Statistical evaluation of spatial concentration of unemployment by gender

Jaba, Elisabeta and Balan, Christiana and Roman, Mihai and Roman, Monica

Academy of Economic Studies Bucharest, A. I. Cuza University Iasi

January 2010

Professor Elisabeta JABA, PhD
E-mail: ejaba@uaic.ro
Assistant Professor Christina Brigitte BALAN, PhD
E-mail: christiana.balan@uaic.ro
"Al. I. Cuza" University,
Faculty of Economics and Business Administration, Iasi, Romania
Professor Mihai ROMAN, PhD
e-mail: romanm@ase.ro
Professor Monica ROMAN, PHD
e-mail: mroman@ase.ro
The Bucharest Academy of Economic Studies

STATISTICAL EVALUATION OF SPATIAL CONCENTRATION OF UNEMPLOYMENT BY GENDER

Abstract. *This paper studies the spatial distribution of unemployment by gender, in the counties of Romania, in 2008.The Lorenz curve and Gini index are used to identify a pattern of spatial concentration of unemployment, differentiated by gender. Evaluation of gender differences in unemployment spatial concentration model shows significant differences. There is a greater spatial concentration of unemployment for female population. Based on results of grouping counties by cluster analysis applied for unemployment rate, one could explain the gender differences in spatial concentration correlated with spatial distribution of the workforce and the characteristics of territorial development of counties in Romania.*

Keywords*: unemployment, gender differentiation, spatial concentration, cluster analysis, territorial development, Romania*

JEL Classification: **R12, J21, E24, R11**

1. Introduction

In the European area, economic activity differs significantly among regions and spatial differences in unemployment are even higher. Currently, there are regions where there is full employment and regions with excessive unemployment, and such situations coexist even within the same country. Germany, Italy and Spain are examples of countries where some regions have unemployment rates below 5% while

other regions have an unemployment level of over 20%. These regional disparities have increased in recent years.

Both theoretical framework and empirical practice that focus on economic activity show inequality assessment. More specific, women and minorities are more likely to be underemployed or out of the labor force altogether compared to their counterparts (Leppel [2009], Frederiksen [2008], Alon & Stier, [1997]; Clogg & Sullivan, [1983]; Lichter & Landry, [1991]). Thus, the distinctive employment patterns of women, young and old individuals, and racial and ethnic minorities require a different conceptual framework to fully account for their market position and employment well-being.

Some major findings emerge the literature. First of all, there is evidence that inadequate employment is more common among women than men (Leppel [2009], Alon & Stier, [1997]; Clogg & Sullivan, [1983]; Lichter & Landry, [1991]). In addition, women are also more likely to stay underemployed for longer periods of time. (Lichter & Landry, [1991]). Second, underemployment is a spatial phenomenon in which underemployment rates are highest in non-metropolitan areas (Findeis, [1993]; Lichter & Landry, [1991]; Tigges & Tootle, [1993]). Third, unemployment rates depend on general economic conditions, although studies find that non-metropolitan areas are less sensitive to economic cycles than metropolitan areas (Hamrick, [1997]; Jensen et al., [1999]).

Alon Signal [2004] scrutinizes whether and how economic cycles shape and forge gender inequality in employment hardship. The basic results shows that men may be more sensitive than women to economic cycles, but the results clearly illustrate how gendered pathways out of underemployment and adequate employment reinforce and reproduce the gender stratification in the labor market.

Détang-Dessendre C. and Gaigné C. [2009] provide a new empirical investigation of the role of residential location in unemployment duration, using spatial distribution of employment opportunities. They use a spatial job search framework that shows the importance of dissociating the role of travel time from physical distance in unemployment duration. Finally, they find that for workers living in France large urban centers, the relationship between location and unemployment duration is insignificant.

Jolliffe D. and Campos N. F. [2005] investigates male–female differences in the labour market before and during the transition from central planning to market economy in Hungary from 1986 to 1998. They find that the relative situation of women improved: the female to male wage ratio (in levels) increased from 73% in 1986 to 80% in 1998.

The process of spatial concentration refers to the way in which a phenomenon, in our case unemployment, is distributed in space. (Aiginger [2004], Goschin et al [2008]).

