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THE UNEMPLOYMENT OF HIGHLY EDUCATED PEOPLE IN ROMANIA. A PANEL VAR APPROACH

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Abstract: The insertion of graduates of higher education on the labor market is one of the problems faced by the Romanian labor market. Based on a VAR model in the panel, the number of unemployed with higher education in Romania is explained in correlation with variables related to the educational environment. As the number of graduates, the number of teaching staff and the number of faculties increase the unemployment rate among people with higher education also increases slightly, showing that they have not immediately integrated into the labor market. A shock (an innovation) in the series of unemployed numbers results in an increase in the number of unemployed and a long-term stabilization of the influence to positive values. A shock to the data series on the number of graduates, the number of faculties and teaching staff does not have an immediate effect on the number of unemployed with higher education.

Keywords: unemployment, panel VAR model, higher educated graduates, faculties

JEL Codes: J21, J24, C53

1. Introduction

The rapid dynamics of society raises major issues in the educational, social and economic field. The answers to these problems must allow their solution on the one hand and, on the other, create the possibility of subsequent economic and social development. The main aim of this paper is to explain the unemployment among

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higher-educated people from Romania based on other variables related to education.

For this macroeconomic analysis, specific research methods will be applied. The analysis of macroeconomic data on the number of unemployed with higher education and the number of higher education graduates aims at applying a vector-autoregressive model (VAR) in the panel and a model with random effects. This method is proper for this situation, when small volume data sets are available. As we have regional data on unemployment rates, faculty numbers, teaching staff and the number of higher education graduates between 1993 and 2017, a panel approach in a vector-autoregressive model (VAR) will be used. This type of model is useful also from the point of view of the Granger causality relationships between variables. The purpose of applying these methods is to explain the phenomenon of unemployment among graduates of higher education, and to suggest, on the basis of the results, some recommendations for a better integration of individuals with higher education in the Romanian labor market.

The novelty elements of this paper are given by the results of empirical analysis at macroeconomic level using appropriate quantitative methods, as well as suggestions for improving the insertion of graduates on the labor market based on these empirical results.

The results of the regional analysis based on the VAR model in the panel suggest difficulties in integrating the graduates of higher education into the Romanian labor market, as confirmed by other studies in the literature by a microeconomic approach (Naroş, 2018) or by a macroeconomic approach (Bălan, 2014).

Recommendations proposed on the basis of quantitative analysis should be taken into account by governmental decision makers who, through appropriate legislative measures, must achieve the objective of sustainable development by supporting quality education at the level of education in general and higher education in particular. Measures are needed to reconfigure educational programs or to promote teaching strategies that require the involvement of young people in educational projects. In this sense, the internship platform would ensure the necessary dialogue between the actors involved in the training programs: candidates, companies and universities.

2. Literature review

Sustainable development, along-term objective pursued by any national economy, also means ensuring a high level of employment and, implicitly, reducing the unemployment rate to the value of natural unemployment rate. This can be achieved by promoting the partnership public-private partnership that can stimulate job creation where productivity is high (Zaman, 2006). Revenue redistribution

mechanisms are needed to avoid giving social assistance to people who do not want to work, although they have the ability to work.

Adaptation of individuals to changes in social systems occurring in every evolutionary period of society, and especially to changes occurring at the level of the education system, can be relatively easy. Any transformation changes at one time was perceived as a paradigm shift, with inevitable effects both within the school institutions, at the community level and even at the individual level. Regarding the education system, various models have been developed over time, different effects interactions and responses have been sought as pertinent to problems arising both inside and outside the system. Any success in resolving the problems of the education system was a step forward in putting into practice the drawn conclusions, as any failure triggered the elaboration of new models to respond effectively and more elaborately to the current challenges.

