Educational Policy Analysis and Strategic Research, V18, N3, 2023
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Transformation of Knowledge into Economic Value in Higher Education and Global Competitiveness: A Panel Causality Analysis on OECD Countries

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Abstract

Entrepreneurial and innovative higher education institutions of the 21st century have become the driving forces of social development, economic growth and global competitiveness by improving human capital through the educational and instructional services they offer, producing qualified scientific information through the scientific research they conduct and by fulfilling an important responsibility in the solution of social problems. In the current study, the effect of higher education on global competition in the context of the transformation of knowledge into economic value in OECD countries was analyzed with the Granger Panel Causality Test. In the application part, a panel data set was created with the data collected from 25 OECD countries for which data were available for the period 2006-2017. The Global Competitiveness Index variable was taken as the basis to reveal the global competitiveness of the countries included in the analysis. In order to reveal the status of their higher education, the gross schooling rate in higher education, the employment rate of the population with higher education, public expenditures on higher education, the quality of the education system, the quality of scientific research institutions, the performance of scientific publications, the R&D expenditures made by higher education and the university-industry cooperation variables were taken as the basis. As a result of the application, it was determined that each variable representing higher education has a bilateral causality relationship in the short term with the Global Competitiveness Index representing global competition.

Keywords: Higher education, global competition, knowledge, economic value, OECD, panel causality test

DOI: 10.29329/epasr.2023.600.11

Submitted: 17 May 2023 **Accepted:** 31 July 2023 **Published:** 30 September 2023

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Introduction

Social institutions which were formed to meet social needs have undergone functional changes in parallel with the changes in social structure and needs in the historical process. Higher education institutions, which are historical and social institutions, have also undergone functional changes in the changing conditions of different periods (Şahin & Alkan, 2016). Higher education institutions, which basically fulfilled the function of "educating-teaching" at first, then undertook the function of conducting scientific research and then creating social benefits in order to respond to the new conditions and needs that emerged over time (Ayten & Göver, 2020; Erdem, 2016; Etzkowitz, 2008; Günay, 2007; Wissema, 2009; Zhang, 2007). Thus, entrepreneurial and innovative higher education institutions of the 21st century, which started to make important contributions to education, scientific research and society, have become the driving forces of change and development by improving human capital through the educational and instructional services they offer, by producing qualified scientific information through the scientific research they conduct and by fulfilling an important responsibility in the solutions of the problems of the society including economic, ecological, social, cultural and political problems.

Entrepreneurial and innovative higher education institutions of the 21st century have become significant and decisive elements in global competition by creating qualified human resources (human capital), generating high-quality scientific knowledge, taking a leading role in the transformation of knowledge into economic value, effectively transforming knowledge into advanced technologies and innovations, producing high-value-added products and services, boosting R&D activities, increasing productivity and efficiency, collaborating with other social stakeholders such as industry, trade, business and civil society to increase economic, social and intellectual capital, promoting the institutionalization of entrepreneurship and its cultural adoption, revealing and developing the potential of their region (industry, trade, agriculture, tourism, etc.) to achieve regional development, developing rational strategies, policies, and solutions against economic, ecological, social, cultural and political problems that are increasingly diverse and complex, creating mechanisms to overcome the middle-income trap and triggering the dynamics that will ensure sustainable economic growth and social development.

Despite the important and decisive role of higher education mentioned above, studies on the effect of higher education on global competition and on their relationships have remained quite limited. In the literature on global competition, the greatest emphasis has been put on high-tech product exports, production based on knowledge and innovation, import and export volume and exchange rate as the factors affecting the global competition. Furthermore, it has been observed that these studies have mainly focused on fields such as economics and econometrics, and there is not enough emphasis on practical studies to investigate the subject in the fields of education and

sociology. However, it is not possible to explain and analyze the competition in today's globalized world with a single discipline such as economics, econometrics, education, sociology, etc. For this reason, interdisciplinary research approach is required and collaboration among several different disciplines is necessary.

In the current study, the effect of higher education on global competition was analyzed in the context of the transformation of knowledge into economic value in the countries of the Organisation for Economic Cooperation and Development (OECD). The Granger Panel Causality Test was used in the study covering the period between 2006 and 2017. The current study is important as it will bring the role of higher education factor, which is often neglected in global competitiveness, to the fore and adopt an interdisciplinary research approach that brings together education, sociology, economics and econometrics. In light of the findings of the current study, some suggestions will be made.

The Process of Functional Transformation in Higher Education

In their early days, higher education institutions primarily fulfilled the function of providing education and instruction. However, in the 19th century, in order to respond to the changing economic, social, cultural and political conditions and needs of the time, higher education institutions undertook the function of conducting scientific research in addition to their function of educating. In the second half of the 20th century, in addition to these two main functions (education-instruction and scientific research), they also assumed the function of creating social benefits (Ayten & Göver, 2020; Erdem, 2016; Wissema, 2009). Then, the process of transforming knowledge into economic value started with third-generation universities that fulfil the functions of educating, conducting research and creating social benefits as a whole.

First Generation Universities: Function of Providing Education and Instruction

Towards the end of the 11th century, the first examples of the first generation universities, which came to the fore with their basic function of providing education and instruction, were encountered in medieval Europe. The historical and cultural heritage taken from the ancient Greek and Roman civilizations and the cultural interaction with other civilizations had a decisive influence on the formation of these universities. According to Antalyalı (2007), the basic legacy taken from the First Age ancient Greek-Roman civilizations were the seven fundamental sciences (grammar, rhetoric, logic, geometry, arithmetic, astronomy and music) that were believed to be learned by a free person. According to Rukancı and Anameriç (2004), the interaction with Islamic civilizations had a significant effect. Especially the Umayyad Caliphate of Cordoba established in Spain influenced the educational institutions by affecting the Medieval European civilizations. According to Piyadeoğlu (2018), Nizamiyya Madrasa (1065) established in Baghdad with the great contributions of Nizam al-Mulk, the vizier of the Great Seljuk Empire (1037-1157) in the Islamic geography of the Middle Ages, was a source of inspiration for universities around the world.

According to Grant (1997), it is not possible to compare the universities that emerged in medieval Europe with the educational institutions that emerged in other civilizations. He suggests that the universities in medieval Europe should be distinguished from educational institutions in other civilizations by their infrastructure to construct modern science, their curriculum, their level of institutionalization, their political-legal privileges and their extraordinary activities. In fact, universities that emerged in medieval Europe (such as the University of Bologna-1088, the University of Paris-1160, the University of Oxford-1167, the University of Cambridge-1209, etc.) have been widely accepted as the first modern universities due to their distinctive superior features (Grant, 1997).

In the first generation universities shaped under the social and cultural conditions of feudal society, Latin was used as the language of instruction. The primary task of these universities was to preserve the knowledge of the past and motivate people to obey church teachings. Furthermore, since they emerged in a period where the preservation of traditional beliefs was the main concern, they did not have enough equipment to conquer science. Therefore, in these universities, which did not make efforts to come up with new knowledge, discoveries or inventions, under the conditions of feudal society's social and cultural constraints, existing knowledge was transmitted to the students through discussion, categorization and interpretation (Wissema, 2009).

The first generation universities, with their aforementioned basic features, continued to exist until the 15th century. However, developments that brought about radical changes and transformations in the social sphere emerging after the 15th century (such as Renaissance movements, Reformation movements, the Enlightenment Age, the French Revolution and the Industrial Revolution) exerted their shaping effects on educational institutions, leading to a transformation of higher education institutions. Thus, the first generation universities, which primarily served the function of providing education and instruction until the 19th century, left their place to second generation universities, which also undertook the function of conducting scientific research (Ayten & Göver, 2020; Erdem, 2016; Wissema, 2009).

Second Generation Universities: Conducting Scientific Research

Second generation universities started to emerge in the 19th century in an atmosphere created by the Renaissance, Reformation, Enlightenment, French Revolution and Industrial Revolution. Humboldt (Berlin) University (1810), founded by Wilhelm von Humboldt (1767-1835) in Germany, is regarded as the first example of second generation universities. The most basic feature of this university is that it undertook the function of conducting scientific research. Thus, universities, which undertook the function of conducting scientific research in addition to providing educational activities with Humboldt (Berlin) University, became institutions that produced scientific knowledge beyond being institutions where knowledge was disseminated to the masses (Erdem, 2016; Sabır Taştan, 2020; Saklı & Akdoğar Akbulut, 2017; Timur, 2000; Wissema, 2009).