Spatial concentration is a process that depends on the interaction between the development of each region at a certain time and the business profile of each county

and also on the geographic location of the counties (Lucas, [1988], Fujita, M. and Thisse, J.F., [2004]), generating differences in unemployment by gender.

If, at county level, there is an economic structure on businesses favoring female population, or male population, then we should expect that, in times of economic crisis, unemployment is more marked for that category of population employed in the field of activity that is essential for one county.

Beneficial effect of spatial concentration on economic development occurs when targeting a factor with positive influence, for example investments in productive activity. For the studied phenomenon, unemployment, concentration reflects the result of a disturbance in the economic activity. It manifests with different intensity and different effects on the economic development in relation to the structure of regional economic activity. The concentration of activities in certain counties and counties specialization in certain activities led to national mobility of labour, differentiated by gender, according to the profile of activities prevailing in the region.

In our study we want to verify two hypotheses: the unemployment rate is distributed differently by gender in Romania, and the second one: there is a different concentration of unemployment in territorial profile.

Highlighting differences in spatial concentration of unemployment by gender may help to found decisions on development both in each county and in Romania, and to build up various development programs in relation to the specific of an area.

2. Method

In the first part of the study, we present a descriptive analysis of the spatial distribution of unemployment by gender, in the counties of Romania, in 2008. Then, we test the significance of differences in the unemployment rate by gender using Student T test.

In the second part, we analyze the spatial concentration of unemployment by sex applying Lorenz curve and Gini index. A difficulty in the analysis of spatial concentration of unemployment is the unit measure of the phenomenon (Puech, [2003]; Brulhart, Traeger, [2003]). By expressing the phenomenon in absolute size, for example unemployment in thousands, does not assure the comparability, given the different dimension, under multiple aspects, of the territorial units. Therefore, in the paper, we use the ratio between the unemployment in one county and the total unemployed in Romania weighted by the ratio between the labour force from one county and the total labour force in Romania, by gender.

In the third part of the paper, we use this weight to group counties by cluster analysis. Depending on the composition of each cluster, we attempt to explain the relation of the unemployment spatial concentration by gender to structural changes of economic activity in territorial profile.

3. Analysis of spatial distribution of unemployment by gender, in the counties of Romania

The analysis considers the unemployment rate, calculated as the ratio between the unemployment and the labour force, for which the histogram is built for each gender (Fig. 1 and Fig. 2).

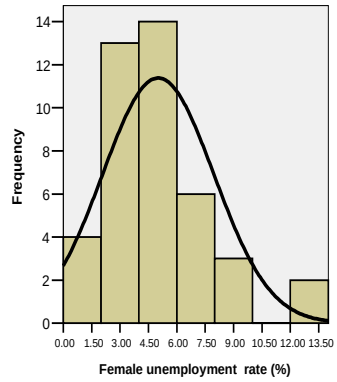


Fig. 1. Counties distribution on female unemployment rate

Fig. 2. Counties distribution on male unemployment rate

It is noticed that unemployment density function differs by gender. Distribution of counties by female unemployment rate indicates an average unemployment rate and a dispersion that are lower than for male population. The average unemployment rate by county, for female population, is 5.02%, while the unemployment rate is 7.16% for male population. The standard deviation is equal to 2.94% and to 3.88% for female population and male population, respectively.

The difference between the average unemployment rate by gender is statistically significant (Student test t = - 4.692, Sig. = 0000, 95% confidence) (Appendix 1).

A more refined analysis of the distribution of counties on unemployment rate, by gender or by total, can be achieved using the percentiles. Such distribution can help us to identify the spatial concentration profile.

Obtaining such a distribution implies the following steps:

(1) Grouping the counties by unemployment rate;

(2) Finding, based on the distribution obtained previously, the distribution of ratios between unemployment for counties by groups and total unemployment;

(3) Calculating the descending cumulative ratios for unemployment by groups of counties.

Results are shown in Table 1.