At the end of the 1970s, the insertion of young people into the labor market was a matter of concern for both the academic community and decision-makers in more developed countries. (Freeman, 1979; Clark and Summers, 1982; Ellwood, 1992; Berger, 1989). Although a series of measures have been implemented to facilitate the transition of young people from school to work, their entry into the labor market has become increasingly difficult. Initially, this phenomenon was associated with the surplus transient job offer given by the high birth rate after the Second World War (baby boomers generations. When the youth unemployment rate continued to rise despite declining cohorts, studies focused on labor market and educational system dysfunctions.

At the end of the 1990s and the early 2000s, with the doubling of the unemployment rate among the younger population in developed countries compared to the previous decade (Blanchflowerand and Oswald, 1998; Blanchflower and Freeman, 2000), the issue of youth integration into the labor market became one of the most critical challenges for public policy at national and international level and a problem of great interest in literature (Blanchflower and Oswald, 1998; Blanchflower and Freeman, 2000; Korenman and Neumark, 2000; Jimeno and Rodriguez-Palenzuela, 2002; O ' Higgins, 2003; Quintini and Martin 2006).

The recent economic crisis has made it more difficult for young people to find a place on the labour market, due to the high sensitivity to macroeconomic developments, as previously demonstrated in the studies by Blanchflower and Freeman (2000), Jimeno and Rodriguez-Palenzuela (2002) O'Higgins (2003) and OECD (2008).

In recent years, amid socio-economic developments at global level and sustainability as an objective, the specialists in the field, but also policy makers

and international organizations, have analyzed in detail the characteristics, risk factors, costs and consequences at individual and social levels related to the difficulties of insertion into the labor market, to find viable solutions. Empirical and theoretical studies cover the global, national or regional levels (OCDE, 2010; Bell & Blanchflower, 2011; Symonds et al., 2011; Vasile & Vasile, 2011; Bălan et al., 2013; Macmillan 2012; Dietrich, 2012; Hawley et al., 2012; Ball & Maguire, 2013).

The labor market for young people in Romania is characterized by the employment deficit, the number of jobs and the falling wages. Moreover, youth unemployment has specific vulnerabilities such as: a growing sensitivity to macroeconomic developments, long periods of unemployment, the difficulty of creating jobs for young people, an easier insertion into the informal labor market (Braica, 2015). Romania is the EU country with the highest unemployment among young people, and the recent economic crisis has accentuated the number of precarious workplaces(with low wages, below the skills of young people), the incidence of poverty, long-term unemployment and the depreciation of skills.

Young people remain the most vulnerable category to unemployment. Although Romania has a level of youth participation in education close to the EU average, this level is the smallest of the new EU Member States. The limited funds allocated to education and their inefficient use adversely affect the quality of the education system.

3. Methodology and empirical data

The empirical research aims at building a vector-autoregressive model (VAR) in the panel. For the estimation of this model, data was downloaded from the Tempo database of the National Institute of Statistics (NIS) for the period 1993-2017 for the eight regions of Romania (North-West, Center, North-East, South-East, South - Muntenia, Bucharest-Ilfov, South-West Oltenia, West): the number of unemployed, the number of license graduates, the teaching staff in higher education and the number of faculties. For the number of graduates (with a Bachelor's degree) data is available only until 2015.

The number of graduates refers to the end of the academic year, and graduates are considered students who have passed the last year of college, regardless of whether they passed the final graduation exam. For the number of licensed graduates, no data is available for 2017, therefore the panel with which we will work is unbalanced.

Teaching staff in higher education includes individuals in higher education who teach in the process of education and training, both full-time and part-time. Teacher registration is done only once and only at the university where it has the basic norm.

