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Higher Education Policies and Employability of University Graduates in the EU-28

ABSTRACT

Objective: The main purpose of this research is to analyze and reveal if the recent policy measures in higher education carried in European Union member countries have had a significant impact on the labour market integration of university graduates.

Methodology: We selected a set of indicators that were common in the 2015 and 2016 editions of Structural Indicators for Monitoring Education and Training Systems in Europe and could offer an image of intensity of higher education policies in relation with labour market at European level. We further used these measures to test for any significant effects of the policies on the integration of graduates in the labour market.

Findings: We found significant effects of various policy measures in high education in the European countries. We estimate a positive role for factors like monitoring of completion rates, requirements for the staff to have higher education, presence of educational guidelines, and recognition of formal and informal learning for entry in higher education.

Value Added: This is the first study to address the impact of high education policies carried in European countries on the integration of college graduates. The study is distinct through both the design of new measures of higher education policy in Europe as well through testing whether the intensity of policies carried for higher education has affected the employability of young graduates or not.

Recommendations: The results of this empirical research allow us to make some recommendations for improving the insertion of young graduates on European labour market.

Key words: higher education, graduates, education reform, university

JEL codes: C53, I23, I28

Introduction

There is an increased awareness at both European and national level that education in general and higher education in particular, are key domains that can bring an increased welfare. This awareness is underscored by the emphasis that the European Commission sees its significance by mentioning it in key documents and strategies.

Probably the key document in terms of impact, since all other documents and strategic plans are derived from it, is the Strategy Europe 2020, see European Commission (2010).

Using the experience gathered through the implementation of previous strategies and maintaining employment and growth among its objectives, the Europe 2020 strategy aims to create a smart, sustainable and inclusive economy. These priorities are achieved through the joint effort of the EU Member States to achieve a high level of labour productivity, employment and social cohesion. The new type of growth promoted by the Europe 2020 strategy (smart and inclusive growth) is achieved through, inter

alia, education and research measures: enhancing permanent education and skills, supporting research and innovation, efficient digital economy and smart grids (EC, 2010).

In order to achieve smart and inclusive growth, the EU's objectives under the Europe 2020 strategy relate to aspects on education, but also research and development (R&D):

- Achieving better results in education by reducing school dropout rates, but also by increasing the share of university graduates to at least 40% of the population aged 30-34;
- Increasing the employment rate to 75% by 2020 for the 20–64 year-old population by better integrating young people, the elderly, women, unqualified persons and legal immigrants;
- Increasing R&D investment to 3% of GDP and creating better conditions for R&D and innovation (EC, 2010).

Other key documents related to higher education that should be mentioned are *Supporting growth and jobs - An agenda for the modernization of Europe's higher education systems*, see European Commission (2011a), as well as *The Seven Principles of Innovative Doctoral Training*, see European Commission (2011b). In (2011a), the European Commission builds on Europe 2020 document and establishes the same target for the share of people with higher education (40%) along a set of measures aimed at improving the higher education system:

- a more inclusive education;
- an increased relevance of higher education for the labour market;
- the increased collaboration between business environment and universities;
- an increased mobility within Europe for students and professors;
- reforming the governance and finance of universities.

The second document mentioned above, see European Commission (2011b), refers to improving the quality of doctoral education and developing the research collaboration between the business environment and universities.

The importance of the higher education for economic development is further underscored by recent studies. For example, Pinheiro and Pillay (2016) perform a case study of two OECD economies, Finland and South Korea, and reveal the key role of higher education in ensuring the economic success of these countries. Further studies confirm the importance of higher education for economic growth, see Aghion (2008), Bridges et al. (2007), Pinheiro et al. (2012), to cite just a few papers.

In spite of the importance of this subject, the topic of the determinants of the employability of (young) graduates remains scarcely addressed. In this paper, we aim at looking at the employability of young graduates in Europe from the perspective of the policies carried in higher education across Europe. A number of papers have already discussed various characteristics of employability of higher education graduates, however, they do not analyze the impact of policy reforms.

For specific case of Greece, Livanos (2010) found employability differences between the jobs corresponding to whether graduates' skills are in demand in the private or in the public sector. The distinction is important given not only the size of the public sector in Europe, but also the fact that many countries in European Union have gone through austerity (which affected the public sector foremost).

Robert (2014) discussed the issues of skills mismatch for graduates in selected post-communist countries. He found significant differences among the study fields, with prior work experience having been found as having a significant impact on employability. The issue of skills mismatch (more severe at the beginning of transition to market economies) is quite known for former socialist countries (which are a consistent number in our sample), see Sondergaard & Murthi (2012).

There are a few contributions that this paper does. First, it proposes, using data available at European level, a set of variables that correspond to various policy measures carried across Europe. Second, it quantifies these variables in order to further use in an econometric framework. Third, it compares the effects of the policies carried by estimating models for EU-28 countries using

the previously derived measures of reforms. The paper also distinguishes between the impact of policies for older and newer member states.

