The Impact of Romania's Accession to the EU. An Analysis of the Effects of Regional Development Policy Through a Multi-regional I-O Model

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Abstract

The aim of this paper is to assess the impact of labour income and employment in Romania which will be produced by rural development and structural policies defined in the proposed 2007-09 financial package related to accession to the EU. The methodology used is based on a multi-regional I-O model derived from a three-stage estimation procedure. The main results show that accession to the EU will lead to great positive effects in Romania, which vary according to the region considered. Regarding these, the Southern and the North-Eastern regions are those in which benefits tend to be concentrated. In all the regions, policy seems to be able to absorb unemployment. Finally, policy gives the impression of reducing regional and sectoral income disparities, leading to a more balanced development. On the contrary, in terms of employment, policy increases divergences, albeit, at a regional level, there is a general tendency towards a reduction of sectoral disparities.

Keywords: *accession to the EU, rural development, structural measures, policy impact, Romanian NUTS-2 level development regions, multiregional I-O model*

Introduction

Romania submitted application for EU membership on June 22, 1995. In October 1999, the Commission recommended starting accession negotiations with Romania, provided that Romania improved the situation of children in institutional care and drafted a medium-term economic strategy. Following the Helsinki European Council's decision in December 1999, accession negotiations started with Romania on February 15, 2000. On April 25, 2005, Romania signed the Treaty concerning its accession to the EU, which will be enforced on January 1, 2007.

In order to prepare the ground for the completion of the negotiations, in 2004, the EU Commission drew up a proposal defining a financial package for the accession negotiations with Bulgaria and Romania (European Commission, 2004). This proposal is based largely on the existing *acquis* and on the principles and methodology underlying the financial package developed for the negotiations with the ten countries, which entered the EU in 2004. In view of possible future modifications of the financial package due to policy reforms or other fundamental changes, the time period covered has been expressly limited to three years and comprises 2007 to 2009.

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The proposal establishes 5 expenditure chapters: (a) agriculture; (b) structural operations; (c) internal policies (nuclear safety and transition facility for institution building); (d) budgetary compensation; (e) administration. With reference to chapter (a), appropriations relate to market measures, direct payments and rural development. Chapter (b) involves structural and cohesion funds.

Although the EU commission gives an estimate of funds allocated to Romania, no evaluation of possible impact caused by the application of the financial package has been carried out. The aim of this paper is to attempt to the impact of employment and labour income in Romania deriving from the application of development policies included in the proposed financial package for the period 2007-09[1]. Development policies considered are rural development policy and structural measures (cohesion funds and structural funds), which represent about 84% of total expenditure (excluding the chapters of internal policies and administration, whose distribution between the two countries is not well specified). The total amount of funds appropriated is 7,683 million € (2000 prices) and it is distributed as follows: 2,218 million € to rural development policy (29.9%), 3,643 million € to structural funds (47.4%) and 1,822 million € to cohesion funds (23.7%).[2]

Methodology Used and Area Under Study

In order to estimate the impact induced by the application of EU policy for the period 2007-09, a multiregional demand-driven I-O model has been adopted (Miller and Blair, 1985). In spite of some restrictive assumptions (Gerking *et al.*, 2001), the I-O model is still considered a valid tool to quantify total effects in terms of output and, by a simple extension, of income and employment, deriving from final demand variation (Doyle *et al.*, 1997). Moreover, the multiregional version offers further advantages: it guarantees major internal consistency in comparison to one-region models; it allows taking account of the diverse pattern of consumption in the different regions; it makes it possible to capture effects due to trade relationships among regions and, finally, it shows impact distribution on the territory.

The regions under study are the eight Romanian NUTS-2 level development regions[3]: the North-Eastern region (NER), the South-Eastern region (SER), the Southern region (SR), the South-Western region (SWR), the Western region (WR), the North-Western region (NWR), the Center region (CR) and the Bucharest region (BR).

A peculiar characteristic of Romania's economic growth over the last ten years has been the increasing importance of BR. With about 10% of the national population, BR in 1998 produced 17% of total GDP (Tab. 1). Development of BR is due to the presence of the capital Bucharest. In 2001, Bucharest attracted more than 50% of total foreign investments. In addition, the capital is one of the few areas which is experiencing high positive internal migration flows for labour and educational reasons. Nevertheless, the capital has not produced significant spill-over in favour of neighbouring areas so far. In fact, several counties which are in its immediate surroundings are still undeveloped (Romanian Ministry of Integration, 2003).