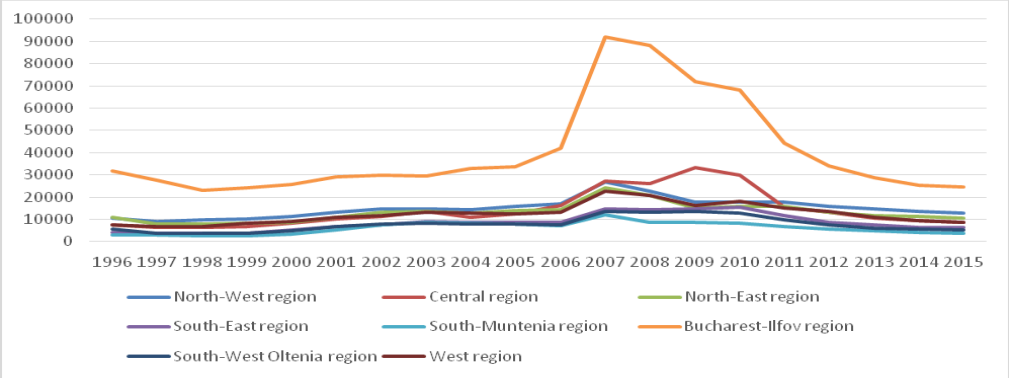

Figure 1 Evolution of the number of graduates (with a bachelor's degree) in the regions of Romania during the period 1996-2015
Source: author's graph

As can be seen from Figure 1, the Bucharest-Ilfov region is the one that supplies most graduates with a Bachelor's degree in Romania, achieving a maximum level of graduates in 2007, which is almost a tripling (an increase of 189.29 %) of the number of graduates compared to 1996. After 2007 the indicator decreses, which is in line with the general decrease of university graduates at a national level. Given that there is a significant gap between the number of graduates from the Bucharest-Ilfov region and that in the other regions, a separate analysis of the regions is necessary, excluding the Bucharest-Ilfov region.

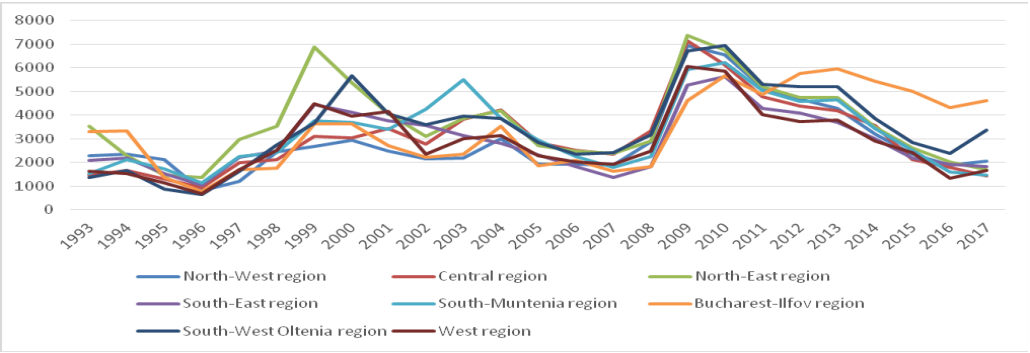

Figure 2 Evolution of the number of unemployed people with university studies in the regions of Romania in the period 1996-2017
Source: author's graph

As can be seen in Figure 2, starting with 2012, most of the unemployed with higher education are concentrated in the Bucharest-Ilfov region, which provides the most graduates with a Bachelor's degree in Romania, reaching a maximum level of unemployed with higher education in 2013. In 2009, when the economic crisis was already in place in Romania, the North-East region, the poorest in the country had the most unemployed with higher education, so that in 2010 and 2011 the South-West Oltenia region would feel the most acute the issue of unemployment among university graduates.

The data series related to the *number of unemployed with higher education* by region in the period 1993-2017 is characterized by the following indicators (Table 1):

Table 1 Indicators for characterization of the number of unemployed with university studies

	North West	Center	North East	South East	South Muntenia	Bucharest Ilfov	South West Oltenia	West
Average	1801.222	1807.111	3271.444	3199.333	2335.667	5744.111	4511.333	3128
Median	1541	1697	3025	3016	2399	5636	4584	2844
Maximum	3348	2760	4485	4230	3347	7388	5960	4998
Minimum	886	638	2159	1924	1354	4282	3006	1481
Standard deviation	894.037	840.013	792.932	863.985	601.804	941.342	1054.896	1289.167
Asymmetry	1.069	-0.238	0.215	-0.131	0.027	0.284	0.060	0.186
Excess	2.562	1.542	1.781	1.584	2.388	2.375	1.675	1.654
Jarque-Bera statistics	1.786	0.883	0.626	0.778	0.142	0.268	0.664	0.731
Probability	0.409	0.643	0.731	0.678	0.932	0.875	0.717	0.694

Source: own processing in EVIEWS

The Jarque-Bera test (JB) applied to the cross-section number of unemployed (by region) does not reject the assumption of normality of data distribution at the materiality threshold of 5% for all cross-sections.

