

Energy Consumption and Efficiency of the Romanian Industry in the Last Two and a Half Decades

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Abstract

The article deals with the main aspects of energy area throughout a period of 25 years, in the context of transition of the Romanian economy to a functioning market model, the de-industrialization process and geo-political changes in the area. The issues refer to the evolution of energy consumption, the price of energy supply, turning to account of renewable resources, dependence on imported energy, energy efficiency.

Keywords: *energy consumption; energy price; energy dependence; energy efficiency.*

JEL Classification: *Q3; Q4.*

Introduction

Deindustrialisation is a complex process which entails significant and continuous industrial activity limitation (essentially the manufacturing), and has become a defining feature of economic growth in developed countries since the eighties of the last century. In various countries, the process was conducted and is ongoing in various rhythms, due to the considerable diversity of conditions and factors that determine and imprint it various particularities from one country to another. Indeed, the position of manufacturing in the overall structure of an economy depends not only on its own performance (productivity, costs, productive, innovative and commercial potential), but also on the other branches of the economy which are beneficiaries of industrial products.

Since 1990, Romania, being engaged in the transition process from the centralized economy model to the free market one, has also underwent such a process, following the trends of the last four or five decades in the global economy, primarily in most industrialized countries. Deindustrialisation has ample economic and social consequences, affecting all sectors of society, at national, regional and enterprise level, requiring the design and implementation of consistent strategies and programs aiming to counteract its negative effects and paving the way for productive potential recovery of entities affected. The energy field is one where the effects of the Romanian economy's deindustrialization were deeply felt, analysed in terms of energy consumption, dependence, efficiency.

Energy Consumption

Restricting industrial activity was reflected in the reduction of energy consumption in the energy balance of the country. Closure of large production capacities in manufacturing industries such as petroleum processing, petrochemical, metallurgy, cement, known for their high energy-intensity, resulted in a significant energy consumption decrease of industry, the main largest consumer in the economy. Final energy consumption variations across industry, including construction, and by manufacturing activities are shown in the following figure.

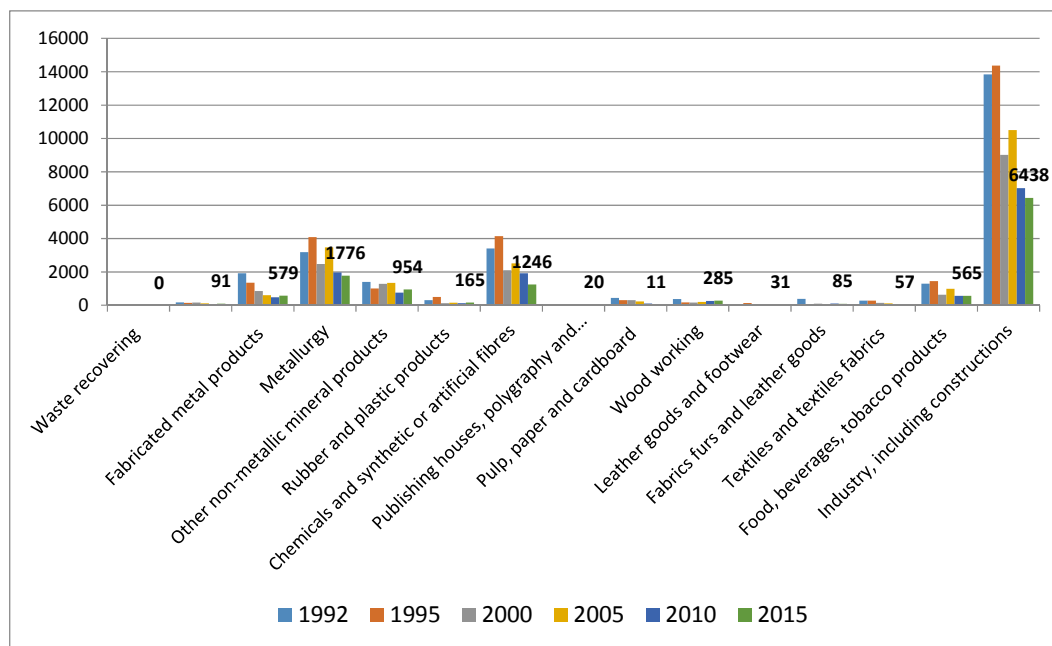


Fig no. 1. Final energy consumption in industry, including construction, and manufacturing activities, 1992 ... 2015 (thou tons of oil equivalent)

Note: To ensure clarity of the figure, the figures shown relate only to 2015.