Methodology

In this paper, an econometric approach consisting in the application of some hierarchical linear models or multilevel models will be employed. The advantage of this method is that the overall error distribution of the linear mixed-effects model is considered to be normal, while heteroskedasticity and correlations within lowest-level groups could be also modeled. Linear mixed models include both fixed and random effects. The approach is based on more cross-sections for which random and fixed-effects are analyzed.

This method was selected for actual research because the analysis is conducted on more countries that could be grouped according to the intensity of the reforms' effects expressed as a set of qualitative indicators. There are countries with the same intensity of reforms' impact. Moreover, we will consider two clusters of countries: old member states (OMS) and new member states (NMS) in the European Union. OMS correspond to developed countries where concerns for education quality are more intense and with a longer tradition. In NMS, the transition to market economy and the overall transformation of society in the new economic context made the education policies more difficult to implement.

These models are a generalization of linear regression including random effects, other than the deviations corresponding to the total error. If the matrix notation is used, then:

$$y = X\beta + Zu + \varepsilon \quad (1)$$

y- vector of responses (n x 1 elements)

X-covariate matrix corresponding to fixed effects (n x p elements)

Z- covariate matrix corresponding to fixed effects *u* (n x q elements)

ε· errors vector with multivariate normal distribution $N(0,\sigma_\varepsilon^2 R)$,

$X\beta$ which is the fixed portion of the equation (1), corresponds to the linear predictor in the traditional OLS regression, where β is the parameter that has to be estimated based on empirical data.

In $Zu + \varepsilon$, which is the random portion of the equation (1), the assumption that u has G has variance-covariance matrix is made. In this case, u is orthogonal to ε:

$$Var \begin{bmatrix} u \\ \varepsilon \end{bmatrix} = \begin{bmatrix} G & 0 \\ 0 & \sigma_\varepsilon^2 R \end{bmatrix}$$

Even if u could be predicted, it is not estimated in a direct way. Its estimation is based on the components of G.

The form of the design matrices Z and X is the support for the estimation of a large number of linear models: multilevel models, split-plot designs, blocked designs, growth curves etc. These matrices permit a flexible method for modeling the correlation that appears within cluster. The correlation between the subjects in the same cluster might result from the shared random intercept or slope. The specification of G brings more flexibility, because random slope or intercept might be modeled as correlated, or independent with equal variances. The general form of R permits to residual for correlation and heteroskedasticity with exact specification on the models of these characteristics.

There are some particular cases when random effects model is preferred to fixed effects model, as Snijders (2012) explained:
 • when the groups are seen as a sample drawn from a population that is the subject of the inference;
 • when level-two effects should be checked;
 • in case of many groups of small size;
 • when group effects are not normally distributed.

For building the suitable mixed models the variance components should be estimated using various methods. At the beginning, variance components were estimated in the ANOVA models. In case of simple models based on balanced data, the estimation of variance components consists in finding

out the solutions of a system of equations obtained by fixing expected mean-squares expressions to the values of observed counterparts.

The ANOVA method has its limits like the absence of uniqueness in the alternative, the unbiased estimates corresponding to variance components being derived based on other quadratic forms of data instead of observed mean squares (Searle et al., 1992). Moreover, Gibbons et al. (2010) showed other disadvantages of ANOVA methods: restrictive assumptions related to missing data across time and in case of repeated measures the presence of variance-covariance structure. After considering the limits of these methods, from historical point of view, two alternatives were proposed to ANOVA method: minimum variance quadratic unbiased estimation (LaMotte, 1973) and minimum norm quadratic unbiased estimation (Rao et al., 1973). These methods suppose the determination of optimal quadratic forms of unbiased data with variance components. However, these methods still have limits, especially because how specific individuals change across time is not reflected. In this context, mixed-effects regression models (MRM) became a popular method in modeling longitudinal data. The main characteristic of MRMs is the consideration of random subject effects in order to compute the impact of subjects on their repeated observations. The role of the random subject effects is to present each cross-section trend across time and to figure out the correlational structure of the data. Moreover, the degree of cross-sections variation that is presented in the population is identified (Gibbons et al., 2010). There are various types of MRMS:

- variance component models (Dempster et al., 1981);
- random-effects models (Laird and Ware, 1982);
- empirical Bayesian models (Strenio et al., 1983; Hiu & Berger, 1983);
- random regression models (Bock, 1983; Gibbons et al., 1988);
- random coefficient models (de Leeuw & Kreft, 1986);
- mixed models (Longford, 1987; Wolfinger, 1993);
- two-stage models (Bock, 1989);
- hierarchical linear models (Bryk & Raudenbush, 1992);

- multilevel models (Goldstein, 1995);

In the case of clustered-data, it is better to consider just a part of the n observations at once and to construct the mixed model as a series of M independent clusters:

$$y_j = X_j\beta + Z_j u_j + \varepsilon_j \text{ (2)}$$

j=1, 2,..., M

Cluster j has n_j observations.

y_j refers to rows of y associated to j-th cluster

The random effects u_j could be considered as M realizations of a q x 1 vector with normal distribution of null average and variance matrix Σ (q x q elements).