A further feature of Romania's economic growth is the unbalanced development in favour of the western and central regions which have benefited from several factors: proximity to western markets, historically lower dependence on the primary sector and relatively higher flows of direct foreign investments. The eastern area is the least developed. Here, NER and SR are those which present lower levels of development. The

former has suffered from its proximity to the borders of Moldova and Ukraine and from its traditional heavy dependence on agriculture whereas the latter, besides its strong dependence on the primary sector, has been hindered by the River Danube which has acted as a barrier to cross-border trade.

Table 1. Some geographic and socio-economic indicators about the Romanian NUTS-2 level development regions

Regions	Area (km^2)	%	GDP (billion lei, 1998)	%	Population (inhabitants, 2000)	%	GDP per capita (million lei)
NER	36,850	15.5	50,385.4	13.5	3,823,492	17.0	13.2
SER	35,762	15.0	48,959.2	13.1	2,934.319	13.1	16.7
SR	34,453	14.5	49,675.0	13.3	3,465.468	15.4	14.3
SWR	29,212	12.3	36,101.5	9.7	2,399.831	10.7	15.0
WR	32,034	13.4	34,377.8	9.2	2,041.129	9.1	16.8
NWR	34,159	14.3	45,320.3	12.1	2,844.042	12.7	15.9
CR	34,100	14.3	46,683.1	12.5	2,642.242	11.8	17.7
BR	1,821	0.8	61,784.5	16.6	2,284.682	10.2	27.0
Romania	238,391	100.0	373,286.8	100.0	22,435,205	100.0	16.6

Source: Author's elaboration on data from the Romania National Institute of Statistics

This diverse path of economic growth has generated a self-reinforcement process also due to fiscal policy mechanisms. In the regions lagging behind, investments have increasingly decreased because fiscal problems have caused a decline in public expenditure and, in turn, a decrease in investments in public infrastructure which has made the degree of attractiveness still lower.

Another peculiarity of regional development in Romania is the co-existence of areas of different levels of development within the single regions and the scarce economic integration among the sub-regional areas. In fact, despite a dense urban network, there are few and insufficient links among urban centres and the surrounding areas. In addition, the system of local transport appears to be extremely inadequate to establish and maintain foreign contacts and economic relationships between counties. This implies that the closure of an important company in a given county generally leads to migration to rural areas or to Bucharest and not to other urban centres located in the same region, causing an urban decline of small and medium sized towns.

A last remarkable characteristic of regional development is the presence of a high number of localities having only one economic activity, generally a State-owned company, likely to undergo restructuring and concentrating a very high share of non-agricultural employment. It is evident that this situation is highly critical for the serious consequences which labour market shocks could produce in the future.

Deriving the multiregional I-O matrix: a three-stage estimation method

A multiregional I-O system describes all economic transactions among productive sectors and among the regions considered. As usual, the multiregional demand-driven I-O model can be written compactly as: $\mathbf{x} = (\mathbf{I} - \mathbf{A})^{-1}\mathbf{fd}$, where $\mathbf{x}$ is output vector, $\mathbf{A}$ is

the input coefficient matrix, $(\mathbf{I}-\mathbf{A})^{-1}$ is the Leontief inverse matrix and **fd** is a final demand vector. The model allows us to determine output variation in the regions under study induced by a change in final demand. Output change takes account of both direct and indirect effects generated by sectoral linkages within regions and spill-over and feedback effects produced by interrelationships between the regions (Miller and Blair, 1985). By a simple extension, the model can be used to evaluate income and employment effects.

To derive the multiregional matrix, $\mathbf{A}$, it is necessary to have at one's disposal a lot of information, which involves both intraregional flows among sectors and interregional flows. Since collecting information by survey is costly, indirect techniques reducing need for data have been introduced over time (Chenery, 1953; Moses, 1955; Leontief and Strout, 1963; Polenske, 1970).

In the case of a bi-regional I-O model, Round's interregional approach (Round, 1972; 1978; 1983) can be a straightforward solution. This approach derives interregional imports and exports and offers a higher degree of internal consistency than single region applications. A problem associated with this technique is that there is no obvious extension of the approach to multiregional input-output tables involving three or more regions (Hewings and Janson, 1980). During this research, we tried to extend Round's approach to constructing multiregional models by implementing this approach within an integrated procedure. The technique proposed is a *three-stage estimation method*.

The starting point is given by the 2000 34-sector Romanian I-O table which is aggregated into 13 sectors owing to the reduced availability of sectoral data at a sub-national level and also for computational reasons.