Source: National Institute of Statistics. TEMPO-Online Time series, IND 109A

Although between 1992-2015 the final energy consumption of manufacturing activities fluctuated for some, the one recorded in 2015 was considerably lower than the level in 1992 in all activities except Publishing houses, polygraphy and reproduction of recorded media. Reductions were determined by restricting activities and technological improvements that have been made in them. Final energy consumption recorded, in the last year of the period compared to the first year of it, lower values in the energy-intensive activities: Chemistry and man-made fibres - 36.6%; Other non-metallic mineral products - 67.8%; Metallurgy - 55.7%; Fabricated metal products, Machinery and equipment - 30.3%. Across the industry, including construction (the consumption of the latter is small compared to that of industry), the level of the indicator was 46.6% in 2015 compared to 1992.

The same final consumption of electric and thermic energy, by the same entities, is represented in the following table.

Table 1. Final consumption of electric (EE) and thermic (TE) energy in industry, including construction, and by manufacturing activities, 1992 ... 2015

(million KWh, respectively thou Gcal)

	1992		1995		2000		2005		2010		2015	
	EE	TE	EE	TE	EE	TE	EE	TE	EE	TE	EE	TE
Industry, including constructions	25334	21339	23343	12551	19909	4680	23684	3548	20381	2824	20524	2702
Food, beverages, tobacco	1553	1901	1130	1776	1302	727	2905	501	1562	230	1824	317
Textiles	827	678	512	559	318	134	290	116	301	52	251	4
Clothing articles	109	468	110	226	322	205	233	44	364	57	279	49
Leather goods and footwear	96	541	71	114	99	111	81	97	148	6	214	3
Manufacture of woods	454	253	277	367	221	116	549	183	701	199	980	19
Pulp, paper, cardboard	925	300	769	243	670	197	480	37	370	:	481	32
Printing houses, poligraphy	28	51	20	41	27	26	62	12	198	9	140	24
Chemicals and synthetic or artificial fibres	5512	8902	4234	4608	3164	1539	3417	1556	2768	1682	2014	1874
Rubber and plastic products	424	1989	515	791	326	115	463	18	700	84	1082	22
Other non-metallic mineral products	1631	1353	1458	199	1772	211	2028	251	1914	66	2374	43
Metallurgy	6984	271	7439	992	5893	166	8463	33	6703	106	5694	15
Metallic constructions, machinery and equipment	4380	2909	3758	1702	2896	703	2338	354	2741	194	3435	225
Furniture and other industrial activities	266	1101	268	455	366	224	320	132	321	6	518	13
Waste recovering	10	3	4	5	12	2	21	1	:	.	:	:

Source: National Institute of Statistics, Data base TEMPO – Time series, IND 112A și IND 113A

In industry, including construction, the final energy consumption, electric and thermic, decreased in 2015 compared to 1992, far more in the case of thermic energy than in the electric energy, the consumption representing, for the former, in 2015, 12.7% from that in 1992, and for the last - 81.0%. For energy-intensive industries, the levels of final consumption of electric energy, respectively thermic, in 2015 compared to 1992, were: Chemistry and man-made fibres - 36.5% and 21.1%; Other non-metallic mineral products - 145.6% and 3.2%; Metallurgy - 81.5% and 5.5%; Metallic construction, machinery and equipment - 78.0% and 7.7%. One of the possible explanations for the more pronounced decrease of the final consumption of thermic energy compared to electric one is that many industrial units have built their own plants producing thermic energy, whose production and consumption are not included in the statistics, which refers to thermic energy supplied in a centralized system.

The Price of Energy Delivery

An important factor that determines energy consumption and encourages producers to save energy necessary to carry on their activity is the price of energy delivery to industrial end-users. State of the price development in the period 2005-2016, in some of the European Union member countries, is shown in the following figure.

