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# Higher Education as a Determinant of the Competitiveness and Sustainable Development of an Economy

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**Abstract:** The aim of this paper is to examine the interdependence between higher education on the one hand and the competitiveness of the economy and sustainable development on the other hand. To examine the mentioned interdependence, we used a sample that includes EU member states and candidate countries. The paper applies correlation and regression analysis of comparative data sections. The research findings indicate a strong correlation between higher education on the one hand and the competitiveness of the economy and sustainable development on the other. The results obtained by research can serve as a "global benchmark" of future public policy in the field of higher education.

**Keywords:** higher education; competitiveness of the economy; European education policy; global competitiveness index 4.0; skillset of graduates; scientific publications; innovations; critical and creative thinking; institutions

## 1. Introduction

Sustainable development, which implies that economic activities are consistent with the conservation and the rational use of natural resources, as well as the protection and improvement of ecosystems [1–4], cannot be achieved only by implementing new technological solutions, providing political regulation, or using financial instruments [5]. There is a need for a change in the way we think and act. Such change requires quality education and learning at all levels and in all social contexts. The goal of education that is focused on sustainable development is improving access to primary, secondary, and higher education, as well as helping people to develop their behaviors, skills, and knowledge, which people need today but also in the future [6].

Agenda 21, one of the final documents of the Conference of the United Nations held in Rio de Janeiro (1992), identified education as an essential tool for achieving sustainable development. Chapters 35 and 36 of Agenda 21 called on educational institutions to: (1) Increase public awareness of the interdependence of human beings and the environment and (2) promote training for development of human resources that facilitates the transition to a sustainable world. Later, in 2002, in order to coordinate the efforts of higher education institutions and other entities to achieve sustainable development, the United Nations adopted the program named the "Decade of Education for Sustainable Development" (DESD). This program has encouraged the introduction of sustainable development issues in the curricula and quality systems of institutions in higher education [7].

However, progress in implementing the concept of sustainable development in the field of higher education seemed slower than expected due to the resistance of universities and other higher education institutions to adopting an approach that could lead to transition from reductionist to holistic and transdisciplinary perspectives. This transition includes cooperation between different scientific disciplines and proactive engagement of universities and society for the purpose of transformative change [7].

The Agenda 2030, through its emphasis on education, can provide further opportunities for transformation towards a "sustainable system" for higher education institutions. Agenda 2030 includes the goal "Quality Education" and a sub-goal related to education for sustainable development, while pointing out the key contribution of education for sustainable development to other sustainable development goals. "The Global Program of Action" of the United Nations, adopted at the UNESCO Conference on Education for Sustainable Development in 2014, which continues the program "Decade of Education for Sustainable Development", has contributed to achieving the sustainable development goal of "Quality Education" by providing best practices and action to educational institutions, including institutions of higher education [7].

From the point of view of the topic of our paper, it is important to note that the higher education system is one of the sources of the competitive position of an economy. Namely, quality higher education and training are conditions for ensuring the efficiency of the economy, so the improvement of education at the tertiary level would enable an easier transition of the economy to a higher level of development.

The aim of the following consideration is to examine the interdependence between higher education, competitiveness of an economy, and sustainable development. This research used correlation and the regression analysis to determine: (1) Whether or not higher education is an important determinant of economic competitiveness in the considered economy; (2) what the nature of the connection between higher education on one hand and sustainable development—which, according to the methodology of the World Economic Forum (WEF), is evaluated by the sub-pillar "Future Orientation of Government"— on the other hand is; and (3) what the relationship between the analyzed measures of the "strength" and the quality of the higher education system is. The key contribution of this paper is that it points to recommendations for improving higher education, the economic competitiveness, and the sustainable development of a country.

In accordance with the set goal, this paper is structured as follows. The second part of the paper discusses the importance of the higher education in Europe. The third part of the paper analyzes the relationship between the concept of sustainable development and the higher education system. In the following section, we expose the methodology and the information base of the research and define the hypotheses. The fifth part of the paper deals with the results of the research and the corresponding discussion. The last part summarizes the conclusions and gives recommendations for improving higher education, competitiveness of economy and sustainable development of country.

## 2. Higher Education in Europe through Facts

The importance of the nine-century-long history of higher education for the development of Europe is significant and indisputable, as are its reputation and influence around the world. The first and oldest university in the world is the University of Bologna, Italy, which was founded in 1088.

It should be no surprise that Europe has always paid great attention to the development of higher education in its territory. There are numerous reasons for this. First, the potential of higher education to stimulate the development of the economy and improve the quality of life in society is high. It is estimated that every additional year of education above the population average increases a country's average productivity by 6.2%, mainly achieved through the contributions that higher education makes to faster technical progress [8]. Furthermore, higher education enables the achievement of high income and higher employment rates [9]. Based on the results of the study "Demographic and Educational Effects on Unemployment in Europe" by Federico Biagi and Claudio Lucifora, conducted in ten

EU countries, it can be concluded that a higher level of education of the population reduces the unemployment rate [10]. Third, the impact of higher education on society is significant when it comes to the reducing crime rates.

Furthermore, the multidisciplinary and cross-national panel database SHARE (Survey of Health, Aging, and Retirement in Europe) reveals a strong correlation between the level of education of the population and health. It is estimated that 70% of the population in Europe that has a lower level of education is physically inactive. The same goes for the mental health of the population. Individuals with lower incomes or less material resources are mostly poorly educated people and often suffer from depression, especially in the northern part of Europe [11]. According to the 2010 Eurostat survey, a systemic relationship between education level and mortality was determined. It was pointed out that the life expectancy of a population with a low level of education is lower and that it increases with the level of education [12].

There is no doubt that a high level of education provides a clearer picture of the world and the way the world works. New knowledge changes people, their habits, their values, and way of life. After all, new knowledge changes the population, the society, and the world for the better. Therefore, any responsible society that strives to ensure economic and social development and improve the quality of life of the population should have higher education in the primary focus of interest [13,14].

In the continuation of this paper, attention is focused on the relationship between the concept of sustainable development and higher education. It emphasizes the concept of sustainable development as a response to the multiple and comprehensive crises that have plagued the modern society. It is pointed out that higher education should be conceptualized, precisely, as a function of sustainable development, which is increasingly assured by the theory and practice of the European Union, particularly by its strategic documents.

## 3. Sustainable Development and Higher Education

As early as 2000, the European Union adopted the development strategy known as the Lisbon Strategy in Lisbon. This strategy states that the goal of EU is to become, by 2010, the most competitive and dynamic knowledge-based economy in the world, capable of achieving sustainable economic growth with more and better jobs and stronger social cohesion.

The Lisbon Strategy was not implemented until 2010. That is why the EU launched the development strategy named "Europe 2020". According to this strategy, it is necessary to achieve three forms of growth: (1) Sustainable growth, which implies promoting a resource-efficient, green, and competitive economy; (2) smart growth, which means the development of a society based on knowledge and innovation; and (3) inclusive growth, which implies a high-employment economy [15].

Accordingly, the European Commission has identified seven leading initiatives that should encourage progress on the following key themes: (1) The "Innovative Union" refers to the development of innovative ideas that can be turned into products and services, which will contribute to growth and employment [16]; (2) the "Digital Agenda for Europe" should accelerate the use of the Internet and create opportunities for exploiting the EU's unique market [17]; (3) "Youth on the Move" refers to improving the performance of the education system and enabling young people to access the labor market; (4) a "Resource-Efficient Europe" should promote energy efficiency and support the transition to renewable energy sources; (5) the "Industrial Policy for the Era of Globalization" refers to the improvement of the business environment, primarily for small- and medium-sized enterprises, as well as to supporting the development of a strong, sustainable, and competitive industry; (6) the "Agenda for New Skills and Jobs" refers to the modernization of the labor market in terms of developing new skills and jobs [18]; (7) the "European Platform against Poverty" should ensure social and territorial cohesion, i.e., the benefit of economic growth should be felt by the poor [19].

