REGIONAL COMPETITIVENESS DEVELOPMENT BASED ON HUMAN RESOURCES

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Into the actual social and economic context, characterised by the challenges of the globalisation process, the need of redefining the state role in the economy, the switch to the knowledge based economy, the problem of increasing the national and regional competitiveness is of high actuality and importance.
The paper hereby approaches into an integrated manner three issues of high actuality: the competitiveness, the transformations into the human resources area and regional development, trying to identify, based on the conceived analysed, solutions for improving the Romanian regions competitiveness.

Keywords: competitiveness, regional development, human resources, statistical analysis, econometrical models

Cod JEL lucrare: I20; J10; R15

Introduction

From the *micro economical* point of view, the human resources are considered, into the human resources management "*the first strategical resources of the organisation*", "*which have to be involved and developed and for which it must be made investments*"[389].
At the *macro economical* level, even there doesn't exist a rigorous definition of the term, it can be noticed the usage of different terms or closed as meaning in order to refer to the same concept: human capital, human factor, human resources, labour force, human potential[390].
The two basic terms, most frequently met into the technical literature are human resources and human capital. Using one or another depends on the analyse context and by the side that it is wanted to be emphasised: quantitative (level and structure) or qualitative (qualification, abilities, aptitudes).
Thus, the term "*human resources*" defines "*the total population of a country, from the economical point of view, by the direct or indirect participation on the labour market, and from the spiritual point of view by knowledge accumulation*" (Roman, 2003). The qualitative side of the human resources, *the human capital*, defines the assembly of "*knowledge, capacities, competences and attributes of the people who make easier the creation of the personal, social and economical welfare*". (OECD, 2001)

Human resources – quantitative and qualitative approaches

The human resources have recently achieved a special signification for the regional competitiveness by the dimensions that it integrates: quantitative (demographic resources and human resources) and qualitative (human capital):

389 Manolescu, A., Human Resources management, Economic Publishing, Bucharest, 2001.
390 Roman, M., Human resources in Romania – evaluation and efficiency, ASE Publishing, Bucharest, 2003.

- *The negative demographical evolutions* of the last years (low fertility and birth rates, infant deaths) affects the regional human potential, a consequence in time being represented by the available labour force decrease ant at the high competence for this production factor;
- Phenomena as *migration* and *ageing* have a direct negative impact on the regional competitiveness, both for the reduction of the productive potential of the region and by the increase of the expenses allocated to the social protection;
- *The population age structure* and *the education level* influence the region's dynamism by the possibility to promote the entrepreneurial spirit;
- *The human capital*, expressed by the human resources knowledge, aptitudes and competences manages the adapting capacity of the technologies and the creation of the new ones, by them being sustained the complex activities that generate added value.

The analyse of the role of the human resources in the regional performance increase must start from the main sources of the competitiveness: productivity and employment. Thus, we can study in which proportion each of this factors influence the increase of the gross domestic product per capita, accepted as the main competitiveness' indicator.

Applying the decomposition method (Cambridge Econometrics, 2003), for each development region (j) it can be emphasized the next relation[391]:

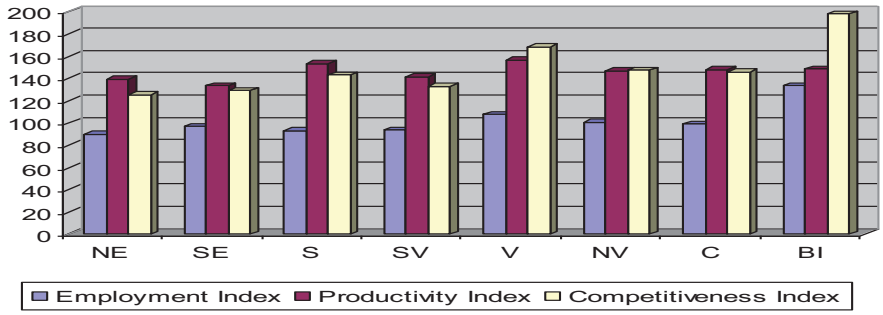
$$\frac{GDP_j}{P_j} = \frac{GDP_j}{E_j} * \frac{E_j}{P_j}$$

where GDP_j represents the gross domestic product of the region j, P_j the population of the region j, and E_j the employment in the j region, $j = 1, 2, ..., n$