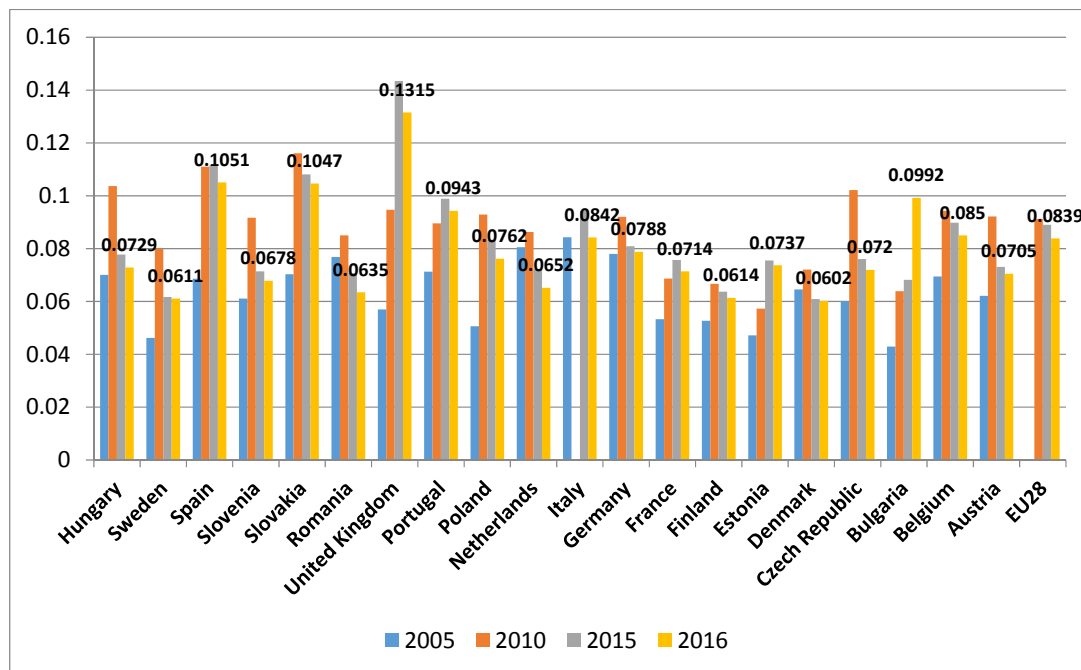


Fig. no. 2. Price of energy supplied to medium-sized industries in some European countries, 2005 ... 2016 (euro/KWh)

Note: To ensure clarity of the figure, the figures shown relate only to 2016.

Source: EUROSTAT. Electricity prices by type of user. Code: ten00117

It should be noted that the price of electricity for industrial consumers is the national average price in euros / kWh, without taxes, applicable in the first quarter of each year for medium-sized industrial consumers (consumption on Band Ic, with annual consumption between 500 and 2000 MWh). In order to assess this price in Romania, certain representative member countries of the European Union are included in the figure. Sometimes big differences between prices in different countries and their random developments can be explained by considerable variety of conditions in each country in terms of resources endowment, energy consumption structure by main consumers, energy import prices, etc. Romania had, in 2016, one of the lowest energy prices among the countries shown in the figure (representing 75.7% of the EU28 average price level), which is an advantage conferred by the relatively low energy share in the cost of industrial products compared to other countries, including developed ones (e.g. United Kingdom, Spain).

Lack of other statistical data concerning energy area in the industry as a whole and, more disaggregated, in that of manufacturing activities, urge us to make references and assessments solely on economy, in which manufacturing is one of the main consumers.

Turning to Account Renewable Resources

Another area in which Romania is proving to be a good performer is the turning to account renewable resources (electricity produced by hydropower, exclusively pumping, wind, solar, geothermal and biomass), the level reached in 2014 in terms of share of these resources in gross consumption energy standing for 151.6% compared to that recorded by the EU28, according to data from the following figure.

