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INDUSTRY STRUCTURE ANALYSIS. A CASE OF ROMANIA

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Summary: *The last years reflect, in term of macroeconomic development, the continuing advances in market-oriented reforms in the most countries of Central and Eastern Europe. Transition in this economic area includes the restructuring of politic, economic and social systems in accordance with the European Integration Directives and local industry policy, with the movements of the economic environment. Our proposed model tries to define the structure of the basic industry components, the stability degree and the intensity of the measures to be use for restructuring the industrial offer and Romanian regional structure (existing and estimated). This model is design as a link between the Pareto's model and the Markov's Chains transitions. The target of industrial policy is to obtain an economic environment that characterizes a stable market economy.*

Key words: *industry, sector analysis, regional analysis, structure, Markov chains*

1. INTRODUCTION

The concerns on industry structure stability are of maximum importance in the context of increasing the integration level of the Romania's economy into the European one, as an effect of the reform process. Specialists for evaluating and disseminating data on the industry trends, in order to provide information to policy makers, use various methods. The structure of Romania's industry sector is one of the basic elements for designing its economic re-launch and development strategies, integration into the European economy and, of course, for establishing the field policies. The industrial field policies could be seen as an instrument for providing the structure stability. Structural analysis is one of the methods used to evaluate the industry structure matrix stability. We are proposing, hereby, such a unified method. This is a component part of a project named "Competitive Strategies of the Domestic Market's Preparation, Components of the Process of Romanian's Integration in the European Union". In project we try to build a system improve the Romanian industry competitiveness, use sector analysis methods and econometric models. The case study, presented in this paper, was made on Romania's industry statistics between 1999 and 2004. The order of analysis stages is presented in figure 1. During this time frame, Romania's industry branches, mainly oriented to the industrial intermediary and population consumption, have been between more than 3 billions euros and an estimated 4,2 billions euros.

2. TRANSITION IN ROMANIA. EFFECTS TO THE INDUSTRY SECTOR.

Romanian's reform was oriented to the three main targets: economic stabilization and restructuration, social protection and reform of administration. All of these targets are macroeconomic ones and were oriented to create the conditions to the economic initiative and the development of the Romanian entrepreneurship. The industry is an important sector of the economy and its development implies the assurance of a large volume of commodities which are offered the private and public companies. In six years these sector had a significant constancy. The Contribution of the industry sector in GDP increased in seven years with as about 1 % (from 26% in 1999 to 27% estimated for 2005). The number of persons employed in industrial activities increased with about 2% (figure 2).

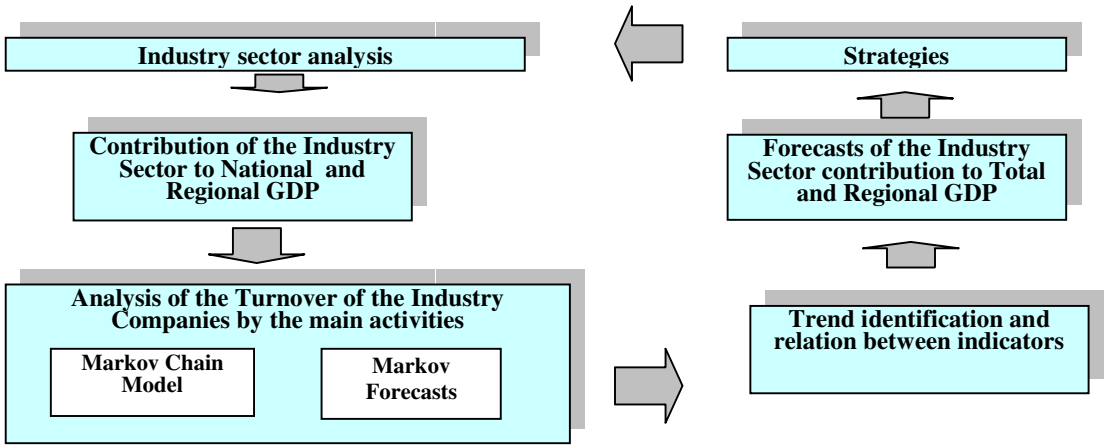

Figure 1: The case study main stages

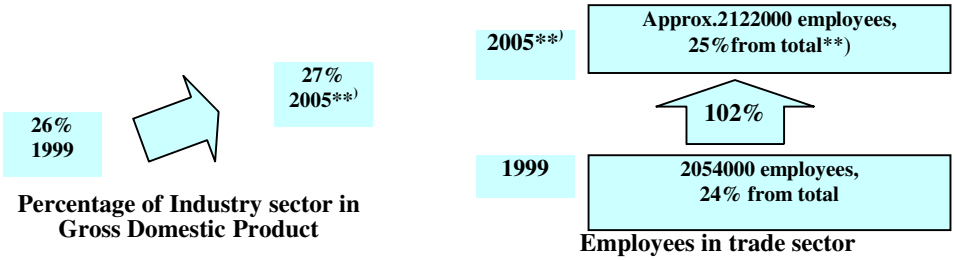

Figure 2: The Development of the Industry Sector*)

