

# Structural Changes of the Manufacturing Industry of the European Union Member Countries and their Specialization

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## Abstract

*This paper deals with the structural changes taking place in the EU economy, concerning, mainly, the manufacturing industry weight in the GDP, the value added, labor force, and productivity registered by industrial sectors and their evolution throughout a long period. A special attention is given to changes occurred in the Romanian manufacturing industry's sectors, drawing conclusions about their concordance or incongruence with the trends that became manifest in the EU.*

**Key words:** *manufacturing industry, industrial sectors, structural changes, country specialization*

**JEL Classification:** *L16*

## Introduction

The economic structure of a country (by economic branches) and that of its industry (by industrial sectors) is the outcome of long term progressive forging of specialized economic activities' configuration, historical process lain under the incidence of some determinative factors – resource availability, demand structure, international trade, productivity growth, living standard rising. The process takes place, depending on the mentioned factors, in variable directions and rhythms in different countries, having as outcome economy and industry structures shown off in a broad range.

## Structural Changes Taking Place in the EU Manufacturing Industry

The state of the EU27 and its member countries manufacturing industry weight in GDP, by 2007, and the changes taken place in this respect throughout the period 1995-2007 (long enough to give to respective changes the long term necessary relevance and to decouple them from short term propitiously or unfavorable conjunctions) are displayed in the next table.

**Table 1.** Manufacturing industry share in GDP of the EU27, by 2007, and its changes during the period 1995-2007

	<b>Weight in 2007(%)</b>	<b>Change in period 1995-2007(percentage points)</b>
<b>UE27</b>	17,1	- 3,4
<b>Austria</b>	20,1	0,5
<b>Belgium</b>	16,4	- 3,8
<b>Bulgaria</b>	18,6	- 2,2
<b>Czech Republic</b>	27,4	3,2
<b>Cyprus</b>	7,5	- 4,3
<b>Denmark</b>	14,2	- 2,9
<b>Estonia</b>	16,7	- 4,3
<b>Finland</b>	23,6	- 1,7
<b>France</b>	12,2	- 3,9
<b>Germany</b>	23,9	1,3
<b>Greece</b>	16,7	- 4,3
<b>Hungary</b>	21,9	-0,6
<b>Ireland</b>	21,9	- 8,2
<b>Italy</b>	18,4	- 3,9
<b>Latvia</b>	19,0	- 0,9
<b>Lithuania</b>	10,8	- 9,8
<b>Luxembourg</b>	8,6	- 5,1
<b>Malta</b>	17,0	- 4,7
<b>Netherlands</b>	13,7	- 3,7
<b>Poland</b>	18,9	- 2,2
<b>Portugal</b>	14,3	- 4,1
<b>Romania</b>	23,8	2,6
<b>Slovakia</b>	24,7	- 2,1
<b>Slovenia</b>	23,4	- 2,3
<b>Spain</b>	16,0	- 2,6
<b>Sweden</b>	19,7	- 2,9
<b>United Kingdom</b>	13,6	-8,1

Note: Change is difference between weights at the end and beginning of the period. Period covered varies as following: United Kingdom 1995-2005; Greece, Poland, Portugal, Sweden 1995-2006; Austria, Belgium, Czech Republic, Cyprus, Denmark, Finland, Germany, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Slovakia, Slovenia 1995-2007; Bulgaria 1996-2007; Romania 1999-2006; France 1999-2007

Source: European Union Industrial Structure 2009. Performance and Competitiveness. European Commission, Enterprise and Industry, Brussels, 2010, p. 57

The main *aspects* spotlighted by the figures in the above table are the following:

- at the EU27 level and in most member countries the industry's share significantly decreased throughout the analyzed period, to services' advantage; at the EU27 level, the decrease by 3,4 percentage points of manufacturing industry share was set off by the increase with 4 percentage points of market services share;
- only four countries – Austria, Czech Republic, Germany and Romania – enhanced, in the mentioned period of time, their manufacturing industry share, and for the first three this enhancement contributed to their outstanding industrial tradition, leading to an increasing demand on the international markets for their products;
- the manufacturing industry share is significant (more then 20%) in nine member countries; in five of them, former communist countries, the State is accountable for the intensive industrialization effects they undergone before 1990;