The panel VAR model is useful to apply in this case as the problem of a small set of data through the panel approach is solved, but it is also possible to identify the causal relations in the Granger sense between variables on stationary data. Based on VAR models, the effect of a shock (innovations) on a variable on the other variables in the system is measured (Simionescu, 2013).

The general form of a VAR model is shown below:

$$y_{n,t} = \mu_n + A_n(i) \cdot Y_{n,t-1} + \varepsilon_{n,t'} \quad (1)$$

$Y_{n,t} = (y_{1t'}, y_{2t'}, \dots, y_{Nt'})$ includes data for all units (regions), n=1,2,…,N
$y_{n,t}$- vector of variables for each spatial unit (region)
μ_n- unit-specific intercept
$A_n(L)$- the delay polynomial with the coefficients of the VAR model
$\varepsilon_{n,t'}$- disturbances (mean 0 and variance σ_n^2)

If an unrestricted model is estimated, matrix A_n includes N x k x N coefficients.
According to Goodhart and Hofmann (2008), links between space units are neglected in the traditional panel VAR model. The approach proposed by Canova and Ciccarelli (2006) will be considered, where the VAR model is redesignated to take into account the links between the spatial units (regions). Various linear combinations of explanatory variables are used to synthesize changes to regressors.
The traditional fixed-effect estimator is not consistent in dynamic models if the coefficients of dependent variables differ across spatial units. Autocorrelation of errors is caused by limitations on coefficients when regressions are autocorelated. Estimation based on instrumental variables does not solve the problem of serial correlation. Therefore, Pesaran and Smith (1995) recommend the estimation with the group average estimator. Coefficients along spatial units are calculated based on the average, to have consistent estimates of average effects.
Coefficients in $A_n(L)$ vary randomly across transverse units under the group average estimator assumptions. The standard element $a_{n,i,j}^p$ of $A_n(L)$ is: $a_{n,i,j}^p = a_{i,j}^p + \mu_{n,i,j}^p$, where p is the lag of the VAR model, p = 1,2, ..., P, and n is the spatial unit index, i, j = 1,2, ..., K.
The reduced form of the VAR in the panel is:
$y_{n,t} = \mu_n + A_n(L) \cdot y_{n,t} + \varepsilon_{n,t}$, (2)
The purpose of applying these methods is to explain the phenomenon of unemployment among graduates of higher education, in order to suggest some recommendations for their better insertion into the Romanian labor market.

4. Empirical results and discussion

Pearson correlation coefficients suggest a weak and negative linear relationship between the number of unemployed with higher education and the rest of the variables (number of graduates, faculties and teaching staff), but there is a strong correlation between the number of faculties and the number of teaching staff, and also between the number of graduates graduates and the number of faculties, which is in line with expectations (Appendix).
Since the data series for all variables are stationary in the panel, a VAR model is built into the panel (VAR (3)). For the choice of lag (1) the principle of parsimony

was applied: between two competing models the simplest is chosen. Thus, we chose a VAR model in the 1st order panel at the expense of a 4th model (Appendix).