**) in accordance with National Economic Activities (NEA) classification*
***) estimation*
Source: Romanian Statistical Yearbook 2004, National Institute of Statistics of Romania and author's estimations.

Some specific indicators (like *regional GDP per inhabitant and contribution of industrial sector to GDP*) confirm this trend. Figure 3 shows the trend of industry contribution to total National Gross Domestic Product.

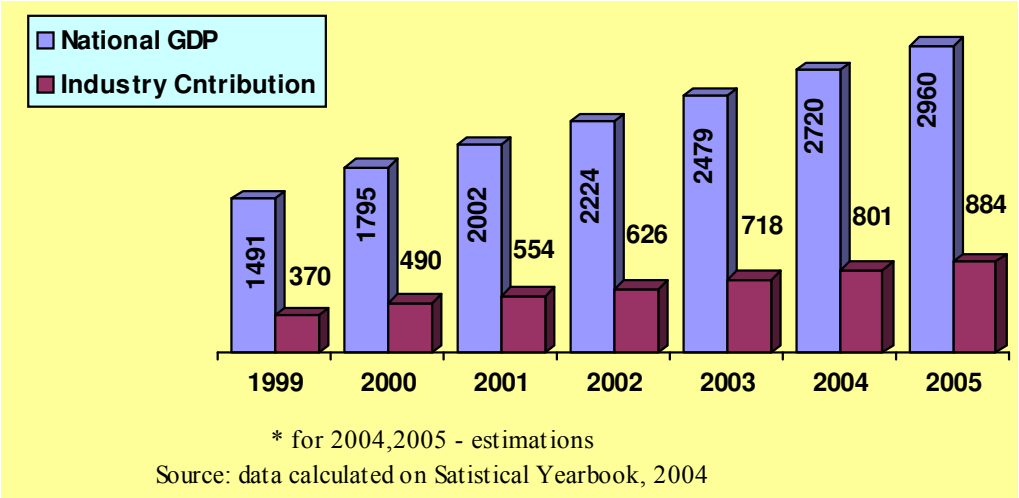

Figure 3: Gross Domestic Product (Euro per inhabitant)*

In table 1 the industry contribution to Regional Gross Domestic Product is shown. The increase is confirmed from the trends at regional level of the industry. The development regions are the result the grouping the districts in accordance with Ordinance Law no.2/1968 with subsequent changes. Under the Romanian National Institute of Statistics (RNIS) methodology these are the following regions: **North West** with districts :Bihor, Bistrița Năsăud, Cluj, Maramureş, Salaj, Satu Mare; **West** – Arad, Caraş Severin, Hunedoara, Timiş; **South West** – Dolj, Gorj, Mehedinți, Olt, Vâlcea; **Centre** – Alba, Braşov, Covasna, Harghita, Mureş, Sibiu; **South** – Argeş, Călăraşi, Dâmbovița, Giurgiu, Ialomița, Prahova, Teleorman; **North East** – Bacău, Botoşani, Iaşi, Neamț, Suceava, Vaslui; **South East** – Brăila, Buzău, Constanța, Galați, Tulcea, Vaslui ; **Bucharest** region.
We introduce the Industry contribution margin between regional GDP and national GDP with the formula:

$$ICM_{i,j} = \frac{RGDP_{i,j} - GDP_i}{GDP_i} \text{ ; with } i=1999, \ldots, 2005 \text{ and } j=1, \ldots, 7 \qquad \textbf{(1)}$$

Table 1:
Industry contribution to Regional Gross Domestic Product per inhabitant*)

(euro)

	1999	**2000**	**2001**	**2002**	**2003**	**2004****)**	**2005****)**
Contribution of Industry to Romania's National GDP per inhabitant	370	490	554	626	718	801	884
1. North – East	257	333	410	416	493	548	604
2. South – East	319	439	497	545	634	708	782
3. South	328	459	461	562	628	699	769
4. South – West	380	496	514	600	667	734	802
5. West	367	508	573	645	748	838	928
6. North – West	325	417	492	561	645	724	802
7. Centre	479	634	760	836	977	1.096	1.216
8. Bucharest	598	759	867	1.015	1.149	1.285	1.421

**) data calculated on Statistical Yearbook of Romania, 2004;*
***) estimation for 2004 and 2005*

The results are in the figure 4. From these results, with the exception of the Bucharest, Centre and West Region, all the regions had a level under the national average.