- in two industrialized countries – France and the United Kingdom – the manufacturing industry share is significantly below the EU27 average, in spite of the fact that these two countries are top rankers in several industrial sectors, particularly in those of high technology (aeronautics, pharmaceutical, electrical equipment, telecommunications equipment etc.);
- In 2007, Romania presented a high manufacturing industry share in GDP – 23,8%, with more than 6 percentage points above the EU27 average. The manufacturing industry contribution's restriction was drastic, if one takes into account that, by 1990, the respective share was of 40,5%, very high even in the range of Central and East-European countries, an effect of a long term forced industrialization policy, in spite of the essential conditions absence (availability of domestic resources, labour force with necessary qualification etc.). By 2007, the other economic sectors' contribution to GDP was the following: Agriculture, and Mining and quarrying – 10,4% (share change in 1999-2006: -6,9 percentage points); Electricity, gas, and water – 2,4% (share change -1,7% p.p.); Construction – 8,4% (share change - 2,8% p.p.); Services – 54,9% (share change - 3,2 p.p.).

In spite of the above mentioned decreases of the manufacturing industry share in GDP at the level of the EU27 and most member countries, it continues to have a vital importance in light of some peremptory *reasons*<sup>1</sup>:

- by 2007, the EU manufacturing industry offered 22 million jobs;
- the manufacturing industry productivity represents the most effective spring for yielding value added, implicitly wealth, for the Union;
- the present process of economic globalization offers new opportunities and markets to European industry, which it can turn adequately into account given its outstanding productive and innovation potential;
- the European industry, by its structure and activities, presents a considerable multitude of efficient value chains, tightly interconnected, which granted it a strong position on the international markets.

Within the EU27, in the manufacturing industry, in the last decade and a half, structural mutations, as a result of variable evolutions of its constitutive sectors, came true in varied paces of increasing value added, productivity, and manpower employed, displayed in the next table.

**Table 2.** Value added, labor force and productivity in the EU27, by industrial sectors, 2007, and evolutions 1995-2007

NACE	Sector	Share of VA 2007 (%)	Share of manpower 2007 (%)	Evolutions 1995-2007		
				Growth of labor productivity (%)	Growth of VA (%)	Growth of manpower (%)
D	Manufacturing industry	17.1	16.4	3.2	2.7	-0.5
DA	Food products, beverages and tobacco	2.0	2.3	1.3	1.1	-0.2
DB	Textiles and textile products	0.6	1.3	1.5	-1.2	-2.7
DC	Leather and leather products	0.1	0.2	0.0	-3.4	-3.4
DD	Wood and wood products	0.4	0.6	2.2	1.4	-0.8

<sup>1</sup> EU Manufacturing Industry : What are the Challenges and Opportunities for the Coming Years?, 2<sup>nd</sup> High-level Conference, Brussels, 26/04/2010. First tentative findings of a sector-specific analysis carried out in DG Enterprise and Industry, p. 2

Table 2 (cont.)

DE	Pulp, paper and paper products; publishing and printing	1.4	1.2	2.5	1.5	-0.9
DF	Coke, refined petroleum products and nuclear fuel	0.4	0.1	2.5	0.4	-2.0
DG	Chemicals, chemical products and man made fibres	1.8	0.8	5.2	4.2	-1.0
DH	Rubber and plastic products	0.8	0.8	2.3	2.9	0.6
DI	Other non metallic mineral products	0.8	0.7	2.9	1.9	-1.0
DJ	Basic metals and fabricated metal products	2.5	2.4	2.5	2.7	0.2
DK	Machinery and equipment n.e.c.	2.0	1.8	2.9	2.5	-0.4
DL	Electrical and optical equipment	2.0	1.7	6.8	6.5	-0.3
DM	Transport equipment	1.8	1.4	2.4	3.0	0.6
DN	Manufacturing n.e.c.	0.7	1.0	1.9	1.7	-0.2

Source: European Commission, Enterprise and Industry. EU Manufacturing Industry: What are the Challenges and Opportunities for the Coming Years?, 2<sup>nd</sup> high-Level Conference on Industrial Competitiveness, Brussels, 26 April 2010, p. 3

Given that the EU manufacturing industry turns out to perform well both from the viewpoint of value added yielded compared to that of employed man power, as well as from productivity and value added growth during the analyzed period, for low technology sectors (Food products, beverages and tobacco, Textiles and textile products, Leather and leather products, Wood and wood products) the ratio is inverted. In these sectors, the productivity growth throughout the period 1995-2007 was the lowest, that of value added was modest, and the man power employed significantly stunted, particularly in Textiles and textile products and Leather and leather products sectors. It is clearly that the four mentioned sectors are more and more difficult coping with foreign competition, coming, particularly, from the South-East Asia countries, having the necessary natural resources and low man power costs.