It is possible to list the distinguishing features of second generation universities as follows: (1) They emerged as nation-state universities under the influence of the nationalist movement that dominated the period. This situation has brought about results such as the increase in the control and supervision of the state in universities, the increase in financing with the public budget, the spread of education in national languages and the political socialization function being dominant. (2) Under the influence of the Enlightenment and the Industrial Revolution, they turned from scholastic institutions of thought into institutions that put scientific thinking into centre. Thus, universities started to adopt new branches of science and scientific methods. However, in the scientific research carried out at these universities, practical concerns were put aside and a scientific approach for the sake of science was adopted. Moreover, a disciplinary approach was adopted in education and research carried out in these universities. (3) They were institutions where scientific production began to gain social structure. While scientific production was an activity that scientists generally did alone, with these universities it turned into a social activity carried out by specialized departments or institutes. The inclusion of people and elements such as academicians, students, assistants, research assistants, libraries, laboratories, research centres in the research process brought a social structure to scientific production. This enabled scientific production to increase exponentially (Erdem, 2016; Tekeli, 2003; Timur, 2000).

The second generation universities continued their activities until the middle of the 20th century with their basic characteristics emphasized above. However, after World War II, the world's economic, social, cultural and political atmosphere began to change rapidly. Higher education institutions began to undergo changes and transformations at many points, such as the structure and functioning of educational activities, student-academic profile, spatial design, financial resources, management and control, institutional structure and organization, language of education and interaction with the environment. This led to the emergence of third generation universities, which came to the fore with their function of creating social benefits.

Third Generation Universities: Creating Social Benefits

It is possible to list the factors that push the second generation universities to change and lead to the emergence of third generation universities as follows:

The Increase in the Number of Students

After World War II, Enlightenment ideas advocating equal opportunities for all, the prevailing belief that social welfare depends on education, the acceptance of a proper secondary education as a sufficient criterion for university admission, increasing government interest and encouragement by politicians, the preservation of academic freedom, students' desire to pursue a scientific career and the aspiration for better job and life opportunities, among many other factors, have led to a significant increase in the number of students, making universities more widespread (Wissema, 2009).

According to Trow (2007), after World War II, higher education started to become more widespread, especially in advanced industrial societies, covering between 16% and 50% of the relevant age group. According to Wissema (2009), there was a significant increase in the number of students in the 1960s in that the volume of many universities increased 4 times in 10 years. According to the research conducted by Perkin (2007), the number of students increased in the period from 1960 to the 2000s in such a way as to cover a large proportion of the relevant age group. This rate increased from 9% to 60% in the UK, from 6% to 54% in Germany, from 11% to 64% in Russia, from 10% to 48% in Japan, from 32% to 81% in the US, from 11% to 48% in Argentina, from 8% to 23% in Colombia, from 14% to 17% in Egypt, from 3% to 10% in India and from 2% to 22% in China.

Financial Difficulties

On the one hand, the rapidly increasing demand for higher education and the inadequate supply of services and on the other hand, the economic crises put higher education under financial constraints. This situation led higher education institutions, which were generally financed with public resources, to seek alternative resources. Higher education institutions that were trying to create sustainable financial resources started to use current public resources more efficiently, frugally and effectively, increase tuition fees, be more responsive to evolving and diversifying societal needs, develop relationships with external stakeholders, establish an entrepreneurial university model, provide consultancy services and develop various projects (Aktan, 2007; Aybarç Bursalıoğlu, 2012; Bernasconi & Celis, 2017; Okumuş, 2021; Storberg-Walker & Torraco, 2004; Wissema, 2009).

Change in Socio-Cultural Structure

One of the main factors pushing higher education institutions to change was the change in the socio-cultural structure and the changing needs of the society (Ayten & Göver, 2020; Günay, 2007; Horn & Dunagan, 2018). From a socio-cultural perspective, the emphasis on religion and the sacred in the First and Middle Ages, on production and land in the Industrial Age, and on knowledge and global problems in the age of information and technology shaped educational institutions. As a result, education has shaped itself according to the socio-cultural values of each era; during the Middle Ages, education preserved the social order dominated by religion through a scholastic approach, during the Industrial Age, it encouraged individuals to research and think for profit and production, and in the 21st century, in the era of digital technology, it emphasizes the importance of knowledge and encourages individuals to find solutions to humanity's common problems (Ayten & Göver, 2020). As a result, feudal societies gave rise to universities for educational purposes, industrial societies for research purposes, and today's knowledge societies have led to the emergence of entrepreneurial and innovative universities.

Transition to Information Society and Technological Innovations

While the information society has forced industrial organizations to produce on the basis of knowledge, it has also forced higher education institutions to act within a market economy. This situation has led universities to move away from their purpose of being institutions that produce knowledge for the sake of knowledge, and towards a position where they can produce, monetize and market knowledge as a commercial commodity under the influence of market forces (Okumuş, 2021; Tekeli, 2003).

In addition, in knowledge societies, the increasing diversity and complexity of economic, ecological, social, cultural and political problems at the local, regional and global levels, and the need for transition to high value-added production, have led to the shift from a disciplinary-based education and research approach (academic Taylorism) to an interdisciplinary/multidisciplinary/transdisciplinary education and research approach, as existing disciplines alone cannot provide solutions, and there is a need for a more holistic and integrated approach (Aktan, 2007; Kiper, 2010; Okumuş, 2021; Şimşek & Adıgüzel, 2012; Ulusoy, 2007; Wissema, 2009).

According to Ulusoy (2007), developed economies have turned to advanced technology fields (such as materials science, nanotechnology, biotechnology, neurotechnology, artificial intelligence, information technology, etc.) to produce high value-added products. These fields, which require the joint work of several disciplines, have brought the understanding of interdisciplinary research and education to the fore. This new understanding has created an environment of intellectual cohesion by removing the walls that limit the potential of science to produce solutions. In this context, the walls between disciplines, faculties, institutes and departments in universities have begun to loosen and disappear. According to Okumuş (2021), this new approach has had a quality-enhancing, multidimensional and holistic impact on all scientific fields. On the other hand, in the knowledge society, where change and development have reached a dizzying pace, information has proliferated to the extent that it cannot be taught merely through transfer, and the age limit for traditional education has disappeared. Educational institutions have focused on teaching ways to reach knowledge rather than transferring knowledge. In short, approaches such as “lifelong learning” and “active learning” have been developed to provide individuals with the knowledge, skills and abilities they need throughout their lives and to facilitate their social adaptation (Aktan, 2007; Berber, 2003; Yaraş & Kanatlı-Öztürk, 2022).

Technological innovations that emerged parallel to the development of the information society have also forced higher education to change. The developments in information, communication and digital technologies, and the active use of the internet in the education process have led to the emergence of new learning forms/modules in higher education, such as distance learning, online education and e-learning. This situation has enabled the establishment of virtual campuses that provide

the opportunity to benefit from higher education from all over the world by removing the barrier of time and space (Aktan, 2007; Bannier, 2016; Günay, 2007; Yaraş & Kanatlı-Öztürk, 2022).

Globalization

The phenomenon of globalization, characterized by the increasing international mobility of knowledge, goods, services, ideas, values, technology and people due to developments in information, communication and transportation technologies, the increasing economic, social and cultural integration of the world, the increasing trend of liberalization, deregulation, demonopolization and privatization, the declining influence of the nation-state, the spread of the English language and so on, has pushed higher education towards change and transformation in many respects. In general, they can be listed as follows: (1) Higher education has begun to internationalize. Accordingly, the mobility of international students and academicians has increased, and cross-border/international/transnational higher education has become widespread. (2) Instead of local and national dynamics, global and international dynamics have begun to come to the fore. Higher education has started to train cosmopolitan, outward-looking citizens who are open to diversity and differences, rather than training citizens who have embraced a closed, inward-looking culture. In this direction, it has aimed to educate and equip individuals not only for the society they live in but for the whole world. (3) There has been a transition from a system in which national standards and criteria are adopted in education to a system in which international standards and criteria are adopted. International quality assurance systems and accreditation practices have started to become widespread. (4) There has been an increase in cooperation and partnerships between higher education institutions in different countries. This situation paved the way for the development of projects on an international scale, the establishment of international academic cooperation and the internationalization of education and research. (5) Higher education, which has started to gain an international dimension, has started to create effects on a regional and global scale by expanding its sphere of influence. (6) Campuses have been opened abroad. (7) There has been an increase in the number of higher education institutions giving English-medium instruction. (8) The tendencies of liberalization, deregulation, demonopolization and privatization nurtured in the state have begun to be adopted in higher education as well. Depending on these tendencies, the role of the state in the provision of services and financing of higher education has gradually weakened. The state has started to become a regulator rather than a provider of these services (Altbach et al., 2010; Aktan, 2007; Bannier, 2016; Burnett & Huisman, 2010; McBurnie, 2002; Günay, 2007; Jantadej, 2021; Kireçci et al., 2016; Kwiek, 2001; Okumuş, 2021; Selvitopu & Aydın, 2018; Wissema, 2009; Yaman, 2021).

