

How Does the Supply of Tertiary Graduates Correlate with the Labour Market? Evidence from European Countries

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Abstract

It is well-known that the education level has significant impact on employment prospects on the labor market. Despite a slight decrease in the number of tertiary graduates in 2018-2019, the year 2020, when the COVID-19 pandemic began, was marked by an increase in the indicator-level. In the long term, the supply of tertiary graduates registered an upward trend. The paper performs - in a note of originality - a cluster analysis of the European countries by the correlation between the evolution of the graduates with higher education and that of the employment rate of the highly qualified, in order to identify the main behavioral patterns. As a novelty element, the paper tests the hypothesis of the existence of statistically significant changes from the perspective of the share of tertiary graduates and that of the employment rate of highly educated, during the current pandemic crisis compared to the previous global financial crisis. The results indicated an important improvement only of the second indicator, which shows the need to develop policies to stimulate the youth to raise their education level, and thus improve the situation on the labor market, even in crisis times.

Keywords

Education level, tertiary graduates, employment, cluster analysis, non-parametric test.

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Introduction

A widely recognized fact is that the education level of people who are involved or want to be involved on the labor market is one of the key factors of work performance, bringing a benefit to the society as a whole. That is why the way in which the transition from school to the labor market is made, but also the involvement in the education and training process throughout adulthood is of significant importance, especially in the conditions of the expansion of digitalization in all areas of life (Central Statistics Office, 2021). Currently, at EU level, the employment rate for tertiary educated is 85% (ISCED 5-8), compared to 72.8% for upper secondary, post-secondary non-tertiary education (ISCED 3-4), or to 54.9% for less than primary, primary and lower secondary education (ISCED 0-2) (Eurostat database, 2021). Given that the number of higher education graduates followed an increasing trend, accentuated in 2020 by the onset of the COVID-19 pandemic, the question arises whether this changes the employment conditions on the labor market, whether it puts increasing pressure on the demand for qualified workforce, with effects on salary incomes. Some studies have pointed out the increasing gaps between the skills and knowledge required at the workplace and those of their occupants, something seen as a potential threat to the long-term economic prosperity of the countries in question (SHRM, 2019; Bouchrika, 2022). The quality of higher education institutions has a significant influence on the results obtained on the labor market (Baciu, 2022; Epuran et

al, 2016; Deaconu et al, 2014; Chebeñ et al, 2020), but more extensive data are needed regarding the situation in several countries of the world, especially in countries with a centralized university education system.

In this context, the general objective of this paper is to analyze the situation of graduates with higher education in European countries, as well as their transition to the European labor market in the last 10 years. Also, the analysis considered the following specific objectives: to analyse the higher education graduates, both in total and by fields of study, by time and space coordinates; to analyse the labor market situation of employees with tertiary education - evolution over time and variation in territorial profile; to analyse the correlation between the evolution of graduates with tertiary education and that of the employment of the highly qualified population on the labor market; to identify the behavioral patterns of European countries with respect to the correlation between these two statistical indicators.

The paper has three parts: the first part reviews the main results of the scientific literature referring to the relation between the education level and the employment level; the second part presents the methodology applied and the data set; the third part shows the main results of the analysis performed, subordinated to the main and the specific objectives. The paper ends with a sum of the main conclusions of this research.