The quantification of each of the competitiveness factors, productivity and employment can be realised by the *factor analysis method* that use in order to decompose the variation of a complex characteristic on quantitative factors (extensive) and qualitative one (intensive) *the statistical indexes*.

The factor analysis based on statistical indexes (ANNEXE 1) proves into a quantitative manner how contributed the two main factors (labour productivity and employment) at the increase of the competitiveness in some regions, for example the region that includes the capital and West and Centre, also their contribution to the competitiveness decrease and the living standard in other regions: North East, South East and South.

Figure 1. Competitiveness index (GDP/P), labour productivity index (GDP/E) and employment index (E/P) (2006/1998)



Source: Computation based on *Romanian Statistical Yearbook 2007* and statistical database TEMPO-online, time series, www.insse.ro

391 This relation synthesises the main factorial components of GDP/inhabitant: labour productivity, active population employment rate, labour productivity, work leisure rate, occupation rate, the weight of aged population in the total population, etc.

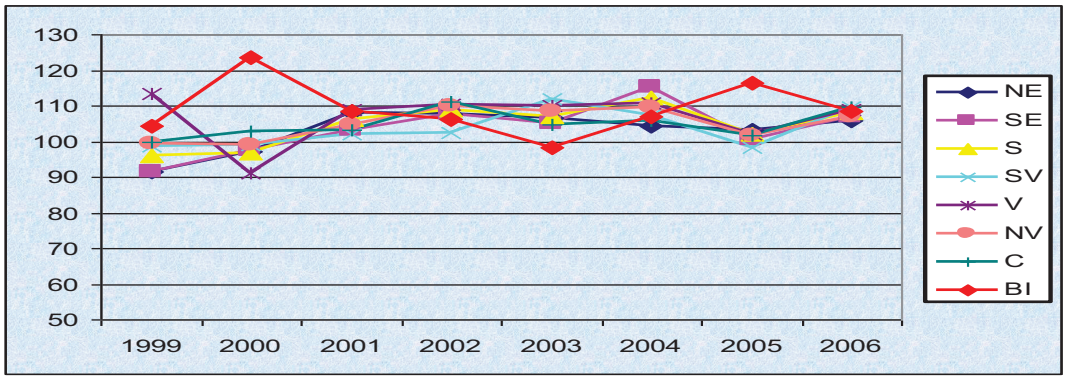
Thus, for all the eight development regions, the labour productivity had most important contribution to the competitiveness increase, the employment rate being the factor with negative influence (in North East, South East, South, South West and Centre) or with a lower impact on the increase of GDP per capita (West, North West and Bucharest Ilfov). Related to 1998, the regions that have recorded the most significant increase of the productivity in 2006 were Bucharest Ilfov, West and South Muntenia, fact that can signify a more rapid process of differences decreasing (Figure 1).

Between 1998-2006, the employment has positively influenced the increase of GDP per capita only in the Bucharest-Ilfov, West and Centre regions, while into the regions South West, North East and South it had a negative impact during certain periods (2001-2002) or it has not significantly influenced the competitiveness increase (1999-2000; 2004-2005) (ANNEXE 1).

On the other hand, labour productivity has increased quicker from one year to another into the regions less developed (North-East, South-East, South, South-West) during 2000-2004 period, while between 2004-2005 it had a slight increase in Bucharest-Ilfov region (ANNEXE 1).

