

# HIGHER EDUCATION AND ECONOMIC GROWTH IN NORTH MACEDONIA: EVIDENCE FROM CAUSALITY TESTING AND COVID-19 CHALLENGES

**Marijana Cvetanoska**

*Faculty of Economics - Skopje, Ss. Cyril and Methodius University*  
[marijana.cvetanoska@eccf.ukim.edu.mk](mailto:marijana.cvetanoska@eccf.ukim.edu.mk)

**Predrag Trpeski**

*Faculty of Economics - Skopje, Ss. Cyril and Methodius University*  
[predrag.trpeski@eccf.ukim.edu.mk](mailto:predrag.trpeski@eccf.ukim.edu.mk)

## **ABSTRACT**

*The link between education and economic growth has been the subject of public debate, and it has been widespread interest among economists in solving key economic problems. As a determinant of human capital, which is one of the factors of production, education has its own contribution in the process of globalization where economies are transformed and based on knowledge. Particularly higher education has a high economic value because it causes the formation of human capital and it is often seen as vital for a continued growth performance, prosperity, and competitiveness in national and global economies. Higher education contributes to the economic growth by producing higher-level skills and competencies needed for a shift towards knowledge-based economy. For these reasons, countries all over the world especially the developing countries such as North Macedonia, are giving higher education special attention to facilitate the economic growth. In this study, the co-integration between higher education and economic growth in North Macedonia is analyzed using dynamic methods. Toda Yamamoto's approach for Granger's causality (TY) developed by Toda and Yamamoto (1995) is used to analyze the causality between economic growth and higher education. For this aim, a bivariate VAR model is constructed. This study provides an evidence for the causality between higher education and economic growth in North Macedonia. Moreover, a key role of higher education institutions is to drive innovation, with the aim of finding solutions to global challenges. Today, in response to the COVID-19 pandemic, there is a danger that COVID-19 will destabilize this educational level, with serious consequences. Therefore, the challenges that higher education is faced are emphasized in order to help education institutions and policy-makers to reflect on them and be prepared to address them, while re-emphasizing the role of higher education in supporting to conform the post-COVID-19 pandemic.*

**Keywords:** *economic growth, COVID-19, higher education, human capital, North Macedonia*

**JEL classification:** *I20, I23, O40*

## **1. INTRODUCTION**

The link between education and economic growth has been a subject of public debate, and there has been widespread interest among economists in solving key economic problems. As a determinant of human capital, education contributes to solving key economic problems, especially in the process of globalization where economies are transformed and based on knowledge. The role of education should be seen in a broader macroeconomic context to ensure that education contributes for the growth of a country's economy. Education is broadly accepted as a strong human capital determinant for poverty reduction, encouraging people towards earning and investment, and creating a competitive environment to enhance economic growth.

The development and progress of a country in the global economy depends on the creation of a highly skilled people with the ability to access, adapt and create new knowledge and technologies.

The impact of education on economic growth has been an important issue for analysts since the late twentieth century, when specialized literature discussed the role of human capital. Human capital theory has become widely debated among economists who have turned their attention from the amount of natural resources to the extent of their efficient use. There is no doubt that investing in human capital is considered a key condition for successful economic policy. Individuals cannot be sufficiently qualified in the workplace without accumulating appropriate education. Education is widely accepted as a leading tool for promoting economic growth at all levels.

In the attempt to find appropriate measures for the concept of human capital, education stands out as one of the most important aspects of human capital. All the arguments about the importance of education for the development of a country are close to the fact that education plays a key role in preparing individuals to enter the labor market by providing them with appropriate knowledge and skills in order to practice lifelong learning. To cope with today's frequent technological changes, people need technical skills and knowledge that need to be acquired, above all, through education. At the European Union level, education and knowledge are the top priorities in the EU 2020 Strategy. Therefore, the contribution of education as human capital in the process of economic growth is not controversial, but it is important to know the level of education that is most relevant in terms of contribution and statistical significance (Qadri and Waheed, 2017).

