EDUCATIONAL ATTAINMENT AND ECONOMIC GROWTH IN EVIDENCE FROM NEW EU MEMBER STATES

Gamze SART[1], Yilmaz BAYAR[2*], Funda Hatice SEZGİN[3]

[1]Department of Educational Sciences, Hasan Ali Yucel Faculty of Education,
İstanbul University-Cerrahpaşa, 34500 İstanbul, Türkiye
[2]Department of Public Finance, Faculty of Economics and Administrative Sciences,
Bandirma Onyedi Eylul University, 10200 Bandirma-Balikesir, Türkiye
[3]Department of Industrial Engineering, Istanbul University-Cerrahpaşa, 34500 İstanbul, Türkiye

Abstract. Educational attainment is a crucial factor underlying economic growth and development. In this study, the mutual interaction between educational attainment and economic growth is investigated in sample of the new European Union member states, which experienced a structural transformation in institutional, economic, and political fields, over the 1996–2019 term by means of causality test. The consequences of causality analysis revealed a bidirectional causal interaction between educational attainment and economic growth. In other words, on the one hand educational attainment has a significant influence on economic growth, on the other hand economic growth has a significant influence on educational attainment.

Keywords: educational attainment, economic growth, new EU Member States, panel causality analysis.

JEL Classification: C33, I20, F43.

Introduction

Education is a key factor underlying sustainable economic growth and development, sustainable environment, and human development. Therefore, quality education is one of sustainable development goals (United Nations, 2022) and also is crucial for implementation of the other goals. In this context, education has been accepted as a significant component of human capital, productivity, research and development, innovation, technological development, and entrepreneurship behind the economic growth theories (e.g. see Solow, 1956; Schultz, 1961; Lucas, 1988; Romer, 1990; Barro & Sala-i-Martin, 1995; Wennekers & Thurik, 1999; Maradana et al., 2017).

Education can affect the economic growth through diverse direct and indirect channels such as labor productivity, absorption of new technologies, competitiveness, foreign direct investments, increases in labor market participation and demand (Bils & Klenow, 2000; Barro, 2013; Marquez-Ramos & Mourelle, 2019; Sebki, 2021). However, an improvement in economic growth is expected to foster the educational attainment because people demand more education as their income increases and governments also raise the educational investments. Therefore, a reciprocal interaction between education and economic growth is theoretically expected. However, the related empirical literature about the causality between education and economic growth has stayed inconclusive. The earlies studies have generally revealed a bidirectional causality between education and economic growth, but the recent studies have generally discovered a unidirectional causality from education to economic growth (e.g. see Erdem & Tuğcu, 2011; Mekdad et al., 2014; Mekdad et al., 2014; Cvetanoska & Trpeski, 2020; Triyani, 2021; Budsayaplakorn & Sompornserm, 2021).

The target of the research is to analyze the mutual interaction between educational attainment and economic growth in sample of the new European Union (EU) member states over the 1996–2019 term by causality test. The new EU member states achieved a significant improvement in educational attainment as seen in Table 1 with the contribution of transformation and EU membership processes.

In the relevant literature, the researchers have generally investigated the influence of education or human capital on economic growth, but the effect of economic growth

Table 1. Education index in the EU member states (1996–2019) (source: authors' own elaboration based on United Nations Development Programme, 2022)

Countries	Years	Education Index
Bulgaria	1996	0.663
	2019	0.779
Croatia	1996	0.575
	2019	0.805
Czechia	1996	0.685
	2019	0.89
Estonia	1996	0.726
	2019	0.882
Hungary	1996	0.71
	2019	0.821
Latvia	1996	0.631
	2019	0.883
Lithuania	1996	0.679
	2019	0.898
Poland	1996	0.723
	2019	0.869
Romania	1996	0.622
	2019	0.765
Slovakia	1996	0.713
	2019	0.826
Slovenia	1996	0.732
	2019	0.91

on educational attainment have been investigated by relatively fewer researchers and stayed inconclusive. Therefore, the study aims to make a contribution to the literature by investigating the mutual interaction between educational attainment and economic growth in sample of the new EU member states. The paper was structured as following: Section 1 reviewed the literature about interaction between economic growth and education, Section described the data and method. Then empirical analysis was depicted in Section 3 and the paper was lasted with Conclusions.