The labour productivity evolution has also influenced the evolution of the GDP per capita index, its quicker increase being recorded into the regions less developed on the same time period, but this increase is not enough in order to reduce the disparities. It might be the case of the so called conditioned convergence to a self balance level, and not about the situation represented by a process focused on equalising the region with the high living standard from Romania – Bucharest Ilfov (Figure 2).

Figure 2. Competitiveness index on regional level (GDP/P)



Source: Computation based on Romanian Statistical Yearbook 2007 and statistical database TEMPO-online, time series, www.insse.ro

Econometric models for the competitiveness factors related to the human resources

Because the results previously obtained have proved the fact that the main competitiveness source is represented by the labour productivity we have further analysed the possible determinant factors of it, estimating the next regression model with fixed effects (in the case of the Romanian regions for the period 1993-2006):

$$GDP\_E_{it} = \beta_i^0 + \beta^1 DEP_{it} + \beta^2 STUD_{it} + \beta^3 E_{it} + \beta^4 INV_{it},$$

where DEP_{it} = dependency rate, $STUD_{it}$ = tertiary students/population, E_{it} employment/labour resources), INV_{it} the ratio of the local units investments in GDP in the region *i* at the moment *t* (Annexe 2).

Table 1. The results of the regression having as dependent variable the labour productivity and as explicative variables: the dependency rate, the tertiary student ratio, the employment rate, the investment ratio

The dependent variable: GDP_E	**Coefficient**	**Standard error**	**T statistic**	**Prob.**
Intercept	442.719,5	30.666,22	14,43672	0,0000
DEP	-6.311,594	797,1423	-7,917776	0,0000
STUD	2.342,872	1.501,050	1,560822	0,1238
E	-1.026,307	264,4592	-3,880777	0,0003
INV	96,65274	77,60318	1,245474	0,2178
Fixed effects	**POZITIVE**		**NEGATIVE**	
R1	7.925,877		-	
R2	-		-14.607,08	
R3	6.620,763		-	
R4	5.436,038		-	
R5	-		-5.977,523	
R6	-		-11.086,41	
R7	-		-7.559,521	
R8	19.247,.86			
F statistic	239,8765			
R2	0,977767			
Durbin-Watson Test	1,127528 (d1 ≈ 1,49, iar d2 ≈ 1,74)			
n	72			

In order to verify the nonautocorrelation of errors, we compared the calculate value[392] for the Durbin-Watson variable, computed with E-Views software (d =1,127528), with the values for α = 0,05 from the Durbin-Watson distribution table, for n = 72 (the observations number) and k = 4 (the number of explicative variables): $d_1 \approx 1{,}49$, and $d_2 \approx 1{,}74$.

It can be noticed that $0 < d = 1{,}127528 < d_1 = 1{,}49$ fact that means there is a significant positive linear correlation of degree one.

In order to correct the influence generated by the autocorrelation of errors we have used the Cochrane-Orcutt algorithm (Annexe 3) and applying this method in E-Views has leaded to the next result:

$$d = \frac{\sum_{i=2}^{n}(e_i - e_{i-1})^2}{\sum_{i=1}^{n} e_i^2}$$

392 Durbin-Watson test involves the computation of the empiric term , using the residues series (e_i), i=1..n, obtained by applying the least squares method in order to estimate the model's parameters.

Table 2. The regression results with autocorrelation elimination

The dependent variable: GDP_E	Coefficient	Standard error	T statistic	Prob.
Intercept	478.749,7	28.731,80	16,66271	0,0000
DEP	-6.465,741	693,5828	-9,322233	0,0000
STUD	2.964,649	1.453,347	2,039876	0,0466
E	-1.568,581	305,6758	-5,131519	0,0000
INV	186,8333	55,92495	3,340786	0,0016
AR(1)	0,342650	0,108581	3,155702	0,0027
Fix effects	**POZITIVE**		**NEGATIVE**	
R1	6.312,577		-	
R2	-		-18.098,95	
R3	8.470,680		-	
R4	6.449,938		-	
R5	-		-4.097,500	
R6	-		-9.382,580	
R7	-		-7.619,628	
R8	17.965,46			
F statistic	438,5196			
R2	0,990401			
Durbin-Watson Test	1,998131 (d1 ≈ 1,47, iar d2 ≈ 1,73)			
n	64			