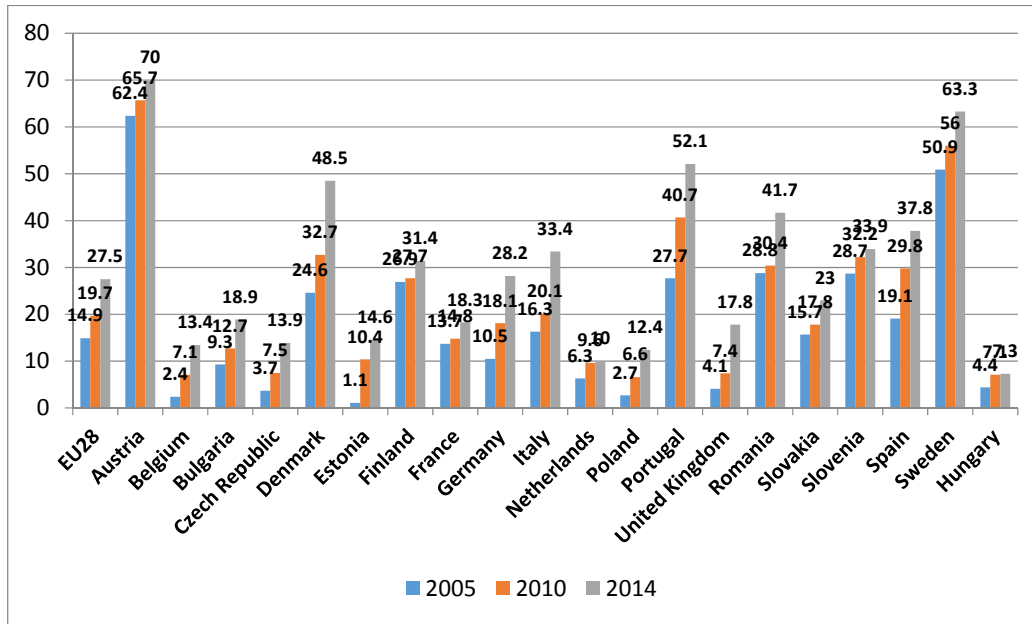


Fig. no. 3. The share of renewable resources in total gross electricity consumption in some member countries of the European Union, 2005, 2010, 2014 (%)

Source: EUROSTAT. Electricity generated from renewable sources (% of gross electricity consumption). Code tsdcc330

Good position of Romania in relation to average EU28 is, also, a competitive advantage for manufacturing, whereas the cost of energy produced from renewable resources is lower than the energy produced from classical resources, which contributes to maintaining moderate price of energy delivered to industry and, thus, reducing the cost of industrial products.

Dependence on Energy Import

Another advantage of the Romanian economy and industry stems from the relatively low level of energy dependence on imports to meet their own energy needs compared to the EU28 average and, therefore, to most member countries (see following figure).