Z_j - matrix design of the j-th cluster random effects (n_j x q elements)

$$u = \begin{bmatrix} u_1 \\ \dots \\ u_M \end{bmatrix}$$

$$Z = \begin{bmatrix} Z_1 & 0 & \dots & 0 \\ 0 & Z_2 & \dots & 0 \\ \dots & \dots & \dots & \dots \\ 0 & 0 & 0 & Z_M \end{bmatrix}$$

$$G = I_M \otimes \Sigma$$

$$R = I_M \otimes \wedge$$

The form in (2) belongs to Laird and Ware (1982) and presents two main advantages. The specification of random-effect component is made easier. If the mixed-model is specified using the form in (2), more random-effects sets could easily be generalized.

Mixed effect models are a useful statistical tool working with clustered data (Goldstein, 2011). In this paper, the aim is to study the effects of various policies in education on labour market knowing that there are groups of countries with the same level of reforms implementations. In the proposed mixed effect models, the unobserved heterogeneity at cluster level determines intra-cluster correlation between responses. Therefore, mean of the responses and/or the effects of the covariates may vary across clusters (Peng and Lu, 2012). This intra-cluster correlation is modeled using fixed and

random effects. The fixed effect assumes that unobserved heterogeneity at cluster level is constant, while the random effect assumes a random quantity.

Data

Considering the objective of this research related to the evaluation of the impact of various education policies on labour market indicators, more variables were selected from the European Commission reports: Structural Indicators for Monitoring Education and Training Systems in Europe 2015 and 2016. These reports are published annually by the European Commission. Their objective is to assess the progress made by the EU Members States towards achieving the targets that were already fixed by the Europe 2020 strategy and by the Education and Training 2020 reform processes (European Commission/EACEA/Eurydice, 2015).

There is a small number of key policy indicators in 6 main areas: early childhood education and care (ECEC), early leaving from education and training, achievement in basic skills, higher education, graduate employability, and learning mobility (European Commission/EACEA/Eurydice, 2016).

The database was reconstituted using the maps provided by these reports for main indicators related to education policies. The data refer to EU-28 countries and the variables are represented by:

1) Requirement for at least one staff member per group of children in ECEC to have a tertiary qualification in education (minimum 3 years ISCED 6) that shows whether education staff in the sector are highly qualified. In general, highly qualified staff in education are able to provide leadership to groups while delivering developmentally suitable activities for children and thus the provided quality is higher.

2) ECEC educational guidelines include learning opportunities for young children.

3) Quantitative targets for widening participation in and/or completion of higher education by underrepresented groups are used in order to

strengthen the social dimension of education as European Commission requests in its education policies.

4) Monitoring the socio-economic characteristics of the student body is an aggregate measure regarding students' or their families' social and economic position compared to others, in what concern education, income, and occupation.

5) Recognition of informal and non-formal learning for entry to higher education.

6) Requirement to monitor completion rates as part of external quality assurance procedures refers to the use of completion rates as criterion used in external quality assurance procedures for higher education programs or institutions.

7) Labour market forecasting as a common way to anticipate demand and supply on the labour market.

8) Using labour-market and skills forecasting in central planning.

9) Involvement of employers in the processes of external quality assurance analyses as higher education institutions have a requirement to have employer representatives on their governing bodies.

10) Long run unemployment

11) Requirements to include work placements/practical training in higher education programs.

Moreover, public expenditure on education (% of GDP) was used as control variable in the model. The dependent variable in the model was taken as *employment rates of young people* (20-24 years) not in education and training with 1-3 years *since graduation*.

The data for public expenditure on education were provided by World Bank, while for the indicators related to labour market the data were taken from Eurostat database. The values of these indicators were taken for 2015 and 2016 for EU-2018 countries.

We describe the data in Appendix A.

Results

Quantifying the Intensity of Educational Policy Measures

Using the available data on policy measures at European level for latest years, see Structural Indicators for Monitoring Education and Training Systems in Europe 2015 and 2016, we construct an index of degree (or intensity) of policy reforms across the EU 28 countries.

The methodology consists in the following steps:
• encoding the variables related to the educational policies for the EU-28 countries based on the colour coding in the maps provided by European Commission/EACEA/Eurydice (2015) ;
• the dependent variables and the control variables are added in the model from World Bank and Eurostat;
• the fixed-effects that are added to the model represent the systematic part of the model: the independent variables represented by the measures of policies explain the patterns of the variables related to labour market;
• random effects are added to countries in order to characterize the idiosyncratic variation due to individual differences between countries.

The set of educational policy indicators that were monitored aim to:
• construct a skilled workforce, by using the opportunities for learning and development;
• improve teaching and learning processes by providing educational guidelines or suitable curricula;
• provide the essential additional support for ensuring adequate language development.