Table 1. Distribution of counties on unemployment rate, unemployment rates and descending cumulative rates, by gender

Unemployment rate (%)	Female population			Male population		
	No. of counties	Unemployment rate (%):	Descending cumulative rates (%):	No. of counties	Unemployment rate (%):	Descending cumulative rates (%):
(0 – 1.5]	3	1.067	100.000	1	0.298	100.000
(1.5 – 3]	8	14.508	98.933	5	4.850	99.702
(3 – 4.5]	9	16.206	84.425	8	15.822	94.852
(4.5 – 6]	11	23.484	68.219	2	4.037	79.030
(6 – 7.5]	3	9.364	44.735	6	10.349	74.993
(7.5 – 9]	4	11.063	35.371	8	18.234	64.644
(9 – 10.5]	2	13.003	24.308	6	17.339	46.410
(10.5 – 12]	0	0.000	11.305	3	15.335	29.071
(12 – 13.5]	1	6.744	11.305	0	0.000	13.736
(13.5 – 15]	1	4.561	4.561	0	0.000	13.736
(15 – 16.5]	0	0.000	0.000	2	8.399	13.736
(16.5 – 18]	0	0.000	0.000	0	0.000	5.337
(18 – 19.5]	0	0.000	0.000	1	5.337	5.337

Source: Authors calculations from data available on TEMPO-Online, Romanian National Institute of Statistics (https://statistici.insse.ro/shop/)

Based on data from Table 1, using the repartition distribution curve of unemployment ratios of groups of counties, we identify the spatial concentration profile of the unemployment. For that reason, we built the repartition distribution curve of female and male unemployment ratio for groups of counties. On the abscissa, we represented the unemployment rate and on the ordinate we represented the cumulative unemployment ratios (Fig. 3 and Fig. 4).

Comparing the two distribution curves and characteristics of the distributions (Fig. 3, Fig. 4 and Table 2), we notice that distribution of unemployment ratio by groups of counties on unemployment rate in Romania, in 2008, shows clear differences between the two populations considered. It is noted that the point of inflection of the curves is different for the two populations, female and male unemployment. Thus, it is found that for female unemployment, 50% of the unemployed population is leaving in counties where the ratio between unemployment in a group and counties and total unemployment is up to 5.84%, while for male unemployment, 50% of unemployed population is located in counties where the ratio between unemployment in the county and total unemployment is over 8.71%.

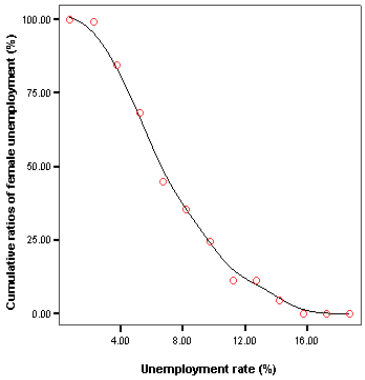


Fig. 3. The cumulative curve of female unemployment ratio

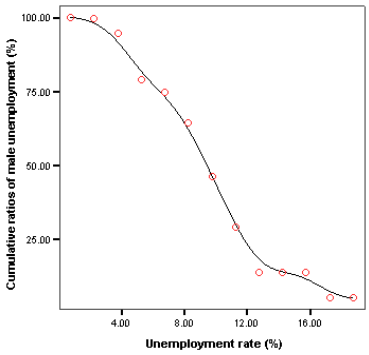


Fig. 4. The cumulative curve of male unemployment ratio

Table 2. Characteristics of the distribution of unemployment ratio by groups of counties on the unemployment rate in Romania, in 2008

	Female population	Male population
Mean	6.49	8.85
Median	5.84	8.71
Std. Deviation	3.43	4.23
1st Quartile	3.84	5.66
2nd Quartile	5.84	8.71
3rd Quartile	8.85	10.91

The ratio of female unemployment in counties where unemployment rate exceeds the overall county median is equal to 68.12% and the ratio of male unemployment corresponding to median is 79.03%. Also, 75% of female unemployment is in counties with unemployment rates of up to 8.85%, while 75% of male unemployment is in counties with unemployment rates of up to 10.91%. Therefore, female unemployment is more concentrated in counties with a low unemployment rate, while male unemployment is concentrated in counties where unemployment rate is above average.

4. The evaluation of the unemployment spatial concentration, by gender

The degree of unemployment spatial concentration according to the distribution of the labour force can be assessed using the Lorenz curve and Gini index.

Lorenz concentration curve [Lorenz, MO, 1905] applied to the study of spatial concentration of unemployment is the graphical representation in a system of two rectangular axes, of the points of coordinates (p_i, q_i), where p_i is the cumulative ratio of the labour force and q_i is the cumulative ratio of unemployment.

