



ECONOMETRIC ANALYSIS OF PANEL DATA FOR GENDER AND AGE DIFFERENCES IN THE UNEMPLOYMENT IN ROMANIA

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Abstract *This paper presents the way in which is analyzed the impact of demand for labor, at the female and male population unemployed, in Romania, at NUTS II (8 regions), before the economic crisis and after installation. It uses econometric model with panel data, with the dependent variable, ILO unemployment rate for women and men, for the four age categories and, as independent variables, the rate of job vacancies across six major groups' occupations: The data used are quarterly, obtained from the household labor force survey (LFS) and survey vacancies made / published by the National Statistic Institute.*

Key words:

Unemployment; job vacancies; panel data; econometric analysis

JEL Codes:

C33, C54, J21, J70

1. Introduction

The equality of opportunity between men and women is a fundamental human right. Recent studies in the field reveal that the introduction of a gender perspective in the labor market leads to significant increases in the economy and living standards of citizens

The economic and social crisis that was felt in Europe, affected all vulnerable groups, especially women and youth. Restructuring, reorganization and layoffs in both the public and private sectors led to a rise in unemployment. In Romania, naturally, there were specific developments in what concerns the participation of women and men in the labor market. Before the manifestation of acute economic and financial crisis. The target to be met of 75% employment of the labor force (70% for women), in accordance with the objectives of the 2020 Strategy, based on the results of the Lisbon Strategy, seemed to be a realistic target. Once the effects of the economic crisis were felt, there were registered massive staff cuts in fields heavily dominated by men (construction, industry), and maintained a high percentage of employment for women. Subsequently, there were also recorded layoffs in the areas of activity in which the majority were women workers (services field).

The rising unemployment rate is due to the restructurings that took place, the low number of job vacancies registered, the lack of training of those who are looking for a job. Vulnerability exists also in terms of employability for different age categories. One in five

young people do not find their place in the labor market in Romania, also, the elderly are not accepted, either because of lack of training in new areas appeared, or because they have resistance to change.

This paper aims to present the results of a comparative econometric analysis on the harmonization of labor demand expressed by the rate of job vacancies, for large groups of occupations with the job offer expressed by the unemployment rate for male and female individuals, divided into four groups of age.

2. Methodology of research

2.1. Date used in the model

The data used are from the household labor force statistical survey (HLFS) for data on ILO unemployment and quarterly, job vacancies survey, for data related to rate of vacancies, made/published by the National Statistics Institute for the periods 2005-2008 and 2009-2013, for the female and male population unemployed, in Romania, at 8 regions, NUTS II (territorial unitary Nomenclature of Territorial Units for Statistics established by the Statistical Office of the European Union-EUROSTAT organized system 6 levels). Dependent variable is Unemployment rate (UR_) ILO,¹ for different age groups: 15-24 years, 25-34 years, 35-54 years, 55- 64 years, for female and male. The Independent variabls are Job vacancy rates by major occupations groups: for workers with technical occupations foreman and assimilated(th_w), farmers and skilled workers in agriculture, forestry and fishery (w_agr), unskilled workers(w_un), operative workers in

services, trade and assimilated (w_srv), civil servants (w_cs), specialists with intellectual and scientific occupations (spc).

2.2. Descriptive Statistics

The analysis shows that in the period 2009-2013, there is an increase in the unemployment rate in both women and men of all ages. The unemployment rate for women between 15 and 24 years exceeds unemployment rate for men, a situation not found in the other age groups. Note that although unemployment

among women is lower than among men, there is a higher rate of increase among women after 2009. It is worrying that youth unemployment is high during the crisis; there were values of 42%. Unemployment among older people is low, but it must be considered also the method for calculating the unemployment rate (the number of unemployed relative to the total number of active persons in that age group). Econometric analysis shows which are the possibilities for a person to find a job in the field in which they have skills and competencies.