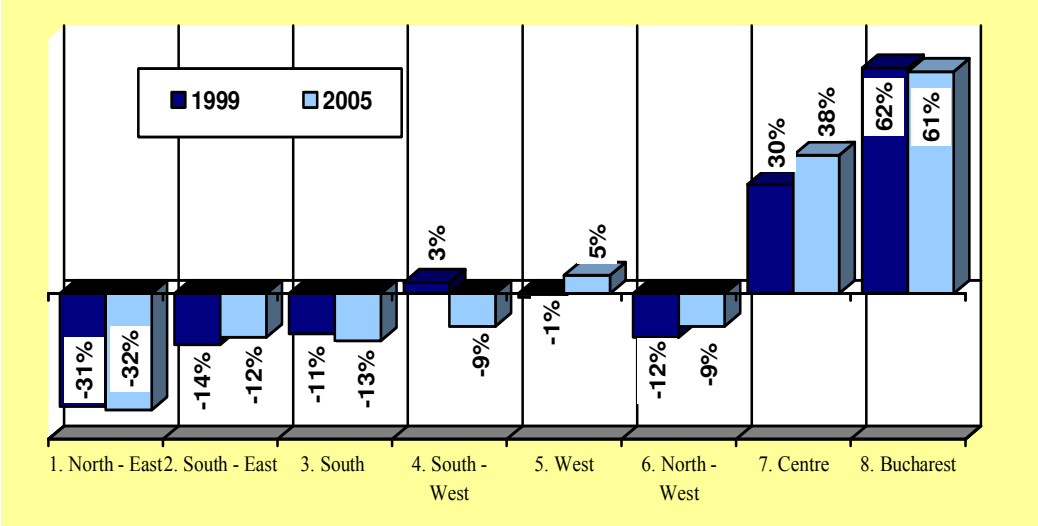

Figure 4: The industry contribution margin to national GDP and regional GDP per inhabitant (%)

The high level of the industry sector contribution to the Bucharest, Centre and West regions RGDP shows that these concentrate a high volume of industrial activities. The other regions contribution shows that the Regional Gross Domestic Product (RGDP) is under the average of National Gross Domestic Product (NGDP).

One of the causes of this disequilibrium was the imperfection of the legislation that rules the action of economic operators in their economic relations, and in this case the main problem of these actors is to adapt permanently to changes of regulations from region to region. In fact the major deficiency of the reform of the Romanian Economy is the instability of regulations caused by the changes of the legislation concerning the investment, taxation, the relation between economic operators and between economic operators and the state. Now, the large part of Romanian companies tries to adapt to these permanent changes of the rules to survive in this instable economic environment. On the other hand, the changes in the political and social systems have generated mutations in the economic fields.

The European Union industrial policy follows the improvement of industrial competitiveness and employed human resources rates. Furthermore, it encourages a favorable environment for the initiative and business development within the Community area. It is based, mainly, on principles and communication concerning horizontal, branch and regional industrial policy

Romania's joining the integration with European and international values could be achieved by developing its exchanges in industry, trade, tourism, commodities, technology, personnel, culture and so on. These constitute both cause and effect of strengthening economic cooperation and interdependencies, as a basis for development. Romania – in its condition of small to medium sized country, not high by economic developed – has to address various forms of economic cooperation in order to create the backbone of its future development and to gain access to several sources of capital, raw materials, technology and so on.

European Economic Integration implies a specific and very complex form of industrial international and domestic trade, which pulls together states or economic units, on bilateral or multilateral basis, in order to perform - by joint efforts and in terms of specific contracts – related activities (manufacturing, trade, R&D, services), within a time frame, with common outputs, at a superior level [1]. This definition highlights the major components of economic cooperation, also by pointing out its goal. For a better presentation of the importance of international economic co-operation, it would be worth to portray its functions. It should be mentioned that, apart from other economic activities, international economic cooperation based on work fulfils duties on microeconomics, macroeconomic and world economic scales [7].

