidence levels, it was determined that the variables became stable in the distinction. The stationarity of the variables in the difference means that the cointegration method can be applied to the analysis. However, to determine the suitable cointegration test, it is necessary to first examine whether there is a correlation between the units and then apply the homogeneity test. Table 5 shows the Fisher ADF Panel unit root test outcomes.

Table 5: Fisher ADF Panel Unit Root Test Results

		LEVEL	
Variable	Test	Statistics	P-value
	P	18.7843	0.0939
	Z	-0.9524	0.1705
LEH	L*	-1.0847	0.1429
	Pm	1.3848	0.0831
		1. VARIANCE	
	P	40.5263	0.0001
	Z	-4.1879	0.0000
ΔLEH	L*	-4.5202	0.0000
	Pm	5.8229	0.0000

The ADF-based unit root test hypotheses in the output in Table 5 are;

H_0: all units contain unit roots,

H_1: at least one unit is stationary.

For ADF regression, the lag length was examined as 1. P, Z, L*, and Pm test statistics were calculated in the ADF test. The p-values of the test statistics of the LEH variable were found to be greater than 0.05. According to all tests, the H_0 hypothesis is accepted, all units contain a unit root. To continue the analysis, the first difference of the variable was taken. The variable whose difference was taken became stationary. Table 6 gives the Breusch and Pagan LM test results.

Table 6: Breusch and Pagan LM Test Result

Test	Statistics	P-value
LM	233.8	0.000
LM adj*	116.8	0.000
LM CD*	15.05	0.000

The test shown as LM in Table 6 is the Breusch Pagan LM test and is taken into account in the case of T>N. The H_0 hypothesis is established as there is no correlation between units. Since the P-value is less than 0.05, the H_0 hypothesis is disclaimed, meaning there is a correlation between units. Cointegration tests that can be used to continue the analysis in the presence of

correlation between units are second-generation methods. Table 7 shows the Swamy-S homogeneity test result.

Table 7: Swamy-S Test Result

SWAMY – S HOMOGENEITY TEST		
	chi2	Prob > chi2
Model	59.45	0.0001

Hypotheses of Swamy-S test;

H_0: Parameters do not change from unit to unit, they are homogeneous,

H_1: The parameters vary from unit to unit, that is, they are heterogeneous.

From to the Swamy-S test outcomes in Table 7, it was determined that the Prob> chi2 value was less than 0.05. According to this result, the H_0 hypothesis is refused, that is, it was determined that all parameters are heterogeneous. In all tests to be applied later in the analysis, relying on methods with heterogeneous parameters allows us to reach more meaningful and unbiased results. Westerlund Durbin Hausman's (2008) panel cointegration test was applied in line with the existence of a correlation between units and heterogeneity assumptions. Westerlund Durbin Hausman (Durbin-H) panel cointegration test result is given in Table-8.

Table 8: Durbin-H Cointegration Test Result

Model	Value	P-value	Robust P-value
Gt	-3.894	0.003	0.020
Ga	-15.418	0.395	0.000

In the Durbin-H cointegration test, the boostrap critical value, which is significant in the presence of correlation between units, is calculated and given as the Robust P-value. The hypotheses of the test are;

H_0: There is no cointegration relationship between the variables,

H_1: There is a cointegration relationship between the variables.

From to the Durbin-H cointegration test result in Table 8, the H_0 hypothesis is rejected for our model. It was decided that there is a cointegration correlation between the variables. The existence of a cointegration relevance between the variables allows us to interpret the long-term

coefficient estimates. To decide on the suitable long-term coefficient estimator, the 2nd Generation heterogeneous tests, Average Group Dynamic Least Squares (DOLSMG), were applied. DOLSMG estimation results are given in Table 9.

Table 9: DOLSMG Test Results

Variables	Beta	T-stat
ΔLEH	-.1079	-5.127
ΔLİE	-.8259	-4.025
ΔLTE	1.031	8.558
ΔLOE	-1.32	6.775

According to the DOLSMG test results in Table 9, since the t-stat values are greater than 1.96 in absolute value, we can interpret all coefficients. A 1% increase in education expenditures decreases economic growth by-.107. A 1% increase in advanced education reduces economic growth by -0.825. A 1% increase in basic education increases economic growth by 1.03. A 1% increase in secondary education reduces economic growth by -1.32.

The analysis was continued with the Dumitrescu and Hurlin panel causality test used for heterogeneous models. Table 10 shows the Dumitrescu and Hurlin panel causality test results.