Let us add that sustainable development is not only "the need", but also "the necessity" caused by the new economic and financial crisis [20]. The new economic and financial crisis, which is a "knock on the door", is the consequence of, first of all, the pandemic of the new coronavirus, but also the

inadequate economic model adopted by North American and Western European countries that includes: (1) "Brutal" budget savings that have led to low allocations for medical equipment, scientific research, and higher education and (2) stagnation of the salaries of most employees. One of the most dramatic effects of this economic and financial crisis is the significant number of small private firms leaving their businesses, which in turn means a large number of redundancies among employees [21,22].

One solution offered by contemporary economic theory is the link between the "good" institutions and investment [23]. Institutions, by providing economic, political, and legal protection to investors, play a decisive role. There is no sustainable development without investment. On the other hand, sustainable (economic and social) development cannot be achieved if these investments are not productive. Therefore, the following chain should be established. "Good" institutions that provide economic, political, and legal protection to investors lead to productive investments that lead to increasing productivity, which leads to sustainable development and growth [24].

Sustainable growth based on new investments should be a function of increasing competitiveness [25]. This competitiveness can be achieved through development based on knowledge and innovation. The contributions of higher education institutions and technological research and innovation are "the key" in all of this [26].

It is important to say that the prevailing view in science is that the higher education system, as a key factor in the development and competitiveness of the modern economy, plays an essential role in socio-economic development. The experience of developed countries shows that higher education is directly linked to economic development. The data suggest, and, as some studies confirm, that in the first decade of the 21st century, the ten countries with the highest percentages of highly educated populations were among the countries with the highest gross domestic product per capita (Figure 1).

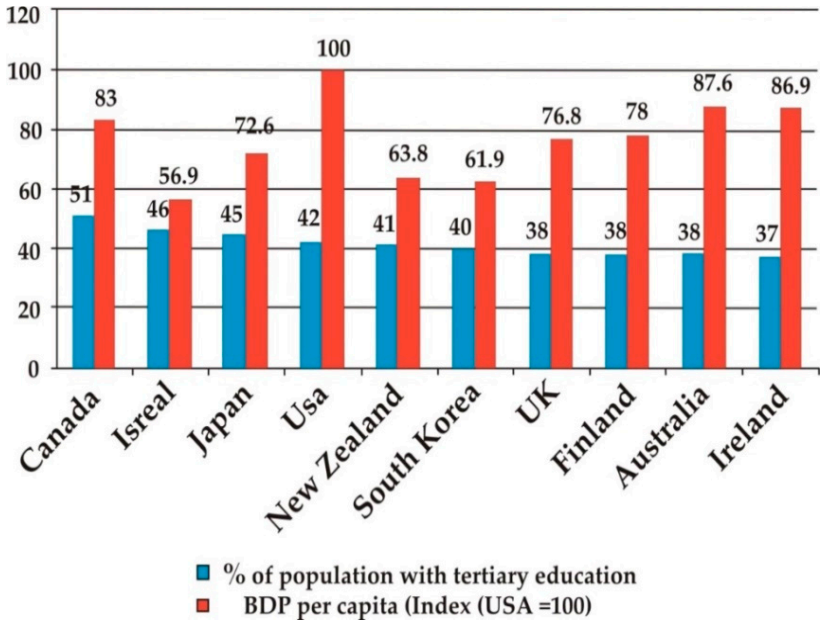


**Figure 1.** Ten most educated countries in the world—percentage of highly educated people in correlation with the GDP per capita (USA = 100). (Source: Prepared by authors based on [27]).

The creation of European education policy in the EU began in the late 1980s on the basis of successful educational programs. It included: (1) The European Community Action Program for Encouraging Student Mobility (Erasmus); (2) the Lingua Action Program; and (3) the Trans-European Student Mobility Program (Tempus). Various measures within the mentioned programs included the following categories: Physical and virtual mobility, development and network of cooperation between higher education institutions, and the development of innovative activities through the application of pilot projects and the like.

There are many goals of the EU education policy, of which we single out the following: (1) Providing contributions to quality, general, higher, and professional education; (2) improving the comprehensive approach to education; and (3) achieving the highest level of knowledge in the EU through continuous training, i.e., lifelong learning. The European Commission has the task to support efforts and launch initiatives in the field of education policy. The Commission does this in the following ways: (1) By actively supporting the principles of the Bologna Declaration and the intergovernmental dialogue aimed at initiating higher education reforms; (2) the development of the Erasmus program, which is primarily aimed at financially supporting youth employment and/or studying abroad; and (3) the launch of numerous European programs focused on encouraging cooperation in the field of higher education with countries outside the EU [28].

In September 2011, the European Commission adopted the "Agenda for the Modernization of the European Higher Education System" with the aim of supporting the necessary reforms in the EU member states. The agenda highlights the most important areas in which reforms should be implemented. The goals of the "Agenda for the Modernization of the European Higher Education System" are: (1) The growth of the number of highly educated citizens; (2) the improvement of the quality and importance of teaching and research experience; (3) providing greater opportunities for students to acquire additional skills by studying and attending training abroad; (4) the continuous training of a larger number of researchers who will contribute to the future development of economic activities in the EU, etc. [29]

Let us say that the largest EU program related to the development of research and innovation for the period from 2014–2020 is "Horizon 2020". The ultimate goal of this program is to ensure the global competitiveness of the EU and member states (and potential members).

The next section of this paper will examine the interdependence between higher education on the one hand, and the competitiveness of the economy and sustainable development on the other hand. The existence of the mentioned interdependence will be tested through regression models. In order to develop regression models, an appropriate program for statistical data processing is used.

## 4. Materials and Methods

### *4.1. Methodological Framework for Research*

The information basis for the research presented in this paper consists of data contained in the Global Competitiveness Report of the World Economic Forum in 2019. The fact is that many international institutions create indices on the basis of which they measure and rank countries according to various aspects of competitiveness. However, the most influential indices are the global indices of the World Economic Forum and the International Institute for Management Development (IMD). The research uses the composite index of the World Economic Forum (WEF), primarily because the WEF reports cover a much larger number of countries than the IMD reports. In addition, the World Economic Forum's index best reflects the real economic situation in relation to other available indices when it comes to countries in transition [30].

The methodology for measuring the competitiveness of the economy of the World Economic Forum is based on a composite index—the global competitiveness index. The methodology used to calculate the global competitiveness index underwent a significant revision in 2018 [31]. The competitiveness of economies is still monitored through 12 pillars of competitiveness, but their position, structure, and method of calculation have changed. In the World Economic Forum's Global Competitiveness Report 2018, the method of grouping economies into stages of development—based on which different weights were applied for the impact of individual groups of competitiveness pillars on the value of the Global Competitiveness Index—has also been abandoned. The index is now calculated for all economies in the same way, and the final value of the index is a simple average of the 12 pillars. The explanation is that, as the fourth industrial revolution continues, all factors of competitiveness

have a similar impact on the competitive position of the economy regardless of income level, so each pillar can be considered as the potential priority [32].

The basic idea behind the change of the methodology for calculating the global competitiveness index of the World Economic Forum is related to the increasing impact of information and communication technologies on social development and the fact that the transfer of knowledge and technology can reduce the time that underdeveloped economies need to reduce their lagging behind developed economies [33]. However, the analysis of the pillars of competitiveness in the WEF reports clearly shows that, in many countries, the main causes of slow development and growth are: The inability to use the new opportunities offered by the fourth industrial revolution in the form of modern information and communication technologies, and "old" problems of social development in the form of "poor" institutions, infrastructure, and skills available to workers [34]. As already mentioned, quality institutions are a fundamental "driver" of both productivity and sustainable development. In addition, the quality of the institutional environment largely determines the level of technology and the development of physical and human capital, which are the main sources of income disparity (GDP) in countries. The importance of these basic determinants for economic and social progress has influenced the first of the 12 pillars of the Global Competitiveness Index 4.0 to measure the quality and development of institutions.