In the paper, the cumulative ratios q_i and p_i were determined by the values of the ratio ($\frac{s_i}{a_i}$), where:

s_i is the unemployment ratio between the unemployment in the county "i" and the total unemployment,

$$s_i = \frac{no.\,unemployment\ county\ i}{no.\,total\ unemployment}$$

a_i is the ratio between labour force in the county "i" and the total labour force,

$$a_i = \frac{labour\ \ force\ county\ i}{total\ labour\ \ force}$$

The values of q_i şi p_i are presented in Appendix 2, and Lorenz curves for the two categories of population, male and female, are built using SPSS (Jaba, E., Grama A., [2004]) and are presented in figures Fig. 5 and 6.

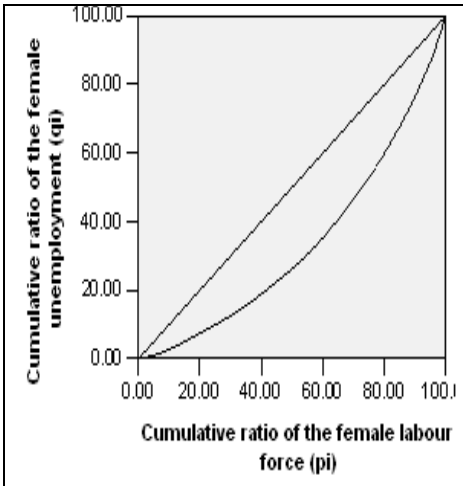


Fig. 5. Lorenz curve for female population

Fig. 6. Lorenz curve for male population

It is noticed that up to the Percentile 50 and after the Percentile 90, the two concentration curves almost overlap. Between the two Percentiles, the concentration curve for female population is placed below the concentration curve of the male population. There is, therefore, a higher concentration of female unemployment than for male ones.

The quantification of the degree of concentration is achieved calculating the Gini index. It is used as a standard measure for studying the degree of spatial concentration (Krugman, [1991]).

In the paper we used the Gini index as an expression of correspondence between the cumulative unemployment ratio (q_i) and the cumulative labour force ratio (p_i), for the two categories of population, male and female.

For the calculation of the Gini concentration index we applied the triangles method (E. Jaba, [2002]), using the relationship: $i_G = \sum_{i=1}^{n-1}(p_i q_{i+1} - p_{i+1} q_i)$.

After calculations, we obtained the Gini index equal to 0.34 for the female population, and the Gini index equal to 0.31 for the male population. These values indicate a higher concentration of female unemployment than of male unemployment. It is noticed that the Gini concentration index expresses the same results obtained by Lorenz curve.

The results from the two processes, Lorenz curve and Gini index, validate the assumption that unemployment is distributed differently by gender, and that there is a different concentration of unemployment in territorial profile.

We consider it necessary to test whether the degree of concentration of unemployment by gender is uniform or differentiated by groups of counties based on the specific activity profile of each county.

5. Grouping of counties based on the unemployment rate

For grouping counties we used cluster analysis. We chose as grouping variable the ratio ($\frac{s_i}{a_i}$) calculated above and shown in Appendix 2. This ratio shows the relation between the number of unemployed population and the labour force. Cluster analysis is performed using SPSS 13.0.

The dendrograms resulted are presented in Appendix 3 and Appendix 4.

For female population, counties are grouped into a **first cluster** of counties which recorded low levels of the ratio report ($\frac{s_i}{a_i}$) (a small percentage of unemployed women in comparatively to labour force) and a **second cluster** of counties with high levels of this ratio (high percentage of unemployed women comparatively to labour force).

The first cluster consists of 2 sub-clusters (A_1-A_2), each in turn consisting of two subgroups, and the second cluster is also composed of two sub-clusters (B_1-B_2), differentiated by the level of female unemployment and the size of the female labour force, namely:

- A_1, sub-cluster formed, on the one hand, of the counties of Bihor, Satu-Mare, Bacău and Vrancea with the lowest number of unemployed and a large volume of labour force, and of counties of Bistrița-Năsăud, Cluj, Botoşani, Iaşi, Suceava, Galați, Argeş, Giurgiu, Teleorman, Bucharest, Olt, Timiş with a number of unemployed higher than counties in the first subgroup, but with the most important human resource, having the largest amount of labour force;