Increased Competition and Market Forces

Competition increasing with the impact of globalization (Storberg-Walker & Torraco, 2004) has brought about consequences such as an increase in the number of actors providing services in

higher education (such as private universities, corporate universities, foundation universities), the proliferation of quality assurance systems and accreditation practices (Aktan, 2007), commercialization (Ayten & Göver, 2020) and a race to attract competent students and researchers at the international level (McBurnie, 2002). In addition, the decrease in public finance has led to the emergence of new providers of education by removing the state from being the sole financier of knowledge production. This has forced higher education to act under the influence of market forces (Tekeli, 2003). Thus, higher education has evolved into a structure that takes into account the expectations, demands and needs of market forces and develops closer relations with market forces (McLendon & Ness, 2003; Storberg-Walker & Torraco, 2004).

The first examples of third generation universities, which were shaped by the influence of the factors mentioned above, were encountered in the USA in the 1960s. Stanford University and Massachusetts Institute of Technology (MIT) are accepted as the first examples (Wissema, 2009). The most basic features of these universities are that they have adopted creating social benefits as a function in addition to the functions of providing education and conducting scientific research (Etzkowitz, 2008; Wissema, 2009; Zhang, 2007). These universities have been able to fulfil their function of creating social benefits by transforming the qualified scientific knowledge they have produced as a result of scientific research into economic value. In short, the process of transforming knowledge into economic value in higher education started with third generation universities having entrepreneurial and innovative qualities.

Transformation of Knowledge into Economic Value in Higher Education

The emergence of technology companies from institutions such as Stanford University and MIT in the United States during the 1960s, some of which have grown into the world's largest companies, has demonstrated that universities can be the cradle of technology-based entrepreneurial clusters (Wissema, 2009). On the one hand, the efforts of a group of academics within Stanford University to convert their knowledge and R&D accumulations into economic value has resulted in Silicon Valley (Stanford Research Park), which is accepted as the first technology park and the world's largest technology park (Kiper, 2010; Sabır Taştan, 2020) and great economies created by the companies established in association with MIT (Wissema, 2009) on the other further strengthened the idea that universities can be the cradle of technology-based entrepreneurial clusters.

This trend of universities in the USA set an example for Europe. In this direction, the University of Cambridge in England has taken a similar initiative. Cambridgeshire, formerly a small county in England, has become the second richest region in England as a result of the establishment of an advanced technology institute under the leadership of Cambridge University (Wissema, 2009). This trend, which spread from the United States to Europe and then to Asian countries, has highlighted the

positive effects that universities can have on society such as solving unemployment problems, creating employment, generating economic stability and fostering regional development (Alkibay et al., 2012).

These developments have brought the added value that universities provide to society to the fore (Ayten & Göver, 2020). A university can serve its society through its scientific and technological achievements. In this regard, the obligation to create value from the knowledge generated by entrepreneurial and innovative universities (third generation universities) has emerged (Wissema, 2009). Especially after the 1980s, when sustainable economic growth and development began to require creating and marketing high-value-added products, services, technologies and innovations to achieve strength and success in global competition, countries started to develop various mechanisms that would transform the knowledge produced in universities into high-value-added products, services, technologies and innovations that would create social benefits. In this context, it is possible to talk about many mechanisms such as providing consultancy services, project development, obtaining patents, licensing, brand-registration, knowledge transfer, technology transfer and university-industry cooperation.

However, when it comes to the transformation of knowledge produced in universities into economic value, university-industry cooperation should be underlined. University-industry cooperation is a systematic set of activities in which knowledge-providing universities and production-centred industries come together to create knowledge, technology, innovation and high value-added products and services. The accomplishment of desired scientific, technological, innovative, economic and societal outcomes from university-industry cooperation depends on the fulfilment of three interconnected conditions. These are: (1) Universities conducting high-quality scientific research, (2) Industry converting scientific knowledge resulting from research into economic value - high value-added products, services, technologies and innovations and (3) the economic value created being marketed globally, i.e. exported.

Models have been developed to determine how actors involved in university-industry cooperation should interact, communicate and fulfil their duties and responsibilities in order to meet the mentioned conditions and achieve the desired outcomes. The most influential of these models is the Triple Helix Model based on effective cooperation between university, industry and government and developed by Etzkowitz and Leydesdorff (2000) (Figure 1).

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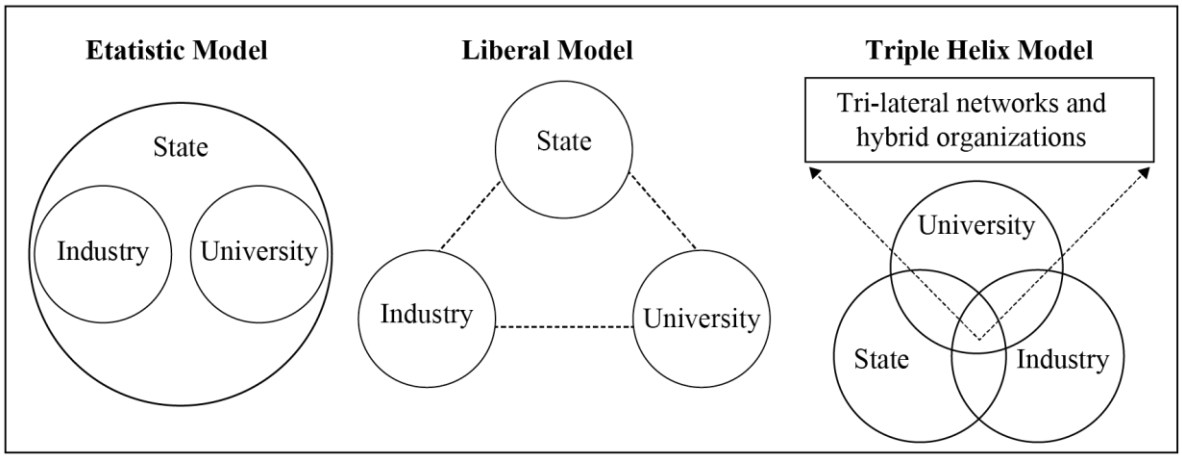

Figure 1. Etatistic model, liberal model and triple helix model in university-industry-government cooperation. Source: (Etzkowitz & Leydesdorff, 2000).

The Triple Helix Model, developed by Etzkowitz and Leydesdorff (2000), argues that the existing models (Etatistic Model and Liberal Model) of university-industry-government cooperation are not effective and dynamic enough to produce the desired level of scientific, technological, innovative and economic outcomes. The prominent actor in the Etatistic Model is the state. The state has a strong influence on the other two actors (industry and university). The state, which has the power to direct the university and industry as it wishes, has limited the entrepreneurial movements of the university and the industry and, accordingly, their potential to introduce innovation. In the Liberal Model, there is a limited and rigid communication/interaction between the three actors (university-industry-state). The industry is at the forefront compared to the other two actors and has a guiding power. While the duty of the university is to train the qualified workforce needed by the industry, the duty of the state is to regulate the economic and social mechanism. The limited roles of the university and the state prevented the introduction of innovations at the desired level. The Triple Helix Model has emerged as a prominent model in today's knowledge societies, where knowledge is considered a fundamental factor of production. In this model, universities are seen as the source of scientific knowledge and technologies, industry as the production centre and the government as a supportive and facilitating organization that prepares the necessary structural, financial and legal framework for active collaboration and sustainable knowledge flow among the actors. The effective and dynamic collaboration of these three actors prepares the necessary ground for the emergence of technology and innovation. In addition, in this model consisting of overlapping and interchangeable triple network structures and hybrid organizations, the actors can assume each other's roles. For example, universities can assume the role of industry by engaging in activities such as marketing and establishing firms and industry can fulfil the roles of universities by conducting educational and research activities (Etzkowitz, 2008; Etzkowitz & Leydesdorff, 2000; Ranga & Etzkowitz, 2013).

In short, in the Triple Helix Model, which highlights knowledge as the fundamental production factor in today's knowledge societies, it is explained that effective collaboration between university, industry and state actors is crucial for turning knowledge into technology and innovation, creating economic value and accelerating social development. The process through which knowledge is transformed into economic value (high value-added products, services, technologies and innovations) is presented in Figure 2.