On the other hand, the medium and high technology sectors display appreciably better outcomes, from them standing out Electrical and optical equipment sector, which registered spectacular productivity and value added growth, simultaneously with a slight restriction of employed man power.

## Structural Changes Taking Place in the Romanian Manufacturing Industry

The structural changes in the Romanian manufacturing industry - although some of them were ranged among those mentioned above which become manifest in the European industry - had not, however, the necessary intensity required by the turning adequately into account of comparative and competitive advantages the Romanian industry possessed.

The changes have been done with small steps, frequently unsatisfactory, and in some zones have taken place even in counterclockwise direction compared to trends that become manifest in the European and world economy. The Romanian manufacturing industry did not know the deep structural changes required by its modernization and competitiveness growth imperative, first of all by strong lessening of power- material- and labor-intensive sectors share and increasing share of those technological-intensive, with high value added and technological irradiation degree.

The analysis of structural changes taking place in the Romanian manufacturing industry throughout 2000-2008 period led to their grouping depending on the variation of their *share* in the industrial production value as follows (according to CAEN classification Rev. 2):

- *sectors whose share significantly increased* – Means of road transport, Crude oil processing, coal coking and nuclear fuel treatment, Rubber and plastic products, Metallic constructions and metal products, IT and office means, Electric machinery and appliances, Radio, TV, and communications equipment;
- *sectors whose share slightly increased* – Publishing houses, polygraphy and recording reproducible registrations, Manufacturing of construction materials and other products of non metallic minerals, Means of transport not included in road transport;
- *sectors whose share was relatively constant* – Medical, precision, optical, watch-making instruments and apparatus;
- *sectors whose share slightly decreased* – Pulp, paper and paper products, Machinery and equipment (except electric and optical equipment), Furniture and other activities not elsewhere classified;
- *sectors whose share significantly decreased* – Food and beverages, Clothing articles, Textile products, Leather and footwear, Chemical substances and products, Metallurgy.

The analysis by industrial sectors led to the finding that the sectors' production value as share in the industrial production total value varied depending on manufacturing industry reorganization trends; some sectors which registered a value added level above the average increased their share, representing a gladdening reality, but it shouldn't pass over the matter that in the case of certain sectors (for instance, IT and office means) the growth, though notable in relative terms, was insignificant in absolute terms, its starting basis being extremely low.

At the same time, it is worth noting that the physical volume of the main industrial products significantly varied in the case of most sectors, depending on the market demand and difficulties met by enterprises in their efforts to modernize production and improve competitiveness of their products; drastic reduction of some products of vital necessity for the national economy, having long traditions, technical expertise and demand on domestic and international markets (electrical motors of 0.25 kW and over, electric and diesel locomotives – whose production ceased, mineral oils etc.) was deeply disquieting.

For the purpose of carrying out a comparative analysis regarding the amplitude and directions of structural changes taken place in the EU and Romania manufacturing industry, the next table shows the changes in intensity expressed, at an acceptable approximation, by the number of plus or minus signs.

Unfortunately, the scanty availability of data provided by the Romanian Statistical Yearbook compelled us to compare the variation of the three indicators presented in Table 2 by reference to different periods for the two compared entities – the European Union and Romania.

**Table 3.** Trends of some indicators variation at the level of manufacturing industry and its constitutive sectors, in the EU27 and Romania

	UE27 1995-2007			Romania 2000-2008		
	Productivity growth	Value added growth	Man power growth	Productivity by employee growth	Value added growth *	Man power growth **
Manufacturing industry	++	++	-	+++++	++	+
Food, beverages, tobacco	+	+	-	++++	++	+++++
Textiles and textile products	+	-	-----	++	+	-----
Leather and leather products	0	---	-----	-	++	+
Wood and wood products	++	+	--	+++++	++	++
Pulp, paper and paper products; Publishing and printing	++	+	--	++	++	+++++ +++++ ++
Coke, refined petroleum products and nuclear fuel	++	-	----	++++	++	-----
Chemicals, chemical products and man made fibres	++++	++++	--	+++++	++	---
Rubber and plastic products	++	+++	+	+++++	++	+++++ +++++
Other non metallic mineral products	++	++	--	+++++ +++++	++	+
Basic metals and fabricated metal products	++	++	+	++++	+++	----
Machinery and equipment	++	++	-	+++	++	----
Electrical and optical equipment	+++++	+++++	-	++++ ++++	+++	+++++ +++++ +++
Transport equipment	++	+++	+	+++	+++	+++
Manufacturing n.e.c.	++	+	-	---	++	++

