10. PRODUCTIVITY AND THE REGIONAL EMPLOYMENT IN SERVICES. ECONOMETRIC ESTIMATIONS FOR ROMANIA

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Abstract

Between 1989 and 2006, in Romania the labour force decreased by about 2.6 mill. persons (with regional differences), but, according to the same general tendency, the labour force in services increased by about 0.5 mill. persons. This occurred in a time when the prices in services increased more rapidly as compared to the ones in the national economy. In the paper, we found that the growth in total income leads to growth of the demand for services, so that the increase rate of services outmarch the amplification of productivity, the end-result being a growth of the employment in that sector. Also, even if in Romanian regions the demand for services is inelastic regarding the total income of the households and the dynamics of productivity in services was lower than the average of the national economy, the positive growth rate of employment in services exceeded the productivity gap between the national economy and the services sector.

Key words: labour productivity, regional employment, price elasticity and income elasticity of demand for services

JEL Classification: C31, J21, L80, O40, R11

1. The dynamics of employment in services – A theoretical model

In order to analyze the employment in services, in a previous paper (Jula D., and N. Jula, 2007a) we have developed a relatively simple equilibrium model. Theoretically, we may consider that the demand for services (S_d) is an increasing function related to

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the population incomes (V) and a decreasing one regarding the level of the prices (p) on the services market. We also admit the hypothesis that the level of the prices on the service market (p) is a decreasing function of the labour productivity in the service industry (w)[1]. In the short run, we consider that the supply of services (S_s) is a function of the employment in service industry (L) and the recorded productivity of those employees (w)[2]. From the equilibrium equation

$$S_d = S_s,$$

we obtain:

$$r_L = r_v \cdot e_v + r_w(e_p e_{pw} - 1) \quad (1)$$

where: r_L – rate of employment in services industry;

r_v – growth in total income;

r_w – labour productivity rate of services;

e_v – income elasticity of demand for services;

e_p – price elasticity of services demand;

e_{pw} – elasticity of services price related to labour productivity in these activities.

We demonstrate that if:

a) the growth rate of productivity in services is lower than in the total economy,
b) the price of services is inelastic regarding the productivity,
c) demand for the final consumption services is also inelastic regarding the price of these goods,
d) the demand for services is elastic regarding the evolution of the income,
e) in the national economy, at least as a tendency, the population incomes are changing in a comparable way with productivity at the national level[3],

then

$$r_L > r_v - r_w, \quad (2)$$

and

$$r_L > r_W - r_w > 0. \quad (3)$$

where: r_W – is the growth rate of productivity at the national level.

In the above-mentioned hypothesis regarding the demand-income elasticity, demand price elasticity and the relation between incomes and productivity, if the productivity of services has a slower evolution than the one in the national economy, then the modification rate of employment in services is positive. Moreover, the increase in employment in services outnumbers the productivity differential between the national economy and that sector. In the long run, this has the effect of an increase in employment in services, at a higher rate related to the dynamics of employment recorded at the national level, and of an increase in the ratio of employment in services to the total employment.

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[1] *Formally, $S_d = f(V, p(w))$, where $(\partial S_d/\partial V) > 0$, $(\partial S_d/\partial p) < 0$, and $(\partial p/\partial w) < 0$.*

[2] *The service supply depends on the resources involved in the production process, on factors of technological background, the dynamics of prices, economic policies or other specific factors: the structure of the market, the evaluation of the economic environment evolution and so on.*

[3] *We calculate, for example, this productivity through the GDP related to the total employment.*

2. Empirical results for Romania

Although the aforesaid findings (3) are robust, the hypotheses (*a* to *e*) that lead to the conclusions are very restrictive and it is extremely difficult to test these hypotheses as a whole. In these conditions, we test for the Romanian economy, on the basis of equation (1), the aggregate conditions when the variation rate of employment in services is positive.

