Econometric Methods Used to Study the Informal Economy and Regional Development

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The study proposes to present some research directions in the field of informal economy and regional development found in economic literature. Are presented some results at the level of Romania and Hungary`s economy. At the Romanian economy level are submited results about the allocation of funds at local level on poltical criteria and the dynamics of some industry lines in territorial profile.

Keywords: *informal economy, regional development, poltical criteria.*

1 Introduction

After 1989 the evaluation of dimension, causes and consequences of the Romanian informal economy became important subjects in economic theory and practice. Also, the informal economy developed during the transition process, affecting the evolution of some activity sectors and the economic environment of the Romanian development regions. Through the most important documents negociated with European Union to realise the adhension process were *"fighting with fiscal evasion"* and *"the reform of fiscal system and fiscal policy"* as important instruments to reduce the dimension of informal economy and the economic and social development of Romania. In the economic Romanian approach an explanation of the informal economy dimension was the higher level of the taxes. Because the taxation system was not adapted to the Romanian economic reality, the taxation base has been reduced, but the informal economy increased. The fiscal policy adopted in the last electoral cicle was based on the reduction of the income taxation, to decrease the informal dimension and to raise the taxation base.

At macroeconomic level are indirect methods to estimate the dimension and the dynamics of the informal economy. The most important methods are: *monetary approach, method of implicit labour offer*, methods based on the statistic information offered by the *national accounting*, methods based on the *energy consumption*, etc. Frequently the results offered by these methods are different. For example, in the case of Romania the numbers are between 20% and 45% from GDP. The lowest value is determined using the method based on the energy consumption (Enste şi Schneider, 2000) and the highest one is evaluated through monetary method (French, Balaita, şi Ticsa, 1999). Also, the numbers reported by the National Institue of Statistics, based on the national account methodology, increased from approximately 5% in 1992 to 20-21% in 2001 – the rise was obtained because of the changes in the calcul methods. To estimate exactly the dimension of informal economy we have to take in account the level of the householder consumption from rural area. In these conditions, in Romania the level of informal economy is around 25-28% from total volume of economic activities.

2. Main fields in regional economy

There is an important literature about disparities analysis between development regions and informal economy. During this section will be presented the main research directions of the two fields presented before, specifying some relevant papers.

▪ *The disparities analysis between development regions at country level.* Relevant papers in this field: Giorgio Brunelor (2005)[1] makes an analysis of regional disparities from Italy; Somik Vinary Lall (2005)[2] af-

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[1] Regional disparities and the Italian NAIRU, Oxford Economic Papers 52, pag. 146-177.
[2] Industrial Location and Spatial Inegality: Theory and Evidence from Indiala, Review of Development Economics, 9(1), 2005, pag. 47-68.

firms that the industrial localization at the level of India`s regions is the main factor of the regional inequalities from this country; Fabienne Bourdier (2005)[3] realises a remarkable analysis of the regional development impact in Hungary over the foreign investments localization. The conclusions obtained after applying some econometric models suggest that the regions preferated by the foreign investments are the ones with higher labour force offer, an important density of the industrial firms and with highest labour force costs; Andrei (2006) realises and econometric analysis of the relation between the regional specilization degree, development level and rate of economic growth at the level of Romanian regions.

▪ *The disparities analysis at the level of some large development regions.* Relevant papers are the ones of Midelfart (2000)[4] and Aiginger (2000)[5]. These are studies which realise the analysis of the specialization degree for countries from Occidental Europe – on industry lines and of the disparities which exists between the member contries. Zaghini (2005)[6] makes an analysis of the specialization degree for the new state members and of the strong dependency between this and the social and economic characteristics which define the discrepancies.

On the papers which analyse the disparities between regions and their dependency with the economic and social factors are used quantitative methods and techniques from macroeconometrics, microeconomics and data analysis: Lafay indexes, VAR methods, analysis on panel data, analysis of cointegrated series, etc. In the field of informal economy the main aspects are: defining the concept of informal economy, the quantification of it, the frame on the national economy

and the application of the econometric models to quantify its effects over the economic and social development at national and regional level. These important aspects are presented in the following papers:

▪ *Definition of the informal economy concept.* Relevant papers: Hussmanns, R. (2000), The Informal sector – statistical definition and survey methods in Handbook of National Accounting, doc.ST/ESA/STAT/SERF/75 (volI), United Notions, New York; Hussmanns, R. (1999), Statistical definition of the informal sector – international standards and national practices, 52nd Session of the International Statistical Institute, Helsinki.