In the new era of the knowledge society, where education in general is recognized as an instrument of great importance, particularly higher education is one of the most important determinants of the economic growth. Higher education has been considered as a key factor for the progress and development of any country, and also as an initiator of change and development of the nations. The contribution of higher education to economic growth is presumed to occur through a number of distinct interacting functions. *First*, it is believed that higher education contributes to economic growth through the production of knowledge and that this largely takes place within the major universities through faculty members' and their advanced students' research and creative activities. *Second*, it is generally acknowledged that colleges and universities contribute to national growth through the diffusion of knowledge, which may result from the external service activities of their faculty, staff, and students. *Finally*, it is universally accepted that postsecondary institutions contribute to the transmission of knowledge through extensive and varied teaching activities (Becker and Lewis, 1993).

The roles of higher education in sustainable economic and social development increase year by year, and this will continue over the next decades. Higher education can be seen as a focal point of knowledge and it makes a great contribution to the economic growth and development through fostering innovation and increasing higher skills. On one hand, higher education serves the purpose of signaling student abilities for higher-order skills as opposed to other purposes like increasing human capital or employability. On the other hand, undergraduate students may signal their college degree to increase their status in the job market. More educated workers may receive higher pay wages because higher education provides them with a credential, rather than acquired skills (Chan, 2016).

There is a rapidly growing demand for higher education because of the substantial expansion in primary and secondary education. Many factors drive rapid growth in higher education. The two main proximate determinates are growth in secondary education and an increased transition rate from secondary to tertiary education. Behind these trends are many cultural and economic factors. Growth in the knowledge-based economy and the perception that the most desired

employment requires a university degree, also drives demand for higher education (World Bank, 2017).

Although there is a solid theoretical background for the economic growth and its relationship with education, the empirical evidence of this relationship is deficient. We have studied the impact of human capital (measured by educational qualifications) on economic growth in North Macedonia using regression and correlation analysis and found that economic growth can be predicted by higher education. Moreover, in North Macedonia, there is a positive link between the level of education and access to work, the employment rate increases with increasing levels of knowledge. Also, the lowest rates of unemployment were registered among those with high education. Furthermore, the largest differences in average monthly earnings are registered among employees with higher education and those with low level. (Cvetanoska and Trpeski, 2019).

Therefore, in order to evaluate the importance of tertiary education, in this study we analyze the causality between higher education (as the highest level of acquired knowledge) and economic growth in North Macedonia. We will test the existence of a direct causality relationship between higher education and economic growth and the direction of this causality, if such a relationship exists.

After the introduction section, the second part of the paper presents a review of relevant literature, which examines the aspects of the research that is the subject of this paper. The third part of the paper covers the methodological approach applied to the paper's research and data sources followed by the empirical analysis and the results. In response to COVID-19 pandemic, the fourth part presents the challenges that higher education is faced. Last section covers the conclusion of the study and in the end the references are presented.

## **2. LITERATURE REVIEW**

Numerous articles discuss the importance and logical connection between higher education and a country's economic growth, but just few of these can justify the direction and the scale of causation. If we look at these studies, the literature consists of examining the co-integration, causality, and regression which seek to understand long-term and causal relationships between education and economic growth.

Lucas (1988) developed an endogenous growth model that considered the human capital as one of the main determinants of the economic growth and in this model, education was considered as a proxy for the human capital.

Mankiw et al. (1992) showed that the human capital has a significant role in the economic growth. They measured human capital through education as a new variable in the model, showing the importance of the investment in education as a determinant of the economic growth.

Agiomirgianakis et al., (2001) examined the relationship between human capital (according to rates in primary, secondary and higher education) and economic growth in Greece and found that causality ranges from educational variables to economic growth, with the exception of higher education where exists reverse causality.

Jaoul (2004) analyzed causality between higher education and economic growth in France and Germany in the period before the Second World War. The results showed that higher education has an influence on gross domestic product for the case of France. For Germany, education did not appear as a cause of growth.

Chaudhary et al., (2009), using the approaches of Johansen and Toda & Yamamoto within VAR, showed that there is a unidirectional causal link from economic growth to higher education and that there is no causality from higher education to economic growth.