In this case, the hypothesis of errors independence is verified: for α = 0,05 from Durbin-Watson distribution table, n = 64 (the observations number) and k = 4 (the number of explicative variables): $d_1 \approx 1{,}47$, $d_2 \approx 1{,}73$, and d = 1,998131>d_2 = 1,73.

The estimators' significance can be analysed by verifying for a certain α, the relations of the next kind:

$$t_{\hat{\beta}} = \frac{|\hat{\beta}|}{\hat{\sigma}_{\hat{\beta}}} > t_{\alpha;v}, \text{ for } \hat{\beta} = 0..5$$

For α = 0,05 and v = n – k = 64 – 6 = 58, the value from the Student distribution table is $t_{0,05;58} = 1{,}672$, fact which means that all the model's estimators are significant.

The model verosimility has been analysed by applying the Fisher-Snedecor test (F), suitable in order to verify the significance of the correlation report and the linear correlation coefficient, according to the next relation:

$$F_c = (n-2)\frac{R^2}{1-R^2}$$

R is significant if the F test's computed value is larger or equal to the tabular value for a certain chosen threshold:

$$F_c \geq F_{\alpha;v_1;v_2}, \; v_1 = k - 1, \; v_2 = n - k$$

Applying the Fisher-Snedecor test: $F_c = 438.5196 \geq F_{0,05;5;58} = 2,374$, proves the fact that *the obtained results are significant*.

Conclusions

The estimated model proves the fact that for all the eight development regions, the demographic factors, for example those of demographic dependency kind have a negative influence on labour productivity increase, while the superior level of population education and the investments exert an important positive impact.

As it was expected, related to the employment rate of the labour resources for all the eight regions it had a significant but negative influence.

This result proves the fact that, in order to increase the Romanian regions' competitiveness, a key element is represented by the level of education of the workforce, fact which significantly influences the creation of gross added value into the economy.

Regarding the others specific regional factors, quantified by the regression equation intercept, these ones had a positive impact on the performances obtained by the North East, South, South East and Bucharest Ilfov regions, while for the others regions it was a negative one.

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ANNEXE 1. Competitiveness index (GDP/P), labour productivity index (GDP/E) and employment index (E/P)

	1999/1998			2000/1999			2001/2000		
Regions	$i^{y(f)}$ (%)	$i^{y(x)}$ (%)	i^{y}(%)	$i^{y(f)}$ (%)	$i^{y(x)}$ (%)	i^{y}(%)	$i^{y(f)}$ (%)	$i^{y(x)}$ (%)	i^{y}(%)
NE	97.87	93.02	91.05	101.54	95.69	97.17	99.19	108.85	107.97
SE	97.14	93.59	90.91	101.70	95.81	97.44	98.22	105.06	103.19
S	97.29	98.13	95.48	100.21	96.72	96.93	98.30	108.14	106.30
SV	100.05	97.97	98.02	100.05	99.15	99.21	99.21	102.86	102.05
V	94.09	119.78	112.70	105.58	86.34	91.16	98.83	110.14	108.86
NV	95.57	103.45	98.86	102.09	97.12	99.15	100.79	104.05	104.87
C	97.83	101.44	99.24	100.51	102.39	102.91	98.27	104.98	103.16
BI	82.34	125.77	103.55	114.82	107.64	123.60	102.68	105.83	108.67