The informal economy dimension is expressed as percentage from Gross Domestic Product – official one. The estimation is difficile; using different methods for the same country we obtain distinctive values. By convention in the European System of National Accounts, the informal economy includes only illicit work and fiscal evasion. In the first trimester of this year it was observed a reduction of the buget incomes, comparative with the estimated ones, which means an increase of the informal economy. But this aspect can be explained by the decrease of incomings from VAT and some registered errors, specially for the intracomunitary trade – the legislation has been change after 1st of January 2007, after the adhension to European Union. Analysing other indicator of the informal economy – rate of employment in the urban informal sector - we obtain a stagnation tendency or a slight decrease.

▪ *Papers which presents dimension evaluation* of the informal economy: Charmes, J. (1998), Progress in Measurement of the Informal Sector: Employment and Share of GDP, in Handbook of National Accounting, United Nations, New York. For example, the European Union Commission has realised a "map of parallel economy" including for each country the main elements of the parallel economy. Some paper analysis the gender discrimination at the level of informal economy.

[3] Economic of Transition, Volume 13(4), 2005, pag. 605-628.
[4] Midelfart-Knarvik, K. H., Overman, H. G., Redding, S. J., Venables, A. J., *The Location of European Industry,* Economic Papers, nr. 142, 2000.
[5] Aiginger, K., Pfaffermayr, M., *The single market and geographic concentration in Europe,* SMCONCFIN – Working Papers, 2000.
[6] Economic of Transition volume 13 (4), 2005, pag. 629-658.

▪ *Papers[7] which have as subject analysis and monographs at country level or geographic region*. Generally, institutions as Organization of United Nation for Development, World Bank, Labour World Organization (Geneve), Monetary International Fund, European Union Commission, but also famous universities and research institutions carry out frequently monographs to evaluate the dimension and the dynamics of the informal economy, especially for the developing countries. Through the author`s of this report we can mention: Joaquin Herranz (Massachusetts Institute of Technology), Marta Chen (Harvard University), Jacques Charmes (Universite de Versailles), which analised the situation from countries underdeveloped. In these countries, the weight of illicit labour force which is not working in agriculture is between 50% and 75%: 48% in North Africa, 51% in Latin America, 65% in Asia and 75% in Africa (near Sahara desert). In India the percentage is higer - 83% and if we consider the agricultural activities - 93% from total labour force, a huge number. If we include in the category of "informal economy activities" the free workers, part-time ones or the limited activities, the percentage of these in 15 European countries is 30% from total labour force, and in United States – 25%. In United States less than 20% of total part-time workers have health insurances or pensions from their employers. Free workers represent almost 1/3 of total labour force which is not working in agriculture. In developed countries this number is only 12%, while in Africa is 53%. Money earned from non-standard activities is significant in developed contries. In 2004, part-time jobs represent 14% of total employees from countries belonging to the Organization of Economic Cooperation and

Development (OECD).

▪ *Framing the informal sector into the macroeconomic models[8]*. In this category are included some classical papers, but new ones also from macroeconomic field. In the Macromodel of the national economy[9] elaborated for Romania by Emilian Dobrescu can be included a component of the informal economy. In the last period appeared famous papers of econometric applied in macroeconomics which includes in the models proposed variables which quantifies the informal economy (see papers of

▪ Gunnard Bardsen (Oxford University Press-2005), Anthony Garratt (Oxford University Press-2005), etc.).

▪ *Analysis of the globalizations impact over the dimension and the evolution of informal economy[10]*. In Romania were made series of studies on some components of the informal economy. These studies were supported by World Bank and European Union Commission through Phare Programme. In the scientific research of the informal economy level, of corruption and its effects over the economic environment outstanding is the activity from Academy of Economic Studies[11] and Forecasting Institute (a. Albu Lucian-Liviu, *Estimating the Size of Underground Economy in Romania*, Tax Evasion, Underground Economy and Fiscal Policies in Candidate Countries (Case of Romania), GDN Research Project, CERGE Working Papers, June, Charles University, Center for Economic Research and Graduate Education, Prague, 26 pg., 2004.; b. Albu Lucian-Liviu, *Potential GDP and informal economy*, Interacademic Exchange Programme – 2004

[7] a. Alejandro Portes, Manuel Castells and Lauren A. Benton, eds. *The informal economy : Studies in Advanced and Less Developed Countries''*, Baltimore, John Hopkins University Press, 1989.
b. Victor Tokman, *Beyond Regulation: The Informal Economy in Latin America*, Lynne Rienner Publishers, 1992.
c. Paul E. Bangasser, *The ILO and the Informal Sector: An Institutional History*, ILO Employement Paper, 9/2000.
d. Jacques Charmes , Informal Sector, Poverty and Gender: A Review of Empirical Evidence, The World Bank, 1998.