It should be borne in mind that the first pillar of the Global Competitiveness Index, called "Institutions", has eight sub-pillars, or dimensions of economic competitiveness: (1) Security; (2) social capital; (3) checks and balances; (4) public-sector performance; (5) transparency; (6) property rights; (7) corporate governance; and (8) future orientation of government [32]. This paper uses the eighth competitiveness sub-pillar, "Future orientation of government", as an indirect indicator of the sustainable development of a country (according to the methodology of the World Economic Forum).

Having in mind all that was mentioned above, the aim of this paper is to consider the working factors from the area of higher education, which are defined according to the methodology of the World Economic Forum, with respect to the competitiveness of the economy and sustainable development. A sample involving EU member states and candidate countries is used to study the relationship of higher education, competitiveness, and sustainable development of a country. The rationale for the inclusion of countries representing potential EU countries is that these countries have started negotiations for full membership in the EU.

Correlation and regression analyses are used in this paper. Regression analysis determines the relationship between dependent and explanatory variables. The dependent variables are: The Global Competitiveness Index 4.0 (GCI 4.0) and (the sub-pillar) "Future Orientation of Government" (FOG). The selected explanatory variables for analysis are: Skillset of Graduates (SOG), Critical Thinking in Teaching (CTiT), Total Public Expenditure on Tertiary-Level Education (TPET), Scientific Publications (SP), Research Institution Prominence (RIP), Internet Users (IU), Digital Skills among the Active Population (DS), Patent Applications (PA), and International Co-Inventions (ICI) (see Tables 1 and 2).

**Table 1.** Independent variables in researching the impact of higher education systems on competitiveness and sustainable development in the analyzed countries.

| The Independent Variable | The Definition of an Independent Variable | The Explanation of Independent Variable Results |
| --- | --- | --- |
| Skillset of Graduates | This measure of quality of the higher education system is related to the quality of teaching in the higher education system. The value of this measure or indicator is calculated based on the answers to a question in the Executive Opinion Survey by the WEF: "In your country, to what extent do graduating students from universities possess the skills needed by businesses?" | High scores for this variable indicate that the higher education systems in the analyzed countries create staffs that meet market and economy requirements and who have knowledge of skills that fit into different contexts. |
| Critical Thinking in Teaching | A measure of the quality of a higher education system related to the quality of teaching in a higher education system. To determine the value of "Critical Thinking in Teaching", the WEF uses the answers to the following question: "In your country, how do you assess the style of teaching?" (1 = frontal, teacher based, and focused on memorizing; 7 = encourages creative and critical individual thinking) | High scores for this variable indicate that lectures and exercises emphasize illustrations, assignments, and other forms of knowledge application that encourage students to think, be creative, work autonomously, etc. |
| Total Public Expenditure on Tertiary-Level Education | Total public expenditure on education as % of GDP at the tertiary level of education | Increasing the budget allocation for higher education leads to higher levels of education of a population and enhances the quality of research in the analyzed countries. |
| Scientific Publications | A measure of the quality of higher education system that is related to the quality of science and research at universities and other institutions in higher education. This factor of competitiveness measures the number of published papers cited in other papers at least *h* times. | High scores for this variable indicate that the country has highly productive researchers in scientific organizations (faculties, institutes). |
| Research Institution Prominence | A measure of quality of higher education system that is related to the quality of science and research at universities and other institutions in higher education. This factor of competitiveness measures the prominence and standing of private and public research institutions. | Low scores for this variable mean that research and development organizations have poor performances and are not competitive enough to function in market conditions. |
| Internet Users | A measure of the quality of the higher education system associated with information and communication technology. This measure shows the percentage of individuals who used the internet in the last three months. | The use of digital technologies in the teaching and learning process leads to higher quality of higher education systems. |

**Table 1.** *Cont.*

| The Independent Variable | The Definition of an Independent Variable | The Explanation of Independent Variable Results |
| --- | --- | --- |
| Digital Skills among Active Population | A measure of the quality of the higher education system related to information and communication technology. The value of this (non-)competitiveness factor is calculated based on data from the Executive Opinion Survey of the WEF. The question of the Executive Opinion Survey concerning this indicator is: "In your country, to what extent does the active population possess sufficient digital skills?" | Improving the quality of the higher education system and increasing competitiveness in the countries analyzed require a population with advanced digital skills (programming, use of online learning resources, etc.). |
| Patent Applications | A measure of the quality of the higher education system that is related to a country's ability to innovate. This measure represents the total number of patent family applications per million population. | The presence of a large number of innovations (patent) is a key factor in the development of education and the economy as a whole. |
| International Co-Inventions | A measure of the quality of the higher education system that is related to a country's ability to innovate. This measure represents the number of patent family applications with co-inventors located abroad per million population. | The presence of a large number of innovations (patent) is a key factor in the development of education and the economy as a whole. |

Source: Prepared by authors based on [32,35].

**Table 2.** Selected indicators of the World Economic Forum for the analyzed countries.

| Countries | GCI 4.0 | SOG | CTiT | TPET [(1)] | SP | RIP | IU | DS | PA | ICI | FOG |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Belgium | 76 | 5.0 | 4.0 | 1.44 | 703.7 | 0.08 | 88.7 | 48 | 114.31 | 23.85 | 62.1 |
| Bulgaria | 65 | 3.8 | 3.5 | 0.65 | 220.7 | 0.02 | 64.8 | 4.7 | 4.40 | 1.04 | 63 |
| Czech Republic | 71 | 4.4 | 3.3 | 1.16 | 396.7 | 0.08 | 80.7 | 4.8 | 29.38 | 6.23 | 58.5 |
| Denmark | 61 | 5.3 | 5.6 | 2.44 | 662 | 0.06 | 97.6 | 5.4 | 207.63 | 23.68 | 75.4 |
| Germany | 82 | 5.1 | 4.9 | 1.40 | 1153 | 0.8 | 89.7 | 5.1 | 292.1 | 21.40 | 79 |
| Estonia | 71 | 4.7 | 4.4 | 1.29 | 234.7 | 0.01 | 89.4 | 5.4 | 26.72 | 4.90 | 67.2 |
| Ireland | 75 | 5.1 | 4.1 | 1.34 | 451.6 | 0.04 | 84.5 | 5 | 84.1 | 9.71 | 73.1 |
| Greece | 63 | 4.3 | 3.4 | 1.48 [(2)] | 434 | 0.06 | 73.0 | 4.1 | 9.34 | 1.02 | 49.3 |
| Spain | 75 | 4.5 | 3.3 | 1.13 | 776 | 0.55 | 86.1 | 4.3 | 28.52 | 3.68 | 59.5 |
| France | 79 | 4.7 | 4.1 | 1.29 | 1027.7 | 1.23 | 82 | 4.5 | 145.94 | 11.44 | 71 |
| Croatia | 62 | 3.4 | 2.3 | 0.93 | 238.7 | 0.01 | 72.7 | 3.7 | 4.14 | 1.04 | 46.4 |
| Italy | 72 | 4.2 | 3.7 | 0.83 | 896.7 | 0.36 | 74.4 | 4.2 | 62.29 | 4.39 | 57.1 |
| Cyprus | 66 | 4.8 | 3.4 | 2.11 | 170 | 0.01 | 84.4 | 4.9 | 9.4 | 1.57 | 62.4 |
| Latvia | 67 | 4.2 | 3.8 | 1.01 | 140.7 | 0.01 | 83.6 | 4.8 | 5.87 | 0.96 | 59 |
| Lithuania | 68 | 3.9 | 3.7 | 1.47 | 182.3 | 0.01 | 79.7 | 4.9 | 12.22 | 1.21 | 62.1 |
| Hungary | 65 | 3.9 | 3.4 | 1.10 | 390.7 | 0.04 | 76.1 | 4 | 2.14 | 4.51 | 65.4 |
| Malta | 63 | 4.7 | 3.9 | 1.11 | 104 | 0.8 | 81.4 | 4.7 | 25.26 | 3.22 | 58.7 |
| Netherlands | 82 | 5.5 | 5.4 | 1.72 | 845 | 0.18 | 94.7 | 5.6 | 199.85 | 20.84 | 78.1 |
| Austria | 77 | 5.3 | 4.1 | 1.56 | 579 | 0.8 | 87.7 | 4.8 | 234.27 | 36.15 | 68.2 |
| Poland | 69 | 3.7 | 3.1 | 1.13 | 481 | 0.14 | 77.5 | 4.3 | 12.68 | 1.69 | 48 |
| Portugal | 70 | 4.8 | 3.9 | 1.04 | 417.2 | 0.07 | 74.7 | 4.5 | 12.97 | 1.55 | 65.7 |
| Romania | 64 | 4.5 | 3.2 | 0.85 | 227.7 | 0.05 | 70.7 | 4.5 | 3.58 | 0.99 | 58.5 |
| Slovenia | 70 | 4.5 | 3.2 | 1.37 | 254.7 | 0.02 | 79.7 | 4.8 | 51.57 | 6.49 | 62 |
| Slovakia | 67 | 3.2 | 2.9 | 0.95 | 242 | 0.02 | 80.7 | 4.6 | 9.82 | 3.31 | 58.7 |
| Finland | 80 | 5.6 | 5.6 | 2.17 | 571 | 0.06 | 88.9 | 5.8 | 255.31 | 24.35 | 76.5 |
| Sweden | 81 | 5.2 | 5.3 | 1.98 | 779.3 | 0.1 | 92.1 | 5.7 | 256.32 | 31.54 | 71.6 |
| Iceland | 75 | 5.2 | 4.6 | 1.43 | 270 | 0.01 | 99 | 5.7 | 92.42 | 13.26 | 67 |
| Montenegro | 61 | 3.8 | 3.6 | 1.1 [(3)] | 45.3 | 0.00 | 71.5 | 4.3 | 2.57 | 0.83 | 61.8 |
| Northern Macedonia | 57 | 3.4 | 2.9 | 0.50 [(4)] | 98.7 | 0.00 | 79.2 | 3.7 | 0.38 | 0.00 | 49.4 |
| Albania | 53 | 4.3 | 4.6 | - [(5)] | 57.3 | 0.00 | 71.8 | 4.0 | 0.22 | 0.10 | 58.9 |
| Serbia | 61 | 4.1 | 3.6 | 0.86 [(6)] | 180 | 0.02 | 73.4 | 4.1 | 2.349 | 1.08 | 53.9 |
| Turkey | 62 | 3.7 | 2.4 | 1.54 | 369.7 | 0.13 | 71 | 3.5 | 3.08 | 0.31 | 57.2 |