Table 10: Dumitrescu and Hurlin Causality Test Result

Direction of Relationship		Z-bar	P-value
ΔLEH ⟶	ΔLGDP	2.386	0.0170
ΔLGDP ↛	ΔLEH	0.711	0.4768
ΔLİE ⟶	ΔLGDP	1.935	0.0434
ΔLGDP ⟶	ΔLİE	5.681	0.0000
ΔLTE ⟶	ΔLGDP	13.89	0.0000
ΔLGDP ↛	ΔLTE	1.788	0.0737
ΔLOE ⟶	ΔLGDP	1.962	0.0497
ΔLGDP ↛	ΔLOE	0.909	0.3634

According to the Dumitrescu and Hurlin causality test results in Table 10, the LEH variable is the cause of the LGDP variable. LIE and LGDP are the cause of each other, that is, there is a

two-way relationship between them. The LTE variable is the cause of the LGDP variable, there is a one-way relationship. The LOE variable is the cause of the LGDP variable.

4. Conclusion

The concept of education is one of the essential factors for the growth and development of societies. Education directly affects the welfare of individuals. Individuals can have qualified jobs and wages thanks to education. When considered from this perspective, the role of education and education expenditures in growing the welfare level of societies is quite large. The ratio of resources that countries transfer to education expenditures affects economic growth positively or negatively in the short-term and long-term. Education expenditures are important in terms of human capital development in the long-term, the society's ability to produce technology as a result of this development, and sustainable economic growth.According to the findings obtained as a result of the econometric analysis, the expenditures that countries will make in the field of education affect economic development in the long-term. While education expenditures, advanced education, and secondary education expenses are among the variables considered for countries that hurt economic growth in the long-term, basic education expenses positively impressed by economic development in the long-term.As a result of the econometric analysis, it has been determined that education expenditures are an effective determinant of economic development for selected countries in the long-term. People whose knowledge, experience, and skills increase thanks to education realize qualified production and increase productivity. The level of production with increasing productivity supports economic growth. For economic growth to occur, individuals who are well-educated and can easily adapt to technological developments are needed. The development of individuals' qualities such as being able to adapt to technological innovations is achieved through developments and innovations in the level of education. Therefore, it is thought that increasing the allocation of resources for education can make major contributions to the economic growth and development process. Increasing the portion of public resources allocated to educational services; While allowing people to be educated to higher standards, also affects the development of their talents and the development of countries. People who cannot receive the necessary level of education due to income inequalities should be supported by the government. The policy-making and implementing units of countries with a sustainable economic development target should increase spending on education, encourage individual spending, and implement strategies to improve this situation. If necessary, radical changes should be made to increase spending on

education and the quality of education. At the same time, cooperation should be established with countries with high status and standards in the field of education and deficiencies should be focused on.

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Genişletilmiş Özet

İnsanoğlunun yaşamı boyunca öğrenme, tasarlama ve uygulama evreleri bulunmaktadır. Söz konusu öğrenmeden kastedilen ise nitelikli öğrenme yöntemidir. Bu yöntem eğitim sayesinde geliştirilebilmektedir. Eğitim olgusunun birçok farklı tanımı bulunmaktadır. Ancak bu tanımlardan ortak bir sonuca ulaşmak gerekirse; eğitim bir süreç olmakla birlikte bireylerin davranış değişikliklerine yol açmakta ve aynı zamanda edinilmiş kültürü nesillere aktarmaktadır. Eğitim; insanların bedensel, duygusal, zihinsel ve toplumsal yetenek ve becerilerini istenilen düzeyde değiştirilmesi ve insanlara yeni amaçlar kazandırmaya yönelik kullanılan bir araç olarak nitelendirilebilir. Ekonomik yönden eğitim ise, işgücü verimliliğinde artış meydana getirerek iktisadi gelişmeye katkı sağlayan ve insanlara beceri ve yeteneklerine göre meslek sahibi olma imkânı sunan uzun bir süreçtir. Eğitim yalnızca bireyin kendisi için değil gelecek nesillere bilgi aktarımı sağlayabilmek açısından da önem arz etmektedir. Günümüz küreselleşme sürecinde olan dünyada nitelikli işgücü talebi oldukça fazladır. Beşeri sermayenin önemli etmenlerinden birisi olan eğitim gelecek nesillerin niteliğini arttırmaktadır. Beşeri sermaye kavramı insan yeteneği ve bilgi birikiminin toplamı şeklinde açıklanmaktadır. İçsel büyüme teorilerinin katkılarıyla beşeri sermayenin iktisadi büyüme üzerindeki etkisi önem kazanmıştır. Nitelikli ve iyi eğitilmiş bireyler beşeri sermayenin temelidir. Ülkelerin gelişimi ve büyümesi yalnızca fiziki sermaye ile sağlanmamaktadır. Fiziki sermayenin kullanımının yanı sıra üretim sürecine dahil olabilmesi için nitelikli işgücü şarttır. Nitelikli işgücü ise eğitimle birlikte sağlanabilmektedir. Eğitim, ülkelerin gelişimi ve büyümesine katkı sağlayan önemli unsurlar arasında yer almaktadır. Bu yüzden de ülkelerin eğitime ayırdıkları pay oldukça önemlidir. Gelişmiş ülkeler için eğitim harcamalarının önemi, ekonomik büyüme, sosyal uyum ve bireysel refah açısından büyük bir anlam taşımaktadır. Eğitim, bireylerin bilgi ve becerilerini geliştirerek işgücü piyasasında daha rekabetçi olmalarını sağlar ve yenilikçi ekonomilerin temelini oluşturur. Ayrıca, iyi finanse edilen eğitim sistemleri, gelir eşitsizliğini azaltarak toplumsal bütünleşmeyi destekler ve sosyal hareketliliği artırır. Eğitim harcamaları, aynı zamanda uzun vadeli sağlık ve yaşam kalitesini iyileştirerek, bireylerin daha üretken ve sağlıklı bir yaşam sürmelerine katkıda bulunur. Bu nedenle, gelişmiş ülkeler, sürdürülebilir kalkınma hedeflerine ulaşmak ve global rekabet gücünü korumak için eğitim harcamalarını öncelikli olarak ele almaktadırlar.