Huang et al. (2009) found that there is a long-run relationship between enrollment in higher education and economic growth. Also, Katircioglu (2009) found a long-run relationship

between higher education and economic growth and a direct causality relationship from higher education to economic growth in North Cyprus.

The results of a study by Erdem and Tugcu (2010) showed that higher education is cointegrated with economic growth and higher education or economic growth have significant causal effects in both directions.

Examining the causality between higher education and economic growth in Romania, Danacica et al., (2010) proved that there is unidirectional causality between economic growth and higher education in Romania, from economic growth to higher education.

In another work, Danacica (2011) found a unidirectional causality between school education measured by enrolment ratio in secondary and higher education and economic growth in Romania, showing that the education has a positive effect on the economic growth.

Barro (2013), who found that education significantly influences economic growth using a cross section of 100 countries, showed that there is a direct causality relationship running from education measured by schooling rates to the economic growth and education has a positive effect on economic growth.

Obradovic and Lojanica (2016) investigated the long and short run relationship between higher education and economic growth for Sweden, for the period from 1971 to 2013, by using ARDL approach. They applied Toda-Yamamoto procedures of Granger non-causality test in order to detect the direction of causality in the relationship between economic growth and higher education and they found that unidirectional causality between higher education and real GDP per capita, exists.

The empirical analysis of Pegkas (2014) reveals that there is a long-run relationship between educational levels and gross domestic product. The overall results showed that secondary and higher education have a statistically significant impact on growth, while primary hadn't contributed to economic growth. He also found an evidence of unidirectional long-run causality running from primary education to growth, bidirectional long-run causality between secondary and growth, long-run and short-run causality running from higher education to economic growth.

### **3. METHODOLOGY AND EMPIRICAL ANALYSIS**

The study on the relationship between variables analyzes the causality between higher education and economic growth in North Macedonia, using dynamic methods. This analysis uses annual time series for gross domestic product and higher education for the period 1990-2018 (there is no data for the academic year 2019/2020). Higher education is expressed through the number of enrolled students, measured as an absolute number. In addition, in order to exclude the impact of population migration on education, due to the demographic changes that took place in North Macedonia in the analyzed period, the number of enrolled students is divided by the total population. For the analysis of economic growth in North Macedonia, the gross domestic product per capita is used as a variable. Databases of the State Statistical Office and the National Bank of North Macedonia are used as data sources.

In this study, Toda Yamamoto's approach (TY) is used for testing Granger's causality developed by Toda and Yamamoto (1995) with the aim to test the causality between economic growth and higher education. This approach is an extended Granger causality test and uses a modified Wald test to limit the parameters of the VAR model. Toda and Yamamoto (1995) developed and used this test to overcome the limitations of the basic Granger causality test. Namely, in most analyzes, it is not known *a priori* whether the variables are integrated, cointegrated or stationary. Consequently, pretests for unit root and cointegration in economic time series are usually required before estimating the VAR model in which statistical inferences are implemented (Toda and Yamamoto, 1995, p.226).

However, in many studies, the researcher's interest is not in the existence of unit roots or cointegrated relations, but in the testing of economic hypotheses expressed as restrictions on the coefficients of the model. To overcome these limitations, TY method is applicable whether the VAR can be stationary, integrated, or co-integrated by estimating the levels of series used and by applying the Wald test. Also, when a shorter time series are considered in analysis (which is often the case when limited data is available), this method is considered more useful in practice.

The causality between two variables can be described as unidirectional, bidirectional or no causality. To test the TY causality between the two variables, the following bivariate VAR model was constructed:

$$GDP_t = \sum_{i=1}^{h+d} \alpha_i HE_{t-i} + \sum_{i=1}^{l+d} \beta_i GDP_{t-i} + \varepsilon_{1t} \quad (1)$$

$$HE_t = \sum_{i=1}^{h+d} \gamma_i HE_{t-i} + \sum_{i=1}^{l+d} \delta_i GDP_{t-i} + \varepsilon_{2t} \quad (2)$$

Where:  $d$  is the maximum order of integration,  $h$  and  $l$  are the optimal lag length and  $\varepsilon_{1t}$ ,  $\varepsilon_{2t}$  are the error terms.