Stage 1 provides the application of a location quotient technique to estimate the intersectoral flows within a given region (input coefficient matrix) and imports of the region from the rest of the country (total trade coefficient matrix). Within the class of location quotients, Flegg *et al.*'s location quotient (FLQ) (Flegg *et al.,* 1995; Flegg and Webber, 1997) was chosen. The FLQ has been designed to overcome some theoretical drawbacks related to traditional location quotients. Of the properties which a regionalization method should incorporate (Round, 1978), the FLQ, different from other location quotients, takes account of all the three properties: the importance of selling sectors, the importance of purchasing sectors and the size of the region. Moreover, recent empirical evidence (Flegg and Webber, 2000; Tohmo, 2004) has shown that the FLQ outperforms traditional location quotients in reproducing survey-based models. The FLQ is used to estimate both the input coefficient matrix, $\mathbf{A}^{SS}$ (where S represents a given region), and the total trade coefficient matrix, $\mathbf{A}^{RS}$ (where R expresses the rest of the country).

In stage 2, a gravity model is used to allocate total imports of a given region (total trade coefficient matrix) among the other regions (trade coefficients matrices). The hypothesis of the model is that the probability of attraction of import flows exerted by a region is an indirect function of its distance from the import region and a direct function of its ability to attract import flows. Given regions L and S, the attraction probability of region L relative to import flows of good i to region S is given by $p_i^{LS} = \left[X_i^L / (d_{LS})^2 \right] \Big/ \left[\sum_{k=1}^{N} X_i^k / (d_{jS})^2 \right]$ with $k \neq S$, where N is the number of regions, d_{LS} is the geographical distance between export region L and import region S (this is

a straight line distance between the barycentre of the respective regions); X_i^L is the output of sector *i* in export region L and it is used as a proxy of the ability of attracting import flows. It is assumed that import flows of a given good (or service), whatever import sector it is, are mostly attracted (or rather produced and exported) by regions with high levels of output in the relevant sector. Output has a greater importance than the distance factor, which is squared just to reduce its effects on the attraction probability. For a given region *S*, trade coefficients matrices, $\mathbf{A}^{LS}$, are derived as follows: $\mathbf{A}^{LS} = \hat{\mathbf{p}}^{LS}\mathbf{A}^{RS}\left(L = 1, 2, \ldots, N \wedge L \neq S\right)$, where $\mathbf{p}^{LS} = \left(p_1^{LS}, p_2^{LS}, \ldots, p_s^{LS}\right)$ and *s* is the number of sectors.

The two stages described above are repeated recursively as many times as there are the regions under study. The result is a 13-sector-by-8-region Romanian I-O matrix which is successively converted into flows multiplying coefficients by output data.

Finally, stage 3 provides the application of a non-linear optimization technique[4] to reconcile discrepancies within the multiregional I-O table and inconsistencies with the national I-O table. In this phase, all the superior data available can be used in order to increase the level of reliability of the table. Once the I-O is balanced, employment and labour income multipliers are derived to be used for impact analysis.

Modelling policy into the multiregional I-O model

Assessing impact from EU policy through a multiregional I-O model requires estimating regional funds and distributing funds sectorally.

The first question derives from the fact that data are available only at a national level. To regionalise data, information from the Romanian Development Plan 2004-2006 was used (Romanian Ministry of Integration, 2003). The National Development Plan calculates a complex index (I_r) for every development region, named the "development index", which is proposed to allocate structural funds regionally. This index should reflect the disparities among regions and gives preference to underdeveloped regions in the process of distribution of resources. It comprises three parts: (a) a combination of per capita income and population reflecting the basic criteria for "structural underemployment"; (b) a combination of the unemployment rate and population highlighting peculiar problems regarding employment; (c) a combination of basic transport and infrastructure highlighting the problems regarding the structural endowment.

From development indices, shares of allocations[5] are calculated as: $(I_r / I_\bullet)$. These shares were applied to the national amounts to estimate regional funds for all the policies considered. Tab. 2 shows the allocation of national funds among the regions.

Once regional funds are estimated, it is necessary to hypothesise how expenditure is distributed among sectors.

The first step was to distribute national funds sectorally. For this, a criterion proposed by Vincze (2004) was applied. With regard to rural development policy and cohesion funds, sectoral distribution of funds was essentially based on both past experience in pre-accession instruments (such as SAPARD and ISPA) and local knowledge. With reference to structural funds, distribution was made by taking account of specific characteristics and the needs of Romania. In particular, funds were first redistributed into 8 axes on the basis of Romanian national priorities and measures: 45% to infrastructure, 15% to education and research, 15% to aids to primary sector enterprises, 5% to office-

supply material computer equipment and precision equipment, 5% to other industrial equipment, 5% to construction, 5% to studies, advice and communication, 5% to aids to enterprises (except for the primary sector). Then, vectors of fixed percentages, each one corresponding to a different axis, were applied to funds assigned to each axis to estimate distribution among sectors.