The data availability is limited to the years 2015-2016, however, we use the available data to measure the state of reforms at the present moment. Thus the values of the policy related variables also comprise information for

the reforms carried out in the previous years and should not be considered as having a limited value.

The results are presented in Table 1 and Table 2.

Quantifying the Impact of Labour Market Integration of Higher Education Policy Measures

The empirical analysis consists in the estimation of 2 mixed-effects models based on data for the EU-28 countries taken from the reports on education in 2014/2015 and 2015/2016. First, the analysis was conducted on panel data, but a valid model was not identified. Knowing that clusters of countries might be identified with the same stage of policy implementations, mixed-effects linear models would be suitable for this type of analysis. In order to extend the data in the sample, the values of the variables were considered for both years. Variables related to labour market like employment and unemployment rate and participation rate of young employed people in education and training were considered, in turn, as a dependent variable, however, in the end, we only kept the employment rate of young graduates. The heterogeneity of the EU countries influences the significance and magnitude of coefficients so we treat the old and new countries separately.

According to the first mixed-effects model, the employment rates of young people (20-24 years) not in education and training with 1–3 years since graduation (%) on the new UE countries depend on:

- the requirement for at least one staff member per group of children in ECEC to have a tertiary qualification in education (minimum 3 years ISCED 6) (denoted by the correlation according to expectations: as the requirements for higher education are less, the staff members get easier employed in education system; the variable was codified as to take the value 1 in case of strong requirements of higher education and 3 for no requirements of superior education);
- ECEC educational guidelines (denoted by Education guideline -the correlation is according to expectations, since the variable takes the value 1

for education guideline for entire period and 2 for education guideline for children of 3 years and older; when guideline is required for a shorter period, young people working in education have more chances to be employed);
• Requirement to monitor completion rates as part of external quality assurance procedures (denoted by monitor completion rates – the strong necessity to monitor completion rate takes value 1 and in this particular case, when there are less restrictions for control completion rates, the employment rate of young people decreases, as expected);
• Labour market forecasting (in this case, the variable takes value 1 for forecasts made at regular intervals; when the regularity in making labour market forecasts decreases, the employment rate decreases, as expected).

Table 1. Mixed effects linear regression model for explaining employment rates of young people (20–24 years) not in education and training with 1–3 years since graduation on new UE countries

Variable	Coefficient	Z	P>|z|
Requirement staff tertiary	2.841441	2.51	0.012
Education guideline	4.499974	2.88	0.004
Monitor completion rate	-2.224444	-2.77	0.0061
Labour market forecasting	-5.267587	-4.04	0.000
Constant	86.09461	26.68	0.000
Random-effects parameters	Estimate	Standard error	
Var (Residual)	12.7191	3.527643	

Source: own computations.

As expected, more educated staff in higher education programs and good education guideline had a positive impact on employment rate of young people with 1-3 years since graduation, helping them to integrate easier on labour market in the period 2015–2016. Aspects related to monitor completion rate

and labour market forecasting succeed in attracting more recent graduates on labour market. However, in new entered countries from Eastern Europe the monitoring practice, that is a strong indicator of priorities attached to internationalization, would occur only if the central government institutions request for it, and only small number of countries do this. As result, the sign is negative. However, in some Eastern European Countries, the forecasting of labour market is done on the ad hoc basis in these countries.

According to the second mixed-effects model, the employment rates of young people (20–24 years) not in education and training with 1-3 years since graduation (%) on the old EU countries are explained by:

• Requirements to include work placements/practical training in higher education programmes (denoted by Requirements training – the variable takes value 1 if practical training/work placements is required for all higher education programs; the employment rate continued to grow, even when the requirements for training decreased);

• Requirement for at least one staff member per group of children in ECEC to have a tertiary qualification in education (minimum 3 years ISCED 6) (the correlation is according to expectations: as the requirements for higher education are less, the staff members get easier employed in education system; the variable was codified as to take the value 1 in case of strong requirements of higher education and 3 for no requirements of superior education);

• ECEC educational guidelines (denoted by Education guideline - the variable takes the value 1 for education guideline for entire period and 2 - for education guideline for children of 3 years and older; when guideline is required for a shorter period, young people working in education have smaller chances to be employed);

• Monitor socio-economic characteristics of the student body (the variable takes value 1 for systematic monitoring; when we have less monitoring of socio-economic characteristics, the employment rate decreases).