- A_2, sub-cluster formed, on the one hand, of the counties of Mureş, Neamț, Brăila, Ialomița, Dolj, Caraş-Severin and Vaslui with the highest number of unemployed within the first cluster, but with an important female human resource, and of the counties of Maramureş, Sălaj, Alba, Harghita, Sibiu, Tulcea, Ilfov, Mehedinți, Vâlcea, Arad, who recorded a small number of unemployed and the lowest level of female labour force for the first cluster;

- B_1, sub-cluster composed of counties of Braşov and Călăraşi, which recorded the highest number of unemployed women and a low level of female labour force;

- B_2 sub-cluster consisting of the counties of Covasna, Buzău, Constanța, Dâmbovița, Prahova, Gorj, Hunedoara, which recorded a large number of unemployed compared to counties in the first cluster correlated with a relatively low level of labour force.

For male population, the results show two clusters.

The first cluster consists of a homogeneous group of counties (Giurgiu, Bucharest, Olt, Timiş, Dolj, Alba, Argeş, Suceava, Iaşi, Botoşani, Cluj, Bistrița-Năsăud, Vrancea, Bacău, Satu-Mare, Bihor) recording a low level for male unemployment and an important human resource.

The second cluster is different of the first cluster by a higher unemployment rate and heterogeneity shown by outlining 2 sub-clusters (C1-C2):

- C1, sub-cluster composed of counties Braşov, Gorj, Vâlcea that have a relatively large number of unemployed and an important size of labour force;

- C2, sub-cluster formed firstly of the counties of Constanța, Prahova, Arad, the first two counties recording the highest number of unemployed and the highest size of male labour force in Romania, at the county level, and of the counties Călărasi, Covasna Buzău, Timiş, Hunedoara, Galați, Teleorman, Mureş, Neamț, Brăila, Ialomița, Caraş-Severin, Maramureş, Sălaj, Harghita, Sibiu, Tulcea, Ilfov, Mehedinți with a lower unemployment compared to the other counties in this sub-cluster, but with a larger workforce.

An analysis related to the type of activity prevailing in the counties within the previously identified clusters explains the existence of differences in the counties concentration by the unemployment rate due to differences in the territorial economic development. The main economic activity profile in one county or another has

involved an employed population predominantly male or female, respectively. During the transition period, characterized by transformations directly targeted towards business activities, the impact on the employed population in the county was imminent and thus a differential in concentration of unemployment in territorial profile occurred, and a shift of the labour force from areas affected by unemployment.

6. Conclusions

The main finding of our analysis is that there are significant differences in the spatial concentration of unemployment by gender.

Differences in unemployment in territorial profile are manifested directly in times of crisis. Most of the unemployed represent category of population in the areas of activity, prevailing at the territorial level, affected by the crisis. If the county prevails in activities where women or men respectively are dominant, we expect that the unemployment, for one gender or another, have the highest weight.

However, it should be noted that different levels of regional economic development has led, over time, to effects on demo-economic dimension of the counties. Considering this hypothesis, the degree of spatial concentration of unemployment was assessed according to the labour force distribution by gender.

In Romania in 2008, regional economic development influences the distribution profile of unemployment, by gender, by counties or by total. Analysis of this distribution elation to the distribution of the labour force by gender shows a higher spatial concentration of female population. If we judge the outcome of research in terms of strategies for a harmonious development of human resources, then, an excessive specialization, which, by tradition, exploits only the male or female labour force, can cause important imbalances for those communities.

REFERENCES

[1]**Aiginger, K., Rossi-Hansberg, E. (2006),** ***Specialization and Concentration: A Note on Theory and Evidence***. Empirica, Vol. 44, No. 4;
[2]**Alon, Sigal (2004),** ***The Gender Stratification of Employment Hardship: Queuing, Opportunity Structure and Economic Cycles***; Research in Social Stratification and Mobility, Volume 20, 115–143;
[3]**Alon, S. & Stier, H. (1997),** ***Job Search, Gender, and the Quality of Employment in Israel.*** Research in Social Stratification and Mobility, 15, 133–149;
[4]**Alonso-Villar, O., Río del, C. (2005) ,** ***The Geographical Concentration of Unemployment: A Male-female Comparison in Spain***; ECINEQ Working Paper Series;