\* 2003/2007 period

\*\* Employees average number by activities of industry, at the level of CAEN division

Source: data processing by author

## Specialization of the EU Member Countries

The specialization degree of a country economy is determined with the following *relation*:

$$S_i = \sqrt{(1 - S_{i1})^2 + (1 - S_{i2})^2 + \dots + (1 - S_{in})^2} \quad (1)$$

where: i – reference country; n – industrial sectors.

It represents euclidian distance between the country specialization vector and the vector corresponding to suppositional case of specialization lack, namely that in which the specialization coefficient has unitary value for each sector.

Determined by the mentioned relation, the specialization degree  $S_i$  of the EU member countries places them in decreasing order presented in the next table. It should be underlined the idea that the specialization degree indicator expresses higher or lower level of a country specialization, but does not point out the direction in which it takes place.

**Table 4.** Specialization degree of the EU member countries by 2007

	<b>Specialization degree</b>		<b>Specialization degree</b>
<b>Malta</b>	12,19	<b>Hungary</b>	3,44
<b>Romania</b>	6,96	<b>Italy</b>	3,38
<b>Bulgaria</b>	6,72	<b>Poland</b>	3,28
<b>Greece</b>	5,71	<b>Netherlands</b>	3,28
<b>Latvia</b>	5,12	<b>Slovenia</b>	3,06
<b>Portugal</b>	5,08	<b>Spain</b>	3,04
<b>Luxembourg</b>	5,07	<b>Sweden</b>	2,48
<b>Lithuania</b>	5,06	<b>United Kingdom</b>	2,43
<b>Ireland</b>	4,70	<b>Germany</b>	2,37
<b>Slovakia</b>	4,42	<b>Austria</b>	2,25
<b>Denmark</b>	4,20	<b>Belgium</b>	2,13
<b>Finland</b>	3,73	<b>France</b>	1,64
<b>Czech Republic</b>	3,68	<b>Estonia</b>	n.d.
<b>Cyprus</b>	3,57		

Source: European Comision. Enterprise and Industry. EU Industrial Structure 2009. Performance and Competitiveness, 2010, pag. 60

According to the paper this table was reproduced from, Malta, the country with the highest specialization degree, has its economy predominantly profiled on fishing, other manufacturing (according to NACE classification), other services, electrical and optical equipment. Romania, situated on the second place in the hierarchy, is specialized in agriculture, food industry, textiles, clothing articles, leather and leather products, crude oil processing. A specialization close to that of Romania is presented also by Bulgaria, with more mining and quarrying. Greece has developed the sectors of fishing, crude oil processing, hotel keeper, and restaurants.

At the bottom of this hierarchy there are situated the countries with the lowest specialization degree, meaning multilateral development of their economies and, implicitly, their reduced vulnerability to haphazard changes which would affect evolution of a sector or another. In spite of their economies outstanding diversification, the countries belonging to this zone have certain sectors intensely developed. For instance, France is specialized in agriculture, fishing, defense industry, non commercial services (public administration, health, social assistance). Belgium is profiled, particularly, on crude oil processing, coal coking and nuclear fuel treatment, chemicals, chemical products and man- made fibers. Austria is specialized on wood processing and wood products, machinery and equipment, hotel keeper, and restaurants. Germany, it is known, has very developed sectors as machinery and equipment n.e.c., electrical and optical equipment, means of transport sectors.

Growth or reduction of a country's economy specialization degree is a long standing process, influenced by a lot of factors, among which the industrial policy decided upon by each country is one of the most important. Analysis of the EU member countries specialization degree in the period 1995-2005, therefore in a long lapse of time, spotlights the fact that in most countries changes were not of great amplitude.

Only in two countries, specialization was considerable deep – Denmark, to which the specialization degree increased from 2.23 in 1995 to 4.20 in 2007, and Malta – from 4.42 to 12.19 in the same reference years.