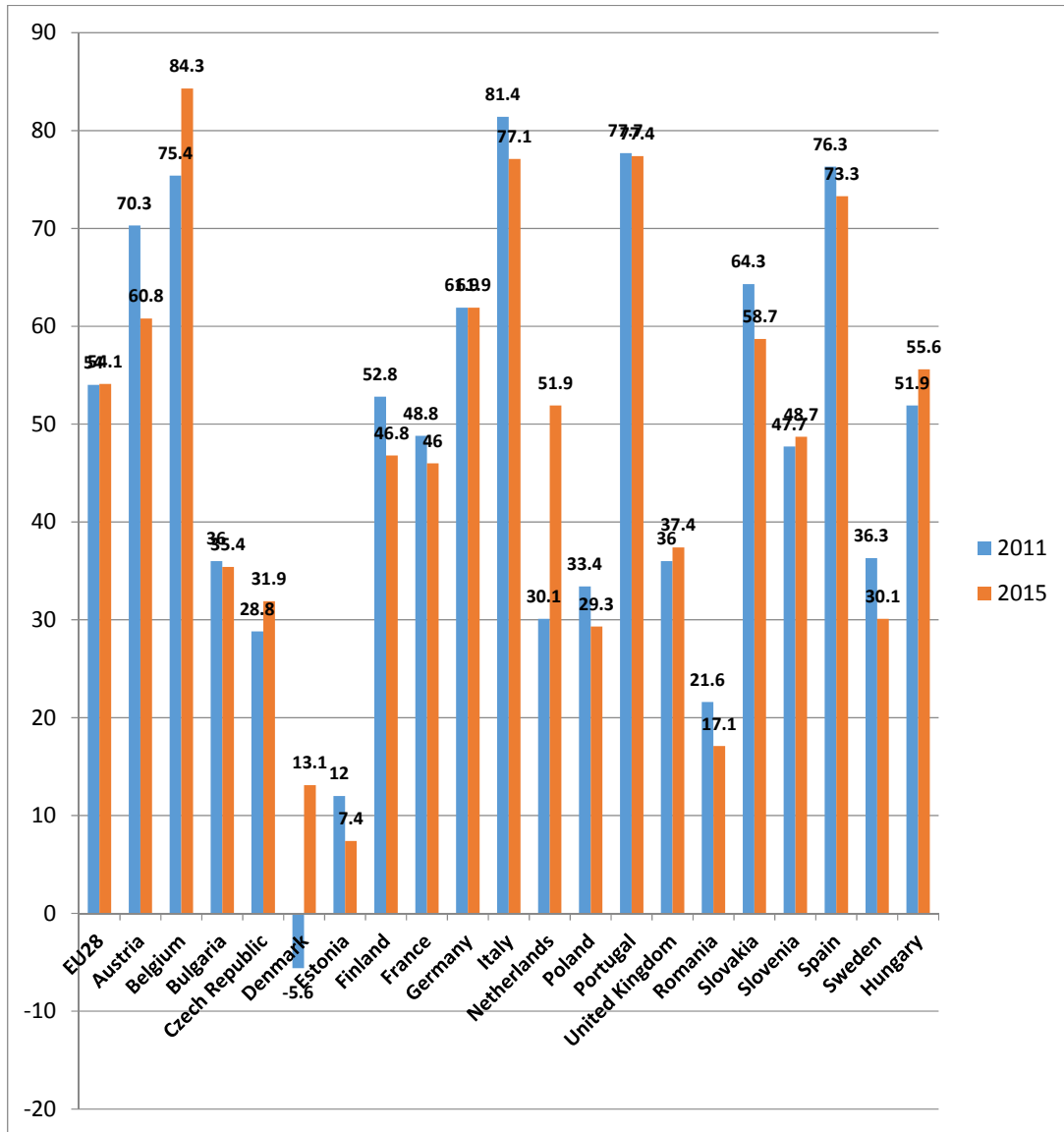


Fig. no. 4. Energy dependence of some member countries of the European Union, 2011, 2015 (%)

Source: EUROSTAT. Data base. Energy dependence (%). Code: tsdcc310

Except Estonia and Denmark, Romania has a much lower level of this indicator compared to other member countries, as a result, for the time being, of energy resources at its disposal, some of which are on the verge of exhaustion.

Detailed by energy products, the degree of energy independence was for Romania, between 1992 2015, as shown in the following figure.