Table 1. Descriptive Statistics for the unemployment rate

	UR 15_24		UR 25_34		UR 35_54		UR 55_64	
	F	M	F	M	F	M	F	M
2005-2008								
Mean	18.5	20.4	5.9	7.7	4.6	5.6	1.4	3.7
Median	17.8	20.6	5.7	7.7	4.5	5.8	1.1	3.1
Maximum	32.4	32.8	12.3	13.9	8.7	10.6	4.9	12.1
Minimum	4.0	8.8	0.1	1.8	0.7	1.7	0.2	0.2
2009-2013								
Mean	23.1	22.8	7.1	8.8	5.1	5.7	2.2	4.6
Median	22.3	22.3	6.8	8.5	4.6	5.8	2.0	4.2
Maximum	42.3	42.1	15.9	17.6	9.4	10.8	7.8	14.5
Minimum	6.8	5.8	0.8	3.2	2.4	1.8	0.2	0.4

Table no 2 shows an image of the rate of job vacancies in the periods 2005-2008 and 2009-2013. It shows a major decrease of the rate of job vacancies for all the occupations, especially for operative workers in services (20% compared to the previous period. We

meet the smallest decline at the rate of job vacancies for specialists in different fields (43%), but also for unskilled workers. Moreover, the highest demand of jobs is to be found in the IT field.

Table 2. Descriptive Statistics for job vacancies rate²

JVR 2005-2008	SPC	W_SRV	W_UN	W_TH	L_AG	JVR 2009-2013	SPC	W_SRV	W_UN	W_TH	W_AG
Mean	1.4	2.9	1.9	5.1	1.9	Mean	0.8	0.6	0.8	2.1	0.6
Median	1.4	2.8	1.8	5.0	1.4	Median	0.7	0.5	0.7	2.0	0.4
Maximum	3.3	4.7	3.9	8.0	10.3	Maximum	3.8	1.7	1.9	4.5	4.8
Minimum	0.4	1.2	0.5	2.5	0.06	Minimum	0.3	0.1	0.2	0.8	0.03

After 2009, in Romania, the employment rate decreased (from 65.7% for men and 52.5% for women in 2008 to 65.2% for men 52% for women in 2009), rebounding after 2012, reaching out to 67.8%, respectively, 53%, in the second semester of 2014; unemployment has increased slightly, from 7% to 8% for men and from 5% to 6.5% for women. It is worrying that unemployment among women recorded a higher growth rate. After 2009, the number of vacancies on the total economy fell by 60% compared to 2008. The occupations for which were recorded the largest decreases were: 65% unskilled workers, skilled workers in technical activities 61%.

2.3. Econometric analysis

The models used in this analysis are Panel data. The advantages of this analysis highlighted by Baltagi (2004) are: the panel data estimation techniques, explicitly consider the heterogeneity of classes, allowing the expression of individual specificity. By combining the time series with cross sectional data (cross), the data panel model provides "more informative data, more variability, less collinearity between variables, more degrees of freedom and more efficiency." [2]By studying repeated observations on cross-sectional data, panel data are more suitable for studying the dynamics of change. The Panel data can better detect and measure the effects which cannot be

seen only in cross-section or in the time series (Unemployment, income, vacancies and labor mobility are better studied with panel data. The Panel data allow the study of more complicated models regarding the behavior of different features. The data panel gives the advantage to pool different units in a unified approach.

A first step in the preparation of the data series to be introduced in econometric models (in number 16). Is the verification of the stationarity and nonstationarity of time series. Eviews software enables the application of

the tests, Summary, Augmented Dickey-Fuller well (ADF test), Philips-Perron (testulPP) Hadri, to verify the existence of the unit root that confirms the non stationary series. After applying the ADF tests, we found that the unemployment rate for all age groups, women and men, for the two periods are stationary series (p-value > 0.05).. For the series of job vacancies rate there was found non-stationarity in the first level, only for technical occupations in the period 2005-2008 and for the other series there was found stationarity.