At the economic unit level, the functions of the international economic integration are:

- Increases the competitiveness of the trade industrial offer and products;
- Contributes to the improvement of the industrial company management;
- Facilitates the rational use of resources (labor, material, financial);
- Contributes to the planning of strategies for comparative advantage(s);
- Provides a window of opportunity for specialization.

At the national economy level (macroeconomics), the functions of the international economic integration are:

- Contributes to better valorization of natural resources;
- Increases the GDP and national wealth;
- Facilitates mutations in the structure of the national economy;
- Improves and intensifies commercial exchanges;
- Facilitates the training of highly skilled experts;
- Establishes some macroeconomic and/or sector policies;
- Stimulates the expansion of the R&D sectors;
- Harmonizes some balance of payments issues.

Both on macroeconomic (states, governments, international organizations) and microeconomic levels (companies, R&D units, non-profit organizations) it is important to depict – as accurate as possible – the amount of the industrial activities and the shares that are related to each and every co-operative partner.

3. ASPECTS OF STRUCTURAL APPROACH – HIERARCHY NECESSITY

The concerns related to the analysis of the industrial stability are very important in the context of increasing the economic integration of Romanian industrial sector into the European economy, as effect of the reform process. This is why various methods are used for dissemination and lighting-up of the trade indicators evolution. Under this concept is placed the matrix method we are presenting hereby. In accordance with the stages shown in figure 1, the process is focused on the analysis of the improvement of the industrial companies turnover through the effect of the rational use of resources (labor, material, financial). The main figures of the turnover indicators of the industry companies are shown on Table 2. From this table results that the turnovers of the industrial companies are composed from seven main groups of activities:

- Energy and water industries;
- Industries mainly oriented to the production of intermediate goods (excluding energy, water and car industry);

- Road means of transport industry;
- Industries mainly oriented to the production of equipment goods (excluding car industry);
- Industries mainly oriented to the production of durable goods (excluding car industry);
- Agricultural produce and food industries (excluding fabrication of milling products, starch and starch products, products for animals);
- Industries mainly oriented to the production of non-durable goods others than agricultural and food ones.

The analysis was developed by using the hierarchy matrix of the turnover in each group of the industrial company activities. It based on hypothesis that many business management problems require discrimination to be made between items that are relevant or substantial in terms of frequency [9]. Assuming that a program for industrial branches contribution is necessary so as to avoid the appearance future periods of decline of activity with its negative concomitant effects on production costs. This program will need to be discrimination between items in order to determine which of them will require stricter controls. The reason is to determine the contribution of each group to the growing of the industrial companies turnover. Note the main industrial activities with Ind_1, Ind_2, Ind_3, Ind_4, Ind_5, Ind_6, Ind_7 (see the table 2).

Table 2:
TURNOVER FOR ENTERPRISES HAVING AS MAIN ACTIVITY INDUSTRY**)

(Million Euro)

	Main industrial Fields of the companies activities	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**)**	**2005**)**
	Industry - total	24.624	29.475	32.491	36.958	38.216	41.339	54.347
Ind 1	Energy and water industries	8.040	9.021	9.766	12.200	11.805	12.972	17.142
Ind 2	Industries mainly oriented to the production of intermediate goods (excluding energy, water and car industry)	6.444	8.553	9.273	10.108	11.082	11.845	15.536
Ind 3	Road means of transport industry	929	901	990	1.096	1.273	1.300	1.743
Ind 4	Industries mainly oriented to the production of equipment goods (excluding car industry)	2.297	2.568	3.013	3.271	3.357	3.641	4.780
Ind 5	Industries mainly oriented to the production of durable goods (excluding car industry)	728	900	1.013	1.164	1.359	1.425	1.910
Ind 6	Agricultural produce and food industries (excluding fabrication of milling products, starch and starch products, products for animals)	3.837	4.691	5.155	5.293	5.405	5.862	7.556
Ind 7	Industries mainly oriented to the production of non-durable goods others than agricultural and food ones	2.350	2.841	3.281	3.826	3.934	4.294	5.680