The subject of this analysis is to determine which of the following relations applies to the variables mentioned:

- higher education cause the gross domestic product per capita;
- gross domestic product per capita cause the higher education;
- there is bilateral causality between higher education and gross domestic product per capita;
- between variables exists no causality.

For this purpose, the following hypotheses are specified:

**For equation (1):**

$H0$ : HE does not Granger cause GDP, or  $\sum_{i=1}^{l+d} \delta_i = 0$

$H1$ : HE does Granger cause GDP, or  $\sum_{i=1}^{l+d} \delta_i \neq 0$

**For equation (2):**

$H0$ : GDP does not Granger cause HE, or  $\sum_{i=1}^{h+d} \alpha_i = 0$

$H1$ : GDP does Granger cause HE, or  $\sum_{i=1}^{h+d} \alpha_i \neq 0$

In the first step, Augmented Dickey-Fuller test (ADF) is used to test the existence of unit roots and to determine the order of integration of the variables. ADF test showed that both series are unstable at the level, so after the first differentiation, the series were stationary. At the first difference, the probabilities of the variables are less than 5% and it shows that all the variables become stationary by integrating Order I (1). Therefore, the maximum order of integration ( $d$ ) is equal to 1 (Table 1).

*Table 1. Results from ADF Unit - Root test*

Series	t - statistics	Prob. (1 <sup>st</sup> difference)	Order of integration
D (GDP)	-4,615078	0,0011	I (1)
D (HE)	-4,695338	0,0009	I (1)

*(Source: Authors' calculations (based on Eviews))*

The next step (Table 2) was to select the optimal lag length ( $h$ ), based on the results of the synthesis of several methods, such as Akaike Information Criteria (AIC), Schwartz Bayesian Criteria (SC), Hannan-Quinn information criteria (HQ), Final prediction error (FPE) and Likelihood ratio test (LR). As it can be noticed from Table 2, the tests suggest that the optimal lag length is 1. Therefore, 2 lags ( $d + h$ ) are used to evaluate the VAR model, i.e. to test the causality with TY approach.

Table 2. Criteria for determining optimal lag through the VAR Model

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-107,1937	/	21,32387	8,735496	8,833006	8,762541
1	-50,79650	99,25908*	0,323127*	4,543720*	4,836250*	4,624855*
2	-49,33267	2,342125	0,399233	4,746614	5,234164	4,881839
3	-45,10937	6,081556	0,400006	4,728749	5,411320	4,918065
4	-43,44209	2,134108	0,500152	4,915368	5,792958	5,158774

(Source: Authors' calculations (based on Eviews))

By performing the LM test for autocorrelation testing, from the following table it can be seen that with 2 lags the zero hypothesis (there is no serial correlation between the residuals in the model) cannot be rejected, which is a requirement for conducting the causality test.

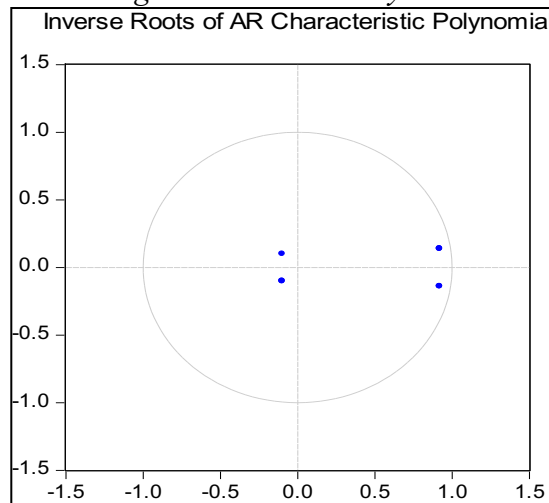
Table 3. LM test for series correlation

Lags	LM-Stat	Prob
1	9.923.044	0.0417
2	6.119.534	0.1904

(Source: Authors' calculations (based on Eviews))

Figure 1 shows the result of stability test for the basic VAR model (2). All values lie in a circle and this means that the estimated model is dynamically stable.