1. Literature review

In the related literature, the researchers have generally investigated the influence of education on economic growth or the effect of parental income on educational attainment. Only a few scholars presented in Table 2 have investigated the mutual interaction between educational attainment and economic growth and discovered mixed findings depending on country's economic development level, study method and period. In this context, Sari and Soytas (2006), Beşkaya et al. (2010), Erdem and Tuğcu (2011), and Mekdad et al. (2014) pointed out a bidirectional causality between education and economic growth. On the other hand, Omojimite (2010), Dănăcică (2011), Cvetanoska and Trpeski (2020), Triyani (2021), Budsayaplakorn and Sompornserm (2021)

discovered a unidirectional causality from education to economic growth. Lastly, Shaari et al. (2014) discovered an insignificant interaction between education and economic growth. However, the studies analyzing the effect of education on economic growth have mainly reached a positive impact of education on economic growth (Hanif & Arshed, 2016; Mendy & Widodo, 2018; Maneejuk & Yamaka, 2021; Sebki, 2021; Chowdhury, 2022).

Table 2. Causality between education and economic growth (source: authors' own elaboration based on literature review)

Study	Sample, Period	Causality Direction
Sari and Soytas (2006)	Turkey, 1937–1996	Bidirectional
Beşkaya et al. (2010)	Turkey, 1993–2007	Bidirectional
Omojimite (2010)	Nigeria, 1980–2005	Causality from education to economic growth
Erdem and Tuğcu (2011)	Turkey	Bidirectional
Dănăcică (2011)	Romania, 1985–2009	Causality from education to economic growth
Mekdad et al. (2014)	Algeria, 1974–2012	Bidirectional
Cvetanoska and Trpeski (2020)	North Macedonia	Causality from education to economic growth
Triyani (2021)	Indonesia, 1980–2017	Causality from higher education to economic growth
Budsayaplakorn and Sompornserm (2021)	ASEAN economies, 1990–2018	Causality from education to economic growth
Shaari et al. (2014)	Malaysia, 1982–2011	Insignificant

The researchers have generally researched the influence of various education indicators on economic growth in different countries and country groups and mainly discovered a positive influence of education on economic growth as seen from the following empirical literature.

Gyimah-Brempong et al. (2006) investigated the effect of higher education on economic growth in African states for the 1960–2000 duration by means of dynamic regression analysis and reached an insignificant effect of higher education on economic growth unlike from the theoretical expectation. On the other hand, Barro (2013) analyzed the effect of education on economic growth in 100 countries over the 1960–1995 term by regression analysis and uncovered a positive influence of secondary and higher-level education on economic growth for adult males, but insignificant influence of education economic growth for adult females. On the other hand, Breton (2013) investigated the influence of education on economic growth in 60 countries with market economies in 2005 and discovered the positive direct and indirect implications of education on economic growth.

Hanif and Arshed (2016) examined the influence of education on economic growth in South Asian

Association for Regional Cooperation members over the 1960–2013 duration via cointegration analysis and pointed out a positive effect of education on economic growth. On the other hand, Kamdar (2017) researched the interaction between various educational attainment indicators and economic growth in India at micro and macro levels in India over the 2001–2011 term and disclosed a positive effect of higher education on economic growth at macro level.

Mendy and Widodo (2018) examined the influence of tertiary, secondary, and primary education on economic growth in Indonesia through ARDL (Autoregressive distributed lag) cointegration test and disclosed a positive long run growth effect of education. On the other hand, Marquez-Ramos and Mourelle (2019) examined the influence of education on economic growth in Spain over the 1971–2013 term through smooth transition regression. Their linear regressions disclosed a positive impact of tertiary and secondary education on economic growth, but there existed nonlinearities in the interaction between education and economic growth.