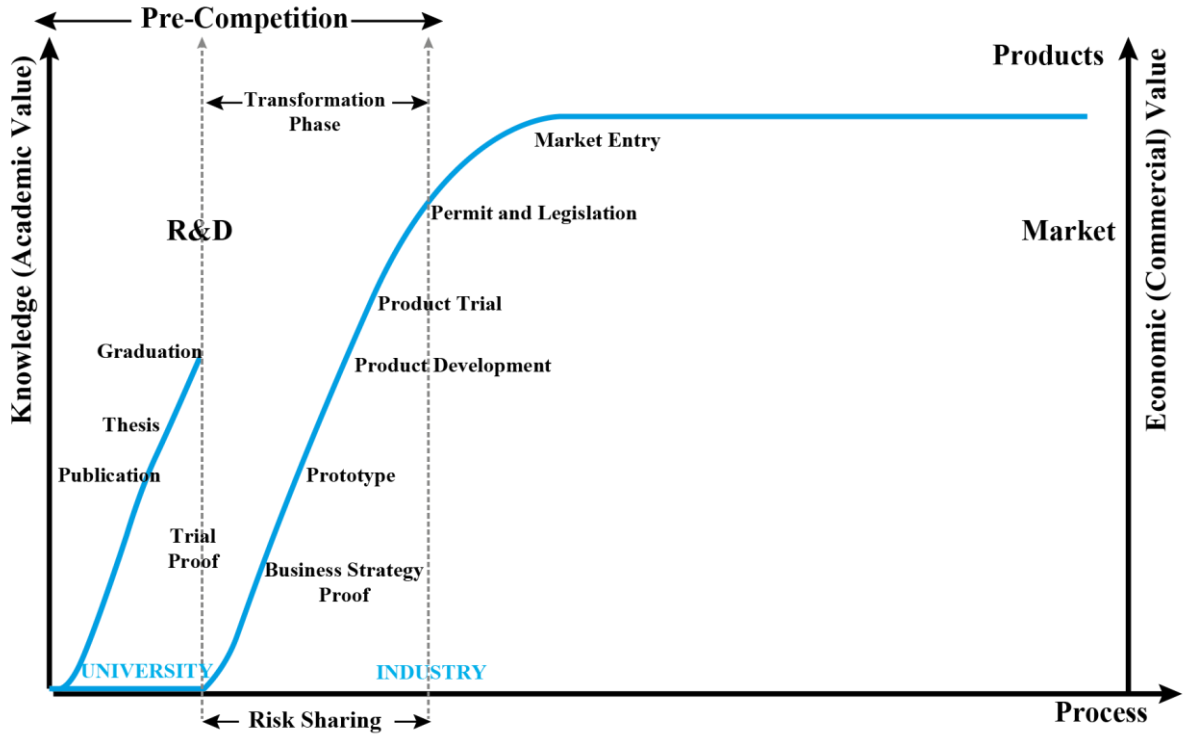

Figure 2. The process through which knowledge is transformed into economic value.

Source: (Onaral as cited in Kiper, 2010).

According to Kiper (2010), the most critical stage in this cycle is the "transformation stage" where knowledge is transformed into commercial value that yields the highest economic return. This stage covers the process that goes beyond the basic tasks and skills of universities and industry. Moreover, the high risk involved in this process causes both actors to be distant and cautious because successfully completing the process brings with it high potential for added value, while failure can lead to serious financial losses. The transition from invention to innovation takes place in this stage, where successful management of many critical and costly processes such as prototype or trial production, approval tests, compliance evaluation procedures, market research, scaling up, etc. becomes essential. In addition, a large financial resource is needed in this stage. Due to these difficulties mentioned, many research outputs end at any point in this process without being commercialized. Therefore, the transformation stage is also known as the "death valley". At this point,

institutional mechanisms of university-industry cooperation such as technology parks, incubators, technology transfer centres and university-industry joint research centres, which serve as bridges or eliminate the death valley, come into play. Also known as technology transfer interfaces, the fundamental purpose of these mechanisms is to provide all the resources needed for the transformation process and to manage the high risk in the best possible way, creating the highest level of economic value.

In today's knowledge societies, where the economy is shaped by factors such as information, technology, innovation, R&D, skilled labour, high value-added products and services and advanced technology-based production, the transformation of knowledge into economic value through university-industry-government collaboration results in many positive outcomes such as increased productivity and efficiency, social development, increased welfare levels, sustainable economic growth and the ability to compete globally.

Effect of Higher Education On Global Competition

After the 1980s, the increasing globalization of markets, the international mobility of products, services and people, the rise of digital technologies, the removal of agreements restricting international trade, the acceleration of trends towards liberalization and deregulation, the rapid increase in privatization and the increasing economic integration of the world have all given competition a global dimension. Competition, which previously took place among a limited number of companies, sectors and countries and on a limited number of products and services, has now become global.

Many definitions of global competition have been made in the literature. According to Fagerberg (1988), global competition is the ability of a country to realize its economic policies (such as economic growth, employment increase, etc.) without causing any economic problems or imbalances. According to Porter (1990), it is the effort of a country to use its existing resources efficiently and effectively in order to gain the ability to compete with rival countries. The OECD (1996) defined competition as the ability to generate relatively more factor income and employment at the firm, industry and national levels by emphasizing the levels of competition. Aiginger (1998) defined global competition as the ability to produce and sell products and services in the quantity and quality required to meet international market demands in an environment where factor income increases and the general welfare level of the country's people reaches a satisfactory level. Garelli (2007) defined global competition as the ability to create and maintain favourable conditions for increasing the welfare level of the country's people and for the country (along with its industries and firms) to create more value. The WEF (2018) links a country's competitiveness to its level of productivity and interprets global competition as a set of factors, policies and institutions that increase a country's productivity.

In its most general sense, global competition is the competition among countries, firms, sectors, and markets worldwide. In other words, it is the struggle that a country engages in with other countries on the international level to achieve a significant position through competition. In this context, global competition is a process in which countries make efforts to be successful in economic, social and commercial terms. Countries strive to improve their living standards, increase economic prosperity, enhance productivity and gain a competitive position in international trade. Global competition is a complex and dynamic process that involves many factors, including economic conditions, technological developments, government policies and cultural differences. Understanding and directing these factors correctly is crucial to be successful in global competition.

One of the important factors that affects and shapes the complex and dynamic process of global competition is higher education. Higher education affects global competition in many ways, such as creating a qualified human resource, generating quality scientific knowledge, developing effective technologies and innovations, giving impetus to research and development activities, promoting entrepreneurship, formulating strategies and policies and increasing productivity and efficiency (Altbach et al., 2010; Bauk & Jusufranic, 2014; Bloom et al., 2014; Etzkowitz, 2013; Etzkowitz & Leydesdorff, 2000; Sahlberg, 2006; Kara, 2019; Krstić et al., 2020; Ranga & Etzkowitz, 2013; Reda, 2012; Sart, 2018; WEF, 2018).

Creating Qualified Human Resources

Human capital (qualified human resources) refers to educated, healthy and active workforce possessing qualified knowledge, skills and abilities. This human capital is a crucial factor in both the economic, social and cultural development of countries, as well as in their ability to achieve global competitiveness in today's globalized economy. The impact of human capital on global competitiveness is primarily dependent on three interrelated factors. These factors are the quality of education and instruction, healthcare services and research and development activities. A quality education increases human capital, efficient healthcare services produce more productive, efficient and active workers and qualified research and development activities lead to the development of new products and technologies. In this way, they all increase global competitiveness. In this context, by creating highly skilled workforce specialized in skill-intensive fields that are suitable for the conditions and can respond to needs of the period, higher education has an impact on global competitiveness.

Capturing the Integrity of Knowledge, Technology and Innovation

Scientific knowledge can guide technological progress and innovation by leading to the creation of new products and services as well as to the improvement of existing ones. This, in turn, increases economic growth and competitiveness for countries that can successfully develop their scientific knowledge. Indeed, capturing the integrity in scientific knowledge, effective technology and

innovation is one of the fundamental ways to achieve competitiveness in today's global economy. To achieve this, the first step is to produce high-quality scientific knowledge. The second step is to transform this knowledge into effective technological products and services that meet societal needs and generate economic value. The third step is to transform technological products and services into highly demanded, high value-added innovative products and services in global markets, creating maximum economic value. Entrepreneurial and innovative higher education institutions transform their produced scientific knowledge into effective products, services, technologies and innovations with high added value in technology clusters (such as IT valleys, techno parks and technology development zones) through collaboration with industry and government, significantly influencing global competition.

Making R&D Activities Effective

R&D refers to the systematic and disciplined activities carried out by a company, industry or country to develop new technologies, products, services and processes. The purpose of R&D activities is to create value for companies/industries/countries by producing new knowledge and technologies, improving the quality of existing products, reducing costs, optimizing production processes and creating innovative products and services (Erdem, 2016). Higher education institutions, which are an important part of the innovation ecosystem, bring together academicians, researchers, students and industrial stakeholders to enable the implementation of R&D activities in practical areas. Higher education institutions, with effective R&D activities, impact global competition by creating new products, services, technologies, innovations, management and marketing approaches that can meet the rapidly changing needs and standards of global markets.