Notes: [(1)] Total Public Expenditure on Tertiary-Level Education in the analyzed countries in 2011. [(2)] Total Public Expenditure on Tertiary-Level Education in Greece in 2005. In addition, data on the amount of Total Public Expenditure on Tertiary-Level Education in Greece for the period 2002 to 2005 are available on the Eurostat website. [(3)] Total Public Expenditure on Tertiary-Level Education in Montenegro in 2002. [(4)] Total Public Expenditure on Tertiary-Level Education in North Macedonia in 2003. [(5)] Unknown. [(6)] Total Public Expenditure on Tertiary-Level Education in Serbia in 2011. Source: Prepared by authors based on [32,35–37].

### *4.2. Hypotheses*

In accordance with the set research goal, the following hypotheses were defined and tested:

**Hypothesis 1 (H1).** *Higher education is an important determinant of economic competitiveness.*

This hypothesis is defined on the basis of the study named "Regional Competitiveness, Economic Growth, and Development Phases" by Robert Huggins and Hiro Izushi. Robert Huggins

and Hiro Izushi investigated the determinants of regional competitiveness and found that education, entrepreneurship, and innovation are key factors that determine the differences in competitiveness and development of a region [38]. In designing this hypothesis, we also used the research "Strengthening Competitiveness as the Factor in Overcoming the Crisis in the Western Balkans" by Jovan Zubović and Aleksandra Bradić-Martinović [39]. In their research, Jovan Zubović and Aleksandra Bradić-Martinović applied econometric analysis in order to determine the key factors of competitiveness of the Western Balkan countries. Using factor analysis, these authors identified a statistically significant group of 10 factors that were the best to explain the level of competitiveness of an economy. The findings of the research of Jovan Zubović and Aleksandra Bradić-Martinović confirm that the quantity of education after the obligatory general level is a key variable that can significantly affect the improvement of the global competitiveness index.

**Hypothesis 2 (H2).** *The variable "Critical Thinking in Teaching" should have a statistically significant impact on "Future Orientation of Government".*

For designing the research hypothesis H2, we used the research titled "Contributions to the Development of Competencies of Primary School Teachers in Education for Sustainable Development" by Dunja Andjić, which was conducted on a sample of 740 teachers in 40 primary schools in the Republic of Croatia. The results showed that the forms of training offered to teachers do not contribute to the development of competencies (the creativity that includes competencies for cooperation and anticipatory thinking, critical individual thinking that implies socially responsible and long-term thinking, etc.), which are key for understanding and implementing the concept of sustainable development [40].

**Hypothesis 3 (H3).** *Higher education should have a significant positive impact on "Future Orientation of Government".*

In designing the research hypothesis H3, we used the theoretic paper "The Importance of Higher Education for Sustainable Economic Development" by Sandra Jednak, Dragana Kragulj, and Ivana Mijatović. The authors note that the advancement of knowledge, technology, and research is a condition for achieving economic growth, sustainable development, and creation of a knowledge-based economy. According to Sandra Jednak and colleagues, higher education should be directed towards the following dimensions: Economic, technological, and environmental dimensions [41].

**Hypothesis 4 (H4).** *Countries that have high scores in one area of quality of higher education systems generally have high scores in other areas of higher education system quality assessments, and vice versa.*

**Hypothesis 5 (H5).** *The quality of teaching in the higher education system and the quality of science and research at universities and other institutions in higher education in the analyzed countries do not depend on the amount of Total Public Expenditure on Tertiary-Level Education to a large extent.*

In defining the hypothesis H5, we were guided by the research of George Psacharopoulos and Harry Patrinos: "Returns to Investment in Education: A Decennial Review of the Global Literature". The authors, examining 1120 estimates in 139 countries in the period from 1950 to 2014, observed that returns from investing in higher education were increasing. The growth of returns from the private and social investments in higher education systems indicates the improvement in the quality of the higher education systems in the analyzed countries [42].

## 5. Results

### *5.1. Analysis of the Impact of Selected Indicators of the World Economic Forum in the Field of Higher Education on Competitiveness in the Analyzed Countries*

In order to analyze the impact of the WEF indicators in the field of higher education on the competitiveness of the economy, multiple regression analysis was applied. The results of multiple regression analysis are shown the following tables: Table 3 "Model summary", Table 4 "Analysis of variance (ANOVA) and Table "Coefficients".

**Table 3.** Model summary.

| Model | R | R Square | Adjusted R Squared | Std. Error of the Estimation |
|---|---|---|---|---|
| 1 | 0.858 [a] | 0.735 | 0.622 | 4.367 |

[a] Predictors: (Constant), ICI, RIP, DS, TPET, SP, IU, SOG, CTiT, PA.

**Table 4.** Analysis of variance (ANOVA) [a].

| Model | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| | | | | 6.48 | |
| Regression | 1113.074 | 9 | 123.657 | | 0.000 [b] |
| 1 | | | | 5 | |
| Residual | 400.474 | 21 | 19.070 | | |
| Total | 1513.548 | 30 | | | |

[a] Dependent Variables: GCI; [b] Predictors: (Constant), Skillset of Graduates (SOG), Critical Thinking in Teaching (CTiT), Total Public Expenditure on Tertiary-Level Education (TPET), Scientific Publications (SP), Research Institution Prominence (RIP), Internet Users (IU), Digital Skills among Active Population (DS), Patent Applications (PA), International Co-Inventions (ICI).