	2002/2001			2003/2002			2004/2003		
Regions	$i^{y(f)}$ (%)	$i^{y(x)}$ (%)	i^{y}(%)	$i^{y(f)}$ (%)	$i^{y(x)}$ (%)	i^{y}(%)	$i^{y(f)}$ (%)	$i^{y(x)}$ (%)	i^{y}(%)
NE	95.55	112.59	107.58	98.56	108.20	106.65	97.18	107.25	104.23
SE	97.55	110.32	107.62	100.31	104.93	105.25	100.24	115.00	115.28
S	98.54	110.52	108.91	99.27	107.71	106.92	98.52	113.82	112.14
SV	95.15	107.87	102.63	99.88	111.98	111.84	97.59	109.88	107.22
V	104.91	105.37	110.54	99.80	110.12	109.91	101.33	109.15	110.60
NV	99.16	110.91	109.98	100.26	108.12	108.41	99.72	109.93	109.62
C	103.29	107.68	111.22	98.48	106.44	104.82	98.47	107.39	105.75
BI	110.16	96.31	106.10	104.42	94.25	98.42	103.89	102.91	106.91

	2005/2004			2006/2005			2006/1998		
Regions	$i^{y(f)}$ (%)	$i^{y(x)}$ (%)	i^{y}(%)	$i^{y(f)}$ (%)	$i^{y(x)}$ (%)	i^{y}(%)	$i^{y(f)}$ (%)	$i^{y(x)}$ (%)	i^{y}(%)
NE	101.18	101.91	103.11	98.48	107.45	105.82	89.90	139.62	125.51
SE	100.82	99.60	100.42	100.96	105.92	106.94	96.88	133.22	129.07
S	100.86	101.38	102.25	100.13	107.90	108.04	93.30	153.18	142.91
SV	101.49	96.75	98.19	100.04	109.62	109.67	93.51	141.64	132.45
V	102.46	99.69	102.14	100.85	107.92	108.83	107.62	156.31	168.22
NV	101.82	100.00	101.81	101.36	105.59	107.03	100.62	146.52	147.42
C	100.48	101.40	101.88	101.63	107.80	109.56	98.83	147.73	146.00
BI	108.20	107.61	116.44	106.12	102.35	108.61	133.21	148.43	197.73

Ro	**1999/1998**	**2000/1999**	**2001/2000**	**2002/2001**	**2003/2002**	**2004/2003**	**2005/2004**	**2006/2005**
$I^{y(f)}$ (%)	94.15	104.49	99.88	102.25	100.74	100.25	102.91	102.01
$I^{y(x)}$ (%)	106.26	98.54	106.13	105.55	104.59	108.47	101.89	106.08
I^{y}(%)	100.05	102.97	106.01	107.93	105.36	108.74	104.85	108.22

ANNEXE 2. Factors of productivity: dependency rate, tertiary student ratio, employment rate, investment ratio

Dependency rate (%)									
Regions/ Years	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
NE	52.25	52.28	52.07	51.74	51.28	50.40	49.56	48.97	48.60
SE	46.60	46.67	46.36	45.88	45.17	44.23	43.42	42.71	42.47
S	49.65	49.86	49.73	49.43	49.07	48.24	47.56	46.98	46.80
SV	50.08	50.01	49.64	49.26	49.00	48.39	47.77	47.01	46.32
V	47.01	46.63	45.95	45.18	44.23	43.40	42.63	41.89	41.37
NV	47.82	47.40	46.73	46.03	45.18	44.37	43.49	42.56	42.23
C	46.99	46.47	45.73	45.00	44.15	43.25	42.52	41.96	41.52
BI	42.04	41.18	40.06	39.15	38.03	37.36	36.62	36.00	35.69

Source: *Romanian Statistical Yearbook 2007* and statistical database TEMPO-online, time series, www.insse.ro