Increasing Productivity and Efficiency

Efficiency and productivity are vital factors for global competitiveness of firms, industries and countries. Economies with high levels of productivity and efficiency are able to produce goods and services faster, at higher quality and at lower costs. This allows them to be more competitive in meeting the demands of global markets and to achieve higher profit margins. On the other hand, economies with low levels of productivity and efficiency produce products and services more slowly, at higher costs and lower quality. This can lead customers to turn to different alternatives, decrease profit margins and ultimately result in losing competitiveness. It is a well-known fact that societal resources are not unlimited. According to Sart (2018), the strategies developed by higher education institutions for effective management and utilization of the existing limited resources are crucial. These strategies may lead to the creation of innovative types of products, services, processes, management and marketing and facilitate more effective management and use of resources in all organizations. As a result, with the increase in productivity and efficiency, global competitiveness also increases.

Encouraging Entrepreneurship

Entrepreneurship refers to the process of initiating, managing and growing a business venture with the aim of creating economic value or making a profit. This process involves taking calculated risks and identifying new opportunities to meet unmet needs and generate innovative solutions. In the global economic plane, where risks are intertwined with opportunities, entrepreneurship has become one of the main ways of gaining competitiveness for companies, industries and countries. Higher education institutions generally encourage entrepreneurship in two different ways. The first one is to promote entrepreneurship by providing students with the necessary knowledge in areas such as finance, marketing and business strategy, as well as teaching critical thinking, problem-solving, collaboration, communication and leadership skills, which are essential for them to become successful entrepreneurs. The second way through which higher education institutions encourage entrepreneurship is to collaborate with stakeholders in industry, commerce and the business world to engage in entrepreneurial activities that will lead to the emergence of new ideas, products and services. Both situations are important in terms of establishing entrepreneurship on the social ground and making it a culture. This culture contributes to increasing global competitiveness by creating innovative products and services, developing technology and innovation, leading to productivity and efficiency, creating new employment opportunities, promoting regional economic development and transforming creative ideas into economic value.

Policy and Strategy Development

In today's world, where the rate of change is increasing exponentially with the effect of scientific and technological developments, the diversity and complexity of social problems are increasing. In this connection, it has become essential to resolve the increasing economic crises, social inequalities, cultural degeneration, political conflicts and ecological destruction, both on a regional and global scale. It is not possible to compete in the global arena without resolving these economic, social, cultural, political, ecological, etc. problems. Higher education institutions affect global competition by fulfilling many important roles in the solution of social problems with the strategies and policies they develop on a scientific and rational basis. Moreover, with the effect of the experienced process of change, the factors affecting global competition are also changing. In today's global competitive environment, a factor (or factors) that is/are decisive for power and success may lose its/their effect for tomorrow's global competitive environment. Higher education institutions shape global competition by analyzing the process of change for yesterday, today and tomorrow correctly, making accurate predictions and developing strategies and policies that meet emerging needs in this regard.

Literature

In literature, there are studies on the effect of education as a component or indicator of human capital on global competition (Altay & Pazarlıoğlu, 2007; Czajkowski, 2014; İlkay, 2019; Reda, 2012; Tijanic & Obadic, 2015; Weresa, 2017; Wyszkowska-Kuna, 2017). However, despite the aforementioned important and decisive role of higher education, studies on the effect of higher education on global competition are quite limited (Kara, 2019; Krstić et al., 2020; Sart, 2018). In the current study, which is thought to contribute to this limited literature, the effect of higher education on global competition in the context of the transformation of knowledge into economic value was analyzed with the Granger Panel Causality Test conducted on OECD countries for the period of 2006-2017. The current study is important as it will bring the role of higher education factor, which is often neglected in global competitiveness, to the fore and adopt an interdisciplinary research approach that brings together education, sociology, economics and econometrics.

A summary of the literature on the effect of higher education on global competition is provided below:

In the study conducted by Sart (2018), it was statistically analyzed whether the global competitiveness levels of countries are affected by the global competitiveness level of their higher education. In the application part of the study, Kruskal-Wallis and Mann-Whitney U tests were applied for 138 countries around the world using data obtained from the Global Competitiveness Index (2017/2018). As a result of the application, it was determined that the global competitiveness level of the countries increased depending on the increasing level of global competitiveness in their higher education.

In the study conducted by Kara (2019), the relationship between national innovation, national competition and the success of the national higher education was statistically analyzed. In the application part of the study, with the data obtained from the Global Competitiveness Index and Times Higher Education (THE) for the period of 2011-2017, panel data tests were conducted for 20 OECD countries. As a result of the application, it was found that educational capacity has a significant negative effect on national competitiveness, while international outlook, knowledge transfer, research and the number of citations were found to have a significant positive effect on national competitiveness.

Krstic et al. (2020) statistically analyzed the relationship between higher education, competitiveness and sustainable development. In the application part of the study, regression and correlation tests were conducted for a total of 32 countries, including EU member countries and candidate countries, using data obtained from the Global Competitiveness Index (2019). As a result of the application, a strong correlation was determined between higher education, competitiveness and sustainable development.

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Dataset and Method

The series analyzed in the application part of the study were obtained from the databases of WEF, UNESCO, OECD and WB. In this context, a panel data set was generated for the 25 OECD countries from which data could be obtained for the period 2006-2017. The 25 OECD countries analyzed in the study are as follows: (1) Austria, (2) Belgium, (3) Canada, (4) Chile, (5) Czech Republic, (6) Denmark, (7) Estonia, (8) Finland, (9) Hungary, (10) Iceland, (11) Ireland, (12) Israel, (13) Italy, (14) Latvia, (15) Lithuania, (16) Mexico, (17) Norway, (18) Poland, (19) Portugal, (20) Slovak Republic, (21) Slovenia, (22) Spain, (23) Sweden, (24) Switzerland, and (25) United Kingdom. Definitions related to the variables analyzed in the study are given in Table 1.

Table 1. Definitions related to the variables

Category	Variables	Abbreviation	Source
Global Competition	Global Competitiveness Index	gci	WEF
Higher Education	Gross enrolment rate in higher education	he1	UNESCO
	The employment rate of the population with higher education (aged 25-64)	he2	OECD
	Public expenditure on higher education (as % of GDP)	he3	WB
	The quality of the education system (1-7)	he4	WEF
	Quality of scientific research institutions (1-7)	he5	WEF
	Scientific publication performance (number of articles)	he6	WB
	R&D expenditures made by higher education (as % of GDP)	he7	UNESCO
	University-industry cooperation in R&D (1-7)	he8	WEF

In the current study aiming to analyze the effect of higher education on global competitiveness in terms of transforming knowledge into economic values,, the relationship between the Global Competitiveness Index (gci) variable, representing global competitiveness, and each variable in the higher education category (from he1 to he8) was tested using the Granger Panel Causality Test for 25 OECD countries and the short-term relationships between these variables were examined.

Data Analysis

Within the scope of panel causality analysis, which is an econometric method, the following stages were followed for the analysis of the data in the current study:

1. First, a cross-sectional dependence test was performed for each series. To this end, Breusch and Pagan LM (1980) test was used.
2. In the first stage, the cross-sectional dependence was determined in each series group, and then in the second stage, unit root testing was carried out with the CADF Test developed by Pesaran (2007) (Bozkurt, 2012; Balmumcu & Bozkurt, 2020; Bozkurt & Balmumcu, 2018; Göktaş et al., 2019).
3. In the third stage, the slope heterogeneity test was performed. For this, the test statistic developed by Blomquist and Westerlund (2013) was used.

4. In the last stage, the Granger Panel Causality Test developed by Dumitrescu and Hurlin (2012) was used to reveal whether there is a short-term relationship between the series. The null hypothesis of this test is that there is no causal relationship, and the alternative hypothesis is that there is a causal relationship in at least one cross-section (Bozkurt et al., 2021).

Results of the Application

In the application part of the study, first, the descriptive statistics of the series were examined. Then, the results of the tests applied for the analysis of the data were presented in tables. The descriptive statistics of the series are presented in Table 2.

Table 2. Descriptive statistics of the series

Variables	Number of Observations	Mean	Standard Error	Minimum	Maximum
gci	300	4.849	0.457	4.057	5.857
he1	300	68.050	13.133	24.790	94.919
he2	300	84.814	3.369	76.390	93.630
he3	300	1.264	0.429	0.447	2.453
he4	300	4.408	0.934	2.690	6.236
he5	300	4.966	0.792	3.231	6.550
he6	300	18833.990	23019.480	376.740	99616.020
he7	300	0.463	0.221	0.095	1.036
he8	300	4.464	0.808	2.904	5.968

The results of the Breusch-Pagan LM (1980) test statistic for testing cross-sectional dependence of the series are presented in Table 3.