Table 2. Financial allocation to regions per kind of policy instrument, Romania, 2007-09 (million euro; 2000 prices)

Policy	NER	SER	SR	SWR	WR	NWR	CR	BR	Romania
Rural development policies	479	302	366	262	191	264	240	115	2,218
Structural Funds	787	495	601	430	313	434	393	189	3,643
Cohesion Funds	393	248	301	215	157	217	197	95	1,822
TOTAL	1,659	1,045	1,268	907	661	914	830	399	7,683

Source: Author's elaboration

The second step was to allocate national sectoral funds to regional sectors. For every sector, regional funds were estimated by applying regional and national output ratio to national sectoral funds. However, in doing so, it was found that the sum of regional funds over all sectors of each region did not correspond with the overall amount of funds allocated to the region on the basis of the development index. Therefore, sectoral funds were reconciled by constraining the matrix of regional and sectoral funds to the vector of national sectoral funds (the row vector) and to the vector of overall amount of regional funds allocated (the column vector) using a RAS-type technique. Tab. 3 shows the final allocation of funds among regions and sectors.

Table 3. Financial allocation to regions by sector, Romania, 2007-09 (million euro; 2000 prices)

Sector	NER	SER	SR	SWR	WR	NWR	CR	BR	Romania
Agriculture	190	98	143	101	72	87	69	3	763
Mining	35	21	43	45	26	24	18	4	217
Manufacturing	492	292	374	214	116	251	283	94	2,116
Energy, gas and water	104	69	73	87	32	45	45	22	477
Construction	178	146	142	117	89	97	90	54	913
Trade	53	36	35	22	23	28	28	25	249
Hotels and restaurants	36	32	27	26	24	24	23	12	204
Transport	213	148	181	119	121	146	112	54	1,094
Communication	106	69	74	50	54	66	56	80	555
Finance, banking and insurance	6	4	5	5	3	4	3	4	32
Real estate and other services	43	34	36	22	30	33	22	17	237
Public administration	61	30	44	28	20	28	22	7	241
Other services	143	65	90	70	52	82	58	24	584
TOTAL	1,659	1,045	1,268	907	661	914	830	399	7,683

Source: Author's elaboration

Assessing Overall Impact Induced By Policy

By applying the multiregional I-O model[6], the impact of employment and labour income, produced in Romania by development policies included in the financial package related to accession to the EU for the period 2007-09, were estimated.

Results from impact analysis reveal that labour income and employment variations in Romania will be 2,425 million euro and about 1.4 million of labour units, respectively. Variation of income per capita is estimated to be 108 €. In terms of income, services and industry are the sectors attracting the greatest part of impact: services absorb 50% of impact whereas industry attracts 45% of income variation. Agricultural employees only receive 5% of income variation. As regards employment, the greatest part of impact is on agriculture (50% of employment variation) whereas the remaining part is distributed between industry (29%) and services (21%) (Tab. 4).

In comparison with 2000 data, income and employment are forecasted to increase by about 16% and 17%, respectively. The biggest variation is noted in agriculture, followed by industry and, finally, services. In terms of effectiveness, policy generates an increase in income by 32% of public expenditure and in employment by 183 labour units for each one million euro. At a sectoral level and in terms of income, policy is demonstrated as being more effective in services. As far as employment is concerned, policy is more effective in agriculture.

To improve the analysis of effectiveness, it is interesting to verify whether policy is able to reduce unemployment, which, in the year 2000, amounted to, at a national level, about 1 million people (according to official figures regarding registered unemployed), equivalent to 12.4% of employment and 6.6% of the population at working age. Looking at the net employment variation, which takes account of the number of unemployed, it results that, at a national level, policy absorbs unemployment and also generates further employment amounting to 5% of the levels registered in 2000.

Further useful information for policy makers is to verify if policy will or will not contribute towards a reduction of territorial and sectoral disparities. Through the analysis of income distribution, it turns out that territorial variability[7] among regions tends to diminish, decreasing from 24.4% to 22.4% (Tab. 5). Even the variability among sectors decreases from 86.5% to 83.3%. Considering all the sectors and the regions jointly, total variability decreases from 92.8% to 89.3%. As far as employment distribution is concerned, variability tends to increase. Variability among regions increases from 20.4% to 24.3% whereas the one among sectors goes from 157.9% to 159.6%. Finally, total variability shifts from 168.8% to 173.1%.

Results in terms of variability show that, at an aggregate level, policy helps to reduce both sectoral and territorial disparities in terms of income, favouring a more uniform development, but sharpens the differences among sectors and regions from an employment point of view.

Application of a multiregional I-O model allows an increase in the level of detail, through the analysis of impact at a sub-national level.