Figure 1. VAR stability test



Source: Authors' calculations (based on Eviews)

The following table shows the results of TY approach for Granger causality test. The results presented in Table 4 show that at a significance level of 5%, with a p-value of 0.0143 (which is less than the significance level  $\alpha = 0.05$ ) we have enough evidence to reject the null hypothesis and accept an alternative hypothesis (for equation 1). Or the results indicate that we can reject the null hypothesis that higher education does not cause gross domestic product but cannot reject the null hypothesis that gross domestic product does not cause higher education.

*Table 4. Granger causality test results (Toda – Yamamoto approach)*

<b>Null hypothesis</b>	<b>Chi-sq</b>	<b>df</b>	<b>Probability</b>
HE does not Granger cause GDP	8,49667*	2	0,0143
GDP does not Granger HE	2,763929	2	0,2511

*(Source: Authors' calculations (based on Eviews))*

Therefore, we can conclude that there is unidirectional causality between higher education and gross domestic product which runs from higher education to gross domestic product. According to the causality test, we can claim that higher education causes gross domestic product, i.e. economic growth in North Macedonia with a time delay of 2 years.

#### **4. COVID-19 CHALLENGES AND RECOMMENDATIONS TO HIGHER EDUCATION**

As of March 2020, universities and other tertiary education institutions are closed in North Macedonia and other countries, enrolled students have had their studies physically ended (it has been stopped face-to-face teaching) or significantly disordered due to COVID-19. Students, academic staff, and administrative officials deal with the implications of this pandemic for their learning, teaching, research, innovation and education outcomes, and financial stability, too. The road from here to resumption of operations will be long and difficult, and some of the changes that this crisis will bring to tertiary education systems around the world will not go away. It is expected that most systems will be sorely challenged to quickly return to the state they were in before the pandemic (World Bank, 2020).

Universities, as well as primary and secondary schools have made a shift from face-to-face toward online courses and seminars. Even though this was done in a very short period of time, there are divided opinions about the effects on teaching and learning. It is undoubtable that even universities which had online courses before the pandemic are struggling to adapt to the new environment. In other words, the crisis has provided an opportunity to all higher education institutions to quickly improve and maximize IT operations. However, the majority of them might not have the capacity to fully deliver whole study programmes online.

The change to online learning has been challenging for most higher education institutions as teaching has been adopting innovative methods to interact with the students. In this context it can be analyzed the challenges of online teaching and its limitations.

First of all, it is students' possibilities to access to internet connectivity. This especially for the students from rural areas, but also for urban areas in a matter of having good internet connectivity. Online courses and seminars are forced to focus more on the theoretical teaching of the subjects without actual use of the laboratory, or other technical tools. However, this challenge is reduced with the use of many online applications such as Google Hangout Meeting, Zoom, Easy Class, and many others.

Secondly, the experiences of COVID-19 disruption to tertiary education globally exposed other significant short-term challenges for higher education (World Bank, 2020):

- diminished resources for institutions;
- demand for improved infrastructure to support continued distance and blended learning models;
- maintaining instructional operations, including coursework, exams, and awarding of degrees – modification of assessment modalities;
- maintaining or closing research operations, including on facilities, field work, conferences, and external research collaborations.

On the side of long-term challenges, universities are confronting with reduced public and private funding for higher education (from household, firms and other third-party funding), permanent closures of programs and institutions - resulting in permanent loss of skills and

human capital in academic and administrative positions, permanent movement of more programs to online/remote platforms, reduced internal mobility - leading to increased local demand for higher education, socio-emotional impacts on students (and academic staff) of remote teaching and learning (World Bank, 2020).