Table 3. Cross-sectional dependence test results

Variables	Breusch-Pagan LM Test Statistic	Probability Value
gci	1497.24	0,0000
he1	1134.47	0,0000
he2	993.56	0,0000
he3	1263.15	0,0000
he4	1389.57	0,0000
he5	1476.72	0,0000
he6	1626.08	0,0000
he7	1395.30	0,0000
he8	1296.85	0,0000

As seen in Table 3, the probability level obtained from the test statistic is lower than the 1% significance level for each series; therefore, it can be concluded that the series group includes cross-sectional dependence.

Since cross-sectional dependence was found in the series in the first stage of the application, in the second stage, a unit root test was conducted using the CADF test developed by Pesaran (2007). The results are presented in Table 4.

Table 4. Panel unit root (CADF) test results

Variables		Z[t-bar]	Probability Value
gci	At level	-1,334	0,091
	At first-difference	-10,593	0,000
he1	At level	1,253	0,895
	At first-difference	-1,620	0,050
he2	At level	-1,778	0,038
he3	At level	-1,656	0,049
he4	At level	-1,146	0,126
	At first-difference	-11,403	0,000
he5	At level	1,191	0,883
	At first-difference	-2,424	0,008
he6	At level	-0,876	0,191
	At first-difference	-14,256	0,000
he7	At level	-0,389	0,349
	At first-difference	-10,617	0,000
he8	At level	-2,570	0,005

When Table 4 is examined, it is seen that the series of the variables he2, he3 and he8 are stationary at level; however, the series of the variables gci, he1, he4, he5, he6 and he7 are non-stationary at level but become stationary when their new values at first difference are taken.

In the third stage, a test which was developed by Blomquist and Westerlund (2013) and whose basic hypothesis is based on the assumption of the presence of slope homogeneity was applied to test slope heterogeneity. The results of the test are presented in Table 5.

Table 5. Slope heterogeneity test results

	Değer
$\widehat{\Delta}$	-4,166*
$\widetilde{\Delta}_{adj}$	-14,0766*

Note: * denotes 1% level of significance.

When Table 5 is examined, it is seen that the test result rejects the basic hypothesis based on the assumption of the presence of slope homogeneity. This means that the slope of the model is heterogeneous.

In the final stage of the application, the Granger Panel Causality Test developed by Dumitrescu and Hurlin (2012) was used to test whether there is a short-term relationship between the variable gci in the global competitiveness category and each variable in the higher education category (from he1 to he8). The results of the test are presented in Table 6.

Table 6. Granger panel causality test results

	1 Lag Length			2 Lag Length		
	$W_{N,T}^{Hnc}$	$Z_{N,T}^{Hnc}$	Z_{N}^{Hnc}	$W_{N,T}^{Hnc}$	$Z_{N,T}^{Hnc}$	Z_{N}^{Hnc}
gci→ he1	5,767	16,855*	8,888*	5,859	9,649*	1,694
he1→ gci	3,91	10,291*	5,166*	8,396	15,990*	3,396*
gci→ he2	5,083	14,438*	7,517*	6,856	12,141*	2,363
he2→ gci	2,731	6,121*	2,802*	6,734	10,937*	2,040
gci→ he3	2,917	6,780*	3,175*	4,022	5,056*	0,462
he3→ gci	3,676	9,461*	4,696*	5,436	8,590*	1,410
gci→ he4	2,241	4,390*	1,821**	3,372	3,430*	0,026
he4→ gci	2,734	6,130*	2,807*	5,248	8,121*	1,284
gci→ he5	3,722	9,626*	4,789*	7,214	13,037*	2,603*
he5→ gci	5,459	15,767*	8,270*	5,508	8,770*	1,459
gci→ he6	2,427	5,047*	2,193**	6,171	10,428*	1,903
he6→ gci	3,153	7,612*	3,647*	7,283	13,207*	2,649*
gci→ he7	2,338	4,732*	2,014**	7,060	12,650*	2,500**
he7→ gci	3,933	10,370*	5,211*	6,163	10,408*	1,898
gci→ he8	3,415	8,539*	4,173*	4,552	6,381*	0,817
he8→ gci	3,386	8,436*	4,114*	6,944	12,360*	2,422**

Note: * denotes 1% level of significance ** denotes 5% level of significance.

When Table 6 is examined, it is seen that there is a bilateral causality relationship in the short term between each variable representing higher education (from he1 to he8) and the variable gci.

Results and Suggestions

Since the 1980s, the increasing globalization of markets, the international mobility of products, services and people, the rise of digital technologies, the removal of agreements restricting international trade, the acceleration of liberalization and deregulation in the economy, the rapid increase in privatization and the growing economic integration of the world have added a global dimension to competition. Competition, which used to be limited to a few companies, industries and countries and focused on a limited number of products and services, has now become global.

In the most general sense, global competition refers to the process in which countries strive to achieve economic, social, commercial and political success and thus to attain a significant position in the international arena. Countries make efforts to improve their living standards, increase economic prosperity, achieve social development, increase productivity and attain a competitive position in international trade. Global competition is a complex and dynamic process that involves various factors, including economic conditions, technological advancements, government policies and cultural differences. It is very important to understand and direct these factors correctly in order to be successful in global competition.

One of the important factors affecting and shaping the complex and dynamic process of global competition is higher education. Serving the functions of providing education and instruction,

conducting scientific research and creating social benefits, entrepreneurial and innovative higher education institutions of the 21st century have become important and decisive factors in global competition by contributing to the creation of a qualified human resource base (human capital), generating high-quality scientific knowledge, taking a pioneering role in the transformation of knowledge into economic value, converting knowledge into effective advanced technologies and innovations, creating high-value-added products and services, strengthening research and development activities, enhancing productivity and efficiency, collaborating with industrial, commercial, business and civil society stakeholders to increase economic, social, and intellectual capital, promoting the integration of entrepreneurship into society and fostering an entrepreneurial culture, unleashing the potential of their regions (industry, trade, agriculture, tourism, etc.) to drive regional development, developing rational strategies, policies and solutions to address the increasing diversity and complexity of economic, ecological, social, cultural and political problems, developing mechanisms to overcome the middle-income trap and activating the dynamics necessary to achieve sustainable economic growth and social development.

In the current study, the effect of higher education on global competition in the context of the transformation of knowledge into economic value in OECD countries was analyzed with the Granger Panel Causality Test. In the application part of the study, a panel data set was generated for the 25 OECD countries from which data could be obtained for the period 2006-2017. The global competitiveness of the countries included in the analysis was evaluated by using the Global Competitiveness Index (GCI) variable.. Their competitiveness in higher education was evaluated by using the variables of gross enrolment ratio in higher education (he1), employment rate of the population having higher education (he2), public expenditure on higher education (he3), quality of the education system (he4), quality of scientific research institutions (he5), performance in scientific publications (he6), R&D expenditure by higher education institutions (he7) and university-industry collaboration in R&D (he8). As a result, it was found that each variable representing higher education (he1 to he8) is in a bidirectional causal relationship with the Global Competitiveness Index (gci) representing global competitiveness in the short term.

This result, supported by the application-based literature on the subject (Kara, 2019; Krstić et al., 2020; Sart, 2018), is significant in demonstrating the influential and determinant role of higher education in global competitiveness. In this connection, the following suggestions have been made for OECD countries that aim to have power in global competition:

1. The number of entrepreneurial, innovative, effective and qualified higher education institutions that will fulfil the functions of providing education, conducting scientific research and creating social benefits in an integrated way should be increased.

2. The enrolment rate in higher education should be increased with an understanding that prioritizes quality over quantity. In this regard, the supply of highly qualified individuals who have received higher education and developed specialized expertise in skill-intensive fields should be increased and they should be employed based on merit.
3. The research infrastructure of higher education institutions should be strengthened. In this regard, quality should be prioritized in scientific research institutions, scientific publication performance should be enhanced through interdisciplinary research approaches and high-value scientific knowledge should be generated.
4. With the awareness that expenditures on quality education are long-term investment, efforts should be made to achieve world-class quality in the education system. For this, the resources allocated to education should be increased and these resources should be used effectively and appropriately.
5. University-industry cooperation should be taken as a basis in order to strengthen R&D activities. In this connection, the budget allocated to R&D activities carried out by higher education institutions should be increased and the number of R&D personnel should be increased.
6. An entrepreneurial identity should be imparted to higher education institutions so that they work in collaboration with other societal stakeholders and take a leading and influential role in addressing societal issues (economic, ecological, social, cultural, political, etc.) through joint action and play a pioneering role in uncovering and developing the potential of their regions (agriculture, industry, trade, tourism, etc.).
7. Mechanisms should be developed to transform knowledge into economic value. In this regard, the number of technology parks, innovation valleys, technology transfer centres and other similar facilities should be increased to facilitate the transformation of knowledge into high-value and influential technological products, services and innovations that meet societal needs.
8. Higher education institutions should take a pioneering role in correctly interpreting the global change process, making accurate predictions and implementing rational strategies, policies and practices to respond to emerging needs.