The regression equation (with nine independent variables) is statistically significantly related to the Global Competitiveness Index 4.0. (F (9,21) = 6,485; $p = 0.000 < 0.1$) (see Table 3 "Model summary" and Table 4 named "Analysis of variance (ANOVA)"). The multiple correlation coefficient in the sample is 0.858, indicating that approximately 74% of the variance of the Global Competitiveness Index 4.0 can be attributed to a linear combination of WEF indicators in higher education. It is important to note that the *B* values from the Unstandardized Coefficients column (see Table 5 "Coefficients") represent the weights related to the regression equation [43,44]. According to the *B* values, the regression equation (or the regression model) is:

*Predicted Global Competitiveness Index 4.0 = 5.282 Skillset of Graduates − 1.888 Critical Thinking in Teaching − 4.638 Total Public Expenditure on Tertiary Level of Education + 0.011 Scientific Publications − 2.182 Research Institutions Prominence + 0.193 Internet Users − 0.010 Digital Skills Among Active Population + 0.022 Patent Applications − 0.007 International Co-inventions + 37.597.*

Although this equation provides the results of the predicted criterion variable, partial slopes are not useful for understanding the relative importance of the predictor variables. They are much more comprehensible if the criteria and predictor variables are standardized to have means (average value) of 0 and standard deviations of 1 (z scores) [45]. The regression equation (or regression model) for standardized variables is:

*Z Projected Global Competitiveness Index 4.0 = 0.493 Z Skillset of Graduates − 0.228 Z Critical Thinking in Teaching − 0.298 Z Total Public Expenditure on Tertiary Level of Education + 0.456 Z Scientific Publications − 0.096 Z Research Institutions Prominence + 0.230 Z Internet Users − 0.011 Z Digital Skills Among Active Population + 0.293 Z Patent Applications − 0.010 Z International Co-inventions.*

**Table 5.** Coefficients [a].

| Model | | Unstandardized Coefficients | | Standardized Coefficient | t | Sig. | 95.0% Confidence Interval for B | | Correlations | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Lower | Upper | Zero-Order | Partial | Part |
| 1 | (Constant) | 37.597 | 11.606 | | 3.240 | 0.004 | 13.452 | 61.732 | | | |
| | SOG | 5.282 | 2.662 | 0.493 | 1.984 | 0.060 | −0.254 | 10.891 | 0.695 | 0.397 | 0.233 |
| | CTiT | −1.888 | 2.373 | −0.228 | −0.796 | 0.435 | −6.822 | 3.046 | 0.618 | −0.171 | −0.089 |
| | TPET | −4.638 | 2.841 | −0.298 | −1.633 | 0.117 | −10.547 | 1.276 | 0.385 | −0.336 | −0.183 |
| | SP | 0.011 | 0.005 | 0.456 | 2.236 | 0.036 | 0.001 | 0.021 | 0.742 | −0.439 | 0.251 |
| | RIP | −2.182 | 3.643 | −0.096 | −0.599 | 0.556 | −9.758 | 5.394 | 0.424 | −0.130 | −0.067 |
| | IU | 0.193 | 0.162 | 0.230 | 1.191 | −0.274 | −0.144 | 0.530 | 0.604 | −0.252 | 0.134 |
| | DS | −0.010 | 0.133. | −0.011 | −0.073 | 0.942 | −0.287 | 0.268 | 0.216 | −0.016 | −0.008 |
| | PA | 0.022 | 0.041 | 0.293 | 0.549 | 0.589 | −0.063 | 0.107 | 0.741 | 0.119 | 0.062 |
| | ICI | 0.007 | 0.292 | −0.010 | −0.023 | 0.982 | −0.640 | 0.600 | 0.694 | −0.005 | −0.003 |

[a] Dependent Variables: GCI.

Based on the data from Table 5, it can be concluded that the skills of people have a special role in increasing the competitiveness of the economy (as seen in the "Coefficients" Table, the "Skillsets of Graduates" variable has a positive and the strongest impact on the Global Competitiveness Index 4.0). Many economists and policymakers agree that improving qualifications and skills would be key to increasing productivity (and thus the competitiveness of the economy), and the most important prerequisite for achieving this goal is quality education [46]. In addition, analyzing the data from Table 5 (see the Standardized Coefficient Beta column), it could be seen that the variable "Scientific Publications" significantly affects competitiveness in the analyzed countries. This means that the improvement of this parameter also enables the achievement of sustainable development of the country (according to the methodology of the World Economic Forum, the achievement of sustainable prosperity requires the improvement of the country's competitive performance). It should be borne in mind that increasing the number of quality scientific papers should enable scientific knowledge that creates innovations. Furthermore, the application of innovations in an economy leads to structural changes in the production process, which results in increased competitiveness of the economy. The most competitive economies in Europe are also the most innovative. Switzerland, Sweden, Denmark, Finland, the Netherlands, and Germany are leaders in innovation in the world. What they have in common is that they all have a strong knowledge-based economy. They are characterized by a strong research and development sector with good international connections and a wide and constantly upgraded base of talented workforce [47].

From the results of the multiple regression analysis, shown in Table 5, it can be concluded that a significant improvement of the competitiveness indicator "Scientific Publications" should be the goal of policymakers in the countries that have small numbers of papers in the international citation databases (Web of Science, Scopus, PsycINFO, and INSPEC), such as Bulgaria, Slovakia, Montenegro, Northern Macedonia, and Serbia. These countries need to fund only the best researchers in order to achieve excellent research results and improve the competitiveness of their economies. This model of science funding will only be effective if other measures are introduced in parallel, such as: (1) Providing modern equipment, (2) improving working conditions, and (3) reducing the administrative responsibilities of researchers and allowing them to focus more on research. Finally, it is very important to increase the quality of national scientific journals in the mentioned countries and to enable them to be included in international databases. This will undoubtedly contribute to the dissemination of new knowledge in the industry and strengthen the competitiveness of their economies [48,49].

In order to better understand the relationships between the analyzed variables, it is useful to make a scatter plot. The scatter plot shows whether the analyzed variables are correlated positively or negatively. With a positive correlation, the line goes upwards. With a negative correlation, the line goes downwards. The scatter plot also roughly shows the strength of the correlation of the two variables. When the correlation is weak, the dots are scattered everywhere without order. When the correlation is strong, one can see the accumulation of points around the straight line (Figure 2).