For this, we estimate on the basis of regional data the equation:

$$r_{L,s} = a_0 + a_1 \cdot r_{V,s} + a_2 \cdot r_{w,s} + e_s \quad (4)$$

where: $r_{L,s}$ – rate of employment in services industry, in region *s*;

$r_{V,s}$ – growth in total income, in region *s*;

$r_{w,s}$ – labour productivity rate of services, in region *s*;

e_s – error variables in the regression equation.

According to the economic theory, we expect a positive correlation between the rate of employment in the service industry and the growth in total income ($a_1 > 0$), and a negative relation between the rate of employment in service industry and the labour productivity rate of services ($a_2 < 0$).

The findings are[4]:

Explanatory variable	Coefficient		t-Statistic
	Symbol	Value	
$r_{V,s}$	a_1	0.291533	9.4296
$r_{w,s}$	a_2	-0.205577	-9.4320

R^2 = 0.72, Durbin Watson statistics = 1.97

The sign of the coefficients is the expected one. The growth in total income leads to growth in the demand for services and, therefore, to growth in the employment in that sector, while the augmentation of labour productivity in services has a negative effect on the dynamics of employment. The size of coefficients suggests that, for Romania, the growth in income generates an increase in the demand for services, so that the growth rate of services exceeds the augmentation of productivity. As a result, the rate of employment in services is positive.

In theoretical model (1), if the price of services is inelastic regarding the productivity

$$-1 < e_{pw} < 0$$

and the demand for the final consumption services is also inelastic regarding the price of these goods

$$-1 < e_p < 0$$

then

$$e_p e_{pw} - 1 < 0,$$

in other words, $a_2 < 0$ in model (4). The deduction of this conjoint hypothesis is confirmed by the data, because the estimated $a_2 = -0.205577$ and it is significantly different from zero.

[4] *The detailed results are presented in Appendix 1.*

However, in the Romanian regions the demand for services is also inelastic regarding the total income of the households: in model (4), $a_1 = 0.2915 < 1$. We explain this by the fact that population in Romania is relatively poor and a big slice of the consumption budgets is for the basic goods.

Under these circumstances, we have tested if there is a type (2) relation: $r_L > r_v - r_w$ based on regional data[5]. Even if in Romania the demand for services is inelastic regarding the income of the households, the relation is, generally, respected. The exception is in the year 2004, election year, when the growth in the incomes of the population exceeded the dynamics of labour productivity[6].

In the Romanian regions, the dynamics of the incomes in 2000-2006 was slightly inferior to the labour productivity, and the dynamics of productivity in services was inferior to the average of the national economy. This explains the reason why, on medium term, a type (3) relation $r_L > r_W - r_w$ is verified, so that the modification rate of employment in services is positive. Moreover, the increase in employment in services outnumbers the productivity differential between the national economy and that sector, as well as in the theoretical model. In the long run this has the effect of an increase in the ratio of employment in services to the total employment (Appendix 3).

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[5] *The detailed results are presented in Appendix 2.*

[6] *For a discussion regarding the economic effects of the elections in Romania, see Jula D., Jula N-M. (2008) and Jula D., Jula N. (2007b).*

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Appendix 1

Regression between rate of employment in services industry, and growth in total income and labour productivity rate of services, regional data, pool estimation

Equation: $d(\ln(L\_serv?)) = a_1 \cdot d(\ln(V?)) - a_1 \cdot d(\ln(w\_serv?)) + e$

where: d(ln(L_serv)) – rate of employment in services industry
d(lnV) – growth in total income
d(ln(w_serv)) – labour productivity rate of services
d – differencing operator
ln(.) – natural logarithm operator

The results:

Dependent Variable: d(ln(L_serv?))
Method: Pooled EGLS (Period SUR)
Total pool (balanced) observations: 36
Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
d(ln(V?))	0.291533	0.030917	9.429616	0.0000
d(ln(w_serv?))	-0.205577	0.021796	-9.431969	0.0000