• Quantitative targets for widening participation in and/or completion of higher education by underrepresented groups (Widening part completed, the variable takes value 1 for quantitative targets for entry to and/

or participation in higher education; when there are smaller targets, the employment rate decreases);

• Recognition of informal and non-formal learning for entry to higher education (variable takes value 1 if informal education is recognized in all higher education institutions; when the recognition is made in fewer educational institutions, the employment rate continues to increase);

• Requirement to monitor completion rates as part of external quality assurance procedures (in this case, the lower control of completion rate does not prevent the employment increase);

• Labour market forecasting (in this case, the variable takes value 1 for forecasts made at regular intervals; when the regularity in making labour market forecasts decreases, the employment rate decreases, as expected);

• Using labour-market and skills forecasting in central planning (denoted by using forecasting – the variable takes value 1 when there is systematic use of forecasts by educational authorities; when the use of these forecasts by educational authorities decreases, the employment rate of young people decreases);

• Involvement of employers in external quality assurance processes (denoted by involving external assurance- the variable takes value 1 for formal requirements regarding the involvement of employers; as expected, when the involvement of employers in external quality process decreases, the employment decreases);

• Public expenditure on education (% of GDP) (positive correlation; the expenditure in education is efficient since the employment rate increases);

• Long run unemployment (negative correlation, as expected, since the increase in unemployment negatively affects employment).

Table 2. Mixed effects linear regression model for explaining employment rates of young people (20-–4 years) not in education and training with 1–3 years since graduation for old EU countries

Variable	Coefficient	Z	P>|z|
Requirements training	3.723479	2.41	0.016
Requirements staff tertiary	3.695234	3.69	0.000
Educational_ guideline	-8.032486	-5.30	0.000
Widening part completed	-2.90757	-3.31	0.001
Monitor socio-economic characteristics of the student body	-12.93755	-11.91	0.000
Recognition learning	0.9552949	2.14	0.032
Monitor completion rate	2.754024	3.99	0.000
Labour market forecasting	-10.45704	-8.45	0.000
Using _forecasting	-3.463634	-2.58	0.010
Involvement external assurance	-7.033406	-6.29	0.000
Expenditure education	2.693214	3.08	0.002
Long run unemployment	-0.008955	-6.40	0.000
Constant	118.1321	12.11	0.000
Random-effects parameters	Estimate	Standard error	
Var (Residual)	5.072629	1.309747	

Source: own computations.

As expected, more public expenses made in education, more educated staff members, and recognition of all types of education (formal and non-formal) helped in increasing employment. Requirement to monitor completion rates as part of external quality assurance procedures had not contributed to better employment rate because the opportunities on labour marker in the developed countries are higher as compared to emerging ones. Other aspects did not have the expected results in employment issue. This might be explained by the fact that the reforms need long-run implementation to have visible and sustainable effects on labour market issues and the pace of reforms differ a lot across the countries base on national consideration.

Discussion of results

The results of the models have some limitations, while unexpected results for some coefficients need more comments.

First of all, we use public expenditure on education (% of GDP) as control variable, it might be sometimes of limited relevance because in many countries a higher part of expenditure for education comes from private and household sectors. The public expenditure offers possibility to us to show if the education is a priority of state government and if there is a great equality of chance for the people with lower income and underprivileged to education. In the future, an extension of our analysis by including all expenditure sources for education will highlight other aspects that were not possible to be revealed in this article. Moreover, more control variables will be added in a future research to assess their impact on employment. The period should also be extended by adding the last reports on structural indicators in education.

The public expenditure has a positive impact on employment rate of young people (20–24 years) not in education and training and participation rate of young people (20–34 years) in education and training as we expected. This result is in accordance with the results of Pencova & Valkov (2015, p. 32), who found a "direct and significant (0.652) relationship between public spending on higher education (ISCED 5–8) as % of GDP and employment for respective group level (derived for the sample countries-Denmark, Sweden, UK, Austria, EU-27, Switzerland, Germany, Italy, Bulgaria and Romania)".

The second limitation comes from the fact that the results of the models are influenced by the data collected from survey. The great difference between countries and the manner to encode the results with number from 1–5, with 1 the favourable situation and 5 - the lack of policies could explain the unexpected sign of some variable coefficients. For example, 64% of the new EU countries perform the labour market forecasting on ad-hoc basis, while in Croatia the forecasting of labour market is not currently used. More than that 76% of the old EU countries have done the labour market forecasting at

the regular intervals, and only 24% on an ad-hoc basis. These results highlight the fact that in many EU countries, educational authorities had limited information about the labour market demand for skills and fields. That fact creates imbalance between the university supply and real labour market needs that influence the employment rate of higher educated persons, even the low rate of unemployment rate of this labour force. There are also national differences, some countries use labour market information to determine the funds needs for some fields of higher education (Latvia, Lithuania, Finland, Scotland, Norway) or when accrediting new study programs (Belgium, France, Portugal, Romania, Sweden, United Kingdom).(EC/EACEA/Eurydice, 2015, p.43). More than that, only in 47% of the old EU countries educational authorities used systematic labour-market and skills forecasting.

A half of the new EU countries and 41% of the older required at institutional or program level to monitor completion rates as part of external quality assurance procedures. More than that, 36% of the new EU countries and 47% of the older had no form of external quality assurance procedures. These levels indicate that the negative sign of coefficient attached to monitor completion rates is generate by the absence of this measure in many countries, so the employment rate of young people decreases, as expected.