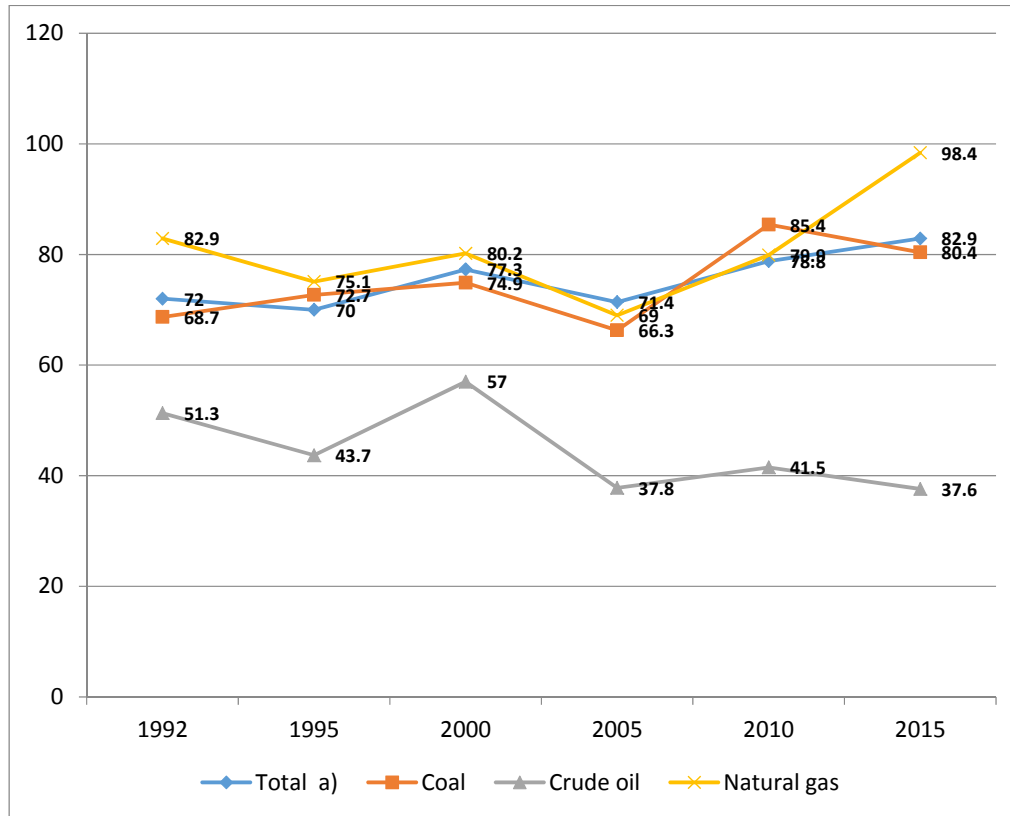


Fig. no. 5. Romania's degree of energy independence, overall and by energy products, 1992 2015 (%)

Note: a) Including energy products produced and consumed in households; b) Including coke; c) Excluding gasoline and ethane from extraction, which are included into crude oil.
Source: National Institute of Statistics. TEMPO – Online. Time series. IND 121A

Energy Efficiency Indicators

Despite the competitive advantages mentioned, but as a result of extensive development of the economy during the centralized economy system and the perpetuation so far of many failures and harmful practices (insufficient structural adjustments, wasteful, clumsy liberalization of the energy market, etc.), energy efficiency indicators of Romania are significantly lower than their average in the European Union. Thus, the energy intensity of the Romanian economy - which means gross domestic consumption to GDP in Kg. equivalent oil / 1000 € - was, in 2015, 1.88 higher than the EU28 average (see following figure, the intensity is highlighted by figures from 2015).

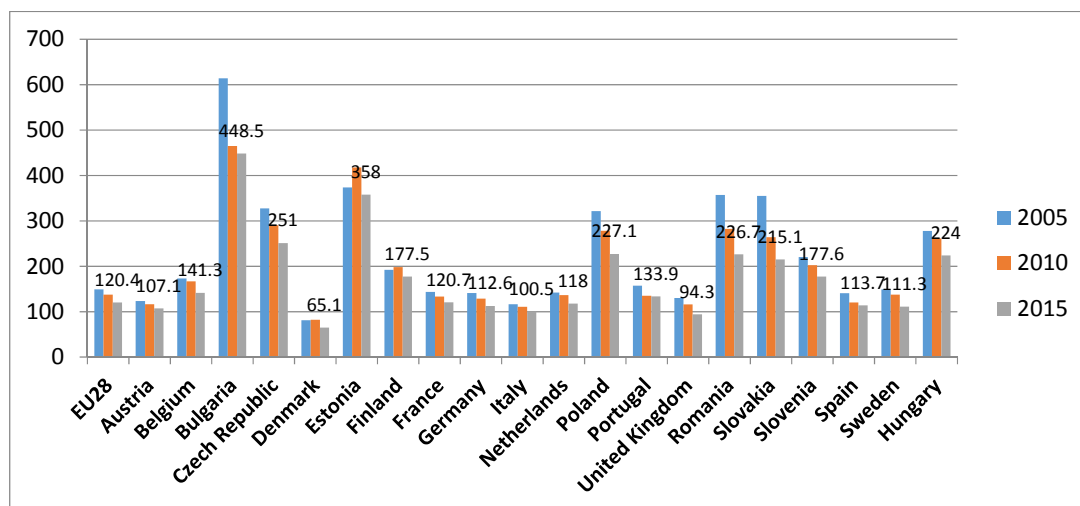


Fig. no. 6. The energy intensity of the economy of some EU member countries in 2005, 2010, 2015 (kgep / 1000 euros)

Source: EUROSTAT. Data base. Energy intensity of the economy. Code: tsdec360

On average, the former communist member countries have energy intensity significantly higher than the other countries included in the table, as a prevailing result of the structure of their economy and industry, and application of less efficient technology in productive activities and households. All countries, without exception, have reduced, to varying degrees, energy intensity during the same period, Romania recording the highest reduction (2015 level represented 63.5% of that recorded in 2005; for the EU28, the same level was 80.7%).