Maneejuk and Yamaka (2021) examined the interaction between higher education and economic growth in ASEAN economies for the 2000–2018 term by means of nonlinear regression analyses and found a nonlinear impact of government expenditures for tertiary students on economic growth with no law of diminishing returns and a positive growth impact of secondary and higher education.

Sebki (2021) examined the influence of secondary and tertiary education on economic growth in 40 developing economies for the 2002–2016 term via dynamic regression analysis and reached that tertiary education had a positive influence on economic growth, but secondary education had a negative impact on economic growth. Gheraia et al. (2021) examined the impact of education on economic growth in Saudi Arabia for the period 1990–2017 by ARDL cointegration approach and discovered a positive impact of education on economic growth.

Chowdhury (2022) investigated the impact of international education on economic growth in Australia over the 1974–2019 term via cointegration analysis and reached a positive growth impact of education internalization. Serifoglu and Oge Guney (2022) examined the effect of tertiary education fields on economic growth in 54 developed and developing countries over the 1998–2012 period through dynamic regression approach and pointed out that graduates from science faculties had the largest positive impact on economic growth in the developed countries, graduates in the faculties of social sciences, humanities, and education had the largest positive impact on economic growth in developing countries.

2. Data and method

In the study, the mutual interplay between educational attainment and economic growth was analyzed by means of causality analysis. In the causality analysis, educational attainment (EDU) was proxied by education index of United Nations Development Programme (UNDP) (2022). The education index is calculated with use of mean and expected schooling years and gets value between 0 (lowest) and 1(highest) (see UNDP, 2022) for detailed information about the methodology). On the other hand, economic growth (GROWTH) was proxied with growth of real GDP per capita by World Bank (2022). Both education index and economic growth were yearly and covered 1996–2019 term considering the availability of economic growth data. The symbols and definition of the variables were depicted in Table 2.

The empirical analyses were implemented by means of EViews 12.0 and Stata 15.0 software packages. The new EU member states consist of Bulgaria, Croatia, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia.

The common descriptive statistics of both variables were depicted in Table 3. The average of education index was 0.7904, and the average of economic growth was 3.7362 in the sample. However, education was relatively more stable among the countries, but economic growth considerably changed among the countries.

Table 3. Descriptive statistics (source: authors' own elaboration)

Characteristics	EDU	GROWTH
Mean	0.7904	3.7362
Standard Deviation	0.0714	4.1147
Maximum	0.91	14.347
Minimum	0.575	–14.464

The causal interplay between educational attainment and economic growth was investigated via Dumitrescu and Hurlin (2012) causality test. The test is developed form of Granger causality test for heterogeneous panels and produces relatively more robust consequences under cross-sectional dependence. The test calculates the statistics of $Z_{hnc}\left(Z_{N,T}^{HNC}\right)$ and $Z_{tild}\left(Z_{N}^{HNC}\right)$. The test statistic of Z_{hnc} $\left(Z_{N,T}^{HNC}\right)$ with asymptotic distribution is be taken into consideration when T>N. On the other hand, the test statistic of $Z_{tild}\left(Z_{N}^{HNC}\right)$ with semi-asymptotic distribution is taken into consideration when N>T. The test statisticcs are calculated as following:

$$W_{N,T}^{HNC} = \frac{1}{N}\sum_{i=1}^{N}W_{i,T}; \quad (1)$$

$$Z_{N,T}^{HNC} = \sqrt{\frac{N}{2K}}\left(W_{N,T}^{HNC} - K\right); \quad (2)$$

$$Z_{N}^{HNC} = \frac{\sqrt{N}\left[W_{N,T}^{HNC} - N^{-1}\sum_{i=1}^{N}E\left(W_{i,T}\right)\right]}{\sqrt{N^{-1}\sum_{i=1}^{N}Var\left(W_{i,T}\right)}}. \quad (3)$$

The presence of heterogeneity and cross-sectional dependence between education and economic growth led us to use Dumitrescu and Hurlin (2012) causality test for relatively more robust consequences.