The built model meets the conditions of stability. The polynomial roots of the autoregressive process are shown below (Table 2):

Table 2 Polynomial roots of autoregressive process

root	module
0.770194	0.770194
-0.43356	0.433558
0.334546	0.334546
-0.01885	0.018848

Source: own processing in EViews

The exclusion test, Wald type, suggests that in the VAR model (1) in the panel, all lags are significant for all variables (Table 3):

Table 3 The lag exclusion test

	UNEMPLOYED	GRADUATES	TEACHING STAFF	FACULTIES	Common
Lag 1	257.9026	16.27785	39.37732	35.10987	334.0559
	[0.000000]	[0.002668]	[5.82e-08]	[4.41e-07]	[0.000000]

Source: own processing in EViews

For the proposed model, the errors are homoscedastic and independent, but their distribution is not normal at a significance level of 5%, as suggested by the results in Appendix 1. From an economic point of view, it is useful for this valid model to analyze the pulse-response function and the decomposition of variables on variance.

Starting from the VAR model (1) in the panel the effect of an impulse (shock) that emerged in one of the teaching staff variables, graduates and faculties on the number of unemployed with higher education (Table 8 and Table 9) is analyzed.

A shock (an innovation) in the series of the number of unemployed leads to an increase in the number of unemployed and a long-term stabilization of the influence to positive values. A shock to the data series on the number of graduates, the number of faculties and teaching staff does not have an immediate effect on the number of unemployed with higher education. Only in the second period the shock on the time series for these variables leads to an increase in the number of unemployed and a long-term stabilization of the influence to positive values (see Table 4). In other words, there are long-term difficulties in inserting the unemployed with higher education into the labor market, as suggested by Bălan et al. (2013).

Table 4 Response of the number of unemployed with higher education to a shock in variables (1993-2017)

Period	UNEMPLOYED	GRADUATES	TEACHING STAFF	FACULTIES
1	932.2144	0	0	0
2	675.3487	141.1185	202.9675	80.60454
3	524.6887	78.44241	54.68993	93.9677
4	396.8095	80.56225	84.03061	82.47922
5	307.0143	55.72929	45.78349	67.11978
6	235.2632	46.46901	43.21661	52.8057
7	181.5191	34.52244	29.75095	41.08208
8	139.5995	27.22892	24.41769	31.7615
9	107.5856	20.72432	18.14486	24.51029
10	82.82534	16.07905	14.25866	18.8904

Source: own processing in EViews

A shock (an innovation) in the series of higher education graduates leads to an immediate increase in the number of graduates, then a decrease in the values of this variable. In the long term, the influence of negative values is stabilized. A shock at the level of the number of faculties and teaching staff does not have any immediate effect on the number of graduates. Only in the second period, the shock to the number of faculties determines an increase in the number of graduates, and the sixth period tends to decrease the number of graduates of higher education (see Table 5).

Table 5 Response of the number of graduates (license) to a variable shock (1993-2017)

Period	UNEMPLOYED	GRADUATES	TEACHING STAFF	FACULTIES
1	-641.769	13081.5	0	0
2	-504.744	-1032.67	-3181.83	1485.091
3	-647.973	609.2498	1218.591	403.7563
4	-264.07	-235.494	-644.72	104.2533
5	-268.225	72.42647	206.7011	2.758885
6	-166.006	-71.194	-140.346	-20.3575
7	-141.281	-5.45517	23.57421	-24.6962
8	-101.598	-27.5077	-38.3278	-21.3891
9	-80.9119	-11.7167	-4.82939	-17.5471
10	-61.0079	-13.3422	-14.357	-13.7519

Source: own processing in EViews

In the first period, the number of unemployed does not change as a result to a shock in the number of graduates, the number of faculties or teaching staff. According to the results of Table 6, in the second period after a shock, 1.4% of the change in the number of unemployed is explained by the changes in the number of graduates of higher education, 2.95% of the variation is due to changes in the teaching staff and only 0.46% of the change in the number of unemployed is

attributed to the change in the number of faculties. The influence of changes in the number of graduates and faculties on the number of unemployed increases from one period to the next, while the influence of the changes in the number of unemployed with higher education slightly decreases from one period to the next, but it remains decisive for the variation in the number of unemployed.