Policy Implications

Global competition is a complex and dynamic process that involves various factors including economic conditions, technological developments, governmental policies and cultural differences. Understanding and effectively managing these factors are crucial to succeed in global competition. The current study focused on higher education as one of the important factors that influence and shape the complex and dynamic process of global competition. In the study, the effect of higher education on global competition was analyzed in the context of the transformation of knowledge into economic value. The Granger Panel Causality Test was used in the analysis conducted on OECD countries. As a result of the analysis, it was determined that each variable representing higher education (from he1 to

he8) is in a short-term bidirectional causal relationship with the Global Competitiveness Index (gci), which represents global competition. This result is important in terms of revealing how OECD countries, which aim to have power in global competition, should shape their higher education policies. In this connection, the primary goal of policy makers in higher education should be to increase the number of entrepreneurial, innovative, effective and qualified higher education institutions. Secondly, scientific research infrastructures of higher education institutions should be strengthened for the production of high value-added scientific knowledge and university-industry cooperation should be based on R&D. Thirdly, mechanisms that will enable the transformation of knowledge into economic value should be developed and their number should be increased. Finally, the resources allocated to higher education should be increased and these resources should be used effectively and properly.

Conflict of Interest

There is no conflict of interest for the authors or third parties arising from the study.

Funding Details

No funding or grant was received from any institution or organization for this research.

Ethical Statement

This study has been prepared in accordance with the rules of scientific research and publication ethics. It is a type of study that does not require ethics committee approval.

Credit Author Statement

The authors contributed equally to this research. The authors acted together and contributed equally in the conceptualization, design creation, method determination, data collection, data analysis, interpretation of the findings and writing processes of the research.

References

Aiginger, K. (1998). A framework for evaluating the dynamic competitiveness of countries. *Structural Change and Economic Dynamics*, *9*(2), 159-188. https://doi.org/10.1016/S0954-349X(97)00026-X

Aktan, C. C. (2007). Yüksek öğretimde değişim: global trendler ve yeni paradigmalar. In C. C. Aktan (Ed.), *Değişim çağında yüksek öğretim: global trendler – paradigmal yönelimler* (pp. 11-64). Yaşar University.

Alkibay, S., Orhaner, E., Korkmaz, S., & Ermeç Sertoğlu, A. (2012). Üniversite sanayi işbirliği çerçevesinde teknoparklar, yönetimsel sorunları ve çözüm önerileri. *Atatürk Üniversitesi İktisadi ve İdari Bilimler Dergisi*, *26*(2), 65-90.

Altay, A., & Pazarlıoğlu, M. V. (2007). Uluslararası rekabet gücünde beşeri sermaye: ekonometrik yaklaşım. *Selçuk Üniversitesi Karaman İ. İ. B. F. Dergisi*, 12, 96-108.

Altbach, P. G., Reisberg, L., & Rumbley, L. E. (2010). *Trend in global higher education: tracking an academic revolution*. Sense Publishers. https://doi.org/10.1163/9789004406155

Antalyalı, Ö. L. (2007). Tarihsel süreç içerisinde üniversite misyonlarının oluşumu. *Süleyman Demirel Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, *6*, 25-40.

Aybarç Bursalıoğlu, S. (2012). *Türkiye ve Avrupa birliği ülkelerinde yükseköğretim kamu harcamalarının karşılaştırmalı etkinlik analizi* [Unpublished doctoral dissertation]. Manisa Celal Bayar University.

Ayten, A. M., & Göver, İ. H. (2020). Değişen yükseköğretim sistemini sosyokültürel ve mekansal bağlamlarda yeniden düşünmek. *Yükseköğretim Dergisi*, *10*(2), 141-152. https://doi.org/10.2399/yod.19.512935

Balmumcu, Ö., & Bozkurt, K. (2020). Gelişmekte olan ülkelerde ekonomik büyüme ve cari işlemler dengesi üzerine bir panel veri analizi. *Ekonomi Politika ve Finans Araştırmaları Dergisi*, *5*(2), 292-307. https://doi.org/10.30784/epfad.770074

Bannier, B. J. (2016). Global trends in transnational education. *International Journal of Information and Education Technology*, *6(*1), 80-84. http://www.ijiet.org/vol6/663-DL0006.pdf

Bauk, S., & Jusufranic, J. (2014). Competitiveness in higher education in terms of the level of students' satisfaction with e-learning in blended environment. *Montenegrin Journal of Economics, 10*(1), 25-42.

Berber, Ş. (2003). Bilgi çağında eğitim. *Türkiye Sosyal Araştırmalar Dergisi*, *7*(2), 39-50.

Bernasconi, A., & Celis, S. (2017). Higher education reforms: Latin America in comparative perspective. *Education Policy Analysis Archives, 25*(67), 1-15. https://doi.org/10.14507/epaa.25.3240

Blomquist, J., & Westerlund, J. (2013). Testing slope homogeneity in large panels with serial correlation. *Economics Letters, 121*(3), 374-378. https://doi.org/10.1016/j.econlet.2013.09.012

Bloom, D. E., Canning, D., Chan, K., & Luca, D. L. (2014). Higher education and economic growth in Africa. *International Journal of African Higher Education*, *1*(1), 23-57. https://doi.org/10.6017/ijahe.v1i1.5643

Bozkurt, K. (2012). *Dışsal teknolojik şokların gelişmekte olan ülkelerin büyüme sürecine etkileri* [Unpublished doctoral dissertation]. Muğla Sıtkı Koçman University.

Bozkurt, K., & Balmumcu, Ö. (2018). Beşeri sermaye ve ekonomik büyüme: gelişmekte olan ülkeler için bir panel veri analiz. *Uluslararası İktisadi ve İdari İncelemeler Dergisi,* Prof. Dr. Harun Terzi Özel Sayısı, 391-405. https://doi.org/10.18092/ulikidince.446072

Bozkurt, K., Armurçuoğlu Tekin, H., & Can Ergün, Z. (2021). An investigation of demand and exchange rate shocks in the tourism sector. *Applied Economic Analysis*, *29*(86), 171-188.

Breusch, T. S., & Pagan, A. R. (1980). The lagrange multiplier test and its applications to model specification tests in econometrics. *The Review of Economic Studies*, *47*(1), 239-253. https://doi.org/10.2307/2297111

Burnett, S. A., & Huisman, J. (2010). Universities' responses to globalization: The influence of organizational culture. *Journal of Studies in International Education*, *14*(2), 117-142. https://doi.org/10.1177/1028315309350717

Czajkowski, Z. (2014). Human capital and innovation determinants of competitiveness. In M. A. Weresa (Ed.), *Innovation, human capital and trade competitiveness: How are they connected and why do they matter?* (pp. 105-157). Springer.

Dumitrescu, E. I., & Hurlin, C. (2012). Testing for granger non-causality in heterogeneous panels. *Economic Modelling*, *29*(4), 1450-1460. https://doi.org/10.1016/j.econmod.2012.02.014

Erdem, A. R. (2016). Üniversite anlayışındaki değişim: birinci nesil üniversiteden dördüncü nesil üniversiteye. *TYB Akademi Dil Edebiyat ve Sosyal Bilimler Dergisi*, *16*(16), 21-52.

Etzkowitz, H. (2008). *The triple helix: industry-university-government innovation in action*. Routledge.

Etzkowitz, H. **(**2013). Anatomy of the entrepreneurial university. *Social Science Information*, *52*(3), 486-511. https://doi.org/10.1177/0539018413485

Etzkowitz, H., & Leydesdorff, L. (2000). The dynamics of innovation: From national systems and mode 2 to a triple helix of university-industry-government relations. *Research Policy*, *29*(2), 109-123. https://doi.org/10.1016/S0048-7333(99)00055-4

Fagerberg, J. (1988). International competitiveness. *The Economic Journal*, *98*, 355-374. https://doi.org/10.2307/2233372

Garelli, S. (2007). *IMD world competitiveness yearbook 2005*. IMD-International Institute for Management Development.