Monitoring of the socio-economic characteristics and the student body, offer a measure to widen access and participation in higher education. The European Higher Education Area in 2015 highlights a small change in the composition of student body in the last decade and a little increase in the number of migrants or students form ethics minorities, and so on. The students' socio-economic characteristics combined measure based on parents' education, occupation, economic status, household income, so the different structure of this characteristics possible also could explain the models results. It is also important to notice that low level of job finding rate during 2014-2016 as compare to 2008, influenced the dynamics of labour market more than other factors (E. C. 2015), and also we cannot exclude the poverty and economic inequality who possible could influence the results.

The unexpected sign of coefficient in the case of monitoring the socio-economic characteristics and the student body, could be explain by the fact that it is referring in the 64% of the countries (2014/2015) and 54% (2015/2016) to the monitoring of students' socio-economic characteristics and less that 18% of the countries systematic monitoring of characteristics of the student body (in terms of disability, ethnic status, so on). The systematic monitoring student characteristics in Greece, Cyprus, Lithuania in 2014/2015, Latvia in 2015/2016, Portugal in 2015/2016, Romania in 2015/2016, Slovenia and Slovakia in 2014/2015 were not in place.

The unexpected sign of the educational guideline is possible influence by the fact that it is referring to the entire period of education, not only for higher education and there no information about the frequency of changes in this guideline. However, when guideline is required for a shorter period, young people working in education have more chances to be employed. Also, the imbalance between the supply of university (skills) and new demand of labour market, that had a greater speed of transformation than university curricula, and the dramatically contraction of the funds for research and development in some countries during the crises period and after, because of economic development fluctuation could be other possible explanations.

The third aspect is that the employment rates of young people (20-24 years) not in education and training with 1–3 years since graduation depend of a *complex set of factors*, that could be interrelated. Stiwne and Alvares studied these aspects and considered the following factors as important in this respect: "economic and professional context, individual trajectories and characteristics as well as teaching and learning in higher education" and consider as a good examples: the " paradox of Swedish situation with high general education and equality aspiration but with increasing difficulties for young adults to access the job market" and "the national differences, i.e. students from Scandinavian countries as well as the United Kingdom emphasized practical learning and facilities to higher degree that students from southern Europe" (Stiwne & Alvares, 2010, pp. 36–37).

A factor that influences the results could be that *period analysed* in our paper 2014–2016 comprises the post-crisis effects. We can mention: some adverse demand shock that affected labour market differently across countries and implied the active measure; a declined tendency in education expenditure in some countries; impact on enrolment rates, staffing and infrastructure issue; deterioration of wealth; a great impact on the young people and more time needed to put in practice active measures on labour market so on. Between active labour market policy we can mention consolidation the labour market relevance of education systems, taking into account the four industrial revolution that implied the higher qualification skill and a polarization between low-skilled and high-skilled the labour market demand. The nature of this impact has not been uniform across the countries, so it had different influence on the indicators selected in the models and possibly, could explain the unexpected sign of some coefficients.

We can also mention as a factor that influences the results of the models *the mass academic migrations* that have positive effects as an injection of a highly skilled workforce for the hosted countries but a negative effects as a great disequilibria on the labour market in the countries that loss this people and on the practice of higher education institution and policies. The brain drain phenomenon was most visible in Europe after the economic crises and hit especially the countries more affected by crises: Greece, Spain, and Portugal where the unemployment rate of educated young people was very high, and also Easter Europe countries like Romania and Bulgaria.

Romania, for example, is one of the countries with a higher migration rate (3 million people, most of them high school graduates). According to Romanian Governor of National Bank, the imbalance between the demand and offers of labour market in Romania highlight a deficit of workers with high education level and an excess of the workers with secondary and primary educational level (Isărescu, 2017).

In Portugal, about 20% of young Portuguese professionals go to use their skills in other countries (Pelletier, 2011), and in Spain thousands of young

researchers considering that they have not professional perspectives in Spain, leave the countries (Morel, 2013).

Grecu and Titan (2016, p.64), using a quantitative method based on two index of Global Competitiveness Report for 2013-2014 period, conclude that according to the first index "Country capacity to retain the talent" Finland, Switzerland and Norway were placed on the second, and respectively third and fifth place out of 148 countries and on opposite side, Slovakia was placed (130th place), Romania (138th place) and Bulgaria (142th place). Regarding the second index "Country capacity to attract talent" on the first place was Switzerland, the United Kingdom on the fourth place and Norway on the 11th, and at the end of ranking was Greece (127th place), Romania (132th place) and Bulgaria (144th place).

Böckerman & Haapanen (2010, pp. 2–3) highlight that "propensity to move increases with the level of education", "easily transferable and because of the" greater earnings differential between region" and a way to open new opportunities in the labour market.

Conclusions

There is an increased awareness about the key role of education in general and higher education in particular, for the performance as well as level of development of an economy. In this sense, the increased competitiveness in world markets and the fast growth of knowledge economy require a highly educated workforce.