Review of the scientific literature

In a survey conducted by the Society for Human Resource Management (SHRM) in 2019 on HR specialists in the US, it was found that more than half of the respondents believe that the contribution of the education system to reducing the skills shortage is low, while 83% of them had difficulties in finding the right employees in the last 12 months. Among the latter, 75% recognized the existence of a skills shortage among applicants for certain jobs, which led to a decrease in the quality of candidates, especially since the phenomenon has significantly worsened in the last two years (SHRM, 2019). Other authors reduce this problem of skills mismatch to an overqualification of candidates for a job, at least in some countries, appreciating the ability of workers who have acquired knowledge and skills through the education system to respond to economic shocks (Machin and McNally, 2007). The transversal skills acquired by recent graduates from the higher education system are essential in their integration into the labor market, especially in a market affected by numerous social, economic or technological changes (Belchior-Rocha, Casquilho-Martins and Simões, 2022). Some other studies focused on the analysis of trends in higher education, especially in the conditions of the manifestation of the COVID-19 pandemic. Thus, one of the major changes that took place in higher education was the transition from classic, traditional education to online education, the openness shown by many universities for this flexible, innovative form of learning. But some authors are of the opinion that these changes are only formal, giving the impression of a reform of the education system, but they do not address the real problems that this system is facing. The problem of accessibility to the higher education system of the less privileged social categories, but also of the quality of knowledge and applied methods, still remains to be solved (World Economic Forum, 2022). The problem of inequalities in terms of access to tertiary education, especially depending on income, was also pointed out by Nascimento, Mutize and Chinchilla (2020), noting, however, that, despite these problems, globally, access to tertiary education has increased in the last two decades, the gross enrollment ratio in tertiary education practically doubled (from 19% to 38%). Numerous studies and analyzes have focused on studying the link between the outcome of the higher education system and the labor market, on the influence of the education level of the participants in the labor market on the employment situation on this market. Thus, Machin and McNally (2007) analyzed whether the increasing supply of graduates with tertiary education led to a change in conditions on the labor market. The main conclusions reached by the authors were: the increase in the supply of graduates with higher education was not excessive, which would put real pressure on the labor market, the average salary difference between tertiary education graduates and other graduates is significant. Also, employers have shown the desire to employ more and more highly qualified workers in their companies. Although the supply of graduates with tertiary education has increased, the salaries of highly qualified employees have continued to increase or have remained constant in most countries. At the same time, this increase in the supply of graduates with tertiary education has led to an increase in the demand for highly qualified employees, as there are more and more positions that require technological, innovative skills (Machin and Manning, 1997; Katz and Autor, 1999; Acemoglu, 2002; Machin and Van Reenen, 2006; Machin and McNally, 2007). The studies show that there is limited evidence regarding the value of graduation diplomas, the returns of the qualification degree, depending on the field of study of the graduates, suggesting a wide heterogeneity of these gains by field of study. Due to the fast pace of demand growth for science and technology jobs, there is a shortage of graduates who have trained in these fields, the demand being covered to some extent by the mobility of graduates from other countries. An OECD study analyzed the benefits of education on employment prospects on the labor

market. Thus, there is a direct correlation between the education level of those looking for a job and employment prospects, with more pronounced differences between those with upper secondary education and those without this education level. Also, there is evidence in all OECD countries that employment opportunities are significantly higher for tertiary education graduates than for other types of graduates, and higher for men than for women. In the year the report was drawn up, 83% of the population with tertiary education was in employment, a significantly higher percentage than in the case of the population with upper secondary education. The employment gender gap decreases with the increase in the education level, which can be partially explained by the over- or under-representation of women in some fields of education, compared to men (for example, women are under-represented in high-technology domains, in engineering, manufacturing and construction and are overrepresented in education, health and welfare) (OECD, 2012). Wolbers (2000) analyzed the correlation between the level of education and unemployment, based on panel data for the Netherlands. The author came to the conclusion that employees with the lowest level of education face the greatest risk of becoming unemployed, compared to employees with the highest level of education. At the same time, the effect of education on unemployment differs according to gender. A second conclusion of the authors is that the unemployed with a higher level of qualification have higher chances to re-engage in work compared to the unemployed without qualification, and this effect differs according to the aggregate unemployment rate, gender and unemployment duration. In the same idea, Epuran et al (2016) showed that in many European countries there is evidence of a strong correlation between the level of education completed and the chances of employment, tertiary education leading to a significant increase in these chances, compared to other lower education levels.

Data and methodology

The selection of statistical indicators used in the analysis was aimed at capturing the importance of the education level on the employees' situation on the labor market under two aspects: on the one hand, the results/outcomes of the education system (considering the graduates with higher education - as a number and as a share in the population aged 20-34); on the other hand, as the employment level on the labor market of the highly educated population (through the prism of the employment rate of the population with tertiary education). A detailed description of the statistical indicators included in the analysis can be found in table no. 1.