Table 3. ADF test results based on the explanatory variables in the two periods

Variables	IPS panel unit root test			
	2005-2008		2009-2013	
	Level	1 st difference	Level	1 st difference
SPC	52.0310 (0,0000)**		63.7253 (0,0000)*	
W_SRV	51,5539 (0,0001)**		32.8093 (0,0078)**	
W_UN	66,1354 (0,0000)**		75,3571 (0,0000)**	
W_TH	23. 7229 (0,0000)**	82,5515 (0,0957)*		92.5266 (0,0000)**
W_AG	74,7245 (0,0000)**		61.0076 (0,0000)*	
W_CS	31,5417 (0,0030)**		59.5507 (0.0000)*	

P-values are in parenthesis. *, and ** show significance at 10%, respectively 1% level.
 The Null hypothesis is that series are non stationary.

The econometric model was estimated for each dependent variable, using the method of least squares for panel data (Pooled OLS, fixed effects (factors) model (FEM) and random effects (factors) model (REM), with the package EViews program. The econometric test that establishes the available model for use, between FEM and REM is the Hausman

test. Nevertheless, estimating models for the three variants, we obtained very close values.

2.4. Results and interpretation

The equation, for the econometric model panel used is:

$$UR_{it}^{F/M} = a_0 + a_1 TH_W + a_2 AG_W + a_3 SRV_W + a_4 CS_W + a_5 UN_W + a_6 SPC + \alpha_i + \beta_t + \varepsilon_{it} \quad (1)$$

The dependent variable is $UR_{it}^{F/M}$ = unemployment rate for the j age group, in the region i, at the time t, for famel oder male.

The independent variables are the rate of vacancies (JVS) in the region i, at time t, for the six major categories of occupations

$a_0...a_6$ = The coefficients (parameters) of the model,

α_i = Individual effects

β_t = Period-specific effects

ε_{it} = Individual random effects, in period t
 j = 1-4, i = 1-8,

Table 4. The econometric estimation results for 2005-2008

Variables/ age/gender	15-24		25-34		35-54		55-64	
	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE
TH_W	0,94*		0,52**	0,51**				
AG_W	-1,11**							
SRV_W	2,10*				0,56*			
CS_W			-0,87**		-0,58**	0,59**		
UN_W								
SPC							-0,73**	
Adjusted R-squared	0,49	0,30	0,48	0,45	0,56	0,56	0,29	0,39
Probability F-statistic	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Observations	120	120	120	120	120	120	120	118

* Sow significance at 10% **Sow significance at 5%

In the results of the analysis, we see indeed, that a lower unemployment rate for women can be justified by a better correlation between supply and demand of jobs. For the period before the crisis, the age group 15-24 years, we observe a significant influence statistically speaking of jobs for workers with technical occupations, agricultural workers and operators' workers in services in the case of women. For the age group 25-34 years, we meet two groups of occupations statistically

significant for women and only one (th_w) for male. The same situation we also meet for the age group 35-54 years. For the age group 55-64 years only women were requested (statistically significant) for occupations that led to a decrease in the unemployment rate- specialists in various fields. Note that, the most hiring's were made in the field of civil servants for women in the age group 25-54 years.

Table 5. The econometric estimation results for 2009-2013

Variables/ age/gender	15-24		25-34		35-54		55-64	
	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE
TH_W					-0,46**		-0,87**	-0,94*
AG_W			-0,88**			-0,57**		
SRV_W	-6,3**							
CS_W		-3,12*		-1,48*	-0,65*	-1,11**		
UN_W					0,70**			
SPC								
Adjusted R-squared	0,61	0,63	0,58	0,52	0,68	0,59	0,38	0,31
Probability F-statistic	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Observations	135	135	135	135	135	128	124	135

* Sow significance at 10% **Sow significance at 5%

For the age groups 15-24 years :For female: UR, mean is 23.1%, maximum is 42.3%, The vacancies which significantly influenced the change of unemployment rate, were for: *operative workers in services, trade and assimilated* (-6.3);For male: UR, mean is 22.8%, maximum 42.1%, The vacancies which significantly influenced the change of unemployment rate, were for *civil servants* (-3,12) . For the age groups 25-34 years : For female: UR, mean is 7.1%, maximum is 15.9%, The vacancies which significantly influenced the change of unemployment rate were for: *agriculture workers* (-0,88)For male: UR, mean is 8,8%, maximum 17,6%, The vacancies which significantly influenced the change of unemployment rate were for, *civil servants* (-

1,48) For the age groups 35-54 years: For female: UR, mean is 7.1%, maximum is 15,9%, JVR: *workers with technical occupation* (-0,46), For male: UR, mean is 8,8%, maximum 17,6%, The vacancies which significantly influenced the change of unemployment rate were for, *civil servants* (-1,48). For the age groups 55-64 years: For female: UR, mean is 2,2%, maximum is 4,6%, JVR: *workers with industrial occupation* (-0,46), For male: UR, mean is 7,8%, maximum 14,5 %, The vacancies which significantly influenced the change of unemployment rate, were for, *civil servants*(-1,48).