The regions attracting bigger impact are SR and NER whereas the ones registering lower impact are WR, in terms of income, and BR, as for employment (Tab. 4). With reference to income, in all the regions, services and industry attract a bigger share of regional impact. As far as employment is concerned, agriculture absorbs most impact in all the regions except for CR and BR where effects are concentrated on extra-agricultural sectors.

Table 4. Impact by region induced by the financial package related to accession to the EU per macro-sector, Romania, 2007-09

Region	Labour Income					Employment					
	Million euro (2000 prices)	%	% on nation	% Var	Y/PE* (%)	Units	%	% on nation	% Var	E/PE**	
NER											
Agric.	27.7	7.2	21.5	21.3	14.6	153,720	55.7	22.1	21.3	809.9	
Industry	153.3	39.7	14.2	21.6	19.0	66,916	24.2	16.4	21.1	82.8	
Services	204.8	53.1	16.9	21.1	31.0	55,491	20.1	18.5	18.8	83.9	
TOTAL	385.8	100.0	15.9	21.3	23.3	276,126	100.0	19.7	20.7	166.4	
SER											
Agric	12.7	4.6	9.9	13.8	12.9	66,576	46.5	9.6	13.8	678.2	
Industry	110.7	40.1	10.2	14.2	20.9	39,189	27.3	9.6	14.2	74.1	
Services	152.9	55.3	12.6	15.5	36.6	37,556	26.2	12.6	14.0	89.9	
TOTAL	276.3	100.0	11.4	14.9	26.4	143,321	100.0	10.2	14.0	137.2	
SR											
Agric	42.8	9.7	33.3	35.0	29.8	220,106	63.8	31.6	35.0	1,534.2	
Industry	220.4	50.0	20.4	24.8	34.9	78,571	22.8	19.2	23.3	124.3	
Services	177.4	40.3	14.6	18.7	36.1	46,246	13.4	15.5	17.1	94.0	
TOTAL	440.6	100.0	18.2	22.5	34.8	344,923	100.0	24.6	27.9	272.1	
SWR											
Agric	14.1	5.3	11.0	16.2	14.0	79,200	52.1	11.4	16.2	786.8	
Industry	134.2	50.8	12.4	19.5	28.9	43,262	28.5	10.6	19.4	93.3	
Services	116.0	43.9	9.6	16.4	33.9	29,483	19.4	9.9	15.0	86.1	
TOTAL	264.3	100.0	10.9	17.8	29.2	151,945	100.0	10.8	16.7	167.6	
WR											
Agric	6.8	3.3	5.3	13.0	9.5	38,455	38.6	5.5	13.0	537.2	
Industry	96.4	47.4	8.9	14.2	36.6	34,790	35.0	8.5	13.8	132.2	
Services	100.0	49.2	8.2	13.5	30.7	26,289	26.4	8.8	11.9	80.7	
TOTAL	203.2	100.0	8.4	13.8	30.8	99,533	100.0	7.1	12.9	150.6	

Region	Labour Income					Employment				
	Million euro (2000 prices)	%	% on nation	% Var	Y/PE* (%)	Units	%	% on nation	% Var	E/PE**
NWR										
Agric	13.4	5.3	10.4	14.3	15.5	77,027	48.6	11.1	14.3	888.8
Industry	109.0	43.0	10.1	16.0	26.1	46,854	29.6	11.5	15.7	112.3
Services	131.1	51.7	10.8	14.1	31.9	34,590	21.8	11.6	12.9	84.3
TOTAL	253.5	100.0	10.5	14.9	27.7	158,471	100.0	11.3	14.4	173.3
CR										
Agric	9.9	3.4	7.7	15.4	14.3	55,529	36.4	8.0	15.4	802.5
Industry	157.0	53.9	14.5	18.0	36.0	63,786	41.9	15.6	17.5	146.5
Services	124.7	42.8	10.3	13.0	38.4	33,098	21.7	11.1	12.0	101.8
TOTAL	291.5	100.0	12.0	15.4	35.1	152,413	100.0	10.9	15.2	183.7
BR										
Agric	1.2	0.4	0.9	10.7	37.4	5,847	7.5	0.8	10.7	1,757.8
Industry	101.7	32.9	9.4	12.7	58.5	35,249	45.4	8.6	12.2	202.9
Services	206.5	66.7	17.0	9.7	92.9	36,484	47.0	12.2	9.0	164.0
TOTAL	309.5	100.0	12.8	10.5	77.5	77,579	100.0	5.5	10.4	194.2
Romania										
Agric	128.6	5.3	100.0	19.7	16.9	696,459	49.6	100.0	19.5	912.9
Industry	1,082.7	44.7	100.0	17.8	29.1	408,617	29.1	100.0	17.3	109.8
Services	1,213.4	50.0	100.0	14.5	38.0	299,236	21.3	100.0	13.6	93.6
TOTAL	2,424.8	100.0	100.0	16.0	31.6	1,404,312	100.0	100.0	17.3	182.8