Göktaş, P., Pekmezci, A., & Bozkurt, K. (2019). *Ekonometrik serilerde uzun dönem eşbütünleşme ve kısa dönem nedensellik-makroekonomik verilerle eviews ve stata uygulamaları*. Gazi Kitabevi.

Grant, E. (1997). When did modern science begin? *American Scholar*, *66*(1), 105-114.

Günay, D. (2007). Yirmibirinci yüzyılda üniversite. In C. C. Aktan (Ed.), *Değişim çağında yüksek öğretim: global trendler – paradigmal yönelimler* (pp. 77-88). Yaşar University.

Horn, M. B., & Dunagan, A. (2018). *Innovation and quality assurance in higher education.* Christensen Institute. https://files.eric.ed.gov/fulltext/ED586374.pdf

İlkay, S. Ç. (2019). *Beşeri sermaye ile uluslararası rekabet gücü arasındaki ilişki: Türkiye ve seçilmiş diğer G20 ülkeleri üzerine bir analiz* [Unpublished doctoral dissertation]. Kayseri Erciyes University.

Jantadej, K. (2021). English as an international language teaching and perceptions: a case study of Thai tertiary English language teachers. *International Journal of Progressive Education, 17*(6), 93-114. https://doi.org/10.29329/ijpe.2021.382.7

Kara, K. (2019). *Ulusal yenilik, ulusal rekabet ve ulusal yükseköğretim başarı ilişkisi: panel veri analizi* [Unpublished doctoral dissertation]. Çanakkale Onsekiz Mart University.

Kiper, M. (2010). *Dünyada ve Türkiye'de üniversite-sanayi işbirliği ve bu kapsamda üniversite-sanayi ortak araştırma merkezleri programı (ÜSAMP)*. Türkiye Teknoloji Geliştirme Vakfı. https://www.ttgv.org.tr/tur/images/publications/6005bd04eec7d.pdf

Kireçci, M. A., Bacanlı, H., Erişen, Y., Karadağ, E., Çelikgöz, N., Dombaycı, M. A., Toprak, M., & Şahin, M. (2016). Türkiye'de yükseköğretimin uluslararasılaşması: Bir endeks oluşturma çalışması. *Eğitim ve Bilim*, *41*(187), 1-28. http://dx.doi.org/10.15390/EB.2016.6223

Krstić, M., Filipe, J. A., & Chavaglia, J. (2020). Higher education as a determinant of the competitiveness and sustainable development of an economy. *Sustainability*, *12*(16), 6607. https://doi.org/10.3390/su12166607

Kwiek, M. (2001). Globalization and higher education. *Higher Education in Europe*, *16*(1), 27-39.

McBurnie, G. (2002). Globalization, GATS, and transnational education. *Educational Sciences: Theory & Practice*, *2*(1), 169-190.

McLendon, M. K., & Ness, E. C. (2003). The politics of state higher education governance reform. *Peabody Journal of Education*, *78*(4), 66-88.

OECD (1996). *Globalisation and competitiveness: Relevant indicators*. OECD. https://doi.org/10.1787/18151965

Okumuş, M. Y. (2021). *Yükseköğretimde değişim ve dönüşüm beklentileri öneriler*. Eğitim-Bir-Sen Stratejik Araştırmalar Merkezi.

Perkin, H. (2007). History of universities. In James J.F. Forest & Philip G. Altbach (Eds.), *International handbook of higher education* (pp. 159-205). Springer.

Pesaran, M. H. (2007). A simple panel unit root test in the presence of cross-section dependence. *Journal of Applied Econometrics*, 22(2), 265-312. https://doi.org/10.1002/jae.951

Piyadeoğlu, C. (2018). Nizamiye medreselerinin kuruluşu ve önemi. *Selçuk Üniversitesi Selçuklu Araştırmaları Dergisi, 8*, 124-135.

Porter, M. E. (1990). The competitive advantage of notions. *Harvard Business Review*, No. 90211, 71-91.

Ranga, M., & Etzkowitz, H. **(**2013). Triple helix systems: An analytical framework for innovation policy and practice in the knowledge society. *Industry and Higher Education*, *27*(4), 237-262. https://doi.org/10.5367/ihe.2013.0165

Reda, M. (2012). *Enhancing Egypt's competitiveness: Education, innovation and labor*. Egyptian Center for Economic Studies.

Rukancı, F., & Anameriç, H. (2004). Ortaçağda ilk üniversiteler: studium generale. *Felsefe Dünyası*, *39*, 170-186.

Sabır Taştan, N. (2020). *Yükseköğretimde akademik performansın etkinlik temelinde değerlendirilmesinde bir model önerisi* [Unpublished doctoral dissertation]. Ondokuz Mayıs University.

Sahlberg, P. (2006). Education reform for raising economic competitiveness. *Journal of Educational Change*, *7*(4), 259-287. https://doi.org/10.1007/s10833-005-4884-6

Saklı, A. R., & Akdoğar Akbulut, H. T. (2017). Dünyada ve Türkiye'de üniversitelerin tarihi gelişimi. In A. R. Saklı (Ed.), *Recep Tayyip Erdoğan Üniversitesi öğrenci ve akademisyenleri ile Rize halkının karşılıklı algı ve beklentileri* (pp. 9-49). Recep Tayyip Erdoğan University.

Sart, G. (2018). *OECD ülkelerinde küresel rekabet gücü ve yüksek öğrenimin rolü*. Nobel Akademik Yayıncılık.

Selvitopu, A., & Aydın, A. (2018). Türk yükseköğretiminde uluslararasılaşma stratejileri: süreç yaklaşımı çerçevesinde nitel bir inceleme. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 33*(4), 803-823. doi: 10.16986/HUJE.2018038522

Storberg-Walker, J., & Torraco, R. (2004). *Change and higher education: a multidisciplinary approach.* https://files.eric.ed.gov/fulltext/ED492430.pdf

Şahin, M., & Alkan, R. M. (2016). Yükseköğretimde değişim dönüşüm süreci ve üniversitelerin genişleyen rolleri. *Eğitim ve Öğretim Araştırmaları Dergisi*, *5*(2), 297-307.

Şimşek, H., & Adıgüzel, T. (2012). Yükseköğretimde yeni bir üniversite paradigmasına doğru. *Eğitim ve Bilim, 37*(166), 250-261.

Tekeli, İ. (2003). Dünya'da ve Türkiye'de üniversite üzerinde konuşmanın değişik yolları. *Toplum ve Bilim Dergisi, 97*, 123-143.

Tijanic, L., & Obadic, A. (2015). Can we boost the competitiveness of the European Union through reducing regional ınequalities in human capital? *Engineering Economics, 26*(3), 295-305. http://dx.doi.org/10.5755/j01.ee.26.3.8029

Timur, T. (2000). *Toplumsal değişme ve üniversiteler.* İmge Kitapevi.

Trow, M. (2007). Reflections on the transition from elite to mass to universal access: Forms and phases of higher education in modern societies since WWII. In Forest, J.J.F., & Altbach, P.G. (Eds.), *International handbook of higher education (pp. 243-280).* Springer. https://doi.org/10.1007/978-1-4020-4012-2_13

Ulusoy, G. (2007). Disiplinlerarası araştırma ve eğitim. In C. C. Aktan (Ed.), *Değişim çağında yüksek öğretim: global trendler – paradigmal yönelimler* (pp. 389-397). Yaşar University.

WEF **(**2018). *The global competitiveness report 2018*. Word Economic Forum. https://www3.weforum.org/docs/GCR2018/05FullReport/TheGlobalCompetitivenessReport2018.pdf

Weresa, M. A. (2017). *Innovation, human capital and competitiveness in Central and Eastern Europe with regard to the challenges of a digital economy*. https://www.etui.org/sites/default/files/Chapter%203_5.pdf

Wissema, J. G. (2009). *Towards the third generation university: Managing the university in transition.* Edward Elgar Publishing.

Wyszkowska-Kuna, J. (2017). The role of intermediate demand and technology for international competitiveness of the KIBS sector: Evidence from European Union Countries. *The Journal of International Trade&Economic Development, 26*(7), 777-800.

Yaman, A. (2021). Good to have an ambitious ranking policy, but how about the realities? analysing the ranking goals for an emerging higher education hub. *Educational Policy Analysis and Strategic Research, 16*(4), 178-197. https://doi.org/10.29329/epasr.2021.383.10

Yaras, Z., & Kanatli-Ozturk, F. (2022). Society 5.0 in human technology integration: digital transformation in educational organizations. *International Journal of Progressive Education, 18*(1), 458-474. https://doi.org/10.29329/ijpe.2022.426.26

Zhang, X. (2007). Re-examining the mission of the university in mass higher education. *Frontiers of Education in China, 2*(3), 378-393.