**) data calculated on Statistical Yearbook of Romania, 2004;*
***) estimation for 2004 and 2005*

4. THE PROPOSED MODEL

The model of the structural analysis and forecast is in figure 4. In accordance with this flow, the first step is to form on a hierarchical matrix for the industrial branches turnover and build for each year an "ABC" matrix. The ABC method derives from the application of Pareto law to the customer behavior. The existence of such behavior law was discovered in various other areas, as example: the stock products and the inventory amount, the customer distribution and the turnover, the capacity structure and the amount of them.
The ``ABC'' classification (or Pareto's Law) of the last year's values for each item might be used for this task. However, if one wishes to make the classification more realistic, imprecise data can be used in a sensitivity analysis to detect possible errors in assigning costs to the items [2], or additional information of uncertain nature can be brought into the process, either by fuzzy treatment of cost per unit and/or future demands, or by assigning probability laws to these variables. Thus, though the new classification process involves greater mathematical complexity, it, also, allows relevant factors that might effect decisions about the above-mentioned control to be included in the process.

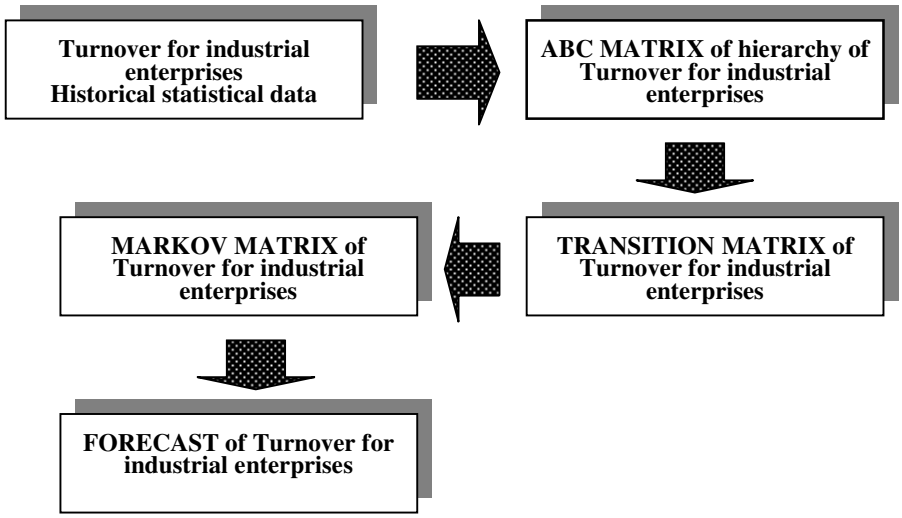

Figure 4: The model of structural analysis and fore cast

The analysis of the products repartition, as per 20% / 80% law, represents the basic element for defining the most proper strategy of adaptation to industrial market pressure and to the specificity of the industry environment. According to this method it can be considered that the capacity is balanced and stable if 20% of the industrial branches covered 80% from the contribution to turnover on industrial companies. This approach gives the ``annual value'' of each item, and the classification established to discriminate which industrial branch need greater control will depend on this parameter [11]. When items are ordered from the highest to the lowest annual value, a similar representation to the one in figure 5 is commonly obtained [10].

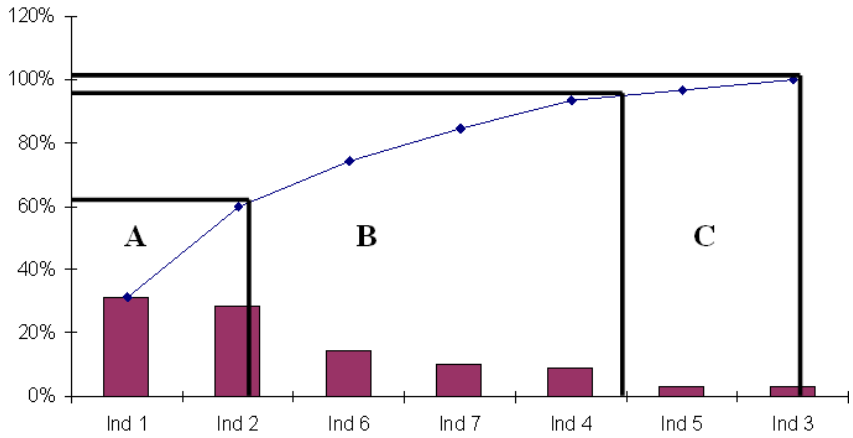

Figure 5: The Pareto chart

For the turnovers of companies the Pareto observations offers the possibility to think of a theory that refers to a industrial branches repartition based on their average contribution to create turnover. This law operates based on by the point of view of the *stability of the fluctuation of the Romanian industrial companies turnover.* Thus, there are three groups of industrial branches which create the turnover continuity:

Group A - 29% from the industrial branches assuring 60% from the companies turnovers; on this group, during the studied period, there are about 2 branches (***Ind 1***- Energy and water industries and ***Ind 2*** - Industries mainly oriented to the production of intermediate goods (excluding energy, water and cars industry)); as a conclusion this group has *the biggest stability on the turnover structure.*

Group B - 29% from the industrial branches (3 branches) assuring 34% from the companies turnovers *(**Ind 6** -* Agricultural produce and food industries (excluding fabrication of milling products, starch and starch products, products for animals); ***Ind 7*** - Industries mainly oriented to the production of non-durable goods others than agricultural and food ones and ***Ind 4*** - Industries mainly oriented to the production of equipment goods (excluding car industry)); this group is characterized by a *high instability*; permanently the industrial branches from this group swing between groups A and C;
Group C - 29% from the industrial branches assuring 6% from the companies turnovers; on this group we can find the two industrial branches (***Ind 5*** - Industries mainly oriented to the production of equipment goods (excluding car industry) and ***Ind 3*** - Road means of transport industry) which are *usually placed on the last places of the hierarchy*.
Each of these three zones presents, by applying the ABC method, specific characteristics which determine the individual measures from the adopted strategy point of view.

5. FORECAST

Taking into account the high oscillation of the 7 branches, we can presume the hypothesis that in the future, due to the various conditions on the national and international industrial markets, these branches will be the nucleus of the Romanian industry. As a result, can be used a matrix type method to presume the future evolution of the companies turnover structure. Model type matrix chains are used to make the prognoses of the structure for phenomena with known distribution of elements and also with known modification and movement between the elements.
Future evolution of the phenomena depends in a probability approach by the previous structure. A method recommended for this type of prognoses is the method of Markov chains. The Markov chains are used to appreciate and foresee the structure of phenomena, taking into account the possible transformation from a stage to a new one, from a period to another. Using this type of matrix it can be obtained prognoses as the presented one in table 3.

Table 3:
INDUSTRIAL COMPANIE'S TURNOVER FORECAST

(millions euros)

		2006		2007		2008	
	2005	min.	max.	min.	max.	min.	max.
Ind 1	14.450	13.911	14.771	13.809	14.663	13.710	14.558
Ind 2	13.424	13.018	13.823	13.014	13.819	13.011	13.816
Ind 3	1.391	1.664	1.767	1.966	2.088	2.256	2.395
Ind 4	4.031	3.936	4.179	3.962	4.207	3.988	4.234
Ind 5	1.644	1.657	1.760	1.719	1.826	1.781	1.891
Ind 6	6.372	6.218	6.603	6.256	6.643	6.293	6.682
Ind 7	4.907	4.768	5.063	4.777	5.072	4.785	5.081
Total	46.219	45.173	47.967	45.503	48.318	45.823	48.657

6. CONCLUSIONS

There are, in our opinion, some matters (problems) that should on the priorities agenda of the industrial policy when trying to establish some generic guidelines for domestic and international economic co-operation on the field of industry.
These could be, *inter alia:*

- Industry activities - are envisaged as an instrument for the participation of Romania to economic development and European integration;
- The industrial companies will consider a high efficiency as their priority in the efforts towards economic promotion;
- The index systems are necessary for evaluating the efficiency and the industry capitalization of the international economic cooperation operations;
- The impact of the privatization process – will be evaluated in terms of the industrial development and international integration;

- It is necessary to create a new balance between of efficiency both at microeconomics and macroeconomic levels, and also liberalism and protectionism;
- Create an equilibrium between liberalism and protectionism, necessary for a proper integration into the industrial international flows.

It is to be said that, after sixteen years from the December revolution, there would be natural for Romania to step into a new qualitative approach as a result of better understanding of industrial market mechanisms and requirements, of local (national) needs and priorities.

Of course, there are many concerns regarding the progress in terms of international industrial flow favorable to the general economic development, framework in which international economic co-operation gets a higher importance.

Another conclusion is that Romania has some specific natural resources and highly trained specialists that could facilitate, through policies structured mostly on efficiency criteria, the country's performances as a robust EU-type business partner.

The EU integration process is the first step towards global economy required alignments and aspiring countries, more or less in competition among themselves, that have to design quite accurately their future role and actions on the world market(s).

The mark-up strategies used by companies are, for the time being, more related to national prospective than to the global environment.

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