The impacts of COVID-19 on higher education are documented in few reports, but it is unknown which of them will leave their mark in the medium or long term. Lack of background and therefore lessons from similar crises in the past makes it difficult to anticipate what may happen in the future. All countries are faced with the same problem which is related to the reluctance to cope with distance learning, as many students are not experienced as online listeners and learners. To be able to meet this challenge of distance learning, it is necessary for the countries to make essential changes. First, it is necessary to use the technological resources at their higher level, and mutual cooperation should be fostered, too. Providing regular guidance and support to students and teaching staff on short term is important to keep stability in the process of learning and teaching. Most faculty members around the world are active online, but there are many of them who have not taught online before the COVID-19 crisis. As there is a lot of material online, and technical support is available, academic staff will need training for digital and online teaching skills. It is crucial for the future that academics, university administrators, policy creators, public authorities and community partners work together to find solutions and opportunities to overcome the challenges that higher education is faced.

## **5. CONCLUSION**

Education is important for the priorities of Macedonian economic development, especially in terms of more productive citizens and the needs of the labor market. Investment in education remains one of the key challenges in the modern economy facing developing countries, such as North Macedonia. Education is a central part of most countries' development strategies. Accordingly, enrollment rates in schools have increased dramatically in most developing countries. But, despite significant progress in primary education and enrollment in high school, there are still several challenges that have to be overcome. Potentially, any type of education should improve employment skills and opportunities. Today's labor market requires highly skilled people at all levels to deal with rapidly changing environment. People who are neither educated nor employed are often excluded from the labor market and are at greater risk of not finding work, which can lead to poverty or social exclusion.

In the structure of the labor force in the EU and in North Macedonia, people with secondary education have the largest share. There is a significant difference between the percentage of employees who have completed primary and secondary education, on the one hand, and employees who have completed university education on the other. In addition, the highest percentage of employment is among those with higher education, which is over 70% within the age group of 20 to 64 years.

As it was found that economic growth can be predicted by higher education (Cvetanoska and Trpeski, 2019), this study has further provided an evidence of a unidirectional causality from higher education to economic growth in North Macedonia. Considering the test results for causality, higher education causes the economic growth in North Macedonia with a time delay of two years. This result is determined for the period from 1990 to 2018.

The results may improve the decisions of policymakers about education and its contribution to economic growth and some policy implications for the findings can be recommended. The government of North Macedonia should increase investments on education as there is simultaneous cause and effect between higher education and economic growth. Policy makers need to focus on creating appropriate policies that should improve education by increasing the quality of skills and knowledge in the workforce, which will meet the needs of employers on the labor market. Higher education is one of the key predictors for greater economic growth.

Or as Delbanco (2012) has found that completing a bachelor's degree is "good for the economic health of the nation and that going to college is good for the economic competitiveness of society". Such implications are particularly important for programs and strategies aimed at improving knowledge and education to achieve and meet priorities within action plans.

Responding to the COVID-19 crisis, many countries and tertiary education institutions have transformed their operations online relatively quickly. The experiences of COVID -19 disruption to higher education globally disclosed significant short-term and long-term challenges facing higher education institutions. In response to the COVID -19 pandemic, there is a danger that COVID -19 may destabilize this educational level, with serious consequences. Therefore, governments and higher education institutions should create coordination mechanisms in the face of this and future crises, whatever their nature may be or not like COVID -19. It is also essential to involve students, academic, teaching, and non-teaching staff in designing the responses that such crises demand. Moreover, governments should include higher education in the stimulus plans for economic and social recovery as there are several channels through which universities may affect growth and because universities are producers of human capital.