[5]**Brulhart, M., Traeger, R. (2003),** ***An Account of Geographic Concentration Patterns in Europe***; Institute for International Integration Studies (IIIS), Research paper No. 03/11;
[6]**Clogg, C. C. & Sullivan, T. A. (1983),** ***Labor Force Composition and Underemployment Trends, 1969–1980.*** Social Indicators Research, 12, 117–152;
[7]**Détang-Dessendre Cécile, Gaigné Carl (2009),** ***Unemployment Duration, City Size, and the Tightness of the Labor Market***. Regional Science and Urban Economics, 39 266–276;
[8]**Dobre, I., Alexandru, A. (2010),** ***A Nonparametric Analysis of the Relationship between Unemployment Rate and U.S.A. Shadow Economy Using Local Polynomial Regression Models***. Economic Computation and Economic Cybernetics Studies and Research, vol. 44, pp. 21-44;
[9]**Findeis, J. (1993),** ***Utilization of Rural Resources***. In: D. Barkley (Ed.), Economic Adaptation: Alternative for Nonmetropolitan Areas (pp. 49–68). Boulder, CO: Westview Press;
[10]**Frederiksen, A. (2008),** ***Gender Differences in Job Separation Rates and Employment Stability: New Evidence from Employer-Employee Data;*** Labour Economics , Volume 15, Issue 5, Pages 915-937;
[11]**Fujita, M., Thisse, J.F. (2004),** ***Economies of Agglomeration: Cities, Industrial Location and Regional Growth***. Cambridge, Cambridge University Press;
[12]**Goschin, Z., Constantin, D., Roman, M., Ileanu, B. (2008) ,** ***The Current State and Dynamics of Regional Disparities in Romania;*** Romanian Journal of Regional Science, vol. 2 issue 2, pp. 80-105;
[13]**Hamrick, K. S. (1997),** ***Rural Labor Markets Often Lead Urban Markets in Recessions and Expansions***. Rural Development Perspective, 12, 11–17;
[14]**Jaba, E., Balan, C., Roman, M., Viorica, D., Roman, M. (2008),** ***Employment Rate Prognosis on the Basis of the Development Environment Trend Displayed by Years-Clusters***; Economic Computation and Economic Cybernetics Studies and Research, vol. 42, pp. 123-136;
[15]**Jaba, E.(2002),** ***Statistica***, Ediția a 3-a. Economica Publishing House, Bucharest;
[16]**Jaba, E., Grama, A. (2004),** ***Analiza statistică cu SPSS sub Windows***. Polirom Publishing House, Iasi;
[17]**Jensen, L., Findeis, J. L., Hsu, W. & Schachter, J. P. (1999),** ***Slipping into and out Underemployment: Another Disadvantage for Nonmetropolitan Workers*** ? Rural Sociology, 64(3), 417–438;
[18]**Jolliffe, D., Campos, N. F. (2005),** ***Does Market Liberalization Reduce Gender Discrimination? . Econometric Evidence from Hungary***, Labour Economics 12, pp. 1 –22;
[19]**Krugman, P. (1991),** ***Geography and Trade***. Cambridge, MIT Press;
[20]**Leppel, K. (2009),** ***Labour Force Status and Genderual Orientation***. Economica , Volume 76, Issue 301, Pages 197-207;

[21]**Lichter, D. T. & Landry, D. J. (1991*), Labor Force Transitions and Underemployment: The Stratification of Male and Female Workers***. Research in Social Stratification and Mobility, 10, 63–87;
[22]**Lorenz, M. O. (1905),** ***Methods of Measuring the Concentration of Wealth***. Publications of the American Statistical Association. Vol. 9, No. 70, pp.209-219;
[23]**Lucas, R. (1988),** ***On the Mechanics of Economic Development***. Journal of Monetary Economics, 22;
[24]**Marinescu, D., Marin, D. (2008),** ***Risk and Uncertainty: Analyzing the Income and Substitution Effects***. Economic Computation and Economic Cybernetics Studies and Research, vol. 43, pages 41-54;
[25]**Prelipcean, G., Boscoianu, M. (2009),** ***Innovation, Technological Change and Labour Saving in the Aftermath of the Global Crisis***. The 5th Balkan Regional Conference on Engineering and Business Education & Icebe, Volumes I and II, Conference Proceedings, Pages: 169-173;
[26]**Puech, F. (2003),** ***Concentration géographique des industries: mesures et enjeux***. Thèse de doctorat, Université de Paris I- Pantheon Sorbonne ;
[27]**Roman, M.(2008),** ***The Efficiency Analysis Applied for the Analysis of Labour Market Policies: Study Case for Romania***; Revista Romana de Statistica, No 11, pages 58-78;
[28]**Tigges, L. M.&Tootle, D. M. (1993),** ***Underemployment and Racial Competition in Local Labor Markets***. The Sociological Quarterly, 34(2), 279–298.