Table 6 Decomposition by Variance of the Number of Higher-Education Unemployed

Period	Standard Error	UNEMPLOYED	GRADUATESS	TEACHING STAFF	FACULTIES
1	932.2144	100.0000	0.000000	0.000000	0.000000
2	1180.138	95.14569	1.429888	2.957924	0.466501
3	1298.460	94.92399	1.546124	2.620808	0.909076
4	1365.215	94.31618	1.746847	2.749632	1.187344
5	1402.774	94.12318	1.812385	2.710881	1.353554
6	1424.760	93.96740	1.863259	2.719870	1.449469
7	1437.586	93.89241	1.887827	2.714381	1.505384
8	1445.160	93.84391	1.903590	2.714551	1.537949
9	1449.628	93.81711	1.912312	2.713510	1.557071
10	1452.275	93.80080	1.917608	2.713271	1.568321

Source: own processing in EViews

In the first period, after a shock in the number of faculties and a shock in the teaching staff, in turn, the number of graduates does not change. According to the results of Table 7, in the first period, 0.24% of the changes in the number of graduates are due to a shock in the number of unemployed. The influence of changes in the number of unemployed increases slightly from one period to the next, reaching lately to explain 0.688% of the variation in the number of graduates, while the staff shocks explain about 6.42% of the variation in the number of graduates of higher education.

Table 7 Decomposition by Variance of the Number of Higher Education Graduates (License)

Period	Standard Error	UNEMPLOYED	GRADUATES	TEACHING STAFF	FACULTIES
1	13097.23	0.240103	99.75990	0.000000	0.000000
2	13608.39	0.359977	92.98217	5.466906	1.190949
3	13697.71	0.579075	91.97129	6.187284	1.262352
4	13717.3	0.614434	91.73111	6.390031	1.264426
5	13722.20	0.652251	91.67547	6.408652	1.263625
6	13724.12	0.666699	91.65249	6.417315	1.263491
7	13724.89	0.677220	91.64222	6.416889	1.263673
8	13725.37	0.682653	91.63629	6.417226	1.263829
9	13725.2	0.686103	91.63295	6.416999	1.263945
10	13725.78	0.688062	91.63096	6.416963	1.264017

Source: own processing in EViews

The relationship between the number of unemployed and the other variables is studied through Granger's causality, knowing that the corresponding data series is stationary.

Granger's Causes in the panel, Dumitrescu Hurlin version have the following results at a significance level of 5% (Table 8):

- Causal relationship from the number of graduates to the number of unemployed with higher education;
- Mutual causality relationship between the teaching staff and the number of unemployed with higher education;
- Mutual causality relationship between the number of faculties and the number of unemployed with higher education;
- Mutual causality relationship between the teaching staff and the number of graduates with higher education;
- The causal relationship between the number of faculties and the number of unemployed with higher education.

Table 8 Granger variability between variables (Dumitrescu Hurlin version)

Null Hypothesis	W	Zbar	Prob.
GRADUATES does not homogeneously cause UNEMPLOYED	16.5569	15.2260	0.0000
UNEMPLOYED does not homogeneously cause GRADUATES	1.96555	-0.34546	0.7297
PROFESSORS does not homogeneously cause UNEMPLOYED	13.2291	11.9148	0.0000
UNEMPLOYED does not homogeneously cause PROFESSORS	4.78700	2.73674	0.0062
FACULTIES does not homogeneously cause UNEMPLOYED	16.7202	15.7102	0.0000
UNEMPLOYED does not homogeneously cause FACULTIES	7.28446	5.45193	5.E-08
PROFESSORS does not homogeneously cause GRADUATES	6.83296	4.84890	1.E-06
GRADUATES does not homogeneously cause PROFESSORS	6.26369	4.24139	2.E-05
FACULTIES does not homogeneously cause GRADUATES	6.10343	4.07036	5.E-05
GRADUATES does not homogeneously cause FACULTIES	8.09955	6.20057	6.E-10
FACULTIES does not homogeneously cause PROFESSORS	2.07944	-0.20686	0.8361
PROFESSORS does not homogeneously cause FACULTIES	3.87808	1.74858	0.0804