In the recent years, we have seen more and more emphasis at European and national level on the necessity of modernizing the higher education with the final aim of a better integration of young graduates on the labour market, on the one hand, and having a better prepared workforce on the other hand. In this paper, we review and quantify some of the recent reform patters at European level and analyse whether the implemented policies have impacted the employment of young graduates. On the one hand, the

public amounts spent on higher education (taken as a control variable) have a clear positive impact, on the other hand, we document a significant role for factors like monitoring of completion rates, requirements for staff of having higher education, the presence of educational guidelines, and recognition of formal and informal learning for entry in higher education, all these factors being associated to various types of educational policies in higher education.

APPENDIX A

Variables' presentation

Variable	Values
Requirements to include work placements/practical training in higher education programs might take the following values	1 for all higher education programs 2 for some higher education programs 3 no requirements/incentives 4 not available
Requirement for at least one staff member per group of children in ECEC to have a tertiary qualification in education (minimum 3 years ISCED 6)	1-for the entire phase of ECEC 2-only in settings for children of 3 years and older 3-no requirement for min. 3 years ISCED 6 4-not available
Status of continuing professional development (CPD) for ECEC staff	1-CPD is a professional duty and/or necessary for promotion for the entire period of ECEC 2-CPD is a professional duty and/or necessary for promotion only for staff working with children of 3 years and older 3- optional
ECEC educational guidelines	1-educational guideline for the entire period of ECEC 2-educational guidelines only for children 3 years and older
Use of student performance data in external school evaluation	1-student performance data used 2-student performance data not used 3-no external evaluation of schools 4-situation varies within the country 5-data not available
Quantitative targets for widening participation in and/or completion of higher education by underrepresented groups	1-quantitative targets for entry to and/or participation in higher education 2-quantitative targets for the completion of higher education and/or fining employment 3-no quantitative targets 4-not available

Monitoring the socio-economic characteristics of the student body	1-systematic monitoring of characteristics of the student body 3-no systematic monitoring student characteristics 2-systematic monitoring and monitoring socio-economic characteristics 4-not available
Recognition of informal and non-formal learning for entry to higher education	1-recognized in all higher education institution 2-recognized in all higher education institutions and access to recognition procedures is a legal right 3-recognised in 2 or more higher education institutions 4-recognised in 2 or more higher education institutions and it is a legal right 5-not recognized
Requirement to monitor completion rates as part of external quality assurance procedures	1-required at institutional and/or program level 2-optional at institutional or program level 3-not part of external quality assurance procedures 4-not available
Performance-based funding mechanisms with a social dimension focus (students and staff)	1-student disability 2-students' socio-economic background 3-other 4-none 5-not available
Labour market forecasting	1-labour market forecasting is done at regular intervals 2-labour market forecasting is done on an ad hoc basis 3-no forecasting 4-not available
Using labour-market and skills forecasting in central planning	1-systematic use by educational authorities 2-no systematic use by educational authorities 3-no forecasting 4-not available
Involvement of employers in external quality assurance processes	1-there are formal requirements regarding the involvement of employers in the external QA processes 2-there are no formal requirements, but employers are normally involved in external QA processes 3-employers are not involved in external QA processes 4-not available
Availability of external career guidance services	1-services are available within HEIs to all students throughout their course of study 2-services are available within HEIs to some students 3-services only available within HEIs to students in the year before they graduate 4-no career guidance available in HEIs 5-not available
Incentives to include work placements/practical training in higher education programs	1-requirements/incentives apply to all higher education programs 2-requirements /incentives apply to some higher education programs 3-no requirements /incentives 4-no available

Employment rates of young people (20-24 years) not in education and training with 1-3 years since graduation (%)	
Unemployment rates of young people (20-24 years) not in education and training with 1-3 years since graduation (%) Participation rate of young people (20-34 years) in education and training, employed people	
Participation rate of young people (20-34 years) in education and training, not employed people	
Public expenditure on education (% of GDP)	

Source: authors' elaboration.

References

Aghion, P. (2008). Higher Education and Innovation. *Perspektiven der Wirtschafts-politik, 9*(1), 28–45.

Bock, R. D. (1983). Within-subject experimentation in psychiatric research. *Statistical and methodological advances in psychiatric research, 10*, 59–90.

Bock, R. D. (1989). Addendum: measurement of human variation: a two-stage model. *Multilevel analysis of educational data, 22*, 319–342.

Böckerman, P., & Haapanen, M. (2010). The Effect of Education on Mogration: Evidence from School Reform. *Working Paper of School of Business and Economics, 36*, 1–25.

Bridges, D., Juceviciene, P., Jucevicius, T., & Stankeviciute, J. (2007). *Higher Education and National Development: Universities and Societies in Transition*. Milton Park: Routledge.

Bryk A.S., & Raudenbush S. W. (1992). *Hierarchical Linear Models: Applications and Data Analysis Methods*. Newbury Park: Sage.

De Leeuw, J., & Kreft, I. (1986). Random coefficient models for multilevel analysis. *Journal of Educational Statistics, 11*(1), 57–85.