Acknowledgements:
This research was supported by grant no. 1829 / 2008, "The effects of labor force migration and of the demographical structures changes on the dynamic of economics" Financed by National University Research Council (CNCSIS).

Appendix 1

Paired Samples Test

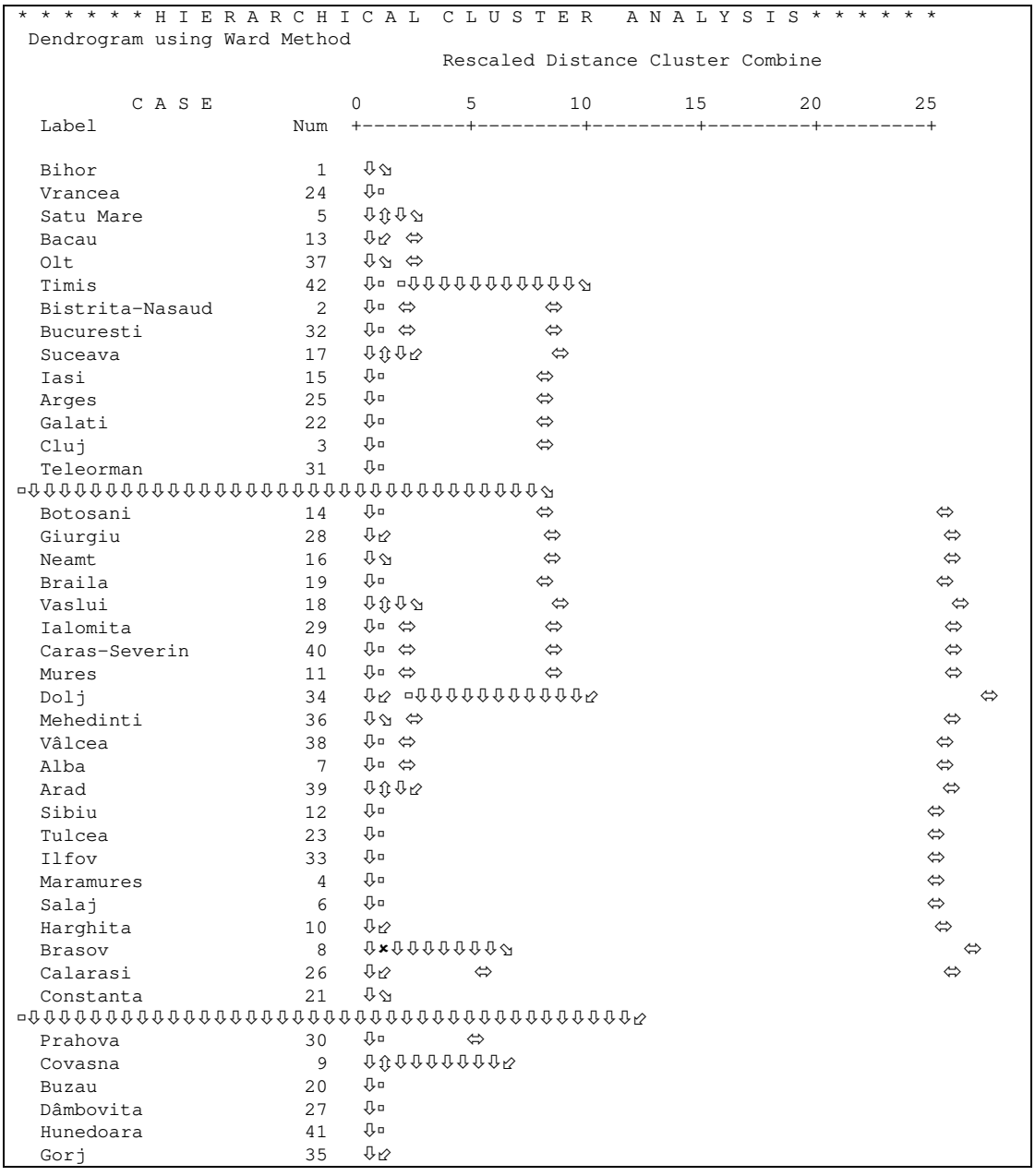
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Rata somajului populatiei feminine (%) - Rata somajului populatiei masculine (%)	-2.14286	2.96007	.45675	-3.06528	-1.22043	-4.692	41	.000