3. Empirical analysis

In the empirical analysis part of the research, the availability of cross-sectional dependence was investigated by means of Pesaran et al. (2008) Lagrange Multiplier (LM) adj. test, Pesaran (2004) LM Cross-sectional Dependence (CD) test, and Breusch and Pagan (1980) LM test. The null hypothesis (cross-sectional independence) was rejected at 1% significance level taking the probability values in Table 4 into consideration. So, the presence of cross-sectional dependence was uncovered.

Table 4. Results of LM, LM CD, LM adj. tests (source: authors' own elaboration based on LM, LM CD, LM adj. tests)

Test	Test statistic	Probability
LM	454.2	0.000
CD*	20.06	0.000
$LM_{adj. *}$	100.5	0.000

Note: *two-sided test.

The presence of heterogeneity was investigated by means of delta tilde tests of Pesaran and Yamagata (2008). The null hypothesis (homogeneity) was rejected at 1% significance level taking the probability values in Table 5 into consideration. So, the entity of heterogeneity was revealed for the panel.

Table 5. Results of delta tilde tests (source: authors' own elaboration based on delta tilde tests)

Test	Test statistic	Probability
$\tilde{\Delta}$	7.342	0.000
$\tilde{\Delta}_{adj.}$	5.876	0.000

The entity of unit root in two series was investigated by means of Pesaran (2007) Cross-sectional augmented Im-Pesaran-Shin (CIPS) (2003)) test taking the cross-sectional dependence into consideration. The unit root test consequences in Table 6 pointed out that both EDU and GRWOTH were I(1).

Table 6. Results of unit root test (source: authors' own elaboration based on unit root test)

Variables	Constant	Constant + Trend
EDU	−2.097	−2.018
D (EDU)	−3.419***	−3.403
GROWTH	−1.559	−1.118
D (GROWTH)	−3.350***	−3.863***

Note: *** it is significant at 1%.

The causal interplay between educational attainment and economic growth was investigated via Dumitrescu and Hurlin (2012) causality test and the consequences of causality test in Table 7 denoted a bidirectional causality between educational attainment and economic growth.

Table 7. Results of causality test (source: authors' own elaboration based on causality test)

Null hypothesis	W-Stat.	Zbar-Stat.	Prob.
D(EDU) ↛ D(GROWTH	0.803	−1.863	0.062
D(GROWTH) ↛ D(EDU)	5.253	3.729	0.000

Education is expected to affect the economic growth by way of human capital and other determinants of economic growth. On the other hand, increasing general and individual income can also foster educational investments and the participation to education. Therefore, theoretical expectation about a mutual interaction between educational attainment and economic growth. Our findings were revealed to be consistent with the theoretical expectation and empirical findings by Sari and Soytas (2006), Beşkaya et al. (2010), and Mekdad et al. (2014) but contradicted with the findings by Omojimite (2010), Dănăcică (2011), Cvetanoska and Trpeski (2020), and Triyani (2021). The mixed findings about the interaction between education attainment and economic growth can mainly resulted from countries' economic development level, income inequality, and inadequacy of other complementary factors of economic growth.

Conclusions

Education level is an important indicator of social and economic development of the countries and also a crucial determinant economic growth and development by way of human capital. Therefore, determination of the interaction between educational attainment and economic growth is critical for design of educational policies.

In this paper, we investigated the causal relation between economic growth and educational attainment in sample of the new EU members experiencing a full transformation for the 1996–2019 term by means of causality test. The consequences of causality test revealed a bidirectional causality between educational attainment and economic growth in compatible with theoretical expectations and early empirical findings. However, our findings contradicted with the findings of the recent studies and the contradiction can be resulted from the different economic development levels of the countries under consideration. The mutual interaction between education and economic growth can make a contribution to the acceleration of economic development of the countries.

Disclosure statement

We do not have any competing financial, professional, or personal interests from other parties.

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