[8] a. Marta Chen, Jennefer Sebstad and Lesley O'Connel, Counting the Invisible Workforce, *World Development,* Vol. 27, No. 3, 1999.
b. Feige, E. L., (1980), A New Perspective on Macroeconomic Phenomena, Netherlands Institute for Advanced Studies, Wassenaar
[9] E. Dobrescu, Macromodel of the Romanian Market Economy – version 2005, working paper, Phare Program, Comisia Nationala de Prognoza
[10] a. J. Charmes, cité dans *Les femmes et l'emploi dans le secteur informel: mondialisation et organisation (WIEGO)*, deuxième réunion annuelle, 22-24 mai 2000, Cambridge, Massachusetts.
b. G. Standing: Global labour flexibility: Seeking distributive justice (Basingstoke, Macmillan, 1999).
[11] a. Andrei Tudorel, L' impact de la corruption sur l'economie au niveau des pays en transition, XXXVII mes Journées de Statistique, 2005, France
b. Andrei Tudorel, The cost of integration in NATO for aspiring countries - a quantitative model, NATO, Brussels , Working Paper, 2002

(British Academy - Romanian Academy), Staffordshire University, 14 June, Stoke on Trent, 23 pg., 2004.; c. Albu Lucian-Liviu, *Nonlinear Models of Tax Evasion and Underground Economy: a Theoretical and Empirical Investigation*, Conference on "Tax Evasion, Trust, and State Capacities", IPS Working Papers, October, University of St. Gallen, Institute for Political Science, St. Gallen, 36 pg., 2003.).

The general problem identified and which need solutions is the measurement of the dimension and of the effects determined by the informal economy over the economic, social environment and values system from a society found in a redefining process and the correlation of this with the social and economic characteristics of the development regions from Romania, also with the development levels.

3. The analyse of investments localization in the territorial profile

In the economic analysis on development regions there are articles which follow *to indentify the economic and social factors which determine the foreign investments localization at the development region level*. In Boudier-Bensebaa (2005) is presented a model which analyses the investments at Hungary level, defined as follows:

$$INV_{i,t} = a + b \cdot LABU_{i,t-1} + cLABW_{i,t} + d \cdot PRR_{i,t-1} + eNFR_{i,t-1} + fDDP_{i,t-1} + g_i + DUM_i + u_{it} \quad [1]$$

Explanatory variables are defined for specific parameters of labour market (labour force cost, labour productivity) and for the economical characteristics of the region (firms density on economic regions, etc). Furthermore, g_i is a parameter which quantifies the individual effects at regions level, DUM_i is a dummy variable, and u_{it} is a residual one.

Because during the article to characterize the labour market, the demand and urban congestion effects were used different variables, we will estimate 5 econometric models to analyse the dynamics of foreign investments at regions level. In the next table are presented the results for Hungary economy.

Tabel 1: Parameter estimation of the derivate models from (1)*

Dependent variable=Volume of foreign investments					
	1	2	3	4	5
Labour market					
LABU	14.468***	10.781***	16.949***	6.027***	10.150**
LABW	246.452**	155.684	291.605**	68.874	209.257*
Demand at region level					
EXR	0.221**		0.298***	0.189***	139*
MAND		1.820***			
Congestion effect					
INTER1	0.120***	0.140***	0.135***		0.146***
INTER2				0.033***	
MANDENS					1.752***
INFROAD	3.589***	4.474***		0.781	4.562***
INFTEL			-0.134		
Statistics					
R^2	0.8243	0.8359	0.8149	0.9481	0.8478

Results presented in Boudier-Bensebaa (2005)

The results presented in the table and the author`s conclusions after empirical tests suggest that the foreign investments volume from a Hungary region are positive influenced: (i) surprinsingly by the labour force cost; the explication can be found in the higher grounding degree of the labour force; (ii) by the increase of industrial demand; (iii) higher density of the firms from a development region.