Table no. 1. Description of statistical indicators included in the analysis

Indicator name	Measurement unit	Space/time coordinates	Source
Population on 1 January by age group	Number (persons)	31 European countries 2013-2022	Eurostat Online code: DEMO_PJAN
Graduates by education level, field of education	Number (persons)	31 European countries 2013-2020	Eurostat Online code: EDUC_UOE_GRAD02
The share of graduates with tertiary education (ISCED 5-8) in the total population aged 20-34	%	31 European countries 2013-2021	Calculated by the authors, based on Eurostat data
Employment by educational attainment level	Thousand persons	31 European countries 2013-2020	Eurostat Online code: LFSI_EDUC_A
Employment rates by educational attainment level	%	31 European countries 2013-2021	Eurostat Online code: LFSI_ERGAED

Source: authors' selection.

The data were provided by Eurostat database for 31 European countries (EU and non-EU members), for the time period 2013-2020. 2020 was the last year for which data on graduates (total number and by field of study) were available, therefore, in the analysis, the level of indicators regarding graduates and employment of the population with tertiary education in 2020 compared to 2013 was compared.

In the first part of the analysis, a descriptive statistical analysis of the selected indicators was applied, characterizing the central tendency and the variability of their level in territorial profile, at the level of the European countries, as well as the distribution shape of the European countries included in the analysis from the point of view of graduates with higher education, by field of education and training. At the same time, a temporal analysis was carried out, of the evolution of the number and share of graduates with higher

education, as well as the employment rate of the population with tertiary education, in the period 2013-2020, based on specific time series statistical indicators. In order to verify some working hypotheses on the existence of significant changes in the level of the selected indicators, at the end of the time period analyzed compared to the beginning, non-parametric statistical tests for paired samples (Wilcoxon signed ranks test and Sign test) were used. The correlation method enhanced the analysis of the existence of a significant correlation between the share of graduates with higher education and the employment rate of the highly qualified population, as evolutions over time. The results of the correlation method were used as input data in the cluster analysis, in order to identify country- groups with different behaviors in terms of how the share of graduates with higher education and the employment rate of the highly qualified population evolved in the period 2013-2020 (Hierarchical and Non-hierarchical Cluster Analysis).

Results and discussions

At the level of the European Union, in the period 2013-2019, the number of graduates with ISCED 5-8 education level (tertiary education) recorded some fluctuations around an approximately constant level, with a peak in 2017 (of 3991 thousand people) and a decrease quite pronounced in 2018 and 2019 (almost 3%). However, there is a strong return of the number of graduates with higher education in 2020, very likely against the background of the onset of the COVID-19 pandemic, of the transition from the classical traditional school to the online school (4240 thousand graduates). As a share of higher education graduates in the 20-34-year-old population, a similar evolution was recorded, in 2020 the percentage increased to 5.37% (from 4.92% in 2019) (Figure no. 1).

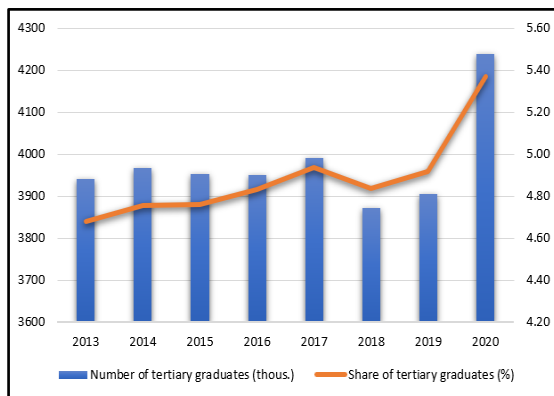


Figure no. 1. The number of graduates with tertiary education (thousand persons) and the share of tertiary graduates in population aged 20-34 (%), EU level, 2013-2020

Source: authors' contribution, based on Eurostat data.