Appendix 2

County	Female population			Male population		
	$\frac{s_i}{a_i}$	p_i	q_i	$\frac{s_i}{a_i}$	p_i	q_i
Bihor	0.21	1.27	.19	0.46	1.43	.30
Bistrita-Nasaud	0.51	2.91	.53	0.79	3.93	.95
Cluj	0.68	5.48	1.07	0.26	6.94	1.84
Maramures	1.00	9.18	2.33	1.30	8.44	2.35
Satu Mare	0.15	12.38	3.74	0.55	11.26	3.51
Salaj	1.03	15.61	5.24	1.05	14.87	5.14
Alba	0.84	25.91	10.43	0.64	17.41	6.30
Brasov	2.71	27.64	11.31	2.33	20.00	7.71
Covasna	1.69	31.04	13.10	1.10	21.22	8.39
Harghita	0.97	33.86	14.75	1.40	24.40	10.18
Mures	1.23	35.21	15.57	1.36	33.83	15.49
Sibiu	1.11	36.60	16.50	1.46	37.66	17.87
Bacau	0.34	39.75	18.63	0.56	39.45	19.01
Botosani	0.59	41.98	20.23	0.54	42.45	20.96
Iasi	0.74	46.26	23.39	0.71	46.29	23.67
Neamt	1.46	50.51	26.59	1.36	47.97	25.00
Suceava	0.53	52.37	28.14	0.65	50.42	27.28
Vaslui	1.26	54.06	29.60	1.38	52.73	29.56
Braila	1.40	55.35	30.76	1.25	53.99	30.89
Buzau	1.66	56.48	31.78	0.93	55.00	31.95
Constanta	2.13	57.93	33.19	1.75	56.96	34.09
Galati	0.72	59.96	35.23	1.24	58.12	35.36
Tulcea	1.10	61.46	36.78	1.20	59.55	37.01
Vrancea	0.21	62.28	37.65	0.21	61.24	38.99
Arges	0.75	63.12	38.57	0.45	62.34	40.32
Calarasi	2.95	65.18	40.85	1.39	65.19	43.84
Dâmbovita	1.63	69.46	46.05	0.98	67.14	46.28
Giurgiu	0.61	71.47	48.52	0.34	68.80	48.37
Ialomita	1.26	73.47	51.04	1.25	70.63	50.73
Prahova	2.02	74.90	52.84	1.61	72.84	53.60
Teleorman	0.66	76.81	55.26	1.17	75.19	56.80
Bucuresti	0.50	78.71	57.93	0.56	77.58	60.05
Ilfov	1.07	81.07	61.38	1.05	79.47	62.65
Dolj	1.21	83.11	64.63	0.62	81.38	65.31
Gorj	1.80	85.19	68.03	2.81	83.20	67.86
Mehedinti	0.90	87.34	71.62	1.15	85.32	70.95
Olt	0.44	88.35	73.31	0.41	89.03	76.91
Vâlcea	0.91	89.67	75.69	2.40	91.02	80.13
Arad	0.86	93.18	82.78	1.62	94.54	86.28
Caras-Severin	1.27	95.96	88.69	1.29	96.92	91.83
Hunedoara	1.59	98.46	95.44	1.09	98.10	94.67
Timis	0.47	100.00	100.00	0.30	100.00	100.00

Source: Calculated from data available on TEMPO-Online, Romanian National Institute of Statistics (https://statistici.insse.ro/shop/)

Appendix 3 – Dendogram for cluster analysis on female population



Appendix 4 – Dendogram for cluster analysis on male population