Weighted Statistics

R-squared	0.723183	Mean dependent var	-0.195602
Adjusted R-squared	0.715042	S.D. dependent var	1.900967
S.E. of regression	1.014764	Sum squared resid	35.01140
F-statistic	88.82499	Durbin-Watson stat	1.970312
Prob (F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.452823	Mean dependent var	0.013518
Sum squared resid	0.039493	Durbin-Watson stat	2.345173

(Software – Econometric Views)

Appendix 2

Verifying the relationship (2), rL > rv - rw, in the Romanian regions

Rate of employment in services industry, by regions
Symbol: d(ln(L_serv_RO))

	2001	2002	2003	2004	2005	2006
Romania	0.0069	-0.0211	0.0104	0.0683	0.0067	0.0520
1. North – East	0.0205	-0.0509	-0.0072	0.1278	0.0021	0.0146
2. South – East	0.0140	-0.0235	0.0188	0.0276	0.0246	0.0348
3. South – Muntenia	0.0069	-0.0545	0.0311	0.0325	-0.0023	0.0578
4. South – West Oltenia	0.0332	0.0391	0.0069	0.0000	-0.0175	0.0779
5. West	0.0159	-0.0419	0.0195	-0.0097	0.0000	0.0600
6. North – West	0.0217	-0.0641	-0.0051	0.0668	0.0166	0.0233
7. Center	0.0114	-0.0317	-0.0118	0.1354	0.0179	0.0710
8. Bucharest – Ilfov	-0.0394	0.0376	0.0209	0.1122	0.0046	0.0879

Rate of total income, by region
Symbol: d(ln(V_RO))

	2002	2003	2004	2005	2006
Romania	0.2327	0.1885	0.3116	0.1101	0.1342
1. North – East	0.2401	0.1987	0.3539	0.0759	0.1453
2. South – East	0.2203	0.1959	0.2093	0.1218	0.1230
3. South – Muntenia	0.1896	0.2179	0.2810	0.1103	0.1178
4. South – West Oltenia	0.1754	0.1687	0.3301	0.1011	0.1368
5. West	0.2469	0.1610	0.3989	0.0892	0.1409
6. North – West	0.2501	0.1861	0.3377	0.0702	0.1248
7. Center	0.2545	0.1899	0.2844	0.1231	0.1086
8. Bucharest – Ilfov	0.2757	0.1782	0.3099	0.1859	0.1708

Rate of labour productivity of services, by region, symbol: d(ln(w_serv_RO))

	2001	**2002**	**2003**	**2004**	**2005**
Romania	0.3266	0.2993	0.2785	0.1462	0.2083
1. North – East	0.3090	0.3612	0.3370	0.1016	0.2006
2. South – East	0.2692	0.3142	0.2759	0.2588	0.1947
3. South – Muntenia	0.3065	0.3843	0.2799	0.1413	0.2375
4. South – West Oltenia	0.2235	0.2919	0.3374	0.1715	0.1987
5. West	0.3209	0.3618	0.3158	0.2228	0.1917
6. North – West	0.2742	0.3602	0.3283	0.1422	0.1795
7. Center	0.2579	0.3436	0.3585	0.0552	0.1648
8. Bucharest – Ilfov	0.4532	0.1612	0.1712	0.1096	0.2461

Difference between rate of total income and rate of labour productivity of services, by regions (r_v - r_w)

	2002	2003	2004	2005
Romania	-0.0666	-0.0901	0.1654	-0.0982
1. North – East	-0.1210	-0.1383	0.2523	-0.1247
2. South – East	-0.0939	-0.0800	-0.0495	-0.0729
3. South – Muntenia	-0.1947	-0.0620	0.1397	-0.1272
4. South – West Oltenia	-0.1164	-0.1687	0.1585	-0.0976
5. West	-0.1149	-0.1548	0.1760	-0.1025
6. North – West	-0.1101	-0.1422	0.1954	-0.1093
7. Center	-0.0891	-0.1686	0.2292	-0.0417
8. Bucharest – Ilfov	0.1146	0.0070	0.2003	-0.0602