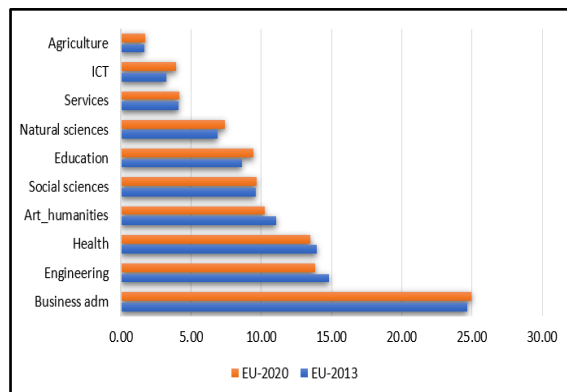


Figure no. 2. The share of tertiary graduates in population aged 20-34 (%) by field of education, EU level, in 2013 and 2020

Source: authors' contribution, based on Eurostat data.

There were, however, some important territorial variations in the level of the two indicators. Thus, in 2020, Hungary recorded an almost 10% share of graduates with higher education (9.93% of the population aged 20-34), while in Luxembourg only 1.38% of the young population graduated from an educational institution superior in the same year. Other countries with high shares of graduates with tertiary education - over 7% - were Ireland (9.78%), France (7.31%) and Denmark (7.13%). At the opposite pole - with less than 4% - were Slovakia (3.60%), Malta (3.68%), Estonia (3.71%), Czechia (3.78%), Romania (3.80%), Bulgaria and Germany (3.97%).

Next, we analyzed the distribution of graduates with tertiary education on fields of education and training. The following areas were considered (according to the *International Standard Classification of Education – Fields of education and training ISCED-F 2013*) (UNESCO Institute for Statistics, 2015): Education; Arts and humanities; Social sciences, journalism and information; Business, administration and law; Natural sciences, mathematics and statistics; Information and Communication Technologies; Engineering, manufacturing and construction; Agriculture, forestry, fisheries and veterinary; Health and welfare. In the year 2020, at the EU level, it is noticeable that the graduates are especially directed towards Business, administration and law (25.14%, in a slight decrease compared to 2013), Engineering, manufacturing and construction (14.83% - with an approximately 1% decrease compared to 2013) and towards Health and welfare (13.46%, slightly lower than in 2013). The fields with the lowest share of tertiary graduates are Agriculture, forestry, fisheries and veterinary (1.87%) and - surprisingly - Information and Communication Technologies (with only 3.92%), although it is a field with explosive growth and an ever-increasing demand. The fields that registered increases in the share of graduates with higher education in total

graduates in 2020 compared to 2013 are Education (by 1.4%), Information and Communication Technologies (by almost 0.8%) and Natural sciences, mathematics and statistics (by almost 0.5%) (Figure 2).

Considering the distribution of European countries by the share of tertiary graduates, for each field of education and training, in 2020, we can characterize these distributions as follows: in terms of central tendency, Business, administration and law has the highest mean, almost twice higher than the two next fields (Engineering, manufacturing and construction and respectively Health and welfare). In terms of variability, Agriculture, forestry, fisheries and veterinary, on the one hand, and Services, on the other hand – experienced the highest relative variability (with a coefficient of variation that exceeds 50%). At the opposite pole two domains: Arts and humanities and respectively Social sciences, journalism and information recorded the lowest relative variability (with a coefficient of variation lower than 35%). In terms of the distribution shape, fields like: Business, administration and law, Natural sciences, mathematics and statistics and Engineering, manufacturing and construction have positive skewness, these fields being characterized by a predominance of the countries with large shares of tertiary graduates (larger than the mean). Other domains, like Social sciences, journalism and information – are negatively skewed, with a predominance of countries with a lower than average share of graduates with tertiary education. Also, country-distribution by the share of tertiary graduates in Business, administration and law, in Arts and humanities and in Natural sciences, mathematics and statistics have positive kurtosis, revealing that these distributions present a higher risk of the occurrence of outliers than the normal distribution (Figure no. 3).