In economic literature are studies and articles which have as subject the indentification of factors which determine the localization the foreign investments in a country. The studies are realised at the level of one country or economic regions. Reprezentative examples are the following: Head, R. (1994, 1995, 1998, 1999) at Japan level, Barell (1999), Clegg (1998), Muccielli (2003) at European Union level, Cantwell (2000), Hill (1991, 1992) for Great Britain, Cheng (1999, 2000) for China, Coughlin (1991, 2000), Nachum (2000), Friedman (1992) for United States of America. Were identify series of factors which determine positive (+) or negativ (-) the investment localization in a country or economic region. From the most important factors we mentioned: labour force cost (-), rate of market increase (+), export (+), opening market degree (+), infrastructure (+), quality of labour force (+), economic congestion or firm number (+), rate of poverty (-), labour productivity (-), restriction over the profit repatriation (-), the demand (+) etc. (Between brackets is specified the factor influence over the investments volume. Surprinsingly and Surprinsingly and singular, aspect mentioned by Boudier (2005) also, at Hungary level is registered a pozitive correlation between the foreign investment volume and the labour force cost. singular, aspect mentioned by Boudier (2005) also, at Hungary level is registered a pozitive correlation between the foreign investment volume and the labour force cost.)

4. The influence of political systems over the regional development

Considering the role of political systems and the qualities of local administrations over the economic development of a country or regions, in the economic literature appeared papers which analyse these two themes. Sole-Olle, A. (2006) presents a theoretical and practical approach about the impact of political system from Spain over the grant distribution to finance the different types of activities developed at the administration level (central, regional and local ones). The study attains applications starting from a database with 900 cities for the period 1993-2003.
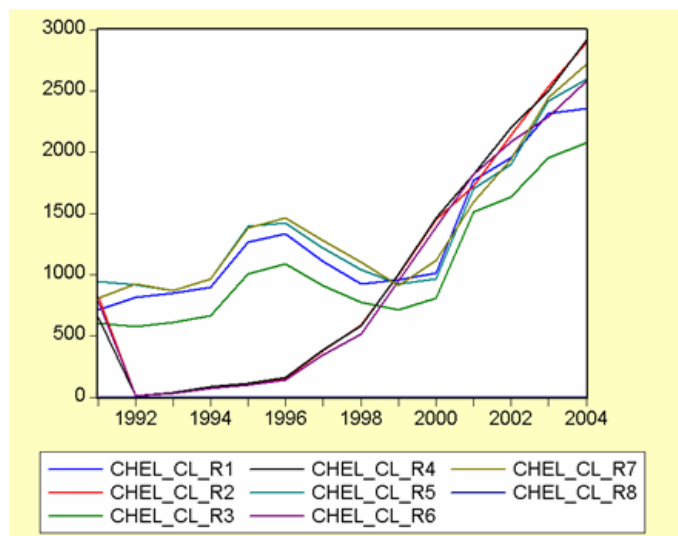
Figure 2. Local expenditures evolution per capita at each economic development region of Romania (comparable prices)

Considering the theoretical approach from the article mentioned before was estimated at the Romania`s level the next regression model. The model wants to analyse the local expenditures per capita depending on variables which characterize the economic development and the political activity at region level. The variables are:

a. dependent variable is represented by local expenditures per capita;

b. explanatory variables are Herfindal index to quantify the specialization degree of de-

velopment region (SPECHM), the distribution of parliamentary mandates on regions between the government factions (GUV) and the ones from opposition (OPOZ), trend component to point out the expenditures in-

crease during time and a Dummy variable to specify the right or left-wing government in Romania.

Model has the following form:

$$CHEL\_CL_{it} = \sum_{i=1}^{8} a_i + b_1 t + b_2 t + b_3 OPOZ_{it} + b_4 GUV_{it} + b_5 SPECHM_{it} + u_{it} \quad [2]$$

where u_{it} is a variable with mean zero and constant variance.

To estimate the parameters were used data, for the former variables, between 1991 and 2004. For the dependent variable data series were conceived in the prices of 2000. The data are available at the National Institute of Statistics and Ministry of Finance.

The parameter estimation was realised on data panel in two variants: for a model with set effect and for one with variable effect, using the least-squared method with weights. After the estimation and assay of parameters, only the model with set effect was validate.

Tabel 2.