* *Y/PE is the percentage ratio between labour income and public expenditure and expresses the increase in labour income (in €) gene one hundred € of public expenditure.*

** *E/PE is the ratio between employment and public expenditure and expresses the increase in the number of employees generated by on lion of public expenditure.*

*** *The net % var. is the employment variation net of the number of registered unemployed in 2000. It expresses the degree of absorptio employment or the degree of creation of employment. In particular, null percentages only indicate total absorption of unemployment, positive percentages indicate total absorption of unemployment and creation of employment equivalent to the percentage variation.*

Table 5. Sectoral variability calculated by region, Romania

Region	Labour Income			Employment		
	VC (1)	VC (2)	(1)-(2)	VC (1)	VC (2)	(1)-(2)
NER	95.9	90.9	-5.0	191.3	191.3	0.0
SER	95.0	92.1	-2.9	167.1	166.0	-1.1
SR	98.3	93.5	-4.8	180.9	189.3	8.4
SWR	75.9	73.0	-2.9	186.0	184.7	-1.3
WR	86.1	83.0	-3.1	141.5	140.3	-1.2
NWR	94.2	91.7	-2.5	174.1	173.6	-0.5
CR	114.9	114.0	-0.9	148.9	148.8	-0.1
BR	74.3	70.5	-3.8	95.3	93.2	-2.1
Romania (VCs)	86.5	83.3	-3.2	157.9	159.6	1.7
Romania (VCr)	24.4	22.4	-2.0	20.4	24.3	3.9
Romania (VCsr)	92.8	89.3	-3.5	168.8	173.1	4.3

VC = Variation Coefficient calculated as a percent ratio between standard deviation and average on all sectors. VC (1) and VC (2) are calculated before and after policy application, respectively
VCs = VC calculated on all sectors aggregated over all regions
VCr = VC calculated on all regions
VCsr = VC calculated on all sectors of all regions
Source: Author's elaboration

Relative to 2000 data, SR and NER are the regions exhibiting the highest levels of growth in terms of both income and employment whereas BR registers the lowest levels.

In terms of effectiveness, policy is by far more effective in generating income in BR (78% of public expenditure is transformed into income). In the other regions, the level of effectiveness is broadly similar and increases from 23% (NER) to 35% (CR). The services sector is the one where policy effectiveness is higher in all the regions except for WR, where industry is the sector in which policy is more effective. With regard to employment, SR uses policy funds in a more efficient way: for each one million euro, policy generates about 272 labour units. The less competitive region from the fund-use standpoint is SER with 137 labour units for each one million euro. At a sectoral level and in all the regions, policy appears to be more effective in the agricultural sector reaching the highest level in BR, which is about 1,758 labour units for each one million euro.

Observing the net employment variation, it can be noted that in all the regions, increases in employment induced by policy absorb regional unemployment. Only in SER and WR, the increases are just a little more than sufficient to remove unemployment. On the contrary, in the other regions, policy also generates further employment specifically in SR where employment increases do not only absorb existing unemployment but also allows an increase in employment by 16%.

Analysing sectoral differences, it turns out that, in terms of income distribution, sectoral variability decreases in all the regions. The biggest decreases involve SR and NER. Also with regard to employment, sectoral differences tend to decrease with the excep-

tions of SR, where variability increases by 8%, and NER, where variability does not change.

The level of detail related to impact analysis can be further increased by looking at sectoral distribution of policy effects. In terms of labour income, results indicate that most impact is concentrated on the manufacturing sector (23%), the transport sector (13%) and the other services sector (see education) (13%), whereas, in terms of employment, increases tend to be concentrated on agriculture (50%) and manufacturing (17%) (Tab. 6).