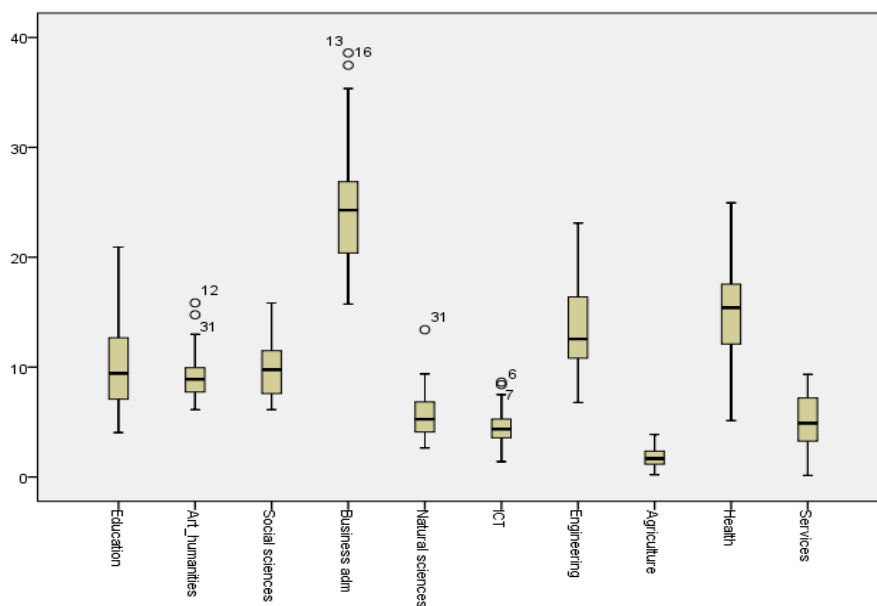


Figure no. 3. Box-and-Whisker Plot - European countries by the share of tertiary graduates by field of education (%) in 2020

Source: authors' contribution, based on Eurostat data.

In order to characterize the situation on the labor market of the population with higher education, the Employment rate by educational attainment level – tertiary education (ISCED 5-8) was analyzed, for 31 European countries, between 2013 and 2021. For the entire period, at EU-level, the indicator-level exceeded the overall employment rate, following an upward trend, but with an average annual growth rate equal to half of that of the overall employment rate. (Figure no.4). The 2021 top 3 countries with the highest employment rate of the tertiary educated population include: Malta (90.2%), Poland and Hungary (89.9%). The last countries ranked from this point of view are three Southern European countries: Greece (75.1%), Italy (79.2%) and Spain (79.7%). In order to analyze the changes over time regarding the share of tertiary graduates in the population aged 20-34 and the employment rate of highly educated, the following working hypotheses were formulated:

- WH1: In 2020 the share of tertiary graduates significantly changed compared to 2013.
- WH2: In 2020 the employment rate of highly educated significantly changed compared to 2013.

Since the two continuous quantitative variables are not normally distributed, non-parametric tests for paired samples were applied (Wilcoxon signed ranks test and Sign test). In the case of the first hypothesis tested, both tests indicated the acceptance of the null hypothesis, according to which there was no statistically

significant change in the share of graduates with tertiary education in 2020 compared to 2013, and therefore WH1 hypothesis is not validated (for 5% significance level).

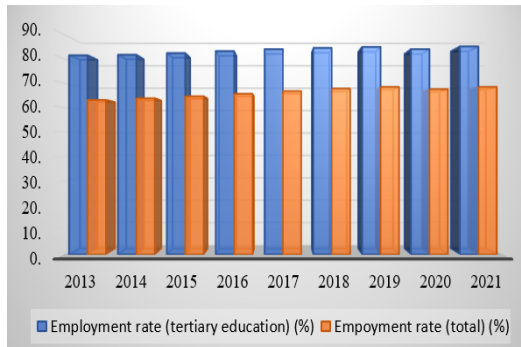


Figure no. 4. Overall employment rate (%) and Employment rate – tertiary education (%), EU-level, 2013-2021

Source: authors' contribution, based on Eurostat data.