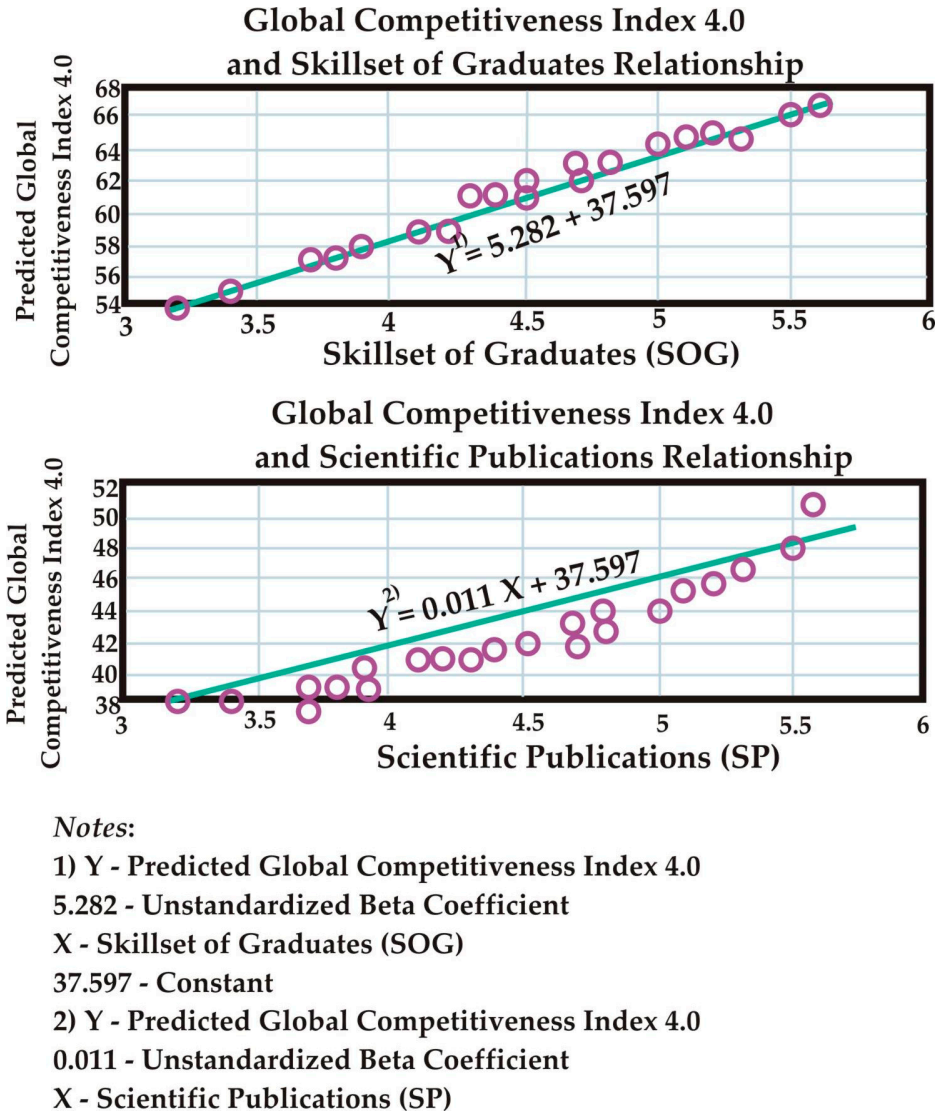


**Figure 2.** Author's diagram in Matlab.

From the previous picture, it seems that strong positive correlation between the observed variables can be discerned. Thus, countries that have high scores for the variable "Skillset of Graduates" also have high scores for the Global Competitiveness Index 4.0. Countries that have high results for the variable "Scientific Publications" also have high results for the Global Competitiveness Index 4.0.

### *5.2. Analysis of the Impact of Selected Indicators of the World Economic Forum in the Field of Higher Education on the Sub-Pillar "Future Orientation of Government"*

In the following part of the paper, we examine the impact of indicators of the World Economic Forum in the field of higher education, i.e., Skillset of Graduates, Critical Thinking in Teaching, Total Public Expenditure on Tertiary-Level Education, Scientific Publications, Research

Institution Prominence, Internet Users, Digital Skills among Active Population, Patent Applications, and International Co-Inventions, on the sub-pillar "Future Orientation of Government" (Table 6).

**Table 6.** The results of the multiple regression analysis.

| The Regression Model | Unstandardized Beta Coefficient | Standardized Beta Coefficient | Sig. | Correlation Section |
|---|---|---|---|---|
| (Constant) | 30.676 | | 0.036 | |
| Skillset of Graduates | 3.108 | 0.237 | 0.333 | 0.107 |
| Critical Thinking in Teaching | 4.898 | 0.483 | 0.094 | 0.189 |
| Total Public Expenditure Tertiary-Level Education | 0.569 | 0.029 | 0.867 | 0.018 |
| Scientific Publications | 0.000 | 0.011 | 0.956 | 0.006 |
| Institution Prominence | 0.592 | 0.021 | 0.892 | 0.015 |
| Internet Users | −0.028 | −0.028 | 0.883 | −0.016 |
| Digital Skills | −0.048 | −0.043 | 0.763 | −0.033 |
| Patent Applications | 0.034 | 0.360 | 0.491 | 0.076 |
| International Co-inventions | −0.152 | −0.182 | 0.662 | −0.048 |
| Adjusted $R^2$ | 0.650 | | | |

Source: Authors' calculation—SPSS.

According to the data in Table 6, the most significant impact on changes in the sub-pillar Future Orientation of Government as an indicator of sustainable development is from the variable Critical Thinking in Teaching, followed by the Patent Applications and Skillset of Graduates, while other variables have several times less impact on changes in the Future Orientation of Government (for example, Scientific Publications has 44 times less impact on the Future Orientation of Government than the variable Critical Thinking in Teaching. Another confirmation of this view is found in the column "Correlation Section". According to this column, if we have omitted, for example, the variable Critical Thinking in Teaching, the explanation of the variability of the dependent variable would be reduced by 23.33%, whereas if we omitted Scientific Publications, the explained variability of the dependent variable would be reduced by only 0.004%.

The scatter diagram presented in Figure 3 shows that there is a positive relationship between the variable Critical Thinking in Teaching and the sub-pillar Future Orientation of Government. The equation Y = 4.898 X + 30.676, which represents the regression line, shows that if the value of the independent variable Critical thinking in Teaching is increased by one unit, the value of the dependent variable Future Orientation of Government will increase by 489.80%.

It should be emphasized that the regression model explained 75% of the total variability of the sub-pillar "Future Orientation of Government" by the changes in nine variables ($F(9,21) = 7.185$; $p = 0.000 < 0.1$). The multiple correlation coefficient of the sample is 0.869 (see Table 7 named "Model Summary").

**Table 7.** Model Summary.

| Model | R | R Square | Adjusted R Squared | Std. Error of the Estimation |
|---|---|---|---|---|
| 1 | 0.869 [a] | 0.755 | 0.650 | 5.1439 |

[a] Predictors: (Constant), ICI, RIP, DS, TPET, SP, IU, SOG, CTiT, PA. Source: Authors' calculation—SPSS.

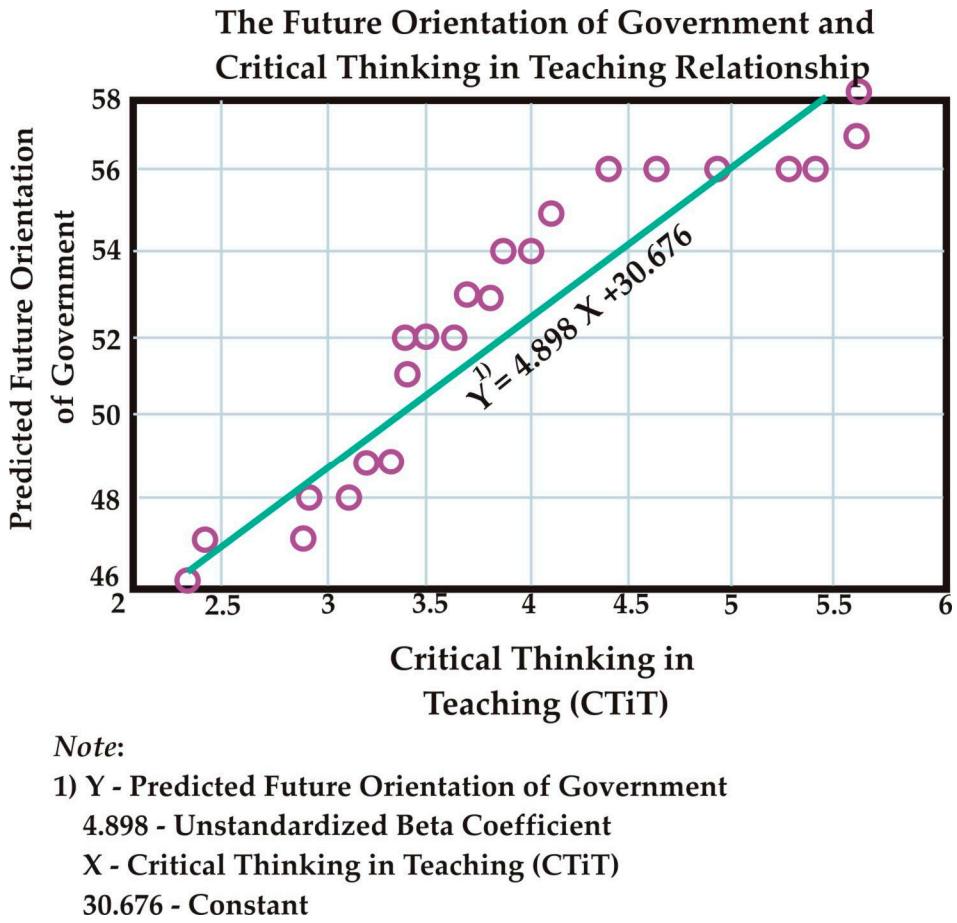


**Figure 3.** Authors' diagram in Matlab.

In the next part of this paper, a table is shown, and it shows the correlations for two variables and partial correlations of independent variables with the sub-pillar "Future Orientation of Government" (Table 8). The correlations between each independent variable and the sub-pillar "Future Orientation of Government" are positive, and one of the nine independent variables is statistically significant ($p < 0.1$). Only the partial correlation between the independent variable Critical Thinking in Teaching and the sub-pillar "Future Orientation of Government" is statistically significant. Based on these correlation analyses, the conclusion is that the only useful independent variable is Critical Thinking in Teaching. It is attributed to 71% ($0.843^2 = 0.71$) of the variance of the sub-pillar "Future Orientation of Government", while other variables participate only in an additional 4% (75% − 71% = 4%).