Source: own processing in Eviews

The tests reject the hypothesis that the number of graduates, faculties and teaching staff is not a cause for the evolution of the number of unemployed with higher education. Therefore, by controlling the variables related to the provision of higher education, the number of unemployed with higher education can be controlled. As the number of graduates increases, the number of teaching staff and the number of faculties increases slightly, and the unemployment rate among people with higher education shows that they have not immediately integrated into the labor market. Our results that show labor market integration difficulties at regional level are confirmed by other studies at national level (Jaba et al., 2010; Bălan, 2014).

In this context, in the case of Romania investing in education and lifelong learning should be based on structural funding and should aim at promoting entrepreneurship. On this line, in 2017, the Managing Authority for the Operational Program Capital Uman launched 5 funding guidelines for projects aimed at reducing unemployment. The projects aim at inserting youth NEETs (people aged 15-24, who are not employed and not integrated into an education or training program), but also other unemployed and inactive people. On the other

hand, it is necessary for employees to participate in short-term vocational training programs to help them adapt more easily to the job requirements.

5. Conclusions

Based on empirical results at macroeconomic level, several recommendations will be formulated: it is useful to integrate students into the labor market before completing their studies, to gain the necessary work experience; incentives should be given to companies that employ fresh graduates who have not worked yet; it may be useful for companies run more internships, in order to select employees from the students. The expansion of the educational offer also increases the number of university graduates, and the number of existing faculties is sufficient to ensure graduates' insertion into the labor market.

The analysis to the regional level based on the VAR model in the panel suggests difficulties in the long-term absorption of graduates on the labor market in Romania. Due to the fact that the education system produces qualified persons in fields for which there is no demand on the labor market, employment is made more difficult the lack of jobs leads to the increase of unemployment among young people. Therefore, policies to diversify the educational offer from higher education institutions are needed to respond to labor market needs and to increase the number of specialists. Thus, the existence of a system to monitor the relationship between educational supply and current demand would prevent system failures and speed up economic growth, creating new jobs and increasing labor demand. Therefore, it is important that the state to embalances the number of specialists in some fields (areas) for to garanted the integration on the labor market a teaching staff . It is necessary a flexible curriculum oriented on the labor market as well as a reorganization of the graduates' structure by professions and occupational groups. This approach is limited by the consideration of only few variables in the panel VAR model. Therefore, in a future study more variables should be consiered.

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Author's Contributions

Mihaela Simionescu conceived the study and was responsible for the methodology and data collection and empirical analysis, model estimation in EViews software, conclusions, review and editing.
Maria-Simona Naroș was responsible for the introduction and literature review section, editing.

Disclosure Statement

The authors declare no conflict of interest.

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Appendix

Pearson correlation coefficients

	UNEMPLOYED	GRADUATE	PROFESSORS	FACULTIES
UNEMPLOYED	1	-0.08043	-0.08076	-0.10772
GRADUATES	-0.08043	1	0.61761	0.643863
PROFESSORS	-0.08076	0.61761	1	0.938329
FACULTIES	-0.10772	0.643863	0.938329	1

VAR Lag Order Selection Criteria						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-3368.723	NA	6.18e+23	66.13182	66.23476	66.17350
1	-3306.987	117.4179	2.52e+23	65.23505	65.74975*	65.44347
2	-3275.225	57.92037	1.85e+23	64.92597	65.85244	65.30113
3	-3242.027	57.93252	1.33e+23	64.58877	65.92699	65.13066
4	-3214.460	45.94596*	1.07e+23*	64.36196*	66.11194	65.07058*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