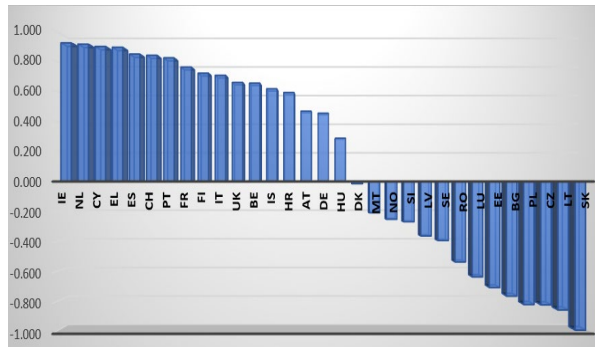


Figure no. 5. Correlation Coefficient between the share of tertiary graduates (%) and the employment rate of tertiary educated (%), European countries, 2013-2020

Source: authors' contribution, based on Eurostat data

Regarding the second working hypothesis, both the Wilcoxon signed ranks test and the Sign test indicated that there are not enough reasons to accept the null hypothesis, so the conclusion formulated is that the employment rate of tertiary educated significantly changed (increased) in 2020 compared to 2013 – and therefore WH2 hypothesis is validated (for 5% significance level) (Tables no. 2 and 3).

Table no. 2. Wilcoxon Signed Ranks Test results

Test Statistics ^a		
	Z	Asymp. Sig. (2-tailed)
Share_tertiary_graduated_2013 - Share_tertiary_graduated_2020	-1.548 ^b	.122
Empl_rate_tertiary_educ_2013 - Empl_rate_tertiary_educ_2020	-4.489 ^b	.000

a. Wilcoxon Signed Ranks Test
b. Based on positive ranks.

Table no. 3. Sign Test results

Test Statistics ^a		
	Z	Asymp. Sig. (2-tailed)
Share_tertiary_graduated_2013 - Share_tertiary_graduated_2020	-1.078	.281
Empl_rate_tertiary_educ_2013 - Empl_rate_tertiary_educ_2020	-3.951	.000

a. Sign Test

Source: authors' contribution, based on Eurostat data.

In the next stage of the analysis, we wanted to see if the evolution over time of the share of graduates with tertiary education is correlated with that of the employment rate of tertiary educated, for the analyzed European countries. The correlation matrix indicated values from -0.995 (in the case of Slovakia) to 0.928 (Ireland), with a predominance of high values, close to 1, in absolute value (Figure no. 5).

Using the Hierarchical and Non-hierarchical Cluster Analysis, the European countries were clustered into 4 groups, by the correlation coefficient between the share of tertiary graduates and the employment rate of tertiary educated (Figure no. 6).

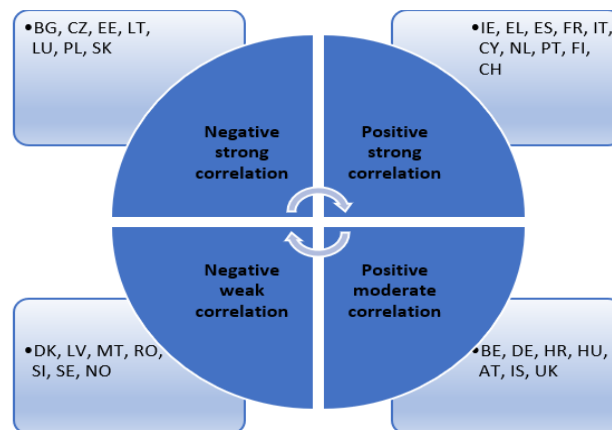


Figure no. 6. Country-clusters by the correlation between the share of tertiary graduates (%) and the employment rate of tertiary educated (%), 2013-2020

Source: authors' contribution, based on Eurostat data

The clusters are characterized as follows:

Cluster 1: BG, CZ, EE, LT, LU, PL, SK - Negative strong correlation - the share of tertiary graduates have decreased, with an average annual rate between 0.47% (Luxembourg) and almost 6% (Slovakia); meanwhile, the employment rate of those tertiary educated have increased with an average annual rate between 0.05% (Luxembourg) and 1.18% (Bulgaria). Correlation ratio have negative values, revealing an inverse relation between the evolution of the two statistical indicators - ranges between -0.71 and -0.995. The decreasing rate in the share of tertiary education graduates was higher, in absolute value, than the increasing rate in the employment rate of highly educated population.