Table 6. Sectoral distribution of impact by region, Romania (in %)

Sectors	NER		SER		SR		SWR	
	Y	E	Y	E	Y	E	Y	E
Agriculture	7.2	55.7	4.6	46.5	9.7	63.8	5.3	52.1
Mining	3.1	0.9	2.8	0.9	12.7	3.5	11.2	3.5
Manufacturing	20.4	14.0	20.4	14.5	24.7	13.1	18.2	12.4
Energy, gas and water	6.5	2.7	5.8	3.1	5.8	2.3	11.2	4.8
Construction	9.8	6.7	11.1	8.8	6.9	4.0	10.2	7.7
Trade	3.9	3.2	3.2	3.1	2.8	1.8	2.9	2.6
Hotels and restaurants	1.5	0.7	2.6	1.3	1.2	0.5	1.7	0.9
Transport	12.1	5.8	23.0	11.9	10.7	4.5	12.3	6.6
Communication	9.5	3.0	7.0	3.0	7.2	2.0	6.9	2.8
Finance, banking and insurance	1.2	0.3	1.1	0.4	1.0	0.2	1.0	0.3
Real estate and other services	1.1	1.1	1.2	1.3	1.6	1.0	0.9	1.0
Public administration	6.4	1.0	5.5	1.2	4.8	0.7	5.9	1.2
Other services	17.4	5.0	11.7	4.1	11.0	2.7	12.3	4.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note: Y and E are labour income and employment, respectively
Source: Author's elaboration

A similar distribution of impact can be observed broadly also in the single regions. Nevertheless, there are some differences which are worth mentioning. In terms of income, like the national level, manufacturing, transport and other services sectors attract most impact in the following regions: NER, SER, SWR, WR, NWR, CR. On the contrary, in SR, the first three sectors are manufacturing, mining and other services whereas in BR they are communication, manufacturing and transport. As for employment, in all the regions except for BR the sectors absorbing most impact are the same as those noted at a national level. In BR the sectors in which impact is concentrated are manufacturing, communication, real estate and business services. The substantial differences between BR and the other regions in terms of sectoral distribution of impact reflect a higher level of development and therefore different needs characterising BR in comparison with the other Romanian regions.

Estimated regional impact is derived from the capability of domestic industries to satisfy both local final demand increases and final demand changes occurring in the other regions through interregional exports. One of the advantages offered by a multiregional I-O model is the possibility of separating the two types of impact. In Tab. 7, for

Table 6. Sectoral distribution of impact by region, Romania (in %) (continued)

Sectors	WR		NWR		CR		BR		Romania	
	Y	E	Y	E	Y	E	Y	E	Y	E
Agriculture	3.4	38.6	5.3	48.6	3.4	36.4	0.4	7.5	5.3	49.6
Mining	11.7	4.3	4.8	1.8	4.9	1.9	0.6	0.3	6.5	2.2
Manufacturing	20.1	18.8	24.6	19.1	35.5	30.5	18.7	28.6	23.0	17.2
Energy, gas and water	6.2	3.8	5.4	2.6	6.7	3.9	7.5	8.1	6.8	3.3
Construction	9.4	8.1	8.2	6.1	6.8	5.5	6.1	8.4	8.4	6.4
Trade	3.5	4.1	3.7	2.9	3.1	2.9	2.4	2.6	3.2	2.7
Hotels and restaurants	2.3	1.5	2.2	1.0	2.7	1.3	2.7	1.7	2.1	0.9
Transport	14.3	8.7	13.0	7.0	11.2	7.2	10.8	9.9	13.1	6.9
Communication	8.6	3.8	9.6	3.4	7.3	3.2	21.8	11.7	9.7	3.3
Finance, banking and insurance	1.1	0.4	1.6	0.5	1.8	0.6	8.3	3.4	2.2	0.5
Real estate and other services	1.3	1.7	1.2	1.3	1.2	1.3	6.8	10.9	1.9	1.7
Public administration	5.7	1.4	5.3	1.0	3.9	0.9	3.5	1.1	5.1	1.0
Other services	12.3	4.7	15.2	4.8	11.6	4.4	10.4	5.7	12.8	4.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note: Y and E are labour income and employment, respectively
Source: Author's elaboration

Table 7. Domestic and interregional impact by region, Romania

Regions	Labour Income			Employment		
	Domestic (%)	Interregional (%)	Total (Million euro – 2000 prices)	Domestic (%)	Interregional (%)	Total (units)
NER	94.4	5.6	385.8	91.2	8.8	276,126
SER	93.1	6.9	276.3	91.4	8.6	143,321
SR	70.8	29.2	440.6	55.9	44.1	344,923
SWR	85.2	14.8	264.3	86.3	13.7	151,945
WR	89.2	10.8	203.2	88.0	12.0	99,533
NWR	83.6	16.4	253.5	81.5	18.5	158,471
CR	66.5	33.5	291.5	65.0	35.0	152,413
BR	36.6	63.4	309.5	37.0	63.0	77,579
Romania	76.7	23.3	2424.8	74.9	25.1	1,404,312

Source: Author's elaboration

every Romanian region, total impact, the part of impact attributable to an increase in final demand within the region (domestic impact) and the one related to final demand outside the region (interregional impact) are shown. As can be noted, at a national level, 77% of labour income impact and 75% of employment impact are due to increases in local final demand, whereas the remaining parts (23% and 25%, respectively) depend on interregional linkages. At a regional level, in all the regions with exception of BR, most policy effects are due to domestic final demand. Conversely, in BR about 60% of impact depends on interregional exports. Therefore, BR is demonstrated to be highly

linked to the other regions by supplying goods and services. Other important supplying regions are CR and SR. Instead, the regions having the industries which are less oriented to interregional exports are NER and SER.