	UNEMPLOYED	GRADUATES	PROFESSORS	FACULTIES
UNEMPLOYED(-1)	0.766019	-0.600576	0.000396	0.000302
	(0.04832)	(0.67881)	(0.12761)	(0.00213)
	[15.8546]	[-0.88475]	[0.00310]	[0.14154]
GRADUATES(-1)	-0.002636	0.073518	0.027076	0.000440
	(0.00715)	(0.10045)	(0.01888)	(0.00032)
	[-0.36864]	[0.73186]	[1.43377]	[1.39259]
PROFESSORS(-1)	0.020200	-3.167912	-0.612678	-0.014114
	(0.07801)	(1.09608)	(0.20605)	(0.00344)
	[0.25893]	[-2.89023]	[-2.97341]	[-4.09723]
FACULTIES(-1)	5.735523	105.6736	6.488856	0.425477
	(4.91897)	(69.1095)	(12.9919)	(0.21719)
	[1.16600]	[1.52907]	[0.49945]	[1.95900]
C	286.2620	17579.32	4626.986	83.69669
	(229.579)	(3225.49)	(606.363)	(10.1368)
	[1.24690]	[5.45012]	[7.63072]	[8.25673]
R-squared	0.621598	0.093941	0.200519	0.182759
Adj. R-squared	0.611957	0.070856	0.180150	0.161938
Sum sq. resids	1.36E+08	2.69E+10	9.52E+08	265990.3
S.E. equation	932.2144	13097.23	2462.156	41.16073
F-statistic	64.47566	4.069462	9.844330	8.777467
Log likelihood	-1335.014	-1763.114	-1492.353	-829.5612
Akaike AIC	16.54338	21.82857	18.48584	10.30322
Schwarz SC	16.63868	21.92386	18.58114	10.39852
Mean dependent	3155.926	13580.24	3318.062	73.24074
S.D. dependent	1496.497	13587.45	2719.244	44.96193
Determinant resid covariance (dof adj.)		1.12E+23		
Determinant resid covariance		9.90E+22		
Log likelihood		-5208.408		
Akaike information criterion		64.54824		
Schwarz criterion		64.92943		

VAR Residual Portmanteau Tests for Autocorrelations		
Null Hypothesis: no residual autocorrelations up to lag h		
Lags	Q-Stat	Prob.
1	28.38786	NA*
2	10.76435	0.8238
3	13.83510	0.6110
4	11.35810	0.7869
5	22.16937	0.1378
6	12.10079	0.7370
7	20.58304	0.1951
8	31.02806	0.1334
9	28.38786	0.2843
10	10.76435	0.8238

VAR Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)		
Joint test:		
Chi-sq	df	Prob.
0.453	80	0.665

Component	Jarque-Bera	df	Prob.
1	1.761443	2	0.4145
2	1436.310	2	0.0000
3	50.69965	2	0.0000
4	22.60889	2	0.0000
Joint	1511.380	8	0.0000

Pairwise Dumitrescu Hurlin Panel Causality Tests			
Sample: 1993 2017			
Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.
GRADUATES does not homogeneously cause UNEMPLOYED	16.5569	15.2260	0.0000
UNEMPLOYED does not homogeneously cause GRADUATES	1.96555	-0.34546	0.7297
PROFESSORS does not homogeneously cause UNEMPLOYED	13.2291	11.9148	0.0000
UNEMPLOYED does not homogeneously cause PROFESSORS	4.78700	2.73674	0.0062
FACULTIES does not homogeneously cause UNEMPLOYED	16.7202	15.7102	0.0000
UNEMPLOYED does not homogeneously cause FACULTIES	7.28446	5.45193	5.E-08
PROFESSORS does not homogeneously cause GRADUATES	6.83296	4.84890	1.E-06
GRADUATES does not homogeneously cause PROFESSORS	6.26369	4.24139	2.E-05
FACULTIES does not homogeneously cause GRADUATES	6.10343	4.07036	5.E-05
GRADUATES does not homogeneously cause FACULTIES	8.09955	6.20057	6.E-10
FACULTIES does not homogeneously cause PROFESSORS	2.07944	-0.20686	0.8361
PROFESSORS does not homogeneously cause FACULTIES	3.87808	1.74858	0.0804