Cluster 2: DK, LV, MT, RO, SI, SE, NO – Negative weak correlation – the two indicators had, in general, similar evolutions to those in the first cluster, but their average annual rate of evolution - although in opposite directions - were closer in absolute terms. The exception was Norway, where % of tertiary graduates in pop. aged 20-34 increased by 2.25% on average per year, while the employment rate of tertiary educated decreased very slightly. For the countries in this group, the correlation coefficients varied between -0.015 and -0.395.

Cluster 3: IE, EL, ES, FR, IT, CY, NL, PT, FI, CH – Positive strong correlation – both indicators followed an upward trend of evolution in the period 2013-2020, but the share of graduates with higher education grew at an average annual rate faster than the employment rate of the highly qualified. Thus, the first indicator increased by 0.8% - 7.55% on average per year (Switzerland, respectively Cyprus), and the second indicator increased with an average annual rate between 0.11% (Switzerland) and 1.34% (Portugal). The correlation coefficients among the countries in this cluster varied between 0.711 (Italy) and 0.928 (Ireland).

Cluster 4: BE, DE, HR, HU, AT, IS, UK – Positive moderate correlation - the two indicators had, in general, similar evolutions to those in the third cluster, both the share of tertiary graduates and the employment rate of highly educated people experiencing an upward trend. There was an exception, Iceland, where both indicators followed a downward trend. The correlation coefficient has positive values, showing a direct correlation between the indicators, its values ranging between 0.289 (Hungary) and 0.663 (UK).

Conclusions

In the long term, at EU-level, the supply of tertiary graduates registered an upward trend. Despite the fact that the number of graduates with tertiary education decreased in 2018 and 2019, 2020 was marked by a significant increase in the indicator-level. In 2020, the share of tertiary graduates in the population aged 20-34 ranges between 1.38% (Luxembourg) and 9.93% (Hungary). In the same year, the graduates are predominantly directed towards Business, administration and law (25.14%), Engineering, manufacturing and construction (14.83%) and Health and welfare (13.46%). Agriculture, forestry, fisheries and veterinary and Information and Communication Technologies are the fields with the lowest share of tertiary graduates (1.87%, respectively 3.92%). Referring to the employment rate of tertiary educated, for the entire period (2013-2020), at EU-level, the indicator-level was higher than the overall employment rate, following an upward trend, but with an average annual growth rate much lower than that of the overall employment rate. In order to analyze the changes over time regarding the share of tertiary graduates in the population aged 20-34 and the employment rate of highly educated, two working hypotheses were formulated. Following the application of non-parametric statistical tests, the working hypothesis claiming that *the share of tertiary graduates significantly changed in 2020 compared to 2013* was not validated. But the working hypothesis which states that *the employment rate of highly educated significantly changed in 2020 compared to 2013* was validated. In the next stage of the analysis, the correlation between the evolution over time of the share of tertiary graduates and the evolution of the employment rate of tertiary educated was analyzed. For almost all European countries, the values of the correlation coefficient range between -0.995 (in the case of Slovakia) to 0.928 (Ireland), with a predominance of high values, close to 1 or -1. The European countries were clustered into 4 groups, by the correlation coefficient, as follows: cluster 1 (BG, CZ, EE, LT, LU, PL, SK) is characterized by a strong negative correlation; Cluster 2 (DK, LV, MT, RO, SI, SE, NO) – by a negative weak correlation; Cluster 3 (IE, EL, ES, FR, IT, CY, NL, PT, FI, CH) – by a positive strong correlation and Cluster 4 (BE, DE, HR, HU, AT, IS, UK) – by a positive moderate correlation.

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