The estimators obtained by applying the models with panel data for the period after 2009 shows that a smaller number of occupations responded to the labor

demand (hence a higher unemployment rate). Note that almost all coefficients obtained show an inverse relationship between unemployment and JVR.

4. Conclusions

The analysis highlights a change in the employers behavior after the installing of the economic crisis in Romania, a poor harmonization of demand and supply of labor, due to economic restructuring and poor adaptability of the system of education and continuous training for the needs of society. The occupations required by employers and leading to a significant decrease of the unemployment rate are in the technical field and the services, before the crisis, and after the 2009 in the services field. In what concerns the unemployment among women versus men unemployment, unemployment among women is lower compared to unemployment among men, both before and after the economic crisis, with the exception of the 15-24 age group, where unemployment is higher for women than for men. The analysis shows a better harmonization between the expectations and the realities of the labor market (UR/JVR) for women, which explains in part the lower unemployment rate. A special position in the labor market is occupied by young people (women and men) for which the unemployment rate is around 21%, but also the elderly, even though the unemployment is low (2.2% for women and 4.6% for men), they are not included in the jobs offered by employers. As such, age and gender are two dimensions of unemployment for which, in Romania, there are not large differences.

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ANNEX

Dependent Variable: UR_25_34?				
Method: Pooled Least Squares				
Date: 04/09/15 Time: 18:32				
Sample (adjusted): 2005Q2 2008Q4				
Included observations: 15 after adjustments				
Cross-sections included: 8				
Total pool (balanced) observations: 120				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.201628	1.500836	6.131004	0.0000
W_AG?	0.173979	0.178200	0.976315	0.3311
D(W_TH?)	0.524730	0.208604	2.515440	0.0134
W_UN?	-0.304299	0.433547	-0.701883	0.4843
W_SRV?	0.673394	0.477872	1.409150	0.1617
CS?	-0.873898	0.436839	-2.000502	0.0480
SPC?	-0.649850	0.442640	-1.468125	0.1450
Fixed Effects (Cross)				
NORD_VEST--C	-2.359383			
CENTRU--C	0.337641			
NORD_EST--C	-2.033953			
SUD_EST--C	0.717947			
SUD_MUNTENIA--C	3.336640			
BUC_ILFOV--C	-0.989201			
SUD_VEST--C	-0.040669			
VEST--C	1.030978			

	Effects Specification		
Cross-section fixed (dummy variables)			
R-squared	0.535936	Mean dependent var	5.738333
Adjusted R-squared	0.479023	S.D. dependent var	2.395099
S.E. of regression	1.728753	Akaike info criterion	4.041959
Sum squared resid	316.7903	Schwarz criterion	4.367166
Log likelihood	-228.5175	Hannan-Quinn criter.	4.174027
F-statistic	9.416680	Durbin-Watson stat	1.404979
Prob(F-statistic)	0.000000		

¹ ILO Unemployed, according to International Labor Office (ILO) criteria, are persons aged 15-74 years who, during the reference period, simultaneously meet the following conditions: have no job and are not carrying out any activity in order to get income; are looking for a job, undertaking certain actions during the last four weeks; are available to start work within the next two weeks, if they immediately find a job.

² Vacancies rate (JVR) represents the ratio between the numbers of vacancies and total number of jobs (occupied and vacant), number of vacancies include the number of part created jobs, unoccupied or becoming vacancies for which employer takes concrete actions to find an adequate candidate for that job. The total number of jobs includes the number of employees at the end of the month and number of vacant jobs.