Concluding Remarks

This paper has estimated the impact of employment and labour income in Romania generated by the application of development policies (rural development policy, structural funds and cohesion funds) defined in the proposed financial package related to accession to the EU for the period 2007-09. Impact has been estimated using a multiregional I-O model. Results show that policy will lead to large positive effects. Income and employment variations will be 2,425 million euro (2000 prices) and about 1.4 million of labour units, respectively. Moreover, variation of income per capita will be 108 €. In comparison to 2000 data, increases will be by 16%, as for income, and by 17%, as for employment.

Sectors which will mostly benefit from impact are services and industry, in terms of income, and agriculture, with reference to employment. This last result can be partly explained by the fact that Romania is still a developing country in which agriculture, although it is losing its importance, still plays a significant role in the economy especially in terms of employment.

In terms of effectiveness, policy produces an increase in income by 32% of public expenditure and in employment by 183 labour units for each one million euro. An interesting result is that increases in employment allow both absorption of unemployment and new employment amounting to 5% of the levels in 2000. Moreover, policy would seem to be able to reduce disparities existing among regions and sectors, leading towards more uniform development, but only in terms of income since employment differences would seem to increase.

At a sub-national level, consistently with the declared policy objectives of sustaining the less developed areas, the Southern and the North-Eastern regions are those in which impact tends to concentrate and those which register the highest levels of growth. Moreover, as occurs at a national level, in all the regions, increases in employment are expected to absorb existing unemployment, which is one of the main priorities for regional policy makers. Analysing ratio impact-public expenditure, the best policy results are produced in the Bucharest region, in terms of income, and in the Southern region, in terms of employment. In line with results at an aggregate level, income disparities among sectors tend to decrease in all the regions. On the contrary, at an employment level, different from that which can be noted at a national level, there is a general trend towards a reduction of differences.

Definitively, policy application following accession to the EU is going to give important support to economic development in Romania and a reduction of both unemployment and gaps among regions. However, it is true that impact results are hardly affected by the hypotheses made regarding regional and sectoral distribution of funds, in addition to strong assumptions of the methodology adopted. Effectively, different forms of fund distribution would lead to diverse results. But this cannot be considered only as a limitation. In fact, by changing the distribution of funds among regions and sectors, it is possible to see how the Romanian economic system would react to various changes. Therefore, the methodology employed in this research might be used by policy makers

to carry out experiments so as to identify the most suitable policy to the needs and characteristics of Romanian regions.

Notes

[1] An attempt to estimate impact coming from accession of Romania to the EU for the period 2007-09 is contained in Vincze (2004). This work, which is a synthesis of the results produced within the REAPBALK European project, is aimed at estimating impact on Romania and in the North-Western region through application of a national I-O model and a regional I-O model, respectively.

[2] Within the EC's proposal, funds are expressed in 2004 prices. Since the multiregional I-O model developed in this study refers to the year 2000, funds were converted into 2000 prices using the Harmonised Index of Consumer Prices (HICPs).

[3] Law No.151 regarding regional development, adopted in 1998, established the institutional framework, objectives, competences, and specific instruments for regional development policy in Romania. With the aim of achieving the main objectives of regional development policy, Law No.151/1998 authorized the creation of 8 development regions - corresponding with NUTS II level, through the voluntary association of counties. These regions are not administrative units and do not have legal power.

[4] In this study, the Pearson χ^2 (or normalized square of differences) function is used as a penalty function (Friedlander, 1961).

[5] Percentages of allocation are: 21.6 (NER), 13.6 (SER), 16.5 (SR), 11.8 (SWR), 8.6 (WR), 11.9 (NWR), 10.8 (CR), 5.2 (BR).

[6] Impact estimated by a multiregional I-O model is different depending on whether final demand changes come from within the region or if they are, in part, satisfied internally and, in part, satisfied by shipments of sectors localised outside the region (Miller and Blair, 1985). In the latter case, final demand changes have to be reallocated among the sectors of all the regions. In this research, final demand changes estimated in the paragraph 2 represent new region-specific final demands, which have been distributed among sectors appropriately.

[7] Variability is measured by the variation coefficient (ratio between standard deviation and average), calculated before and after an application of policy.

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