Dependent Variable: CHEL_CL_?				
Total panel (balanced) observations: 112				
Convergence achieved after 8 iterations				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
TIME_?	98.57882	13.12182	7.512587	0.0000
OPOZ_?	-305.3295	37.56832	-8.127315	0.0000
GUV_?	-309.9227	36.90418	-8.398036	0.0000
SPECHM_?	3149.919	882.0777	3.571022	0.0006
DUMMY_PER	-363.9460	99.41672	-3.660812	0.0004
Fixed Effects				
R1--C	27584.46			
R2--C	21618.25			
R3--C	25052.98			
R4--C	18848.70			
R5--C	16421.49			
R6--C	21871.60			
R7--C	21123.34			
R8--C	16971.16			
Weighted Statistics				
R-squared	0.923546	Mean dependent var		1406.215

The conclusions obtained after the parameter estimation of the econometric model [2]:
(i) starting with 1999 it can be observed a radical change of the local expenditures level considering the government measures to accelerate the descentralization process. Furthermore, the gap among regions, which has widened between 1992 and 1998, has decreased conderably in the period 1999-2004.
(ii) the difference between the government factions and opposition ones is not significant considering the preferential distribution of local expenditures;
(iii) the region specialization represented a pozitive factor to increase the volume of lo-

cal expenditure. Also, the regions with an important specialization degree have higher local incomes and expenditures;
(iv) there is a specific effect at the level of each region development which determine a particular evolution of the local expenditures.

5. Regional development and the industry during the transition period
During the tranzition period took place radical changes at the industries level from various development regions. Considering these aspects we will make some general comments over this important subject of economic research.

First of all, the employees number from industry has decreased in the perioad analysed with 1696487 persons. So, if in 1991 the total number was 3188055 persons, in 2004 this number was reduced to 1491568 persons. In relative terms, this reduction was by 53.2%. The greatest annual reduction was in 1992 – 13.8%, considering the employees from the previous year. This decrease is followed by the one from 1999 – 13.0%. Important reductions of the industry employees has been in 1993 (-5.8%), 1994 (-6.4%), 1995 (-9.5%), 1998 (-6.1%), 2000 (-6.0%) şi 2004 (-5.7%). Generally, insignificant increases were registred only in 2001 (1.9%) and 2002 (0.2%).

Secondly, the reductions of the employees from industry, at the level of 8 economic regions and considering the period analysed, generally were different in relative terms. The greatest reductions were registred in regions 1 and 8, approximately 60% and the smallest one at the level of region 3 – almost 40%. An important cause which generates this situation was the overmeasure during the planned economy of some industrial capaci-

ties. Hereby, the most important personel reductions were at the overmeasured lines level. To follow the dependency between the dimension of employees' reduction on industry lines between 1991 and 2004 and the real number of employees from 1991 has been defined 3 models of liniar regression:

• In the first model, the percentage reduction of the employees number on industry lines is a liniar function considering the line`s weight in total industry at the level of 1991.

• In the second one, the percentage reduction of the employees number on industry lines is an exponential function considering the line`s weight in total industry at the level of 1991.

• In the third one, the absolute personel reduction from this period is a liniar function considering the employees number from each line at the level of 1991.

The parameter estimation in all three situations was made using least-squared method, and the results are presented in table below:

Tabel 3: Regression models for analysing the industry activity volume

	Model I	Model II	Model III
Free term	-34.188	-19.564	26296.85
Slope coefficient	-1.650	-38.825	-0.6394
F-statistic	3.380^{***}	5.140^{**}	57.140^{*}
R-squared	0.235	0.319	0.839

* $\alpha = 0.00$, ** $\alpha = 0.05$, *** $\alpha = 0.1$

Previous data shows that the staff reduction, in absolute and relative values, was important in the dominate lines of industry starting with 90`s. So, the most significant reduction, by 79.7%, was registered at the level of line I10, which had approximately 18.28% from the total industry employees. At the level of line I2, which had the higher weight in industry – 19.8%, the decrease was by 43.2%. The smallest reduction – 14.2% - was at the level of line I4, which had only 2.74% from the industry employees in 1991. These results show a weak adaptation of the Romanian industry at the open market competition and an overmeasure of the industry lines during the planned economy. As it will be shown in this paper, between the Herfindal specialization

index and the rate of unemployment is a liniar dependency, direct and significant, at the level of each development region.

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