Rates of employment in service industry are greater then the difference between rate of total income and rate of labour productivity of services

(Equation 2: $r_L > r_v - r_w$)

	2002	2003	2004	2005
Romania	TRUE	TRUE	FALSE	TRUE
1. North – East	TRUE	TRUE	FALSE	TRUE
2. South – East	TRUE	TRUE	FALSE	TRUE
3. South – Muntenia	TRUE	TRUE	FALSE	TRUE
4. South – West Oltenia	TRUE	TRUE	FALSE	TRUE
5. West	TRUE	TRUE	FALSE	TRUE
6. North – West	TRUE	TRUE	FALSE	TRUE
7. Center	TRUE	TRUE	FALSE	TRUE
8. Bucharest – Ilfov	FALSE	TRUE	FALSE	TRUE

Source: Authors' processing data on the basis of the National Institute of Statistics, Romanian Statistical Yearbook – 2007.

Appendix 3

The dynamics of the employment in Romanian regions

Employment	2000	2001	2002	2003	2004	2005	2006
ROMANIA	10508	10440	9234	9223	9158	9147	9313
Agriculture	4613	4541	3361	3293	2894	2945	2840
Industries and construction	2701	2683	2724	2748	2857	2772	2859
Services	3194	3216	3149	3182	3407	3430	3613
1. North – East	1914	1919	1645	1652	1701	1688	1653
Agriculture	1102	1103	841	846	822	817	788
Industries and construction	377	372	383	388	405	395	382
Services	434	443	421	418	475	476	483
2. South – East	1320	1294	1160	1175	1151	1147	1182
Agriculture	618	577	442	448	383	382	384
Industries and construction	277	286	297	298	327	313	330
Services	425	431	421	429	441	452	468
3. South – Muntenia	1684	1674	1443	1443	1417	1414	1437
Agriculture	829	837	628	603	534	534	509
Industries and construction	424	403	404	416	445	443	466
Services	431	434	411	424	438	437	463
4. South – West Oltenia	1282	1296	1083	1076	1039	1043	1039
Agriculture	756	758	543	521	496	510	482
Industries and construction	259	262	253	266	255	249	250
Services	267	276	287	289	289	284	307
5. West	910	890	803	800	793	788	815
Agriculture	351	314	222	222	168	163	152
Industries and construction	247	259	276	269	318	318	337
Services	312	317	304	310	307	307	326

Employment	2000	2001	2002	2003	2004	2005	2006
6. North – West	1317	1343	1164	1154	1115	1118	1145
Agriculture	553	567	396	383	310	334	337
Industries and construction	354	357	375	380	387	359	373
Services	410	419	393	391	418	425	435
7. Center	1118	1116	1027	1017	980	987	1019
Agriculture	349	344	266	256	168	188	171
Industries and construction	420	420	419	423	425	406	425
Services	349	353	342	338	387	394	423
8. Bucharest – Ilfov	963	908	909	906	962	962	1023
Agriculture	56	44	25	14	15	15	21
Industries and construction	337	316	315	311	296	293	288
Services	570	548	569	581	650	653	713

Notes:
1. The sectors include:
Agriculture: agriculture, hunting and related service activities; forestry, logging and related service activities; fishing, operation of fish hatcheries and fish farms, service activities incidental to fishing
Industry and construction: mining and quarrying; manufacturing; electricity, gas and water supply; construction
Services: wholesale and retail trade; hotels and restaurants; transport, storage and communication; financial intermediation; real estate, renting and business activities; public administration and defence; compulsory social security; education; health and social work; other community, social and personal service activities
2. Beginning with 2002, the data are not comparable with the series of the previous years, because of redefinition.
Source: Authors' processing data on the basis of *Romanian Statistical Yearbook – 2007*, National Institute of Statistics.