Çalışmada, büyük ekonomiler olarak nitelendirilen ve veri seti tam bulunan; Almanya, Fransa, İspanya, İsveç, İtalya ve Kanada için 1990- 2023 dönemi ele alınmıştır. Bağımsız değişkenlerin (eğitim harcamaları, ileri eğitim harcamaları, temel eğitim harcamaları, orta eğitim harcamaları) bağımlı değişken (ekonomik büyüme) üzerindeki etkisinin incelendiği çalışmaya ait veri seti Dünya Bankası İstatiksel Veri Tabanı (WDI)'dan alınmıştır. Ekonometrik analize başlamadan önce ilk olarak değişkenlerde meydana gelebilecek varyansı en aza indirgemek amacıyla logaritmik formlar alınmıştır. Ekonometrik analize ilk olarak değişkenlere ait yatay kesit bağımlılığını tespiti ile başlanmıştır. Yatay kesit bağımlılığını tespit edebilmek için Pesaran CD testi tercih edilmiştir. Test sonucuna göre eğitim harcamaları değişkeninde yatay kesit bağımlılığının olmadığı belirlenmiş ve bu sebeple ilgili değişken için birinci nesil birim kök testinin kullanılması uygun görülmüştür. Eğitim harcamaları değişkeni için Fisher ADF Panel Birim kök testi uygulanmıştır. Diğer değişkenlerde yatay kesit bağımlılığın varlığı sonucuna ulaşıldığı için ikinci nesil birim kök testlerinden CIPS Panel Birim Kök testi kullanılmıştır. Analize konu olan bütün değişkenlerin düzeyde birim kök içerdikleri, birinci farkı alındığında durağan hale geldikleri tespit edilmiştir. Bütün değişkenler birinci farkta durağan olduğu için analizde eşbütünleşme yöntemi uygulanabilir durumdadır. Uygun eşbütünleşme yöntemine karar verebilmek için modele ait yatay kesit bağımlılığı ve homojenlik testleri uygulanmıştır. Breusch ve Pagan LM test sonucuna göre modelde birimler arası korelasyon vardır. Swamy-S test sonucuna göre modelde yer alan bütün parametreler heterojen bulunmuştur. Model de birimler arası korelasyon varlığında ve heterojenlik bulguları altında uygun eşbütünleşme testi olarak Westerlund Durbin Hausman (Durbin-H) panel eşbütünleşme testi tercih edilmiştir. Durbin-H test sonucuna göre eşbütünleşik ilişkinin varlığı belirlenmiştir. Bu durum bize uzun dönem katsayı tahmini yapabileceğimizi göstermektedir. Uzun dönem katsayı tahmincisi olarak Ortalama Grup Dinamik En Küçük Kareler (DOLSMG) testi uygulanmıştır. Test sonucuna göre yalnızca temel eğitim harcamalarındaki %1'lik artış ekonomik büyümeyi pozitif etkilemektedir. Diğer tüm değişkenler uzun dönemde ekonomik büyümeyi negatif etkilemektedir. Çalışmada değişkenlerin ekonomik büyümeyle nedensellik ilişkisini belirlemek için Dumitrescu ve Hurlin testi kullanılmıştır. Test sonucuna göre eğitim harcamaları ile ekonomik büyüme arasında, temel eğitim harcamaları ve ekonomik büyüme arasında, orta eğitim harcamaları ve ekonomik büyüme arasında tek yönlü nedensellik ilişkisi tespit edilirken ileri eğitim harcamaları ve ekonomik büyüme arasında çift yönlü nedensellik ilişkisi tespit edilmiştir.