Dempster, A. P., Rubin, D. B., & Tsutakawa, R. K. (1981). Estimation in covariance components models. *Journal of the American Statistical Association*, 76(374), 341–353.

European Commission (2010). Europe 2020 – A Strategy for a smart, sustainable and inclusive growth.

European Commission (2011a). Supporting growth and jobs - An agenda for the modernisation of Europe's higher education systems.

European Commission (2011b). The Seven Principles of Innovative Doctoral Training.

European Commission /EACEA/Eurydice (2015). Structural Indicators for Monitoring Education and Training Systems in Europe – 2015. Eurydice Background Report to the Education and Training Monitor 2015 Eurydice Report. Luxembourg: Publications Office of the European Union.

European Commission (2015). Labour Market and Wage Development in Europe 2015. Employment, Social Affairs & Inclusion, Brussels.

European Commission/EACEA/Eurydice (2015). European Higher Education Area in 2015. Bologna Process Implementation Report. Luxembourg: Publications Office of the European Union.

European Commission/EACEA/Eurydice (2016). Structural Indicators for Monitoring Education and Training Systems in Europe – 2016. Eurydice Background Report to the Education and Training Monitor 2016 Eurydice Report. Luxembourg: Publications Office of the European Union.

Eurostat, Statistics Explained (2017). Adult learning Statistics.

Gibbons, R. D., Hedeker, D., & DuToit, S. (2010). Advances in analysis of longitudinal data. *Annual review of clinical psychology, 6*, 79–107.

Gibbons, R. D., Hedeker, D., Waternaux, C., & Davis, J. M. (1988). Random regression models: a comprehensive approach to the analysis of longitudinal psychiatric data. *Psychopharmacology Bulletin, 24*(3), 438–443.

Goldstein, H. (1995). *Multilevel Statistical Models.* New York: Halstead Press.

Grecu, M., & Titan, E. (2016). Brain drain-Brain Gain, Evidence from the European Union. *Journal of Applied Quantitative Methods, 11*(3), 61–69.

Hui, S. L., & Berger, J. O. (1983). Empirical Bayes estimation of rates in longitudinal studies. *Journal of the American Statistical Association, 78*(384), 753–760.

Isărescu, M. C. (2017). The inflation Report (Raport asupra inflaţiei). National Bank of Romania.

Laird, N. M., & Ware, J. H. (1982). Random-effects models for longitudinal data. *Biometrics,* 38(4), 963–974.

LaMotte, L. R. (1973). Quadratic estimation of variance components, *Biometrics, 29,* 311–330.

Livanos, I. (2010). The Relationship between Higher Education and Labour Market in Greece: the Weakest Link?. *Higher Education, 60*(5), 473–489.

Longford, N. T. (1987). A fast scoring algorithm for maximum likelihood estimation in unbalanced mixed models with nested random effects. *Biometrika, 74*(4), 817–827.

Morel, S. (2013). En Espagne, la fuite des cerveaux face à la crise. *Le Monde,* 20 May.

Pelletier, B. (2011). L'Europe en crise et la fuite des cerveaux. *Gestion des Risques Interculturels.*

Pencova, E., & Valkov, A. (2015). The Quality of Education: An Economic View. *Journal of Process Management-New Technologies, International, 3*(3), 26–33.

Peng, H., & Lu, Y. (2012). Model selection in linear mixed effect models. *Journal of Multivariate Analysis*, *109*, 109–129.

Pinheiro, R., & Pillay, P. (2016). Higher Education and Economic Development in the OECD: Policy Lessons for Other Countries and Regions. *Journal of Higher Education Policy and Management*, *38*(2), 150–166.

Pinheiro, R., Benneworth, P., & Jones, C. A. (2012). *Universities and Regional Development: a Critical Assessment of Tensions and Contradictions*. Milton Park: Routledge.

Rao, C. R., Rao, C. R., & Statistiker, M. (1973). *Linear statistical inference and its applications*. New York: Wiley.

Robert, P. (2014). Job Mismatch in Early Career of Graduates under Post-Communism. *International Journal of Manpower*, *35*(4), 500–513.

Searle, S., Cassella, G., & McCullouch, C. (1992). *Variance Components*. New York: John Wiley-Sons.

Snijders, T. A. (2012). Multilevel analysis. In *International encyclopedia of statistical science* (pp. 879–882). Berlin Heidelberg: Springer.

Sondergaard, L., & Murthi, M. (2012). *Skills, Not Just Diplomas*, Washington DC: World Bank.

Stiwne, E. E., & Alves, M. G. (2010). Higher Education and Employability of Graduates: will Bologna make a difference?. *European Educational Research Journal, 9*(1), 32–44.

Strenio, J. F., Weisberg, H. I., & Bryk, A. S. (1983). Empirical Bayes estimation of individual growth-curve parameters and their relationship to covariates. *Biometrics*, *39*, 71–86.

Wolfinger, R. (1993). Covariance structure selection in general mixed models. *Communications in statistics-Simulation and computation*, *22*(4), 1079–1106.