It should be said that when formulating the (mentioned) conclusions, information on the statistical significance of the influence of individual variables from the "Sig." column (Table 6) was ignored. The impact of the variables "Skillset of Graduates", "Critical Thinking in Teaching", "Total Public Expenditure on Tertiary-Level Education", "Scientific Publications", "Research Institution Prominence", "Internet Users", "Digital Skills among the Active Population", "Patent Applications", and "International Co-Inventions" on the sub-pillar "Future Orientation of Government" is not statistically significant, because their $p$ values (see column "Sig." in Table 6) are above the threshold of statistical significance (0.1 or 10%). This would imply that the influence on the Future Orientation of Government is rigorously confirmed only for Critical Thinking in Teaching (see column "Sig." in Table 6), which may be due to the narrow specification period of the regression model.

The result of the regression model confirms the hypothesis that changes in the pillars of competitiveness, expressed through the dynamics of selected independent variables, have a statistically

significant impact on the sub-pillar Future Orientation of Government as an indicator for assessing sustainable development.

The results obtained by this research show that inventions or innovations play the key role in achieving sustainable development. The development of so-called ecological innovations will help us, in a direct or indirect way, to reconnect with nature, ensure continuous economic development, and leave a legacy for upcoming new generations of the same state of the environment [50]. The conducted research also showed that critical thinking has a significant place in the process of achieving sustainability. In addition to critical thinking, the competencies required for sustainability are also the competence for anticipatory thinking, the competence for strategic thinking, and the competence for self-awareness (in terms of thinking about one's own role in the local community and society) [5].

In short, tertiary education should enable all individuals to contribute to achieving the goals of sustainable development of the 2030 Agenda, providing them the necessary knowledge and competencies [7].

In the following section, two-dimensional and partial correlations of the five indicators of the World Economic Forum are examined. The goal is to contribute to a clearer understanding of the impact of public expenditure on higher education on the indicators of the World Economic Forum in the domain of higher education.

**Table 8.** Correlations for two variables and partial correlations of independent variables with the sub-pillar "Future Orientation of Government".

| Independent Variable | Correlation Between Each Independent Variable and the Global Competitiveness Index 4.0 (GCI 4.0) | Correlation Between Each Independent Variables and GCI 4.0 by Controlling Other Independent Variables |
|---|---|---|
| SOG | 0.782 | 0.211 |
| CTiT | 0.843 * | 0.357 * |
| TPET | 0.600 | 0.370 |
| SP | 0.530 | 0.012 |
| RIP | 0.208 | 0.30 |
| IU | 0.648 | −0.033 |
| DS | 0.045 | −0.067 |
| PA | 0.777 | 0.151 |
| ICI | 0.694 | −0.096 |

* $p < 0.1$; Source: Authors' calculation—SPSS.

### *5.3. Correlation Analysis between Selected Indicators of the World Economic Forum in the Field of Higher Education*

We hypothesized that countries that have high scores in one area of higher education system quality are also more likely to have high scores in other areas of higher education system quality (see Hypothesis 4 in Section 4.2. "Hypotheses"). In order to test this hypothesis, we collected results for five variables from the regression model in the previous section. The variables are the following: Skillset of Graduates, Critical Thinking in Teaching, Scientific Publications, Research Institution Prominence, and Total Public Expenditure on Tertiary-Level Education. The variables Skillset of Graduates and Critical Thinking in Teaching are used as measures of the quality of teaching in the higher education system. The quality of science and research at universities and other institutions in higher education is assessed by the following indicators: Scientific Publications and Research Institution Prominence.

In this study, we are particularly interested in the partial correlations between the four variables for the quality of the higher education systems in the areas of assessment, excluding the impact of the control variables Total Public Expenditure on Tertiary-Level Education. In other words, we calculated partial correlations in order to evaluate why the measures for quality of teaching in higher education and the variables for quality of science and research at universities and other institutions in higher

education are mutually interrelated. One possible explanation is the "common cause hypothesis" (Figure 4) [51]. According to the "common cause hypothesis", the variables for the quality of the higher education system in the areas of assessment are positively interconnected because they have a common cause—Total Public Expenditure on Tertiary-Level Education. If this hypothesis is correct, the two-dimensional correlation between the these variables should be different from zero ($r \neq 0$), but the correlation between the analyzed variables, excluding the impact of Total Public Expenditure on Tertiary-Level Education, should be approximately zero ($r = 0$).

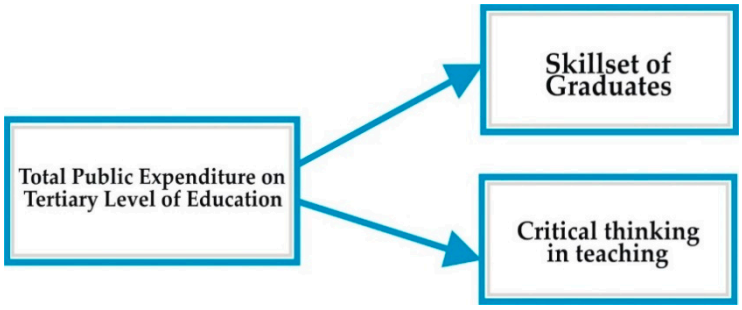


**Figure 4.** Common cause hypothesis (Source: Prepared by authors based on [51]).

The requirements of two-dimensional and partial correlation research concern, first, the magnitude of the correlation between each of the five variables, and then the magnitude of the correlation between the four variables, excluding the influence of the control variable Total Public Expenditure on Tertiary Level of Education.

(1) Correlations between the two variables (two-dimensional correlation): Do the countries with high scores in one area of higher education strength or quality assessment generally have high scores in other areas of higher education quality assessment?

(2) Partial correlation between variables, excluding the influence of the control variable: If the quality of the higher education system in the analyzed countries largely depends on Total Public Expenditure on Tertiary-Level Education, do the analyzed countries generally have high scores in one area of higher education system quality assessment when they have high scores in another area of higher education system quality assessment, or not?

In order to fully respond to these research requirements, it is necessary to calculate both two-dimensional and partial correlations. The results of the two-dimensional and partial correlations are shown in Table 9. Each cell in Table 9 shows certain correlation coefficients (correlations between two variables or partial correlations), the $p$ values of the certain correlations (marked "Significance"), and the degrees of freedom ($df = N - 2$).

Two-dimensional correlation coefficients (or Pearson's correlation coefficients) were calculated between the five variables. In order to revise the statistical significance threshold, Bonferroni's approach was used, which requires that the division of 0.05 (significance level) by the number of calculated (two-dimensional) correlations ($0.05/10 = 0.005$) is used to correct the statistical significance threshold. According to this approach, the correlation is statistically significant if the $p$ value of the two-dimensional correlation is less than the revised value of the statistical significance threshold. Generally, 6 out of 10 two-dimensional correlations are statistically significant and greater than or equal to 0.506 (positive correlations). The two-dimensional correlations between pairs of independent variables that are lower and not statistically significant include: (1) Skillset of Graduates and Research Institution Prominence; (2) Critical Thinking in Teaching and Research Institution Prominence; (3) Scientific Publications and Total Public Expenditure on Tertiary-Level Education; and (4) Research Institution Prominence and Total Public Expenditure on Tertiary-Level of Education. Generally speaking, the results of the two-dimensional correlation indicate that if countries have a

high score in one area of higher education system quality assessment, they usually have high scores in other areas of higher education system quality assessment as well.