Regarding the inverse indicator to that previous of energy efficiency, namely energy productivity, in euro/kgep, Romania's situation is unfavourable, the level registered in 2015, representing 53.0% of that of UE28, according to figures in the following table.

Table 2. Energy productivity in some European Union member countries, 2000...2015 (euro/kgep and PPS/kgep)

	In euro/kgep				In PPS/kgep			
	2000	2005	2010	2015	2000	2005	2010	2015
EU28	6.5	6.7	7.3	8.3	5.6	6.3	7.3	9.0
Austria	8.7	8.1	8.6	9.3	7.1	7.0 ^b	7.8	9.5
Belgium	5.3	5.8	6.0	7.1	4.2	5.0	5.5	7.1
Bulgaria	1.3	1.6	2.2	2.2	2.5	3.4	4.8	5.3
Czech Republic	2.8	3.1	3.4	4.0	3.5	4.2	4.9	6.3
Denmark	11.4	12.3	12.1	15.4	6.8	8.0	9.1	1.4
Estonia	2.1	2.7	2.4	2.8	2.3	3.4	3.6	4.5
Finland	4.9	5.2	5.0	5.6	3.7	4.1	4.3	5.2
France	6.9	7.0	7.5	8.3 ^p	5.4	5.9	6.7	8.1 ^p
Germany	6.9	7.1	7.8	8.9	5.7	6.6	7.4	9.3
Italy	8.9	8.6	9.0	9.9	7.7	7.8	8.9	10.8
Netherlands	7.1	7.0	7.3	8.5 ^p	5.6	6.1	6.6	8.1 ^p
Poland	2.8	3.1	3.6	4.4	4.0	4.9	6.1	8.0
Portugal	6.6	6.4	7.4	7.5	6.7	7.4	9.1	10.0 ^c
United Kingdom	6.8	7.7	8.6	1.6	5.8	7.1	8.0	10.6
Romania	2.3	2.8	3.5	4.4	3.2	4.5	7.4	10.1 ^p
Slovakia	2.3	2.8	3.8	4.6	2.9	4.0	5.8	7.4
Slovenia	4.3	4.5	4.9	5.6	4.9	5.6	5.9	7.5
Spain	7.0	7.1	8.3	8.8 ^p	6.2	7.1	8.7	9.9
Sweden	6.1	6.7	7.3	9.0	4.7	5.1	5.9	7.7
Hungary	3.2	3.6	3.8	4.5	4.2	5.3	6.4	8.0

Source: EUROSTAT: Data Base. Energy productivity. Code: t2020_rd310

In terms of purchasing power standards (PPS), the level of the same indicator for Romania is above EU28 average by 12,2%, as a result of lower prices of all products, including that of energy, compared to most other member countries. Energy productivity, expressed in EUR / kgep, achieved by the former communist countries of Central and Eastern Europe is considerably lower than that registered by the countries of Western Europe; the same indicator expressed in PPS / kgep shows that Romania is efficient from this point of view, roughly at the level of Italy and the United Kingdom, and over all the other former communist countries.

Conclusion

The final energy consumption of Romanian manufacturing industry as a whole and its component activities has decreased significantly after 1990, as a result of productive activities restriction and the refurbishment and modernization of most production processes. Energy delivery prices offered to manufacture industry competitive advantage, their relatively low level compared to that from other countries meaning lower cost for producers. Romania recorded notable performances in terms of renewable resources, exceeding significantly, from the standpoint of their share in total electricity consumption, the UE28 average. Romania's energy dependence is low. Economy and manufacturing industry still keep the feature of energy-intensity, in terms of energy efficiency indicators - energy intensity and energy productivity - performance being modest, well below the EU28 levels.

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