## REFERENCES

- Agiomirgianakis, G., Asteriou, D., and Monastiriotis, V. (2002), "Human capital and economic growth revisited: A dynamic panel data study", *International advances in economic research*, 8(3), pp.177-187.
- Barro, R. J. (2013), "Education and Economic Growth", *Annals of Economics and Finance*, 14(2A), pp.277-304.
- Becker, W. E., and Lewis, D. R. (1993), "Preview of higher education and economic growth", *Higher Education and Economic Growth*, Springer, Dordrecht, pp. 1-20.
- Chan, R. Y. (2016), "Understanding the purpose of higher education: An analysis of the economic and social benefits for completing a college degree", *Journal of Education Policy, Planning and Administration*, 6(5), pp.1-40.
- Chaudhary, A. R., Iqbal, A., and Gillani, S. Y. M. (2009), "The nexus between higher education and economic growth: An empirical investigation for Pakistan", *Pakistan Journal of Commerce and Social Sciences (PJCSS)*, 3, pp.1-9.
- Cvetanoska, M., and Trpeski, P. (2019), "The impact of human capital on the economic growth in Macedonia", *Journal of Contemporary Economic and Business Issues*, 6(1), pp. 21-29.
- Cvetanoska, M., and Trpeski, P. (2019), "Education and its effects on the labour market in Macedonia", In Bozic, R. (Ed.), *Proceedings of Jahorina Business Forum 2019: Market, ethics and economic policy in the light of the modernization of economy and society in Jahorina, 27-29 March, 2019*, Faculty of Economics Pale, University of East Sarajevo, pp.55-65.
- Danacica, D. E., Belascu, L., and Ilie, L. (2010), "The interactive causality between higher education and economic growth in Romania", *International Review of Business Research Papers*, 6(4), pp.491-500.
- Danacica, D. E. (2011), "Causality between School Education and Economic Growth in Romania", *Argumenta Oeconomica*, 1(26), pp.57-72.
- Delbanco, A. (2012), *College: What it was, is, and should be*, Princeton University Press, Princeton, New Jersey.
- Erdem, E., and Tugcu, C. (2010), "Higher education and economic growth: An empirical investigation of cointegration and causality for Turkish economy", *Erciyes Universitesi Iktisadi ve Idari Bilimler Fakultesi Dergisi*, 36, pp.1-14.
- Huang, F., Jin, L., and Sun, X. (2009), "Relationship between Scale of Higher Education and Economic Growth in China", *Asian Social Science*, 5(11), pp.55-60.

- Jaoul, M. (2004), “Higher education, causality, and growth: a comparison of France and Germany before the Second World War”, *Compare: A Journal of Comparative and International Education*, 34(1), pp.117-133.
- Katircioglu, S. T. (2009), *Investigating Higher-Education-Led Growth Hypothesis in a Small Island: Time Series Evidence from Northern Cyprus*, Paper presented at Anadolu International Conference in Economics, Eskişehir Turkey. Retrieved from <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.572.6120&rep=rep1&type=pdf>
- Lucas, R. (1988), “On the Mechanisms of Economic Development”, *Journal of Monetary Economics*, 22(1), pp.3–42
- Mankiw, N. G., Romer, D., and Weil, D. (1992), “A Contribution to the Empirics of Economic Growth”, *Quarterly Journal of Economics*. 107(2), pp. 407–437.
- Obradović, S., and Lojanica, N. (2016), “Higher Education and Economic Growth: Swedish Evidence From Multivariate Framework”, *Facta Universitatis Series: Economics and Organization*, 13(2), pp.177-185.
- Pegkas, P. (2014), “The link between educational levels and economic growth: a neoclassical approach for the case of Greece”, *International Journal of Applied Economics*, 11(2), pp.38-54.
- Qadri, F. S., and Waheed, A. (2017), “Human Capital-Economic Growth Relationship: Finding the Most Relevant Level of Education in Pakistan”, *South Asian Journal of Management Sciences*, 11(2), pp.140-152.
- Toda, H.Y., and Yamamoto, T. (1995), “Statistical inference in vector autoregressions with possibly integrated processes”, *Journal of econometrics*, 66(1-2), pp. 225-250.
- World Bank (2017), *Higher education for development: An Evaluation of the World Bank Group’s Support*, International Bank for Reconstruction and Development: The World Bank
- World Bank (2020), *The COVID-19 Crisis Response: Supporting tertiary education for continuity, adaptation, and innovation*, World Bank Group, available at <http://pubdocs.worldbank.org/en/621991586463915490/WB-Tertiary-Ed-and-COVID-19-Crisis-for-public-use-April-9.pdf> (accessed 19 May: 2020)