In 15 of the EU 27 member countries the specialization degree increased, but in lower proportions than in the case of the two above mentioned countries. This category includes also the countries which in the Table 4 displayed the smallest specialization degree, namely France (growth from 1.32 in 1995 to 1.64 in 2007), Belgium (from 1.95 to 2.13), Austria (from 2.00 to 2.25) and Germany (from 1.83 to 2.37), representing the expression of the fact that ensuring

high competitiveness on international markets supposes specialization deepening, even made slowly.

The former communist countries knew different evolutions with respect to their specialization, for most the specialization degree reducing in the mentioned interval: Bulgaria – from 8.70 to 6.72; Latvia – from 6.76 to 5.12; Romania – from 7.59 to 6.96; Slovakia – from 6.06 to 4.42; Hungary – from 5.07 to 3.44. On the other hand, the following countries emphasized their specialization - Czech Republic (from 3.22 to 3.68), Lithuania (from 4.94 to 5.06) and Poland (from 2.78 to 3.28).

## Conclusions

- The comparison of structural changes taking place in the EU and Romania manufacturing industry allowed us to highlight some relevant aspects.
- The manufacturing industry registered growth of the three indicators level (see Table 3) for the two compared entities, except for man power in the case of the EU27. These evolutions turn out that the manufacturing industry has in the two entities a sound base for asserting its rising role in modern economy, according to reasons mentioned above;
- In most sectors of the manufacturing industry, the evolution trends of the three indicators level are congruent in the two compared entities. Exception makes the sector Leather and leather products, in which there are diverging evolutions: unchanging productivity and significant decrease of the other two indicators in the EU27, growths (excepting productivity by employee) in Romania, as effect of a high demand for the Romanian products on the domestic and foreign markets, as well as massive penetration of foreign capital through direct investment. The gladdening convergence of indicators evolution trends in the two compared entities turn out that technological modernization and organizational restructuring taking place in the Romanian manufacturing industry were in line, as orientation and change intensity, with the coordinates specific to the European industry;
- The productivity increased in most analysed sectors both in the EU27 (excepting Leather and leather products sector) and Romania (with two exceptions – Leather and leather products and Manufacturing n.e.c.), as effect of production technologies and qualifications improvement. In Romania the growths were more substantial, because the reference basis was significantly scanty; also, the differences between growth paces registered in different sectors were significantly larger;
- The value added increased, also, in all sectors, both in the EU27 (with three exceptions – Textiles and textile products, Leather and leather products, Coke, refined petroleum products and nuclear fuel) and Romania (no exception). The remarks concerning Romania made at the previous point are also valid in this respect;
- The indicator ”man power growth” diminished in most sectors of the EU27 manufacturing industry, with three exceptions, as an effect of superior technologies implementation and structural adjustment carried out ceaseless. In Romania, the number of sectors in which the employees average number increased was larger – eight –, bringing about a growth at the level on the manufacturing industry as a whole; the increasing or decreasing differences among sectors are more emphasized. The level of this indicator in Romania, very much different from that in the EU, is the outcome of man power reallocation among sectors and the reflex of the fact that organizational restructuring process of enterprises from the respective sectors is not yet finished;
- The congruence of analysed indicators evolution trends at the level of manufacturing industry and its constitutive sectors in the EU27 and Romania is beneficial for the

Romanian industry, since it offers a large field for complementarities identifying, namely opportunities for intra-industries trade within the EU, as well as niches in the European industry that may be turned profitable into account by the Romanian producers. From these opportunities, there are two sectors ruled conspicuously out which significantly stunted in the European industry and registered a diminution of analysed indicators – Textiles and textile products and Leather and leather products;

- The specialization degree of the Romanian economy diminished in the decade 1995-2005, similarly with the trends which become manifest in the same period in most of the EU member countries.

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## Specializarea sectorială a țărilor membre ale Uniunii Europene

### Rezumat

*Articolul tratează specializarea sectorială a țărilor membre ale UE, abordată din trei puncte de vedere – tehnologia, calificările necesare și intensitatea creșterii sectoarelor. O atenție specială este acordată schimbărilor produse în sectoarele componente ale industriei prelucrătoare din România, trăgându-se concluzii cu privire la concordanța sau divergența acestora cu tendințele manifestate în UE.*