Tertiary students/population (%)									
Regions/ Years	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
NE	1.26	1.40	1.70	1.91	2.01	2.04	2.06	2.11	2.14
SE	0.86	0.99	1.34	1.48	1.54	1.64	1.66	1.79	1.94
S	0.48	0.65	0.91	1.11	1.19	1.21	1.18	1.19	1.11
SV	0.94	1.14	1.47	1.79	1.75	1.81	1.88	1.95	2.06
V	2.43	2.71	3.01	3.15	3.49	3.61	3.73	3.88	4.21
NV	2.05	2.31	2.61	2.86	2.97	3.16	3.31	3.56	3.59
C	1.48	1.78	2.01	2.34	2.59	2.61	2.70	2.99	3.34
BI	6.41	6.62	7.56	7.76	8.08	8.63	9.52	11.46	13.64

Source: *Romanian Statistical Yearbook 2007* and statistical database TEMPO-online, time series, www.insse.ro

Employment/labour resources (%)									
Regions/ Years	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
NE	63.35	61.87	62.57	60.95	57.93	56.21	54.14	54.07	53.25
SE	61.97	60.07	60.80	58.31	56.64	55.89	55.26	55.13	55.72
S	66.41	64.53	64.61	62.37	61.02	59.34	57.39	57.40	57.48
SV	68.66	68.52	68.51	66.64	62.87	61.94	59.93	60.27	60.31
V	67.52	63.27	66.95	64.90	67.75	66.49	66.11	66.78	67.06
NV	71.95	68.39	69.66	68.98	67.92	66.81	65.47	66.38	66.73
C	67.64	65.92	66.03	63.59	65.34	63.27	61.71	60.99	62.38
BI	62.24	50.71	59.04	59.09	64.24	65.55	66.64	71.33	75.28

Source: *Romanian Statistical Yearbook 2007* and statistical database TEMPO-online, time series, www.insse.ro

The ratio of the local units' investments in GDP (%)									
Regions/Years	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
NE	29.29	35.69	15.49	15.44	21.64	17.74	17.32	17.33	22.03
SE	28.78	46.68	22.33	25.69	34.38	21.70	25.47	24.00	27.06
S	30.72	30.78	17.24	29.34	26.01	24.23	28.24	22.65	25.72
SV	42.86	52.14	34.75	60.17	28.18	16.93	34.78	19.30	23.76
V	24.83	53.46	29.00	23.83	29.46	25.14	26.53	29.54	32.04
NV	27.87	30.52	13.91	26.48	22.92	20.40	20.91	21.06	23.91
C	23.81	30.85	17.96	25.04	27.01	22.03	24.55	25.18	29.96
BI	81.26	64.47	80.26	56.86	34.37	35.53	46.71	66.60	55.72

Source: *Romanian Statistical Yearbook 2007* and statistical database TEMPO-online, time series, www.insse.ro

ANNEXE 3. Cochrane-Orcutt method

Current no.	**Stages**	**Algorithm**
1.	**The parameters estimation**	It is estimated by the least square method the regression model parameters having as general shape: $y_i = \beta_0 + \sum_{j=1}^{p} \beta_j x_{ij} + \varepsilon_i$ and there is retained the residues series.
2.	**ρ estimation**	It is estimated ρ from the formula $\varepsilon_i = \rho\varepsilon_{i-1} + vi$, considering that the residues series follow a first rank autoregressive process.
3.	**Transforming the initial model and estimating the new one**	It is transformed the initial model into a new one as it follows: $y_i^* = \beta_0^* + \sum_{j=1}^{p} \beta_j x_{ij}^* + v_i$, where $\begin{cases} y_i^* = y_i - \hat{\rho} y_{i,t-1} \\ \beta_0^* = \beta_0 (1 - \hat{\rho}) \\ x_{ij}^* = x_{ij} - \hat{\rho} x_{ij,t-1} \\ v_i \to N(0, \sigma_{v_i}^2) \end{cases}$ It is estimated the transformed model in order to obtain the estimators and the residues series, which will be used in order to go to the second stage.
The algorithm is finalised after a certain number of iterations or when the difference between ρ evaluated in two successive stages is lower than a chosen value (usually 0.01 or 0.05)		

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