The partial correlation coefficients were then calculated between the variables Skillset of Graduates, Critical Thinking in Teaching, Scientific Publications, and Research Institution Prominence, maintaining constant the variable Total Public Expenditure on Tertiary-Level Education. According to Bonferroni's approach, the value of $p$ should be less than 0.05 divided by 6 (number of calculated correlations), or 0.008, for the (partial) correlation to be declared as statistically significant. Two of the six partial correlations are statistically significant and large. One of the two statistically significant (and large) partial correlations is the partial correlation between the two measures of quality of the higher education system that are related to the quality of learning and teaching (partial correlation between the variables Skillset of Graduates and Critical Thinking in Teaching, r = 0.715, $p = 0.000 < 0.006$), while the other is the partial correlation between the two measures aimed towards assessing the quality of science and research at the universities (partial correlation between variables Scientific Publications and Research Institution Prominence, r = 0.617, $p = 0.000 < 0.008$). If Total Public Expenditure on Tertiary-Level Education were the only decisive factor in assessing the quality of the higher education system in specific areas, all parity correlations would be zero.

**Table 9.** Correlations.

| Control Variables | | | SOG | CTiT | SP | RIP | TPET |
|---|---|---|---|---|---|---|---|
| −none- [a] | SOG | Correlation | 1.000 | 0.841 | 0.513 | 0.281 | 0.685 |
| | | Significance (2-tailed) | | 0.000 | 0.003 | 0.126 | 0.000 |
| | | Df | 0 | 29 | 29 | 29 | 29 |
| | CTiT | Correlation | 0.841 | 1.000 | 0.506 | 0.170 | 0.649 |
| | | Significance (2-tailed) | 0.000 | | 0.004 | 0.360 | 0.000 |
| | | Df | 29 | 0 | 29 | 29 | 29 |
| | SP | Correlation | 0.513 | 0.506 | 1.000 | 0.584 | 0.343 |
| | | Significance (2-tailed) | 0.003 | 0.004 | | 0.001 | 0.059 |
| | | Df | 29 | 29 | 0 | 29 | 29 |
| | RIP | Correlation | 0.281 | 0.170 | 0.584 | 1.000 | 0.014 |
| | | Significance (2-tailed) | 0.126 | 0.360 | 0.001 | | 0.914 |
| | | Df | 29 | 29 | 29 | 0 | 29 |
| | TPET | Correlation | 0.685 | 0.649 | 0.343 | 0.014 | 1.000 |
| | | Significance (2-tailed) | 0.000 | 0.000 | 0.059 | 0.914 | |
| | | Df | 29 | 29 | 29 | 29 | 0 |
| TPET | SOG | Correlation | 1.000 | 0.715 | 0.407 | 0.372 | |
| | | Significance (2-tailed) | | 0.000 | 0.026 | 0.043 | |
| | | Df | 0 | 28 | 28 | 28 | |
| | CTiT | Correlation | 0.715 | 1.000 | 0.397 | 0.212 | |
| | | Significance (2-tailed) | 0.000 | | 0.030 | 0.261 | |
| | | Df | 28 | 0 | 28 | 28 | |
| | SP | Correlation | 0.407 | 0.397 | 1.000 | 0.617 | |
| | | Significance (2-tailed) | 0.026 | 0.030 | | 0.000 | |
| | | Df | 28 | 28 | 0 | 28 | |
| | RIP | Correlation | 0.372 | 0.212 | 0.617 | 1.000 | |
| | | Significance (2-tailed) | 0.043 | 0.261 | 0.000 | | |
| | | Df | 28 | 28 | 28 | 0 | |

[a] Cells contain zero-order (Pearson) correlations; Source: Authors' calculation—SPSS.

The results of the partial correlation analysis do not confirm hypothesis H5, which says that the quality of the higher education system in the areas of assessment largely depends on the level of Total Public Expenditure on Tertiary-Level Education. The study of two-dimensional and partial correlation between the five selected independent variables, which included 32 countries, shows that there is "significant space" for public policy engagement in certain areas, such as the adoption of new information and communication technologies, digital skills of the population, or some others. Namely,

new information and communication technologies create the preconditions for engaging all the senses in the process of acquiring new knowledge, developing creativity, and providing greater activities in the process of education and business. Therefore, information science and information technology are considered to be significant contents of the educational process at all their levels [52,53].

Considering the above, it can be concluded that informatics and information technologies by themselves have a positive effect on the quality of the entire education system and, consequently, on the ability of society to generate economic well-being, which is actually the starting point of a nation's competitiveness.

## 6. Conclusions

Multiple regression analysis was used to explore the interdependence between higher education, competitiveness, and sustainable development. The hypothesis that states that higher education appears as one of the factors that determines the level of competitiveness of an economy has been confirmed. The level of competitiveness of the economy, on the other hand, significantly determines the sustainable level of prosperity achieved by an economy. The obtained research results show that the higher education system—which, according to the Report of the World Economic Forum in 2019, is represented by the variables "Skillset of Graduates", "Critical Thinking in Teaching", "Scientific Publications", etc.—has a statistically significant impact on the sub-pillar "Future Orientation of Government". The reform of education policy in the analyzed countries should be aimed at increasing the number of highly educated members of the population and improving the quality of the teaching process, but also toward maximizing the direct effects of the higher education system on sustainable development.

Using data from 32 countries in Europe, the hypothesis that speaks of the connection between quality measures of the higher education system in the areas of assessment was confirmed. Finally, one can speculate about the reasons for the "deficiency" of the research results. The technical specification of regression models conditioned by the thematic setting of the research, which implies a short observation period, the relatively large number of independent variables (nine), etc. can be taken as the most acceptable. Another significant limitation of the research refers to the shortcomings of the WEF and Eurostat indicators ("How well are the mentioned indicators grounded in theory?", "Are they logically defined?", "How well can they be measured and aggregated?", and the like).

Further scientific contribution in this area could be achieved by analyzing the relative position of economies within the pillars of the World Economic Forum with respect to higher education and sustainable development. Similarly, further research should, based on the geometric growth rate, measure the progress of each category (indicators, sub-pillars, etc.) within pillars of the World Economic Forum concerning higher education and sustainable development. In order to obtain more precise insights into the relationship between higher education, competitiveness of the economy, and sustainable development, researchers should use other methods (benchmarking, comparative methods in the dynamics of time, etc.).

Based on the above results of the research, certain recommendations can be formulated that will significantly contribute to the improvement of economic competitiveness and the achievement of sustainable development in the observed countries. In that sense, it is proposed that the measures and activities of the competent state bodies in the coming period should be aimed: (1) Towards the development of abilities, knowledge, and skills that will increase the competitiveness of graduates in the labor market, and (2) towards the stimulation of activities of higher education institutions in areas of key importance for the preservation of the planet in order to enable life for future generations.

Analysis of the impact of the WEF indicators in the field of higher education on the Global Competitiveness Index 4.0 showed that increasing the quality of graduates' skills can contribute to improving the competitiveness of an economy and, thus, achieving sustainable development. In that sense, we believe that the corrective activities of the competent authorities in the analyzed states should be directed towards education, training, and development of student skills through the organization of

new student internship programs, the formation of university business incubators, the provision of greater financial incentives for the entry of as many companies and universities into the dual education system, the stimulation of stronger connections between science and economy by introducing tax and other incentives, the nurturing of talent and support of talented individuals and institutions involved in their training, the motivation of educated people to return to their home countries, etc. It is very important that, when developing the above recommendations, the competent authorities in the analyzed states take into account the specifics of their own economies and the specifics of their own systems of (higher) education.

It should be underlined that the conducted analysis showed that the higher education system greatly contributes to the generation of sustainable development of national economies. In this regard, we believe that in order to achieve the goals of sustainable development of the Agenda 2030, it is necessary that higher education institutions align visions, goals, and actions with a "green" discourse on sustainable development that includes prioritizing nature and social well-being [7].

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